Basic Financial Management

Third Edition

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Preface to the Third Edition

We are pleased to place in the hands of the readers this thoroughly revised edition of our highly successful book **Basic Financial Management**. The focus continues on equipping the readers with the theories, concepts and techniques that can be applied to corporate decision-making whether they are strategic, analytical or simply routine decisions, a financial manager faces everyday.

Changes in the Third Edition

Numerous changes distinguish this edition from the earlier edition. They include chapter-wise updates of contents.

Updated Chapter—Contents The thrust of the revision of the existing chapters is on incorporating up-to-date knowledge about financial management discipline as well as the regulatory and policy developments. The important chapter-wise updates of the contents of the third edition are summarised below:

Chapter	*Addition/Inclusion/Rewriting/Pruned*
5	**(i)** Effect of depreciation
	(ii) Working capital effect
6	**(i)** Figure 6.1 (NPV and discount rate) re-drawn
	(ii) Modified IRR method
	(iii) Fallout of capital rationing
7	**(i)** Debt-yield plus risk premium approach
	(ii) Cost of equity capital (pruned)
9	**(i)** Concept of zero working capital
	(ii) Policies related to current assets investment
10	Framework of Indian CP market (rewritten)
12	Cost of additional investment in debtors, cash and inventories added
15	**(i)** Bankruptcy costs
	(ii) Figure 15.4: Cost of equity and bankruptcy cost

	(iii) Figure 15.5: Degree of leverage and WACC
	(iv) Trade-off theory
	(v) Signalling theory
	(vi) Pecking-order theory
17	IRR approach to evaluate lease versus borrow/buy decision has been added
18	Residual theory of dividends has been added in Section 1
19	Section 2 on bonus shares and stock splits has been expanded

Pedagogical Features The time-tested pedagogical features (listed below) of the second edition have been retained and new features added.

Learning Objectives Each chapter begins with a number of learning objectives to ensure broad understanding of the concepts, theories and techniques of financial management.

Mini Cases Another distinct feature is the inclusion of **mini cases** in serveral chapters. These chapter-end cases can be used by the readers to synthesise and apply related concepts, theories, and techniques.

Multiple Choice Questions The inclusion of multiple choice questions with answers is yet another distinct feature of the new edition.

Spreadsheet/Excel-Application Spreadsheet solutions have been provided in several chapters.

Special Features

With the aim of developing the readers' ability in the application of various financial principles and techniques, the special features of the third edition are the following:

Up-to-date Comprehensive Coverage The book is structured around financial decision-making and comprehensively covers objectives of financial management, organisation of finance function, time value of money, valuation of bonds and shares, risk and return, financial analysis, capital budgeting decisions, cost of capital, capital structure decisions, dividend policy decisions and working capital management.

Target

The book is primarily targeted at teachers/students of finance, management, commerce, accounting and related professional disciplines/courses. Practitioners/professionals would also find it invaluable text.

Acknowledgements

Finally, we would express our intellectual debt of gratitude to the numerous authors who have enriched the stream of literature in finance on which we have liberally drawn. Some of the more specific references are indicated in the text itself.

Our colleagues Prof. R. K. Arora (International Management Institute, New Delhi) and Dr. Alok Dixit (IIM Lucknow) have helped in several ways, in particular, in contributing the spreadsheet solutions included in various chapters of the book. We gratefully acknowledge their contribution.

The authors record a word of appreciation for Professor Surendra S. Yadav's contribution. The authors have also a word of appreciation for the excellent support from Ms. Vibha Mahajan, Mr. Tapas K. Maji, Mr. Hemant K. Jha, Mr. Manohar Lal, Mr. Atul Gupta, and Ms. Silvi Dua of Tata McGraw-Hill for the speedy and excellent publication of the book.

AUTHORS

Preface to the First Edition

Objective

Basic Financial Management describes the framework of financial management in terms of the three inter-related core areas, namely, investment, financing, and dividend policy. It discusses the basic concepts, theories and techniques in context of the Indian financial, legal, and taxation environment. In response to the feedback from teachers and students on our book Financial Management—Text and Problems, 3rd edition, this book is an attempt to customise financial management to the requirements of the undergraduate students in commerce and management. It is designed for B.Com., B.B.A and B.B.S. students of Indian universities and management institutes. It will also be useful for the professionals and practioners.

Organisation

Consistent with the main objective of the book, the contents of the book are structured around the three inter-related components of financial management, that is, investment, financing, and dividend policy. The book consists of five Parts.

Part 1 comprises two chapters. Chapter 1 describes the nature of financial management in terms of its relationship with related disciplines, its scope, objectives, and the organisation of financial management function. The basic financial concepts, namely, time value of money, valuation of long-term securities and risk and return are discussed in Chapter 2.

One core area of financial management is the investment decision relating to both long-term and current assets. While long-term investment decision is covered in Part 2, the management of current assets is examined in Part 3. The principles and techniques of capital budgeting are elucidated in Chapter 3 of Part 2. The next chapter of this Part (Chapter 4) is devoted to a discussion of the concept and measurement of cost of capital.

Part 3 deals with the issues and problems involved in the management of current assets. The theory of current assets/working capital management and its planning are illustrated in Chapters 5 and 6 respectively. The components of current assets, that is, cash and marketable securities, receivables and inventory are explained in the next 3 chapters (7 to 9).

The second core area in financial management is financing decision. The three chapters of Part 4 deals with leverage (Chapter 10), cost of capital and valuation (Chapter 11) and factors affecting capital structure (Chapter 12).

Part 5 of the book covers the third core area of financial management. The theoretical

relationship between dividend and valuation, and the determinants of dividend policy of a firm are described in Chapters 13 and 14 respectively.

Pedagogical Features

The pedagogy of the book aims at developing the readers' ability in understanding the various financial concepts and their application in a real business situation. Apart from a comprehensive and up-to-date coverage of the core of financial management, the pedagogical features of the book are as follows:

Analytical approach: The orientation of the presentation of the theme is analytical and managerial with emphasis on the solution of financial problems of business firms in the context of the legal, taxation and financial environment in the country.

Chapter organisation: Each chapter is related to the managerial decision-making perspective. We have not merely described a concept but have also related it to the overall goal of wealth maximisation. After describing a concept, its application is illustrated with the help of step-by-step examples to improve clarity. In the preparation of the text, we have kept readability constantly in mind and have accordingly used a clear and concise, by and large non-mathematical writing style, especially in the treatment of concepts requiring the use of mathematics.

Numerous Illustrations/solved problems, and exercises: A comprehensive set of real-life problems, including some from professional examinations, at the end of each chapter are intended to serve as a review guide to test the readers' understanding of the subject. Numerous end-of-chapter exercises are included together with answers to help preparing detailed solutions.

Procedural orientation and practice discussion: To enable the readers to understand the real world of finance, contemporary industry practices as also procedural aspects have been included at the relevant places in reasonable detail.

Financial tables, glossary and bibliography: A complete set of financial tables is included as a ready reckoner. A comprehensive glossary at the end of the text aims at helping the reader to master the vocabulary of finance. A select bibliography would be of special interest to teachers/advanced students of the subject.

Complementary volumes: The following are the related titles published by Tata McGraw-Hill:

- *Financial Management: Text and Problems, 3rd Edition*
- *Theory and Problems in Financial Management, 2nd Edition*
- *Cost Accounting*
- *Theory and Problems in Cost Accounting*

Basic Financial Management would hopefully receive on overwhelming response from readers, suggestions from whom for the improvement of the book are most welcome.

Authors

A Note to the Reader

Dear Reader,

The third edition of the book before you, ***Basic Financial Management: Text, Problems and Cases***, has evolved over the last 10 years as an outcome of our teaching experience at two premier academic institutions in the country—University of Delhi and IIT Delhi. An invaluable input has indeed been experience sharing and feedback from students, professionals and colleagues. Our endeavour has always been to satisfy the needs of professors and students. The book has emerged as a highly popular text-cum-reference book. One of the hallmarks of the current edition of the book is its teaching and learning system (pedagogy). The distinct features of the pedagogy pertain to the organization of the book and its various chapters.

Organisation of Book

The book is structured around financial decision-making, with a comprehensive coverage. A careful and thorough presentation of the financial consequences of managerial decision is the underlying **theme**.

The theme could be organised in several ways. We have used a modular (part-wise) approach. Although the text is sequential, teachers can assign almost any chapter as a self-contained unit on a standalone basis. This flexibility would enable them to customise the text to various teaching strategies and course lengths. For instance, the 19 chapters of the book can be used in **two** semester courses. The 14 chapters would be found useful in a course variously described as **Managerial Finance**, **Financial Management** and **Corporate Finance**. Chapters 3, 4 and 9–13 could be used in a course on **Management of Working Capital**.

Chapter-Contents

The contents of each chapter are related to a managerial decision-making perspective, pertaining to the firm's overall goal of wealth maximisation. To facilitate understanding by the readers, we have used a simple and lucid style in plain English. To satisfy their needs, the book incorporates a step-by-step teaching/learning system. The key elements of the system are portrayed in the Visual Walkthrough feature in the beginning of the book. The sequential elements of the system are briefly outlined below:

(i) Learning Objectives Each chapter begins with a number of learning objectives. They anchor the most important concepts/theories/tools/techniques to be learnt in the chapter.

(ii) Key Terms/Concepts and Margin Notes The key terms/concepts are discussed in the different sections of the chapter to facilitate their understanding. For help in study and review, their definitions appear on the margin when they are first introduced.

(iii) Key Equations They follow the key terms and help readers to identify the most important mathematical relationships.

(iv) Examples Key terms and equations are followed by examples. They provide immediate and concrete demonstration of how to apply the concepts/tools/techniques.

(v) Spreadsheet Solutions accompany calculator solutions and show the inputs, solutions and cell formulas of the spreadsheet. In this edition, spreadsheet solutions have been added in several chapters.

(vi) Summary Provides a bird's-eye-view of the main points discussed in the chapter.

(vii) Solved Problems A comprehensive set of a large number of real-life solved problems after summary illustrate an integrated view of the concepts/tools/techniques discussed in the chapter.

(viii) Chapter (Mini) Cases Solved problems are followed by mini cases in several chapters. They call for applications of concepts and techniques to a more complex realistic situation than the solved problems. They help strengthen practical application of financial tools and techniques.

(ix) **Examination Questions** Finally, examination questions are provided to familiarise the students with the broad pattern of examinations conducted by various universities/ Institutes during the last 5 years.

Both teachers and students would hopefully find these teaching/learning features of the book useful for better grasping of the discussion of the financial tools and techniques described in the book. We look forward to their feedback for refining/polishing them in future editions.

Authors
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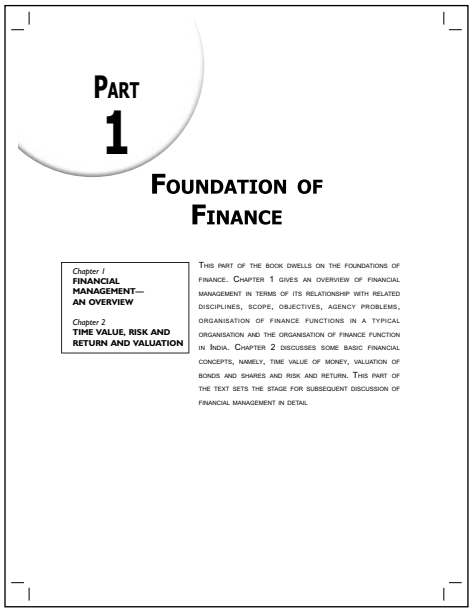
PART 2 Financial Analysis

PART 3 Long-term Investment Decision



PART
1

FOUNDATION OF FINANCE

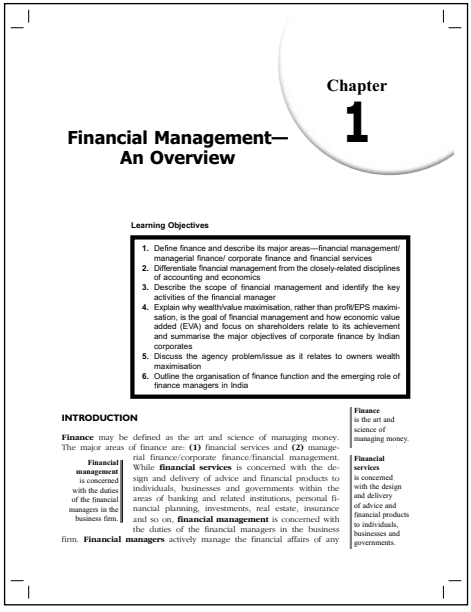
Chapter 1
FINANCIAL MANAGEMENT—AN OVERVIEW

Chapter 2
TIME VALUE, RISK AND RETURN AND VALUATION

THIS PART OF THE BOOK DWELLS ON THE FOUNDATIONS OF FINANCE. CHAPTER 1 GIVES AN OVERVIEW OF FINANCIAL MANAGEMENT IN TERMS OF ITS RELATIONSHIP WITH RELATED DISCIPLINES, SCOPE, OBJECTIVES, AGENCY PROBLEMS, ORGANISATION OF FINANCE FUNCTIONS IN A TYPICAL ORGANISATION AND THE ORGANISATION OF FINANCE FUNCTION IN INDIA. CHAPTER 2 DISCUSSES SOME BASIC FINANCIAL CONCEPTS, NAMELY, TIME VALUE OF MONEY, VALUATION OF BONDS AND SHARES AND RISK AND RETURN. THIS PART OF THE TEXT SETS THE STAGE FOR SUBSEQUENT DISCUSSION OF FINANCIAL MANAGEMENT IN DETAIL

Part Preview

Each part begins with an overview that provides a glimpse of the contents in its chapters.



Chapter
1

Financial Management—An Overview

Learning Objectives

1. Define finance and describe its major areas—financial management/ managerial finance/ corporate finance and financial services
2. Differentiate financial management from the closely-related disciplines of accounting and economics
3. Describe the scope of financial management and identify the key activities of the financial manager
4. Explain why wealth/value maximisation, rather than profit/EPS maximisation, is the goal of financial management and how economic value added (EVA) and focus on shareholders relate to its achievement and summarise the major objectives of corporate finance by Indian corporates
5. Discuss the agency problem/issue as it relates to owners wealth maximisation
6. Outline the organisation of finance function and the emerging role of finance managers in India

INTRODUCTION

Finance may be defined as the art and science of managing money. The major areas of finance are: **(1)** financial services and **(2)** managerial finance/corporate finance/financial management. While **financial services** is concerned with the design and delivery of advice and financial products to individuals, businesses and governments within the areas of banking and related institutions, personal financial planning, investments, real estate, insurance and so on, **financial management** is concerned with the duties of the financial managers in the business firm. **Financial managers** actively manage the financial affairs of any

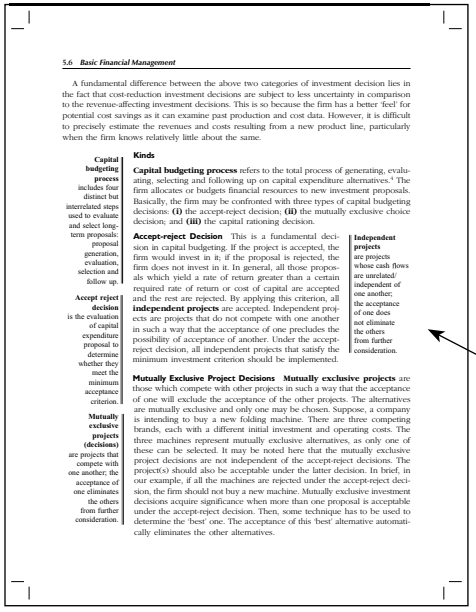
Finance is the art and science of managing money.

Financial management is concerned with the duties of the financial managers in the business firm.

Financial services is concerned with the design and delivery of advice and financial products to individuals, businesses and governments.

Learning Objectives

At the beginning of each chapter, the learning objectives outline what all the reader has to know when the chapter is completed



5.6 *Basic Financial Management*

A fundamental difference between the above two categories of investment decision lies in the fact that cost-reduction investment decisions are subject to less uncertainty in comparison to the revenue-affecting investment decisions. This is so because the firm has a better 'feel' for potential cost savings as it can examine past production and cost data. However, it is difficult to precisely estimate the revenues and costs resulting from a new product line, particularly when the firm knows relatively little about the same.

Capital budgeting process includes four distinct but interrelated steps used to evaluate and select long-term proposals: proposal generation, evaluation, selection and follow up.

Accept reject decision is the evaluation of capital expenditure proposal to determine whether they meet the minimum acceptance criterion.

Mutually exclusive projects (decisions) are projects that compete with one another; the acceptance of one eliminates the others from further consideration.

Kinds

Capital budgeting process refers to the total process of generating, evaluating, selecting and following up on capital expenditure alternatives.[3] The firm allocates or budgets financial resources to new investment proposals. Basically, the firm may be confronted with three types of capital budgeting decisions: **(i)** the accept-reject decision; **(ii)** the mutually exclusive choice decision; and **(iii)** the capital rationing decision.

Accept-reject Decision This is a fundamental decision in capital budgeting. If the project is accepted, the firm would invest in it; if the proposal is rejected, the firm does not invest in it. In general, all those proposals which yield a rate of return greater than a certain required rate of return or cost of capital are accepted and the rest are rejected. By applying this criterion, all **independent projects** are accepted. Independent projects are projects that do not compete with one another in such a way that the acceptance of one precludes the possibility of acceptance of another. Under the accept-reject decision, all independent projects that satisfy the minimum investment criterion should be implemented.

Independent projects are projects whose cash flows are unrelated/ independent of one another; the acceptance of one does not eliminate the others from further consideration.

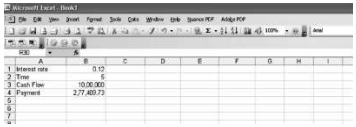
Mutually Exclusive Project Decisions **Mutually exclusive projects** are those which compete with other projects in such a way that the acceptance of one will exclude the acceptance of the other projects. The alternatives are mutually exclusive and only one may be chosen. Suppose, a company is intending to buy a new folding machine. There are three competing brands, each with a different initial investment and operating costs. The three machines represent mutually exclusive alternatives, as only one of these can be selected. It may be noted here that the mutually exclusive project decisions are not independent of the accept-reject decisions. The project(s) should also be acceptable under the latter decision. In brief, in our example, if all the machines are rejected under the accept-reject decision, the firm should not buy a new machine. Mutually exclusive investment decisions acquire significance when more than one proposal is acceptable under the accept-reject decision. Then, some technique has to be used to determine the 'best' one. The acceptance of this 'best' alternative automatically eliminates the other alternatives.

Margin Notes

Important concepts and key terms are briefly summarised in the notes given in the margins.

WALKTHROUGH

Spreadsheet Solution 2.10



The solution is similar to that in the previous example. There is only one difference. In the preceding example, the sum to be accumulated represented a future value. In this problem, the loan represents a present value. While using the PMT function, PV is to be entered as B3 and FV is to be entered as 0. The entry in cell B4 will be =PMT(B1,B2,-B3,0,0). The result would be the amount of annual installment.

3. An investor may often be interested in finding the rate of growth in dividend paid by a company over a period of time. It is because growth in dividends has a significant bearing on the price of the shares. In such a situation compound interest tables are used. Let us illustrate it by an Example (2.13).

***Example* 2.13**

Mr X wishes to determine the rate of growth of the following stream of dividends he has received from a company:

Year	*Dividend (per share)*	
1	Rs 2.50	
2	2.60]	1
3	2.74]	2
4	2.88]	3
5	3.04]	4

Solution

Growth has been experienced for four years. In order to determine this rate of growth, the amount of dividend received in year 5 has been divided by the amount of dividend received in the first year. This gives us a compound factor which is 1.216 (Rs 3.04 ÷ Rs 2.50). Now, we have to look at Table A-1 which gives the compounded values of Re 1 at various rates of interest (for our purpose the growth rate) and number of years. We have to look to the compound factor 1.216 against fourth year in the row side. Looking across year 4 of Table A-1 shows that the factor for 5 per cent is exactly 1.216; therefore, the rate of growth associated with the dividend stream is 5 per cent.

Examples

Solved examples help in the better understanding of concepts.

Summary

- Working capital management is concerned with the problems that arise in managing the current assets (CA), current liabilities (CL) and the interrelationships between them. Its opera-tional goal is to manage the CA and CL in such a way that a satisfactory/acceptable level of net working capital (NWC) is maintained.
- There are three concepts of working capital (WC): gross, net and zero. The gross WC means the total CA. The NWC is the difference between the CA and CL. Zero WC = inventories plus receivables minus payables.
- The NWC is necessary due to non-synchronous nature of expected cash inflows and required cash outflows. The more predictable the cash inflows are, the less NWC will be required and *vice-versa*. The NWC represents the liquidity position of a firm.
- The NWC has a bearing on liquidity, profitability and risk of becoming technically insolvent. In general, the greater is the NWC, the higher is the liquidity, the lower is the risk and the profitability, and *vice-versa*. The trade-off between profitability and risk is an important element in the evaluation of the level of NWC of a firm.
- Determination of financing mix is another important constituent of WC management. The financing mix refers to the proportion of CA to be financed by short-term sources (CL) and long-term sources (such as share capital and long-term borrowings). It is concerned with determination of relative share of these two broad sources in financing CA.
- There are three approaches to determine an appropriate financing mix: **(i)** hedging/matching approach, **(ii)** conservative approach and **(iii)** trade-off between these two.
- According to hedging approach, long-term funds should be used to finance the permanent/core part of the CA and the purely temporary and seasonal requirements (over and above the permanent needs) should be met out of short-term funds. This approach is a high profit-high risk financing mix.
- According to the conservative approach, the estimated total requirements of the CA should be financed from long-term sources. The short-term sources of finance should be used only in emergency situations. The firm has NWC equal to the excess of long-term financing over the permanent requirement. This approach is a low-profit, low-risk combination.
- Neither the hedging approach nor the conservative approach is suitable for determining an appropriate financing mix. A trade-off between these two extreme approaches would give an acceptable financing strategy.
- The need for working capital (WC) arises from the cash/operating cycle of a firm. It refers to the length of time required to complete the following sequence of events: conversion of cash into inventory, inventory into receivables and receivables into cash. The operating cycle creates the need for working capital and its length in terms of time-span required to complete the cycle is the major determinant of the firm's working capital needs.
- Working capital can be **(i)** permanent and **(ii)** temporary. While the permanent component reflects the need for a certain irreducible level of current assets on a continuous and uninterrupted basis, the temporary portion is needed to meet seasonal and other temporary requirements. While permanent working capital requirements should be financed from long-term sources, short-term funds should be used to finance temporary working capital needs of a firm.
- Working capital requirements are determined by a variety of factors. These factors, however, affect different enterprises differently. In general, the factors relevant for proper assessment of the quantum of working capital required are: general nature of business, production cycle,

Summary

Each chapter ends with a summary—a series of bulleted statements that restates the most important points that have been mentioned in the chapter. This feature will aid the readers in recapitulating what they have learnt earlier in the chapter.

23. *Ibid.* p. 94.
24. Based on Solomon, E *op. cit.* p. 95.
25. *Ibid.* p. 96.

Practical Problems

P.15.1 Assuming no taxes and given the earnings before interest and taxes (EBIT), interest (*I*) at 10 per cent and equity capitalisation rate (k_e) below, calculate the total market value of each firm.

Firms	*EBIT*	*I*	k_e *(per cent)*
X	Rs 2,00,000	Rs 20,000	12
Y	3,00,000	60,000	16
Z	5,00,000	2,00,000	15
W	6,00,000	2,40,000	18

Also, determine the weighted average cost of capital for each firm.

Solution

Determination of K_o and *V* of firms X, Y, Z and W

Particulars	*X*	*Y*	*Z*	*W*
EBIT	Rs 2,00,000	Rs 3,00,000	Rs 5,00,000	Rs 6,00,000
Less: Interest	20,000	60,000	2,00,000	2,40,000
Net income for equity-holders	1,80,000	2,40,000	3,00,000	3,60,000
Equity capitalisation rate (k_e)	0.12	0.16	0.15	0.18
Market value of equity (*S*)	15,00,000	15,00,000	20,00,000	20,00,000
Market value of debt (*B*) = I/0.10	2,00,000	6,00,000	20,00,000	24,00,000
Total value of firm (*V*)	17,00,000	21,00,000	40,00,000	44,00,000
Weighted average cost of capital (k_o) = EBIT/*V* (%)	11.76	14.29	12.5	13.64

P.15.2 Company X and Company Y are in the same risk class, and are identical in every respect except that company X uses debt, while company Y does not. The levered firm has Rs 9,00,000 debentures, carrying 10 per cent rate of interest. Both the firms earn 20 per cent operating profit on their total assets of Rs 15 lakhs. Assume perfect capital markets, rational investors and so on; a tax rate of 35 per cent and capitalisation rate of 15 per cent for an all-equity company.

(a) Compute the value of firms X and Y using the Net Income (NI) Approach.
(b) Compute the value of each firm using the Net Operating Income (NOI) Approach.
(c) Using the NOI Approach, calculate the overall cost of capital (k_o) for firms X and Y.
(d) Which of these two firms has an optimal capital structure according to the NOI Approach? Why?

Solution

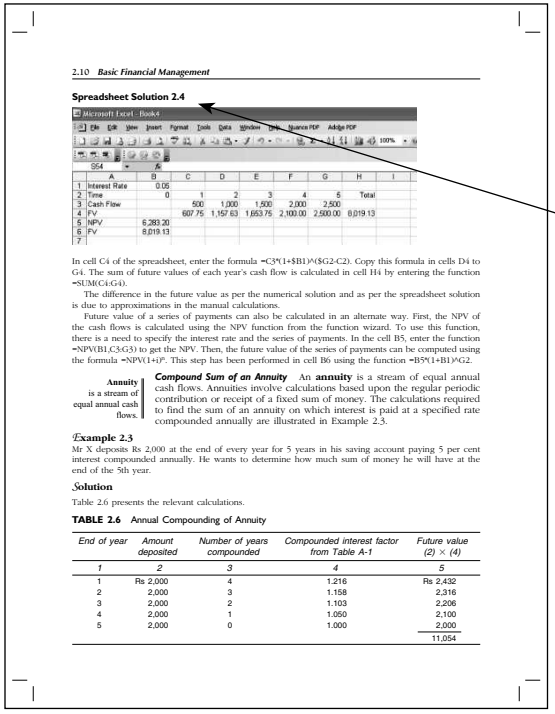
(a)

Valuation under NI approach

Particulars	*Firm X*	*Firm Y*
EBIT	rs3,00,000	Rs 3,00,000
Less: Interest	90,000	—
Taxable income	2,10,000	3,00,000
Less: Taxes	73,500	1,05,000
Earnings for equity holders	1,36,500	1,95,000
Equity capitalisation rate (k_e)	0.15	0.15
Market value of equity (*S*)	9,10,000	13,00,000
Market value of debt (*B*)	9,00,000	—
Total value of firm (*V*)	18,10,000	13,00,000

Practical Problems

A number of solved problems at the end of every chapter will help the rader understand how to apply to problems the concepts discussed in the chapter.



2.10 *Basic Financial Management*

Spreadsheet Solution 2.4

Microsoft Excel - Book4

	A	B	C	D	E	F	G	H	I
1	Interest Rate	0.05							
2	Time	0	1	2	3	4	5	Total	
3	Cash Flow		500	1,000	1,500	2,000	2,500		
4	FV		607.75	1,157.63	1,653.75	2,100.00	2,500.00	8,019.13	
5	NPV	6,283.20							
6	FV	8,019.13							
7									

In cell C4 of the spreadsheet, enter the formula =C3*(1+$B1)^($G2-C2). Copy this formula in cells D4 to G4. The sum of future values of each year's cash flow is calculated in cell H4 by entering the function =SUM(C4:G4).

The difference in the future value as per the numerical solution and as per the spreadsheet solution is due to approximations in the manual calculations.

Future value of a series of payments can also be calculated in an alternate way. First, the NPV of the cash flows is calculated using the NPV function from the function wizard. To use this function, there is a need to specify the interest rate and the series of payments. In the cell B5, enter the function =NPV(B1,C3:G3) to get the NPV. Then, the future value of the series of payments can be computed using the formula =NPV(1+i)^. This step has been performed in cell B6 using the function =B5*(1+B1)^G2.

Annuity is a stream of equal annual cash flows.

Compound Sum of an Annuity An **annuity** is a stream of equal annual cash flows. Annuities involve calculations based upon the regular periodic contribution or receipt of a fixed sum of money. The calculations required to find the sum of an annuity on which interest is paid at a specified rate compounded annually are illustrated in Example 2.3.

Example 2.3

Mr X deposits Rs 2,000 at the end of every year for 5 years in his saving account paying 5 per cent interest compounded annually. He wants to determine how much sum of money he will have at the end of the 5th year.

Solution

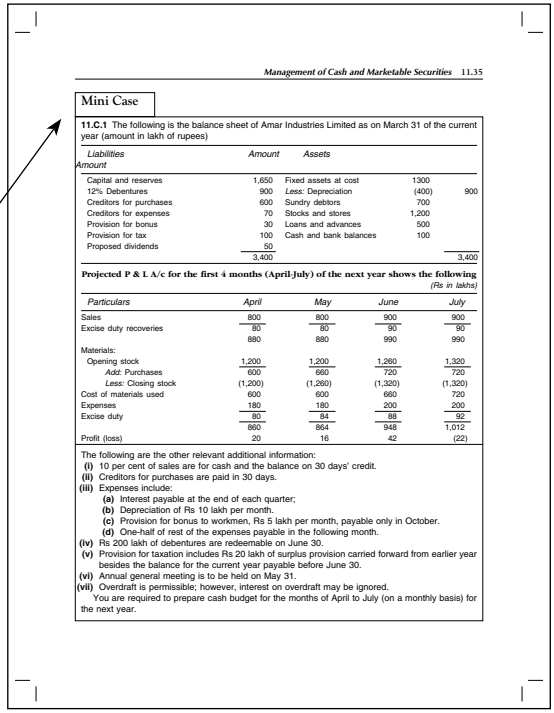
Table 2.6 presents the relevant calculations.

TABLE 2.6 Annual Compounding of Annuity

End of year	*Amount deposited*	*Number of years compounded*	*Compounded interest factor from Table A-1*	*Future value (2) × (4)*
1	*2*	*3*	*4*	*5*
1	Rs 2,000	4	1.216	Rs 2,432
2	2,000	3	1.158	2,316
3	2,000	2	1.103	2,206
4	2,000	1	1.050	2,100
5	2,000	0	1.000	2,000
				11,054

Excel Spreadsheet Solutions

A large number of problems have also been solved with the help of Excel spreadsheets.



Management of Cash and Marketable Securities 11.35

Mini Case

11.C.1 The following is the balance sheet of Amar Industries Limited as on March 31 of the current year (amount in lakh of rupees)

Liabilities	*Amount*	*Assets*		*Amount*
Capital and reserves	1,650	Fixed assets at cost	1300	
12% Debentures	900	*Less:* Depreciation	(400)	900
Creditors for purchases	600	Sundry debtors	700	
Creditors for expenses	70	Stocks and stores	1,200	
Provision for bonus	30	Loans and advances	500	
Provision for tax	100	Cash and bank balances	100	
Proposed dividends	50			
	3,400			3,400

Projected P & L A/c for the first 4 months (April-July) of the next year shows the following

(Rs in lakhs)

Particulars	*April*	*May*	*June*	*July*
Sales	800	800	900	900
Excise duty recoveries	80	80	90	90
	880	880	990	990
Materials:				
Opening stock	1,200	1,200	1,260	1,320
Add: Purchases	600	660	720	720
Less: Closing stock	(1,200)	(1,260)	(1,320)	(1,320)
Cost of materials used	600	600	660	720
Expenses	180	180	200	200
Excise duty	80	84	88	92
	860	864	948	1,012
Profit (loss)	20	16	42	(22)

The following are the other relevant additional information:

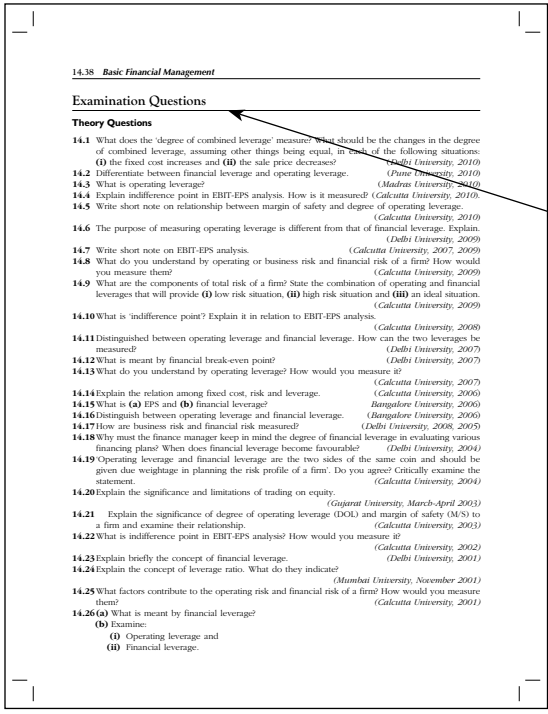
(i) 10 per cent of sales are for cash and the balance on 30 days' credit.
(ii) Creditors for purchases are paid in 30 days.
(iii) Expenses include:
  (a) Interest payable at the end of each quarter;
  (b) Depreciation of Rs 10 lakh per month.
  (c) Provision for bonus to workmen, Rs 5 lakh per month, payable only in October.
  (d) One-half of rest of the expenses payable in the following month.
(iv) Rs 200 lakh of debentures are redeemable on June 30.
(v) Provision for taxation includes Rs 20 lakh of surplus provision carried forward from earlier year besides the balance for the current year payable before June 30.
(vi) Annual general meeting is to be held on May 31.
(vii) Overdraft is permissible; however, interest on overdraft may be ignored.

You are required to prepare cash budget for the months of April to July (on a monthly basis) for the next year.

Mini Case

Small case studies at the end of every chapter will illustrate the theoretical inputs of the chapter.

WALKTHROUGH



14.38 *Basic Financial Management*

Examination Questions

Theory Questions

14.1 What does the 'degree of combined leverage' measure? What should be the changes in the degree of combined leverage, assuming other things being equal, in each of the following situations: **(i)** the fixed cost increases and **(ii)** the sale price decreases? *(Delhi University, 2010)*

14.2 Differentiate between financial leverage and operating leverage. *(Pune University, 2010)*

14.3 What is operating leverage? *(Madras University, 2010)*

14.4 Explain indifference point in EBIT-EPS analysis. How is it measured? *(Calcutta University, 2010).*

14.5 Write short note on relationship between margin of safety and degree of operating leverage. *(Calcutta University, 2010)*

14.6 The purpose of measuring operating leverage is different from that of financial leverage. Explain. *(Delhi University, 2009)*

14.7 Write short note on EBIT-EPS analysis. *(Calcutta University, 2007, 2009)*

14.8 What do you understand by operating or business risk and financial risk of a firm? How would you measure them? *(Calcutta University, 2009)*

14.9 What are the components of total risk of a firm? State the combination of operating and financial leverages that will provide **(i)** low risk situation, **(ii)** high risk situation and **(iii)** an ideal situation. *(Calcutta University, 2009)*

14.10 What is 'indifference point'? Explain it in relation to EBIT-EPS analysis. *(Calcutta University, 2008)*

14.11 Distinguished between operating leverage and financial leverage. How can the two leverages be measured? *(Delhi University, 2007)*

14.12 What is meant by financial break-even point? *(Delhi University, 2007)*

14.13 What do you understand by operating leverage? How would you measure it? *(Calcutta University, 2007)*

14.14 Explain the relation among fixed cost, risk and leverage. *(Calcutta University, 2006)*

14.15 What is **(a)** EPS and **(b)** financial leverage? *Bangalore University, 2006)*

14.16 Distinguish between operating leverage and financial leverage. *(Bangalore University, 2006)*

14.17 How are business risk and financial risk measured? *(Delhi University, 2008, 2005)*

14.18 Why must the finance manager keep in mind the degree of financial leverage in evaluating various financing plans? When does financial leverage become favourable? *(Delhi University, 2004)*

14.19 'Operating leverage and financial leverage are the two sides of the same coin and should be given due weightage in planning the risk profile of a firm'. Do you agree? Critically examine the statement. *(Calcutta University, 2004)*

14.20 Explain the significance and limitations of trading on equity. *(Gujarat University, March-April 2003)*

14.21 Explain the significance of degree of operating leverage (DOL) and margin of safety (M/S) to a firm and examine their relationship. *(Calcutta University, 2003)*

14.22 What is indifference point in EBIT-EPS analysis? How would you measure it? *(Calcutta University, 2002)*

14.23 Explain briefly the concept of financial leverage. *(Delhi University, 2001)*

14.24 Explain the concept of leverage ratio. What do they indicate? *(Mumbai University, November 2001)*

14.25 What factors contribute to the operating risk and financial risk of a firm? How would you measure them? *(Calcutta University, 2001)*

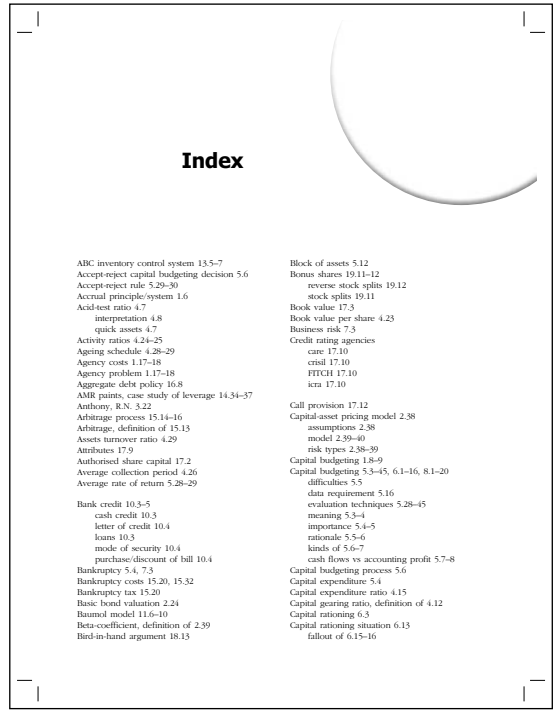
14.26 (a) What is meant by financial leverage?
(b) Examine:
(i) Operating leverage and
(ii) Financial leverage.

Examination questions

These questions would help the students with the broad pattern of examinations conducted by various universities/institutes during the last 5 years.

A Detailed Index

A comprehensive index would aid the readers in locating the entries in the right context in an accurate manner.



Index

PART 1

FOUNDATION OF FINANCE

This part of the book dwells on the foundations of finance. Chapter 1 gives an overview of financial management in terms of its relationship with related disciplines, scope, objectives, agency problems, organisation of finance functions in a typical organisation and the organisation of finance function in India. Chapter 2 discusses some basic financial concepts, namely, time value of money, valuation of bonds and shares and risk and return. This part of the text sets the stage for subsequent discussion of financial management in detail

Chapter

1

Financial Management—An Overview

Learning Objectives

1. Define finance and describe its major areas—financial management/ managerial finance/ corporate finance and financial services
2. Differentiate financial management from the closely-related disciplines of accounting and economics
3. Describe the scope of financial management and identify the key activities of the financial manager
4. Explain why wealth/value maximisation, rather than profit/EPS maximisation, is the goal of financial management and how economic value added (EVA) and focus on shareholders relate to its achievement and summarise the major objectives of corporate finance by Indian corporates
5. Discuss the agency problem/issue as it relates to owners wealth maximisation
6. Outline the organisation of finance function and the emerging role of finance managers in India

INTRODUCTION

Finance may be defined as the art and science of managing money. The major areas of finance are: **(1)** financial services and **(2)** managerial finance/corporate finance/financial management. While **financial services** is concerned with the design and delivery of advice and financial products to individuals, businesses and governments within the areas of banking and related institutions, personal financial planning, investments, real estate, insurance and so on, **financial management** is concerned with the duties of the financial managers in the business firm. **Financial managers** actively manage the financial affairs of any

Finance is the art and science of managing money.

Financial management is concerned with the duties of the financial managers in the business firm.

Financial services is concerned with the design and delivery of advice and financial products to individuals, businesses and governments.

Financial managers actively manage the financial affairs of any type of business, namely, financial and non-financial, private and public, large and small, profit-seeking and not-for-profit.

type of business, namely, financial and non-financial, private and public, large and small, profit-seeking and not-for-profit. They perform such varied tasks as budgeting, financial forecasting, cash management, credit administration, investment analysis, funds management and so on. In recent years, the changing regulatory and economic environments coupled with the globalisation of business activities have increased the complexity as well as the importance of the financial managers' duties. As a result, the financial management function has become more demanding and complex. This Chapter provides an overview of financial management function. It is organised into six Sections:

- Relationship of finance and related disciplines
- Scope of financial management
- Goal/objectives of financial management
- Agency problem
- Organisation of the finance function
- Emerging role of finance managers in India

SECTION I FINANCE AND RELATED DISCIPLINES

Financial management, as an integral part of overall management, is not a totally independent area. It draws heavily on related disciplines and fields of study, such as economics, accounting, marketing, production and quantitative methods. Although these disciplines are interrelated, there are key differences among them. In this Section, we discuss these relationships.

Finance and Economics

The relevance of economics to financial management can be described in the light of the two broad areas of economics: macroeconomics and microeconomics.

Macroeconomics is concerned with the overall institutional environment in which the firm operates. It looks at the economy as a whole. Macroeconomics is concerned with the institutional structure of the banking system, money and capital markets, financial intermediaries, monetary, credit and fiscal policies and economic policies dealing with, and controlling level of, activity within an economy. Since business firms operate in the macroeconomic environment, it is important for financial managers to understand the broad economic environment. Specifically, they should **(1)** recognise and understand how monetary policy affects the cost and the availability of funds; **(2)** be versed in fiscal policy and its effects on the economy; **(3)** be ware of the various financial institutions/financing outlets; **(4)** understand the consequences of various levels of economic activity and changes in economic policy for their decision environment and so on.

Microeconomics deals with the economic decisions of individuals and organisations. It concerns itself with the determination of optimal operating strategies. In other words, the theories of microeconomics provide for effective operations of business firms. They are concerned with defining actions that will permit the firms to achieve success. The concepts and theories of microeconomics relevant to financial management are, for instance, those involving **(1)** supply and demand relationships and profit maximisation strategies, **(2)** issues related to the mix of productive factors, 'optimal' sales level and product pricing strategies,

(3) measurement of utility preference, risk and the determination of value, and **(4)** the rationale of depreciating assets. In addition, the primary principle that applies in financial management is **marginal analysis**; it suggests that financial decisions should be made on the basis of comparison of marginal revenue and marginal cost. Such decisions will lead to an increase in profits of the firm. It is, therefore, important that financial managers must be familiar with basic microeconomics.

Marginal analysis suggests that financial decisions should be made on the basis of comparison of marginal revenues and marginal costs/ added benefits exceed added costs.

To illustrate, the financial manager of a department store is contemplating to replace one of its online computers with a new, more sophisticated one that would both speed up processing time and handle a large volume of transactions. The new computer would require a cash outlay of Rs 8,00,000 and the old computer could be sold to net Rs 2,80,000. The total benefits from the new computer and the old computer would be Rs 10,00,000 and Rs 3,50,000 respectively. Applying marginal analysis, we get:

Benefits with new computer	Rs 10,00,000	
Less: Benefits with old computer	3,50,000	
Marginal benefits (**a**)		Rs 6,50,000
Cost of new computer	8,00,000	
Less: Proceeds from sale of old computer	2,80,000	
Marginal cost (**b**)		5,20,000
Net benefits [(**a**) – (**b**)]		1,30,000

As the store would get a net benefit of Rs 1,30,000, the old computer should be replaced by the new one.

Thus, a knowledge of economics is necessary for a financial manager to understand both the financial environment and the decision theories which underline contemporary financial management. He should be familiar with these two areas of economics. Macroeconomics provides the financial manager with an insight into policies by which economic activity is controlled. Operating within that institutional framework, the financial manager draws on microeconomic theories of the operation of firms and profit maximisation. A basic knowledge of economics is, therefore, necessary to understand both the environment and the decision techniques of financial management.

Finance and Accounting

The relationship between finance and accounting, conceptually speaking, has two dimensions: **(i)** they are closely related to the extent that accounting is an important input in financial decision making; and **(ii)** there are key differences in viewpoints between them.

Accounting function is a necessary input into the finance function. That is, accounting is a subfunction of finance. Accounting generates information/data relating to operations/activities of the firm. The end-product of accounting constitutes financial statements such as the balance sheet, the income statement (profit and loss account) and the statement of changes in financial position/sources and uses of funds statement/cash flow statement. The information contained in these statements and reports assists financial managers in assessing the past performance and future directions of the firm and in meeting legal obligations, such as payment of taxes and so on. Thus, accounting and finance are functionally closely related. Moreover,

the finance (treasurer) and accounting (controller) activities are typically within the control of the vice-president/director (finance)/chief financial officer (CFO) as shown in Fig. 1.2. These functions are closely related and generally overlap; indeed, financial management and accounting are often not easily distinguishable. In small firms the controller often carries out the finance function and in large firms many accountants are intimately involved in various finance activities.

But there are two key differences between finance and accounting. The first difference relates to the treatment of funds, while the second relates to decision making.

Accrual method recognises revenue at the point of sale and expenses when they are incurred.

Treatment of Funds The viewpoint of accounting relating to the funds of the firm is different from that of finance. The measurement of funds (income and expenses) in accounting is based on the **accrual principle/system**. For instance, revenue is recognised at the point of sale and not when collected. Similarly, expenses are recognised when they are incurred rather than when actually paid. The accrual-based accounting data do not reflect fully the financial circumstances of the firm. A firm may be quite profitable in the accounting sense in that it has earned profit (sales less expenses) but it may not be able to meet current obligations owing to shortage of liquidity due to uncollectable receivables, for instance. Such a firm will not survive regardless of its levels of profits.

Cashflow method recognises revenues and expenses only with respect to actual inflows and outflows of cash.

The viewpoint of finance relating to the treatment of funds is based on **cashflows**. The revenues are recognised only when actually received in cash (i.e. cash inflow) and expenses are recognised on actual payment (i.e. cash outflow). This is so because the financial manager is concerned with maintaining solvency of the firm by providing the cashflows necessary to satisfy its obligations and acquiring and financing the assets needed to achieve the goals of the firm. Thus, cashflow-based returns help financial managers avoid insolvency and achieve the desired financial goals.

To illustrate, total sales of a trader during the year amounted to Rs 10,00,000 while the cost of sales was Rs 8,00,000. At the end of the year, it has yet to collect Rs 8,00,000 from the customers. The accounting view and the financial view of the firms performance during the year are given below.

Accounting view (Income statement)		*Financial view (Cash flow statement)*	
Sales	Rs 10,00,000	Cash inflow	Rs 2,00,000
Less: Costs	8,00,000	*Less*: Cash outflow	8,00,000
Net profit	2,00,000	Net cash outflow	(6,00,000)

Obviously, the firm is quite profitable in accounting sense, it is a financial failure in terms of actual cash flows resulting from uncollected receivables. Regardless of its profits, the firm would not survive due to inadequate cash inflows to meet its obligations.

Decision Making Finance and accounting also differ in respect of their purposes. The purpose of accounting is collection and presentation of financial data. It provides consistently developed and easily interpreted data on the past, present and future operations of the firm. The financial manager uses such data for financial decision making. It does not mean that accountants *never* make decisions or financial managers *never* collect data. But the primary focus of the functions of accountants is on collection and presentation of data while the financial

manager's major responsibility relates to financial planning, controlling and decision making. Thus, in a sense, finance begins where accounting ends.

Finance and Other Related Disciplines

Apart from economics and accounting, finance also draws—for its day-to-day decisions—on supportive disciplines such as marketing, production and quantitative methods. For instance, financial managers should consider the impact of new product development and promotion plans made in marketing area since their plans will require capital outlays and have an impact on the projected cash flows. Similarly, changes in the production process may necessitate capital expenditures which the financial managers must evaluate and finance. And, finally, the tools of analysis developed in the quantitative methods area are helpful in analysing complex financial management problems.

The marketing, production and quantitative methods are, thus, only indirectly related to day-to-day decision making by financial managers and are supportive in nature while economics and accounting are the primary disciplines on which the financial manager draws substantially.

The relationship between financial management and supportive disciplines is depicted in Fig 1.1.

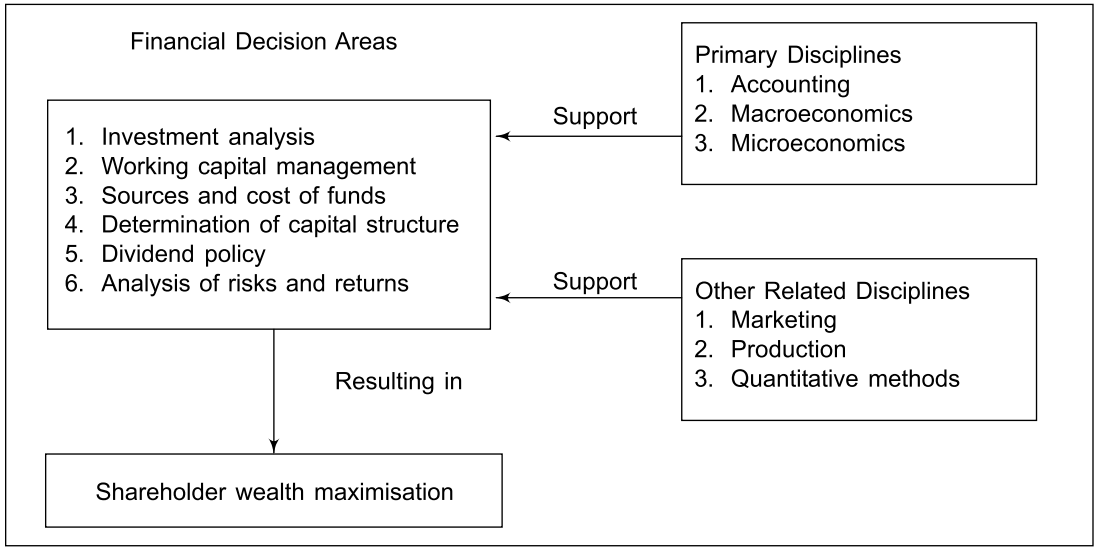


FIGURE 1.1 Impact of Other Disciplines on Financial Management

SECTION 2 SCOPE OF FINANCIAL MANAGEMENT

Financial management provides a conceptual and analytical framework for financial decision making. The finance function covers both acquisition of funds as well as their allocations. Thus, apart from the issues involved in acquiring external funds, the main concern of financial management is the efficient and wise allocation of funds to various uses. Defined in a broad sense, it is viewed as an integral part of overall management.

The financial management framework is an analytical way of viewing the financial problems of a firm. The main contents of this approach are:[1] What is the total volume of funds an enterprise should commit? What specific assets should an enterprise acquire? How should the funds required be financed? Alternatively, the principal contents of the modern approach to financial management can be said to be: **(i)** How large should an enterprise be, and how fast should it grow? **(ii)** In what form should it hold assets? and **(iii)** What should be the composition of its liabilities?

The three questions posed above cover between them the major financial problems of a firm. In other words, the financial management, according to the new approach, is concerned with the solution of three major problems relating to the financial operations of a firm, corresponding to the three questions of investment, financing and dividend decisions. Thus, financial management, in the modern sense of the term, can be broken down into three major decisions as functions of finance: **(i)** The investment decision, **(ii)** The financing decision, and **(iii)** The dividend policy decision.

Investment decision relates to the selection of assets.

Investment Decision The **investment decision** relates to the selection of assets in which funds will be invested by a firm. The assets which can be acquired fall into two broad groups: **(i)** long-term assets which yield a return over a period of time in future, **(ii)** short-term or current assets, defined as those assets which in the normal course of business are convertible into cash without diminution in value, usually within a year. The first of these involving the first category of assets is popularly known in financial literature as **capital budgeting**. The aspect of financial decision making with reference to current assets or short-term assets is popularly termed as **working capital management**.

Capital budgeting relates to the selection of an asset whose benefits would be available over the project's life..

Capital Budgeting Capital budgeting is probably the most crucial financial decision of a firm. It relates to the selection of an asset or investment proposal or course of action whose benefits are likely to be available in future over the lifetime of the project. The long-term assets can be either new or old/existing ones. The *first* aspect of the capital budgeting decision relates to the choice of the new asset out of the alternatives available or the reallocation of capital when an existing asset fails to justify the funds committed. Whether an asset will be accepted or not will depend upon the relative benefits and returns associated with it. The measurement of the worth of the investment proposals is, therefore, a major element in the capital budgeting exercise. This implies a discussion of the methods of appraising investment proposals.

The *second* element of the capital budgeting decision is the analysis of risk and uncertainty. Since the benefits from the investment proposals extend into the future, their accrual is uncertain. They have to be estimated under various assumptions of the physical volume of sale and the level of prices. An element of risk in the sense of uncertainty of future benefits is, thus, involved in the exercise. The returns from capital budgeting decisions should, therefore, be evaluated in relation to the risk associated with it.

Finally, the evaluation of the worth of a long-term project implies a certain norm or standard against which the benefits are to be judged. The requisite norm is known by different names such as **cut-off rate**, **hurdle rate**, **required rate**, **minimum rate of return** and so on. This standard is broadly expressed in terms of the cost of capital. The concept and measurement

of the cost of capital is, thus, another major aspect of capital budgeting decision. In brief, the main elements of capital budgeting decisions are: **(i)** the long-term assets and their composition, **(ii)** the business risk complexion of the firm, and **(iii)** the concept and measurement of the cost of capital.

Working Capital Management Working capital management is concerned with the management of current assets. It is an important and integral part of financial management as short-term survival is a prerequisite for long-term success. One aspect of working capital management is the trade-off between profitability and risk (liquidity). There is a conflict between profitability and liquidity. If a firm does not have adequate working capital, that is, it does not invest sufficient funds in current assets, it may become illiquid and consequently may not have the ability to meet its current obligations and, thus, invite the risk of bankruptcy. If the current assets are too large, profitability is adversely affected. The key strategies and considerations in ensuring a trade-off between profitability and liquidity is one major dimension of working capital management. In addition, the individual current assets should be efficiently managed so that neither inadequate nor unnecessary funds are locked up. Thus, the management of working capital has two basic ingredients: **(1)** an overview of working capital management as a whole, and **(2)** efficient management of the individual current assets such as cash, receivables and inventory.

Working capital management is concerned with the management of current assets

Financing Decision The second major decision involved in financial management is the financing decision. The investment decision is broadly concerned with the asset-mix or the composition of the assets of a firm. The concern of the financing decision is with the financing-mix or capital structure or leverage. The term **capital structure** refers to the proportion of debt (fixed-interest sources of financing) and equity capital (variable-dividend securities/source of funds). The financing decision of a firm relates to the choice of the proportion of these sources to finance the investment requirements. There are two aspects of the financing decision. *First*, the theory of capital structure which shows the theoretical relationship between the employment of debt and the return to the shareholders. The use of debt implies a higher return to the shareholders as also the financial risk. A proper balance between debt and equity to ensure a trade-off between risk and return to the shareholders is necessary. A capital structure with a reasonable proportion of debt and equity capital is called the **optimum capital structure**. Thus, one dimension of the financing decision whether there is an optimum capital structure and in what proportion should funds be raised to maximise the return to the shareholders? The second aspect of the financing decision is the determination of an appropriate capital structure, given the facts of a particular case. Thus, the financing decision covers two interrelated aspects: **(1)** the capital structure theory, and **(2)** the capital structure decision.

Financing decision relates to the choice of the proportion of debt and equity sources of financing

Dividend Policy Decision The third major decision area of financial management is the decision relating to the dividend policy. The dividend decision should be analysed in relation to the financing decision of a firm. Two alternatives are available in dealing with the profits of a firm: **(i)** they can be distributed to the shareholders in the form of dividends or **(ii)** they can be retained in the business itself. The decision as to which course should be followed depends largely on a significant element in the dividend decision, the **dividend-pay out ratio**, that is, what proportion of net profits should be paid out to the shareholders. The final decision

will depend upon the preference of the shareholders and investment opportunities available within the firm. The second major aspect of the dividend decision is the factors determining dividend policy of a firm in practice.

To conclude, the traditional approach to the functions of financial management had a very narrow perception and was devoid of an integrated conceptual and analytical framework. It had rightly been discarded in the academic literature. The modern approach to the scope of financial management has broadened its scope which involves the solution of three major decisions, namely, investment, financing and dividend. These are interrelated and should be jointly taken so that financial decision making is optimal. The conceptual framework for optimum financial decisions is the objective of financial management. In other words, to ensure an optimum decision in respect of these three areas, they should be related to the objectives of financial management. The goals/objectives of financial management are discussed in Section 3.

Key Activities of the Financial Manager

The primary activities of a financial manager are: **(i)** performing financial analysis and planning, **(ii)** making investment decisions and **(iii)** making financing decisions.

Performing Financial Analysis and Planning The concern of financial analysis and planning is with **(a)** transforming financial data into a form that can be used to monitor financial condition, **(b)** evaluating the need for increased (reduced) productive capacity and **(c)** determining the additional/reduced financing required. Although this activity relies heavily on accrual-based financial statements, its underlying objective is to assess cash flows and develop plans to ensure adequate cash flows to support achievement of the firm's goals.

Making Investment Decisions Investment decisions determine both the mix and the type of assets held by a firm. The mix refers to the amount of current assets and fixed assets. Consistent with the mix, the financial manager must determine and maintain certain optimal levels of each type of current assets. He should also decide the best fixed assets to acquire and when existing fixed assets need to be modified/replaced/liquidated. The success of a firm in achieving its goals depends on these decisions.

Making Financing Decisions Financing decisions involve two major areas: *first*, the most appropriate mix of short-term and long-term financing; *second*, the best individual short-term or long-term sources of financing at a given point of time. Many of these decisions are dictated by necessity, but some require an in-depth analysis of the available financing alternatives, their costs and their long-term implications.

SECTION 3 OBJECTIVES OF FINANCIAL MANAGEMENT

To make wise decisions a clear understanding of the objectives which are sought to be achieved is necessary. The objective provide a framework for optimum financial decision making. In other words, they are concerned with designing a method of operating the internal investment and financing of a firm. The term 'objective' is used in the sense of a goal or **decision criterion** for the three decisions involved in financial management. It implies that what is relevant is not the overall objective or goal of a business but a operationally useful criterion by which to judge a specific set of mutually interrelated business decisions, namely, invest-

ment, financing and dividend policy. Moreover, it provides a normative framework. That is, the focus in financial literature is on what a firm should try to achieve and on policies that should be followed if certain goals are to be achieved. The implication is that these are not necessarily followed by firms in actual practice. They are rather employed to serve as a basis for theoretical analysis and do not reflect contemporary empirical industry practices. Thus, the term is used in a rather narrow sense of what a firm *should attempt* to achieve with its investment, financing and dividend policy decisions.

Firms in practice state their vision, mission and values in broad terms and are also concerned about technology, leadership, productivity, market standing, image, profitability, financial resources, employees satisfaction and so on.

We discuss in this Section the alternative approaches in financial literature. There are two widely-discussed approaches: **(i)** Profit (total)/Earning Per Share (EPS) maximisation approach, and **(ii)** Wealth maximisation approach.

Profit/EPS Maximisation Decision Criterion

According to this approach, actions that increase profits (total)/EPS should be undertaken and those that decrease profits/EPS are to be avoided. In specific operational terms, as applicable to financial management, the profit maximisation criterion implies that the investment, financing and dividend policy decisions of a firm should be oriented to the maximisation of profits/EPS.

The term 'profit' can be used in **two** senses. As a *owner-oriented concept*, it refers to the *amount* and *share of national income* which is *paid to the owners of business*, that is, those who supply equity capital. As a *variant*, it is described as **profitability**. It is an operational concept[2] and signifies economic efficiency. In other words, profitability refers to a situation where output exceeds input, that is, the value created by the use of resources is more than the total of the input resources. Used in this sense, profitability maximisation would imply that a firm should be guided in financial decision making by one test; select assets, projects and decisions which are profitable and reject those which are not. In the current financial literature, there is a general agreement that profit maximisation is used in the second sense.

The rationale behind profitability maximisation, as a guide to financial decision making, is simple. Profit is a test of economic efficiency. It provides the yardstick by which economic performance can be judged. Moreover, it leads to efficient allocation of resources, as resources tend to be directed to uses which in terms of profitability are the most desirable. Finally, it ensures maximum social welfare. The individual search for maximum profitability provides the famous 'invisible hand' by which total economic welfare is maximised. Financial management is concerned with the efficient use of an important economic resource (input), namely, capital. It is, therefore, argued that profitability maximisation should serve as the basic criterion for financial management decisions.

The profit maximisation criterion has, however, been questioned and criticised on several grounds. The reasons for the opposition in academic literature fall into two broad groups: **(1)** those that are based on misapprehensions about the workability and fairness of the private enterprise itself, and **(2)** those that arise out of the difficulty of applying this criterion in actual situations. It would be recalled that the term objective, as applied to financial management,

refers to an explicit operational guide for the internal investment and financing of a firm and not the overall goal of business operations. We, therefore, focus on the second type of limitations to profit maximisation as an objective of financial management.[3] The *main technical flaws* of this criterion are **ambiguity, timing of benefits,** and **quality of benefits**.

Ambiguity One practical difficulty with profit maximisation criterion for financial decision making is that the term profit is a vague and ambiguous concept. It has no precise connotation. It is amenable to different interpretations by different people. To illustrate, profit may be short-term or long-term; it may be total profit or rate of profit; it may be before-tax or after-tax; it may return on total capital employed or total assets or shareholders' equity and so on. If profit maximisation is taken to be the objective, the question arises, which of these variants of profit should a firm try to maximise? Obviously, a loose expression like profit cannot form the basis of operational criterion for financial management.

Timing of Benefits A more important technical objection to profit maximisation, as a guide to financial decision making, is that it ignores the differences in the time pattern of the benefits received over the working life of the asset, irrespective of when they were received. Consider Table 1.1.

TABLE 1.1 Time-Pattern of Benefits (Profits)

Time	*Alternative **A** (Rs in lakh)*	*Alternative **B** (Rs in lakh)*
Period **I**	50	—
Period **II**	100	100
Period **III**	50	100
Total	200	200

It can be seen from Table 1.1 that the total profits associated with the alternatives, A and B, are identical. If the profit maximisation is the decision criterion, both the alternatives would be ranked equally. But the returns from both the alternatives differ in one important respect, while alternative A provides higher returns in earlier years, the returns from alternative B are larger in later years. As a result, the two alternative courses of action are not strictly identical. This is primarily because a basic dictum of financial planning is **the earlier the better** as benefits received sooner are more valuable than benefits received later. The reason for the superiority of benefits now over benefits later lies in the fact that the former can be reinvested to earn a return. This is referred to as time value of money. The profit maximisation criterion does not consider the distinction between returns received in different time periods and treats all benefits irrespective of the timing, as equally valuable. This is not true in actual practice as benefits in early years should be valued more highly than equivalent benefits in later years. The assumption of equal value is inconsistent with the real world situation.

Quality refers to the degree of certainty with which benefits can be expected.

Quality of Benefits Probably the most important technical limitation of profit maximisation as an operational objective, is that it ignores the quality aspect of benefits associated with a financial course of action. The term **quality** here refers to the degree of certainty with which benefits can be expected. As a rule, the more certain the expected return, the higher is the quality of the benefits. Conversely, the more uncertain/fluctuating is

the expected benefits, the lower is the quality of the benefits. An uncertain and fluctuating return implies **risk** to the investors. It can be safely assumed that the investors are **risk-averters**, that is, they want to avoid or at least minimise risk. They can, therefore, be reasonably expected to have a preference for a return which is more certain in the sense that it has smaller variance over the years.

Risk
is the chance that actual outcomes may differ from those expected.

Risk-averters
want to avoid risk.

The problem of uncertainty renders profit maximisation unsuitable as an operational criterion for financial management as it considers only the size of benefits and gives no weight to the degree of uncertainty of the future benefits. This is illustrated in Table 1.2.

TABLE 1.2 Uncertainty About Expected Benefits (Profits)

	Profit (Rs crore)	
State of Economy	*Alternative **A***	*Alternative **B***
Recession (Period I)	9	0
Normal (Period II)	10	10
Boom (Period III)	11	20
Total	30	30

It is clear from Table 1.2 that the total returns associated with the two alternatives are identical in a normal situation but the range of variations is very wide in case of alternative B, while it is narrow in respect of alternative A. To put it differently, the earnings associated with alternative B are more uncertain (risky) as they fluctuate widely depending on the state of the economy. Obviously, alternative A is better in terms of risk and uncertainty. The profit maximisation criterion fails to reveal this.

To conclude, the profit maximisation criterion is inappropriate and unsuitable as an operational objective of investment, financing and dividend decisions of a firm. It is not only vague and ambiguous but it also ignores two important dimensions of financial analysis, namely, risk, and time value of money. It follows from the above that an appropriate operational decision criterion for financial management should **(i)** be precise and exact, **(ii)** be based on the **'bigger the better'** principle, **(iii)** consider both quantity and quality dimensions of benefits, and **(iv)** recognise the time value of money. The alternative to profit maximisation, that is, wealth maximisation is one such measure.

Wealth Maximisation Decision Criterion

This is also known as value maximisation or net present worth maximisation. In current academic literature value maximisation is almost universally accepted as an appropriate operational decision criterion for financial management decisions as it removes the technical limitations which characterise the earlier profit maximisation criterion. Its operational features satisfy all the three requirements of a suitable operational objective of financial course of action, namely, exactness, quality of benefits and the time value of money.

The value of an asset should be viewed in terms of the benefits it can produce. The worth of a course of action can similarly be judged in terms of the value of the benefits it produces less the cost of undertaking it. A significant element in computing the value of a financial course of action is the precise estimation of the benefits associated with it. The wealth maxi-

misation criterion is based on the concept of cash flows generated by the decision rather than accounting profit which is the basis of the measurement of benefits in the case of the profit maximisation criterion. Cash-flow is a precise concept with a definite connotation. Measuring benefits in terms of cash flows avoids the ambiguity associated with accounting profits. This is the first operational feature of the net present worth maximisation criterion.

The second important feature of the wealth maximisation criterion is that it considers both the quantity and quality dimensions of benefits. At the same time, it also incorporates the time value of money. The operational implication of the uncertainty and timing dimensions of the benefits emanating from a financial decision is that adjustments should be made in the cash-flow pattern, firstly, to incorporate risk and, secondly, to make an allowance for differences in the timing of benefits. The value of a stream of cash flows with value maximisation criterion is calculated by discounting its element back to the present at a capitalisation rate that reflects both time and risk. The value of a course of action must be viewed in terms of its worth to those providing the resources necessary for its undertaking. In applying the value maximisation criterion, the term **value** is used in terms of worth to the owners, that is, ordinary shareholders. The **capitalisation (discount) rate** that is employed is, therefore, the rate that reflects the time and risk preferences of the owners or suppliers of capital. As a measure of quality (risk) and timing, it is expressed in decimal notation. A discount rate of, say, 15 per cent is written as 0.15. A large capitalisation rate is the result of higher risk and longer time period. Thus, a stream of cash flows that is quite certain might be associated with a rate of 5 per cent, while a very risky stream may carry a 15 per cent discount rate.

For the above reasons, the net present value maximisation is superior to the profit maximisation as an operational objective. As a decision criterion, it involves a comparison of value to cost. An action that has a discounted value—reflecting both time and risk—that exceeds its cost can be said to create value. Such actions should be undertaken. Conversely, actions, with less value than cost, reduce wealth and should be rejected. In the case of mutually exclusive alternatives, when only one has to be chosen, the alternative with the greatest net present value should be selected. In the words of Ezra Solomon,[4]

> The gross present worth of a course of action is equal to the capitalised value of the flow of future expected benefit, discounted (or captialised) at a rate which reflects their certainty or uncertainty. Wealth or net present worth is the difference between gross present worth and the amount of capital investment required to achieve the benefits being discussed. Any financial action which creates wealth or which has a net present worth above zero is a desirable one and should be undertaken. Any financial action which does not meet this test should be rejected. If two or more desirable courses of action are mutually exclusive (i.e. if only one can be undertaken), then the decision should be to do that which creates most wealth or shows the greatest amount of net present worth.

It can, thus, be seen that in the value maximisation decision criterion, the time value of money and handling of the risk as measured by the uncertainty of the expected benefits is an integral part of the exercise. It is, moreover, a precise and unambiguous concept, and therefore, an appropriate and operationally feasible decision criterion for financial management decisions.

It would also be noted that the focus of financial management is on the value to the owners or suppliers of equity capital. The wealth of the owners is reflected in the market value of shares. So wealth maximisation implies the maximisation of the market price of shares. In other words, maximisation of the market price of shares is the operational substitute for value/wealth/net present value maximisation as a decision criterion.

In brief, what is relevant is not the overall goal of a firm but a decision criterion which should guide the financial course of action. Profit/EPS maximisation was initially the generally accepted theoretical criterion for making efficient economic decisions, using profit as an economic concept and defining profit maximisation as a criterion for economic efficiency. In current financial literature, it has been replaced by the wealth maximisation decision criterion because of the shortcomings of the former as an operational criterion, as **(i)** it does not take account of uncertainty of risk, **(ii)** it ignores the time value of money, and **(iii)** it is ambiguous in its computation. Owing to these technical limitations, profit maximisation cannot be applied in real world situations. Its modified form is the value maximisation criterion. It is important to note that value maximisation is simply extension of profit maximisation to a world that is uncertain and multiperiod in nature. Where the time period is short and degree of uncertainty is not great, value maximisation and profit maximisation amount to essentially the same thing.[5]

However, two important issues are related to the value/share price-maximisation, namely, **economic value added** and **focus on stakeholders**.

Economic value added is equal to after-tax operating profits of a firm less the cost of funds used to finance investments.

Economic Value Added (EVA) It is a popular measure currently being used by several firms to determine whether an existing/proposed investment positively contributes to the owners'/shareholders' wealth. The **EVA** is equal to after-tax operating profits of a firm less the cost of funds used to finance investments. A positive EVA would increase owners' value/wealth. Therefore, only investments with positive EVA would be desirable from the viewpoint of maximising shareholders' wealth. To illustrate, assuming an after-tax profit of Rs 40 crore and associated costs of financing the investments of Rs 38 crore, the EVA = Rs 2 crore (Rs 40 crore – Rs 38 crore). With a positive EVA, the investment would add value and increase the wealth of the owners and should be accepted. The computation of the after-tax operating profits attributable to the investment under consideration as well as the cost of funds used to finance it would, however, involve numerous accounting and financial issues.

The **merits** of EVA are: **(a)** its relative simplicity and **(b)** its strong link with the wealth maximisation of the owners. It *prima facie* exhibits a strong link to share prices, that is, positive EVA is associated with increase in prices of shares and *vice versa*. However, EVA is, in effect, a repackaged and well-marketed application of the NPV technique of investment decision. But EVA is certainly a useful tool for operationalising the owners' value maximisation goal, particularly with respect to the investment decision.

Stakeholders include groups such as employees, customers, suppliers, creditors, owners and others who have a direct link to the firm.

Focus on Stakeholders The shareholders wealth maximisation as the primary goal notwithstanding, there is a broader focus in financial management to include the interest of the stakeholders as well as the shareholders. The **stakeholders** include employees, customers, suppliers, creditors and owners and others who have a direct link to the firm. The implication of the focus on stakeholders is that a firm should avoid actions detrimental to them through the transfer of their wealth to the firm and, thus, damage their wealth. The goal should be preserve the well-being of the stakeholders and not to maximise it.

The focus on the stakeholders does not, however, alter the shareholders' wealth maximisation goal. It tends to limit the firm's actions to preserve the wealth of the stakeholders. The stakeholders view is considered part of its "social responsibility" and is expected to provide maximum long-term benefit to the shareholders by maintaining positive stakeholders relationship which would minimise stakeholder turnover, conflict and litigation. In brief, a firm can better achieve its goal of shareholders' wealth maximisation with the cooperation of, rather than conflict with, its other stakeholders.

Shareholder Orientation in India Traditionally, the corporate industrial sector in India was dominated by group companies with close links with the promoter groups. Their funding primarily was through institutional borrowings from public/ development finance institutions like IFCI, ICICI, IDBI and so on. There was preponderance of loan capital in their financial structure and shareholders equity played a rather marginal role. It was no wonder, therefore, that corporate India paid scant attention to shareholders' wealth maximisation with few exceptions such as Reliance Industries Ltd. In the post-90 liberalisation era, the goal of shareholders' wealth maximisation has emerged almost at the centre-stage. The main contributory factors have been **(i)** greater dependence on capital market, **(ii)** growing importance of institutional investors, **(iii)** tax concessions/incentives to shareholders and **(iv)** foreign exposure.

With the gradual decline in the significance of the development/public financial/term lending institutions over the years and their disappearance from the Indian financial scene recently (as a result of their conversion into banks) and the consequent emergence of the capital market as the main source of corporate financing, shareholders' wealth maximisation is emerging as the prime goal of corporate financial management. Secondly, as a result of the institutionalisation of savings, institutional investors such as mutual funds, insurance organisations, foreign institutional investors and so on dominate the structure of the Indian capital market. To cater to the requirements of these institutional investors, corporates are pursuing more shareholder-friendly policies as reflected in their efforts to focus on shareholders' wealth maximisation. Thirdly, the abolition of wealth tax on equity shares and other financial assets coupled with tax exemption on dividends in recent years has provided an incentive to corporates to enhance share prices and, thus, focus on shareholders' wealth. Finally, the family-owned corporates are also undergoing major transformation. The scions of most business families are acquiring higher professional education in India and abroad. With the foreign exposure, they also appreciate the importance of shareholders' wealth. Thus, shareholder orientation is unmistakably visible in the corporate India.

SECTION 4 AGENCY PROBLEM

A characteristic feature of corporate enterprise is the separation between ownership and management as a corollary of which the latter enjoys substantial autonomy in regard to the affairs of the firm. With widely-diffused ownership, scattered and ill-organised shareholders hardly exercise any control/influence on management which may be inclined to act in its own interest rather than those of the owners. However, shareholders as owners of the enterprise have the right to change the management. Due to the threat of being dislodged/dismissed for poor performance, the management would have a natural inclination to achieve a minimum acceptable level of performance to satisfy the shareholders' requirements/goals, while focusing primarily on their own personal goals. Thus, in furtherance of their objective of survival, management would aim at **satisfying** instead of **maximising** shareholders' wealth.

Resolving the Agency Problem

From this conflict of management objective of survival (personal goals) and maximising owners value arises the agency problem, that is, the likelihood that managers may place personal goals ahead of corporate goals. The **agency problem** can be prevented/minimised by acts of **(i)** market forces and **(ii)** agency costs.

Agency problem is the likelihood that managers may place personal goals ahead of corporate goals.

Market Forces Market forces act to prevent/minimise agency problems in two ways: **(1)** behaviour of security market participants and **(2)** hostile takeovers.

Behaviour of Security Market Participants The security market participants/ shareholders in general and large institutional investors like mutual funds, insurance organisations, financial institutions and so on which hold large blocks of shares of corporates, in particular, actively participate in management. To ensure competent management and minimise agency problems, they have in recent years actively exercised their voting rights to replace more competent management in place of under-performing management. In addition to exercising their legal voting rights, the large institutional shareholders also from time to time communicate with, and exert pressure on, corporate management to perform or face replacement.

Hostile Takeovers Another market force that has in recent years threatened corporate management to perform in the best interest of the owners/shareholders is the possibility of a **hostile** takeover, that is, the acquisition of the (target) firm by another firm/group (i.e. acquirer) that is not supported by management. Such takeovers typically occur when the acquirer is of the view that the target firm is undevalued due to poor management and that its acquisition at its current low price may result in the enhancement of its value (i.e. share price) through restructuring its management, operations and financing. The constant threat of a takeover would motivate management to act in the best interests of the owners despite the fact that techniques are available to defend against a hostile takeover.

Hostile takeover is the acquisition of the firm (target) by another firm (the acquirer) that is not supported by management.

Agency costs are costs borne by shareholders to prevent/ minimise agency problems as to contribute to maximise owners wealth.

Agency Costs To respond to potential market forces by preventing/maximising agency problems and contributing to the maximisation of owners' wealth/value, the shareholders/owners have to incur four types of costs: **(i)** monitoring, **(ii)** bonding, **(iii)** opportunity and **(iv)** structuring.

Monitoring Expenditures Such expenditures relate to monitoring the activities of the management (agents) to prevent a **satisfying** in contrast to **share price maximising** behaviour by them. The monitoring outlays relate to payment for audit and control procedures to ensure that managerial behaviour is tuned to actions that tend to be in the best interest of the shareholders.

Bonding Expenditures They protect the owners against the potential consequences of dishonest acts by management/managers. The firm pays to obtain a **fidelity bond** from a third-party bonding company to the effect that the latter will compensate the former up to a specified amount for financial losses caused by dishonest acts of manager(s).

Fidelity bond is a contract in which a bonding company agrees to re-imburse a firm upto a stated amount for financial losses caused by dishonest acts of managers.

Opportunity Costs Such costs result from the inability of large corporates from responding to new opportunities. Due to the organisational structure, decision hierarchy, and control mechanism, the management may face difficulties in seizing upon profitable investment opportunities quickly.

Structuring Expenditure The structuring expenditures are the most popular, powerful and expensive agency costs incurred by corporates. They relate to structuring managerial compensation to correspond with share price maximisation. The objective is to offer incentives/compensation to management to act in the best interests of the owners. The restructured higher compensation packages to managers also enable corporates to hire the best available managers. The management compensation plans fall into two groups: **(a)** incentive plans and **(b)** performance plans.

Incentive plans tie anagement compensation to share price.

Stock options allow management to purchase shares at a special/ concessional price.

Performance plans compensate management on the basis of proven performance.

Performance shares are given to management for meeting the stated performance goals.

Incentive Plans They tie management compensation to share price. The most widely-used incentive plan is **stock options** which confer on management the right to acquire shares of the corporate at a special/concessional price. A higher future price would result in larger management compensation. However, share prices may be affected by economic and behavioural "market forces" over which management may have no control. Despite positive management performance, market prices may decline.

Performance Plans These plans compensate management on the basis of its proven performance measured by EPS, growth in EPS and other ratios related to return. Based on these, performance shares may be given to management for meeting the stated performance goals. Another form of performance-based compensation is cash bonuses, that is, cash payments tied to the achievement of certain performance goals.

In brief, unconstrained managers may have other goals in addition to share price maximisation, but there are enough evidence to suggest that due to agency costs and market forces, share price maximisation is the primary goal of most firms.

SECTION 5 ORGANISATION OF FINANCE FUNCTION

The responsibilities for financial management are spread throughout the organisation in the sense that financial management is, to an extent, an integral part of the job for the managers involved in planning, allocation of resources and control. For instance, the production manager (engineer) shapes the investment policy (proposal of a new plant); the marketing manager/analyst provides inputs in forecasting and planning; the purchase manager influences the level of investment in inventories; and the sales manager has a say in the determination of receivables policy. Nevertheless, financial management is highly specialised in nature and is handled by specialists. Financial decisions are of crucial importance. It is, therefore, essential to set up an efficient organisation for financial management functions.

Since finance is a major/critical functional area, the ultimate responsibility for carrying out financial management functions lies with the top management, that is, board of directors/ managing director/chief executive or the committee of the board. However, the exact nature

of the organisation of the financial management function differs from firm to firm depending upon factors such as size of the firm, nature of its business, type of financing operations, ability of financial officers and the financial philosophy, and so on. Similarly, the designation of the chief executive of the finance department also differs widely in case of different firms. In some cases, they are known as finance managers while in others as vice-president (finance), director (finance), and financial controller and so on. He reports directly to the top management. Various sections within the financial management area are headed by managers such as controller and treasurer.

Figure 1.2 depicts the organisation of the financial management function in a large typical firm.

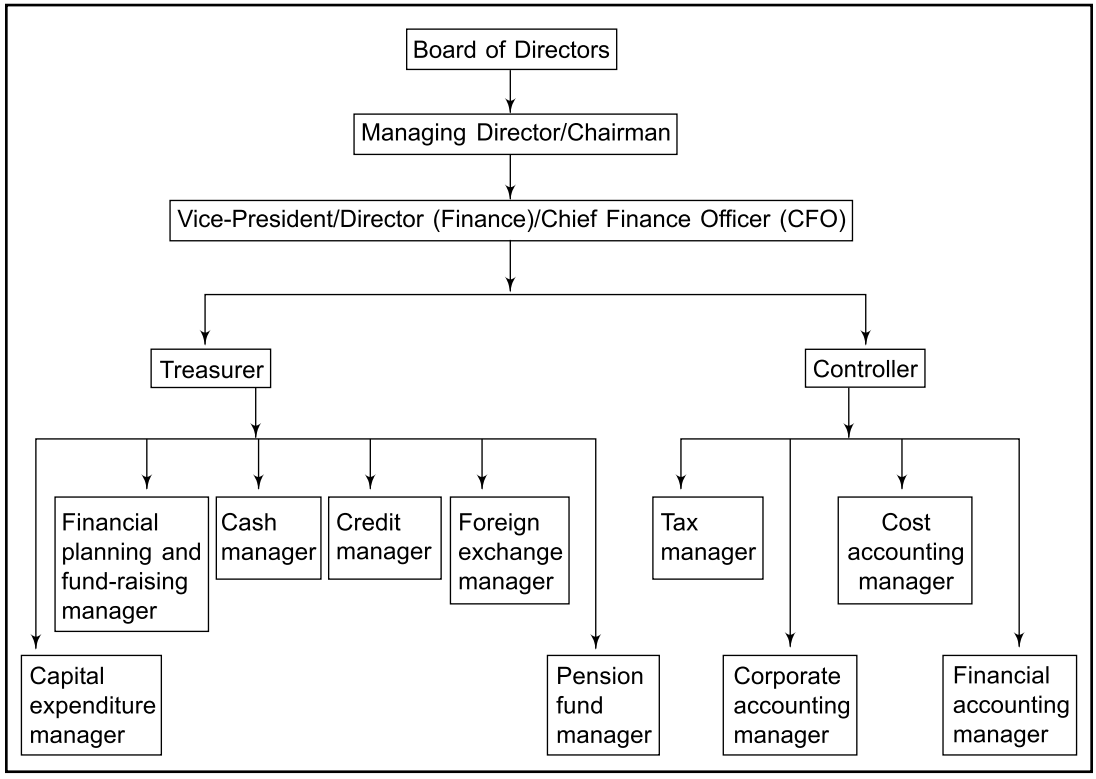


FIGURE 1.2 Organisation of Financial Management Function

The *job of the chief financial executive* does not cover only routine aspects of finance and accounting. As a member of top management, he is closely associated with the formulation of policies as well as decision making. Under him are controllers and treasurers, although they may be known by different designations in different firms. The tasks of financial management and allied areas like accounting are distributed between these two key financial officers. Their functions are described below.

The main concern of the treasurer is with the financing activities of the firm.

The **main concern of the treasurer** is with the financing activities of the firm. Included in the range of his functions are: **(i)** obtaining finance,

(ii) banking relationship, **(iii)** investor relationship, **(iv)** short-term financing, **(v)** cash management, **(vi)** credit administration, **(vii)** investments, and **(viii)** insurance.

The functions of the controller are related mainly to accounting and control.

The **functions of the controller** are related mainly to accounting and control. The typical functions performed by him include: **(i)** financial accounting, **(ii)** internal audit, **(iii)** taxation, **(iv)** management accounting and control, **(v)** budgeting, planning and control, and **(vi)** economic appraisal and so on.

SECTION 6 EMERGING ROLE OF FINANCE MANAGERS IN INDIA

Reflecting the emerging economic and financial environment in the post-liberalisation era, the role/job of financial managers in India has become more important, complex and demanding. The key challenges are, *inter-alia*, in the areas specified below: **(a)** financial structure, **(b)** foreign exchange management, **(c)** treasury operations, **(d)** investor communication, **(e)** management control and **(f)** investment planning. The main elements of the changed economic and financial environment, *inter alia*, are the following:

- Considerable relaxation in industrial licensing framework in terms of the modifications in the Industries Development (Regulations) Act;
- Abolition of the Monopolies and Restrictive and Trade Practices (MRTP) Act and its replacement by the Competition Act;
- Repeal of Foreign Exchange Regulation Act (FERA) and enactment of a liberalised Foreign Exchange Management Act (FEMA);
- Abolition of Capital Issues (Control) Act and the setting-up of the Securities and Exchange Board of India (SEBI) under the SEBI Act for the regulation and development of the securities market and the protection of investors;
- Enactment of the Insurance Regulatory and Development Authority (IRDA) Act and the setting-up of the IRDA for the regulation of the insurance sector and the consequent dismantling of the monopoly of LIC and GIC and its subsidiaries;
- Emergence of the capital market at the centre-stage of the financing system and the disappearance of the erstwhile development/public financial/term lending institutions from the Indian financial scene;
- Emergence of a highly articulate and sophisticated money market;
- Globalisation, convertibility of rupee, liberalised foreign investments in India, Indian foreign investment abroad;
- Market-determined interest rate, emergence of highly innovative financial instruments;
- Growth of mutual funds; credit rating, other financial services;
- Rigorous prudential norms, credit risk management framework for banks and financial institutions;
- Access to Euro-issues, American Depository Receipts (ADRs);
- Privatisation/disinvestment of public sector undertakings.

Summary

- Financial management/corporate finance/managerial finance is concerned with the duties of the finance manager in a business firm. He performs such varied tasks as budgeting, financial forecasting, cash management, credit administration, investment analysis and funds procurement. The recent trends towards globalisation of business activity has created new demands and opportunities in managerial finance.
- Finance is closely related to both macroeconomics and microeconomics. Macroeconomics provides an understanding of the institutional structure in which the flow of finance takes place. Microeconomics provides various profit maximisation strategies based on the theory of the firm. A financial manager uses these to run the firm efficiently and effectively. Similarly, he depends on accounting as a source of information/data relating to the past, present and future financial position of the firm. Despite this interdependence, finance and accounting differ in that the former is concerned with cash flows, while the latter provides accrual-based information; and the focus of finance is on the decision making but accounting concentrates on collection of data.
- The financial management function covers decision making in three inter-related areas, namely, investment including working capital management, financing and dividend policy. The three key activities of the financial manager are **(1)** performing financial analysis; **(2)** making investment decisions and **(3)** making financing decisions.
- The goal of the financial manager is to maximise the owners/shareholders wealth as reflected in share prices rather than profit/EPS maximisation because the latter ignores the timing of returns, does not directly consider cash flows and ignores risk. As key determinants of share price, both return and risk must be assessed by the financial manager when evaluating decision alternatives. The EVA is a popular measure to determine whether an investment positively contributes to the owners wealth. However, the wealth maximising action of the finance managers should be consistent with the preservation of the wealth of stakeholders, that is, groups such as employees, customers, suppliers, creditors, owners and others who have a direct link to the firm. Corporate India paid scant attention to the goal of shareholders wealth maximisation till the eighties. In the post-liberaliastion era, it has emerged at the centre-stage of corporate financial practices, the contributory factors being greater dependence on capital market, growing importance of institutional investors and foreign exposure.
- An agency problem results when managers as agents of owners place personal goals ahead of corporate goals. Market forces and the threat of hostile takeover tend to act to prevent/minimise agency problems. In addition, firms incur agency costs in the form of monitoring and bonding expenditures, opportunity costs and structuring expenditures which involve both incentive and performance-based compensation plans to motivate management to act in the best interest of the shareholders.
- The importance of the finance function depends on the size of the firm. Financial management is an integral part of the overall management of the firm. In small firms, the finance functions are generally performed by the accounting departments. In large firms, there is a separate department of finance headed by a specialist known by different designations such as vice-president, director of finance, chief finance officer and so on.
- Reflecting the emerging economic and financial environment in the post-liberalisation era since the early nineties, the role/job of finance managers in India has become more important, complex and demanding. The key challenges are in the areas of **(1)** financial structure, **(2)** foreign exchange management, **(3)** treasury operations, **(4)** investor communication, **(5)** management control and (**6)** investment planning.

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2. *Ibid*., p 17.
3. For a comprehensive account of the first category of shortcomings please refer to Solomon, E and J J Pringle, *An Introduction to Financial Management*, Good Year Publishing Company, (Santa Monica, Calif), 1977, pp 8-9. Also Solomon E, *op. cit.*, pp 15-16; Johnson, R W, Financial Management, Allyn and Bacon, (Boston), 1971, pp 8-10.
4. Solomon, E, *op. cit*., p 20. Reprinted by permission of Columbia University Press, New York.
5. Solomon, E and Pringle J J, *op. cit*., p 13.

Review Questions

RQ.1.1 **(a)** Indicate whether the following statements are True or False.

(i) Financial management deals with two major decisions/functions, namely, investment and financing decisions.

(ii) Profit/EPS maximization is the sole objective of financial management.

(iii) Agency problem occurs when the management tries to fulfil its own interests at the cost of value of the firm.

(iv) Agency cost consists of **(a)** monitoring **(b)** binding **(c)** opportunity and **(d)** structuring cost such as stock options and cash bonuses, etc.

[Answers: (i) False (ii) False (iii) True (iv) True]

(b) In the following multiple choice questions select the correct answers.

(i) The only viable goal of financial management is

(a) profit maximization **(b)** wealth maximization
(c) sales maximization **(d)** assets maximization.

(ii) The basic objective of financial management is

(a) maximisation of profits
(b) maximisation of shareholder's wealth
(c) ensuring financial discipline in the organization
(d) none of the above.

(iii) Finance function involves

(a) procurement of finance only
(b) expenditure of funds only
(c) safe custody of funds only
(d) procurement and effective utilization of funds.

(iv) The goal of wealth maximization takes into consideration

(a) risk related to uncertainty of returns **(b)** timing of expected returns
(c) amount of returns expected **(d)** all the above.

(v) Financial management is mainly concerned with

(a) arrangement of funds
(b) all aspects of acquiring and utilizing means of financial resources for firm's activities
(c) efficient management of every business
(d) none of the above.

[Answers: (i) b (ii) b (iii) d (iv) d (v) b]

RQ.1.2 Describe the close relationship between finance and economics and explain why the finance manager should possess a basic knowledge of economics. What is the primary economic principle used in managerial finance?

RQ.1.3 What are the major differences between accounting and finance with respect to **(a)** emphasis on cash flows and **(b)** decision making?
RQ.1.4 Briefly explain the three key activities of the financial manager.
RQ.1.5 Briefly describe the three basic reasons why profit/EPS maximisation fails to be consistent with wealth maximisation.
RQ.1.6 What is the goal of the firm? Discuss how to measure achievement of this goal.
RQ.1.7 What is economic value added (EVA)? How is it used?
RQ.1.8 Who are a firm's stakeholders and what consideration is often given to them in pursuing the firm's goal? Why?
RQ.1.9 What is the agency problem? How do market forces act to prevent/minimise this problem?
RQ.1.10 Define agency costs and explain why firms incur them. What are structuring expenditures and how are they used? Describe and differentiate between incentives and performance compensation plans.
RQ.1.11 Describe the salient features of the modern approaches to financial management.
RQ.1.12 Describe the three broad areas of financial decision making.
RQ.1.13 Outline the factors behind Indian companies according greater importance to the goal of shareholders wealth maximisation.
RQ.1.14 Comment on the emerging role of the finance manager in India.
RQ.1.15 How is the finance function typically organised in a large organisation?
RQ.1.16 What are the primary objectives of corporate management in India?

Examination Questions

Theory Questions

1.1 "Wealth maximisation is a better criterion than profit maximisation." Do you agree? Explain. (*Delhi University 2011*).
1.2 "Financial goal of a firm should be to maximise value of wealth." Explain. (*Calcutta University, 2010*).
1.3 What is financial management? Discuss its importance. (*Gujarat University, 2010*).
1.4 What do you mean by financial management? (*Madras University, 2010*)
1.5 Mention any three objectives of financial management. (*Madras University, 2010*)
1.6 State any two aims of finance function. (*Madras University, 2010*)
1.7 Financial accounting and financial management are complementary in finance. Do you agree? Explain. (*Delhi University, 2009*)
1.8 Explain the various functions of financial management. (*Calcutta University, 2007, 2009*)
1.9 Explain the functions of finance manager. (*Bangalore University, Mumbai University, 2009*)
1.10 What do you mean by `financial management'? Explain in brief, duties and responsibilities of finance manager in modern business orgsnisation. (*University of Pune, 2009*)
1.11 Define traditional and modern concept of finance function. Also explain goals of financial management. Which goal is considered to be superior and why? (*University of Pune, 2009*)
1.12 Explain in detail the role and functions of finance manager of a globally diversified corporate entity. (*Pune University, 2009*)
1.13 Distinguish between profit maximisation and wealth maximisation objectives of a firm. (*Calcutta University, 2008*)
1.14 Explain the role of finance executive. (*Pune University, 2007, 2008*)
1.15 What are important financial decisions? Explain. (*Punjab University, 2008*)
1.16 Basic objectives of financial management is: **(a)** Maximisation of profits, **(b)** Maximisation of shareholders' wealth, **(c)** Ensuring financial discipline in the organisation, **(d)** All of the above. (*Bangalore University, 2008*).

1.17 What do you mean by wealth maximisation? (*Bangalore University 2008*)

1.18 Explain the concept of profit maximisation and wealth maximisation. Which of these, do you think, is a better operational guide for a finance manager? (*Delhi University, 2007*).

1.19 "Financial management is nothing but managerial decision making in asset mix, capital mix and profit allocation." Comment. (*Delhi University, 2006*).

1.20 What are the objectives of finance function? (*Bangalore University, 2006*)

1.21 Outline functional area of financial management. (*Bangalore University, 2006*)

1.22 "Financial management is indispensable in any organisation". Bring out its importance. (*Bangalore University, 2006*)

1.23 Define business finance. Discuss aims and scope of finance function. (*Punjab University, 2006*)

1.24 Give an idea about the `wealth maximisation objective of financial management. (*Calcutta University, 2006*)

1.25 "Wealth maximisation is only a decision criterion and not a goal." Explain. (*Delhi University, 2005*)

1.26 Enumerate responsibilities of financial manager. (*Delhi University, 2005*)

1.27 "Financial management is more than procurement of funds." What do you think are the responsibilities of a finance manager? *(Delhi University, 2004)*

1.28 What is value maximisation objective of the firm? Explain the role of various finance functions in achieving this objective. *(Calcutta University, 2004)*

1.29 (a) How should the finance function of an enterprise be organised?
(b) Explain the functions of financial manager.
(c) Explain the concept of profit maximisation and wealth maximisation. Which of these, do you think, is a better operational guide for a finance manager.
(Periyar University, Oct./Nov. 2004)

1.30 (a) Explain the nature of financial statement.
(b) Explain the steps a firm should take for wealth maximisation.
(c) Explain the objectives of financial management.
(d) Explain the traditional approach of financial management.
(Bharatiyar University, April 2003)

1.31 State in brief any three functions of finance manager. *(Mumbai University, November 2003)*

1.32 "The financial goal of a firm should be to maximise profit and not wealth." Do you agree with this statement? Comment. *(Delhi University, 2003)*

1.33 (a) Discuss the modern approach to financial management.
(b) Explain the executive and routine functions of a financial manager.
(Gujarat University, March-April 2003)

1.34 (a) Explain briefly the concepts of investment decisions.
(b) "Growth is a realistic objective of a joint stock company for financing decision-making." Comment.
(c) The finance manager has no role to play in a dot com company." Comment.
(Delhi University, 2002)

1.35 "The corporate firm will attempt to maximise the shareholders' wealth by taking actions that increase the current value per share of existing stock of the firm." (Ross). Comment.
(Delhi University, 2001)

1.36 (a) What do you mean by the term 'finance function"?
(b) What is profit maximisation?
(c) Evaluate the merits and demerits of the alternative goals or objectives of financial management.
(d) Explain the scope of financial management from the modern point of view.
(e) Explain the functions of finance.
(f) Explain the scope of finance function.
(g) What are the goals of finance function? Explain. *(Bharatiyar University, November 2001)*

1.37 Investment, financing and dividend decisions are all inter-related. Comment. *(Delhi University, 2000)*

1.38 "Financial management is concerned with solution of three major decisions a firm must make: the investment decision, the financing decision and the dividend decision." Explain this statement highlighting the inter-relationship amongst these decisions. *(Delhi University, 1999)*

1.39 What are the major types of financial management decisions that business firms make? Describe briefly each one of them. *(Delhi University, 1998)*

1.40 (a) "The profit maximisation is not an operationally feasible criterion." Do you agree? Illustrate your views.

(b) What are the major differences between accounting and finance? *(Delhi University, 1997)*

1.41 Which of the following statements are 'correct' and which are 'incorrect'?

(a) The objective of financial management is wealth maximisation and not profit maximisation. *(Delhi University, 1999)*

(b) Traditionally the role of finance manager was restricted to acquisition and efficient allocation of funds. *(Delhi University, 2000)*

1.42 Choose the best answer

1. The only viable goal of financial management is
   (a) Profit maximisation. (b) Wealth maximisation.
   (c) Sales maximisation. (d) Assets maximisation.
2. Basic objective of financial management is
   (a) Maximisation of profits. (b) Maximisation of shareholder's wealth.
   (c) Ensuring financial discipline in the organisation.
   (d) None of the above. *(Bharatiyar University, April 2001)*
3. Finance function involves
   (a) Procurement of finance only. (b) Expenditure of funds only.
   (c) Safe custody of funds only. (d) Procurement and effective utilisation of finance.
4. The goal of profit maximisation takes into consideration
   (a) Risk related to uncertainty of returns. (b) Timing of expected returns.
   (c) Amount of returns expected. (d) All of the above.
   (Bharatiyar University, November 2001)
5. Financial management is mainly concerned with
   (a) Arrangement of funds.
   (b) All aspects of acquiring and utilising means of financial resources for firm's activities
   (c) Efficient management of every business (d) None of the above
   (Bharatiyar University, April 2003)

Chapter

2

Time Value, Valuation, Risk and Return

Learning Objectives

1. Discuss the role of time value in finance particularly future (compound) value and present (discounted) value
2. Understand the concept of future value, its calculation for a single amount, compounding of interest more frequently than annually and find the future value of annuties.
3. Review the concept of present value, its calculation for a single amount and determine the present value of a mixed stream of cash-flows, an annuity and a porpetuity
4. Describe procedure involved in determining deposits to accumulate a future sum, loan amortisation and finding interest or growth rates
5. Apply the basic valuation model to bonds/debentures to evaluate the relationship between both required return and time to maturity and bond values
6. Explain YTM (yield to maturity), its calculation and the procedure used to value bonds that pay interest semi annually
7. Explain the framework for valuation of preference shares.
8. Understand basic share valuation under each of three cases—zero growth, constant growth, and variable growth
9. Understand the fundamental of risk and return
10. Describe procedure for assessing and measuring the risk of a single asset
11. Review the procedure to assess and measure the risk return of a protfolio
12. Explain the capital asset pricing model (CAPM) as a framework for basic return trade-off

INTRODUCTION

This chapter presents the basic financial concepts underlying contemporary financial management practices. Section 1 of the chapter is devoted to the time value of money since

an understanding of future value and present value is necessary for effective financial decision-making. The framework of valuation of long-term securities is discussed in section 2. The concepts of risk and return are analysed in section 3. To understand the wealth maximisation goal and its role in the financial decision process, an understanding of risk and return as a key determinant of value/security prices is necessary. The section focuses on the relationship between risk and return as specified by the capital asset pricing model (CAPM). The main points are summarised in the last section.

SECTION I TIME VALUE OF MONEY

The object of this section is to illustrate the basics of the mathematics of finance, that is, the time value of money. Recognition of the time value of money in financial decision-making is extremely important. It was observed in Chapter 1 that wealth maximisation, as an objective of financial management, is superior to profit maximisation because, among other things, the former incorporates the timing of benefits received while the latter ignores it. Given the objective of wealth maximisation, much of the subject-matter of financial management is future oriented. A financial decision taken today has implications for a number of years, that is, it spreads into the future. For example, firms have to acquire fixed assets for which they have to pay a certain sum of money to the vendors. The benefits arising out of the acquisition of such assets will be spread over a number of years in the future, till the working life of the assets. On the other hand, funds have to be procured from different sources such as raising of capital through new issues, bank borrowings, term loans from financial institutions, sale of debentures and so on. These involve a cash inflow at the time of raising funds as well as an obligation to pay interest/dividend and return the principal in future. It is on the basis of a comparison of the cash outflows (outlays) and the benefits (cash inflows) that financial decisions are made. For a meaningful comparison the two variables must be strictly comparable. One basic requirement of comparability is the incorporation of the time element in the calculations. In other words, in order to have a logical and meaningful comparison between cash flows that accrue in different time periods, it is necessary to convert the sums of money to a common point of time. This section is devoted to a discussion of the techniques for doing so. We first explain the meaning of, and rationale underlying, the time value of money. The technique employed in adjusting the timing aspect of financial decision making through compounding is explained subsequently. The discounting techniques are illustrated thereafter. The important applications of these techniques are also demonstrated.

Rationale

Time value of money means that the value of a unit of money is different in different time periods.

Conceptually, 'time value of money' means that the value of a unit of money is different in different time periods. The value of a sum of money received today is more than its value received after some time. Conversely, the sum of money received in future is less valuable than it is today. In other words, the present worth of a rupee received after some time will be less than a rupee received today. Since a rupee received today has more value, rational investors would prefer current receipt to future receipts. The time value of money can also be referred to as **time preference for money**.

The main reason for the time preference for money is to be found in the reinvestment opportunities for funds which are received early. The funds so invested will earn a rate of

return; this would not be possible if the funds are received at a later time. The time preference for money is, therefore, expressed generally in terms of a rate of return or more popularly as a discount rate. The expected rate of return as also the time value of money will vary from individual to individual depending, *inter alia*, on his perception. The time value of money can be illustrated using a simple example.

> Suppose, Mr X is given the choice of receiving Rs 1,000 either now or one year later. His choice would obviously be for the first alternative as he can deposit the amount in his saving bank account and earn a nominal rate of interest, say, five per cent. At the end of the year, the amount will accumulate to Rs 1,050. In other words, the choice before Mr X is between Rs 1,050 and Rs 1,000 at the end of the year. As a rational person, Mr X should be expected to prefer the larger amount (i.e. Rs 1,050 here). Here we say that the time value of money, that is, the rate of interest is five per cent. It may, thus, be seen that future cash flows are less valuable because of the investment opportunities of the present cash flows.

What applies to an individual applies equally, if not in greater measure, to a business firm. It is because business firms make decisions which have ramifications extending beyond the period in which they were taken. For instance, the capital budgeting decision generally involves the current cash outflows in terms of the amount required for purchasing a new machine or launching a new project and the execution of the scheme generates future cash inflows during its useful life. Let us assume that the project cost (current cash outflows) is Rs 10,00,000. To keep the illustration simple, it is assumed that the project has a useful life of only one year in which it is estimated to have cash inflows of Rs 10,80,000 (at the end of the first year). The project appears to be *prima facie* acceptable as it adds Rs 80,000 as profit. However, when we take into account a rate of interest, say, of 10 per cent, the earlier conclusion will have to be revised as, without the project, the sum could have amounted to Rs 11,00,000. Likewise, when the decision is made to raise a loan of Rs 10,00,000 from a financial institution or by issuing debentures, for a period of 10 years, the firm is not only under obligation to meet interest payment as and when it becomes due on the debt at fixed intervals but also must make provisions so that it can repay Rs 10,00,000 when the loan or debentures become due. Thus, time value of money is of crucial significance. This requires the development of procedures and techniques for evaluating future incomes in terms of the present.

Techniques

The preceding discussion has revealed that in order to have logical and meaningful comparisons between cash flows that result in different time periods it is necessary to convert the sums of money to a common point in time. There are two techniques for doing this: **(1)** Compounding, and **(2)** Discounting.

Compound interest is the interest earned on a given deposit/principal that has become a part of the principal at the end of a specified period.

Compounding Technique Interest is compounded when the amount earned on an initial deposit (the initial **principal**) becomes part of the principal at the end of the first compounding period. The term principal refers to the amount of money on which interest is received. Consider Example 2.1.

Principal refers to the amount of money on which interest is received.

Example 2.1

If Mr X invests in a saving bank account Rs 1,000 at 5 per cent interest compounded annually, at the end of the first year, he will have Rs 1,050 in his account. This amount constitutes the principal for earning interest for the next year. At the end

of the next year, there would be Rs 1,102.50 in the account. This would represent the principal for the third year. The amount of interest earned would be Rs 55.125. The total amount appearing in his account would be Rs 1,157.625. Table 2.1 shows this compounding procedure:

TABLE 2.1 Annual Compounding

Year	*1*	*2*	*3*
Beginning amount	Rs 1,000.00	Rs 1,050.00	Rs 1,102.500
Interest rate	0.05	0.05	0.050
Amount of interest	50.00	52.50	55.125
Beginning principal	1,000.00	1,050.00	1,102.500
Ending principal	1,050.00	1,102.50	1,157.625

This compounding procedure will continue for an indefinite number of years. The compounding of interest can be calculated by the following equation:

$$A = P(1 + i)^n \qquad \textbf{(2.1)}$$

in which

A = amount at the end of the period
P = principal at the beginning of the period
i = rate of interest
n = number of years

The amount of money in the account at the end of various years is calculated by using Eq. 2.1.

Amount at the end of year 1 = Rs 1,000 (1 + .05) = Rs 1,050
2 = Rs 1,050 (1 + .05) = Rs 1,102.50
3 = Rs 1,102.50 (1 + .05) = Rs 1,157.625

The amount at the end of year 2 can be ascertained by substituting Rs 1,000 (1 + .05) for Rs 1,050, that is, Rs 1,000 (1 + .05) (1 + .05) = Rs 1,102.50. Similarly, the amount at the end of year 3 can be determined in the following way: Rs 1,000 (1 + .05) (1 + .05) (1 + .05) = Rs 1,157.625.

Thus, after substituting the actual figures for the investment of Rs 1,000 in the formula $A = P(1 + i)^n$, we arrive at the same result as in Table 2.1. This is the fundamental equation of compound interest. The formula is useful as it can be applied quite readily for wide ranges of i and n. However, the calculations involved will be tedious and time-consuming if the number of years involved is large, say, 15 years or 20 years. To find the compound value of Rs 1,000, assuming the rate of interest to be 5 per cent, the compounding factor 1.05 is to be raised to fifteenth power or twentieth power. In order to simplify the compound interest calculations, compound interest tables for values $(1 + i)^n$ for wide ranges of i and n have been compiled. Table A-1 given in *Appendix I* at the end of the book gives compound value interest factor of one rupee at different rates of interest for different time periods. The compounded values can be readily calculated with the help of Table A-1. For instance, if Mr X wishes to find out how much his savings, Rs 1,000, will accumulate to in 15 years at 5 per cent rate of interest, application of the formula will require solving 1.05 raised to the power of fifteen: Rs 1,000 $(1.05)^{15}$ = A

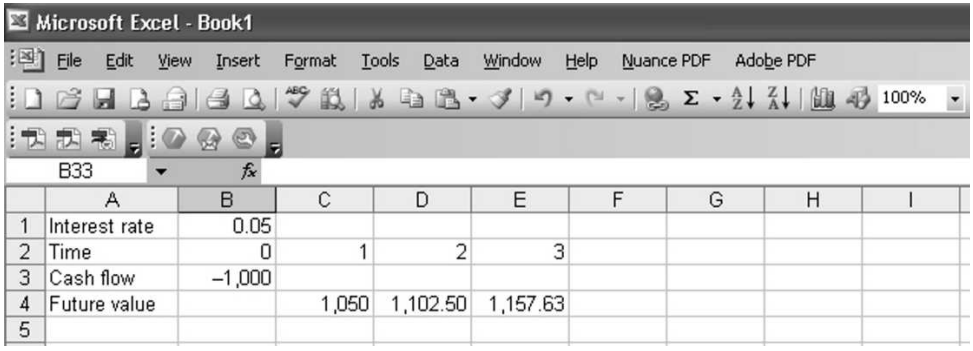
Using Table A-1, we find that the compound value interest factor (CVIF) of Re 1 at 5 per cent interest rate for 15 years is 2.079. Multiplying the initial principal (Rs 1,000) by 2.079, we obtain Rs 2,079. With the help of the table, it is possible to calculate the compounded value for any combination of interest rate, i and number of years, n. Let us take another illustration.

The compound interest phenomenon is most commonly associated with various savings institutions. These institutions emphasise the fact that they pay compound interest on savings deposited with them. If an investor deposits Rs 20,000 with a bank which is paying interest at 8 per cent on a 15-year time deposit, we consult Table A-1 and read the relevant value in the 15th row (time period) in the column of 8 per cent (rate of interest). This value is 3.172. Multiplying this factor by the actual deposit of Rs 20,000, we find his savings will accumulate to Rs 63,440.

Two important observations can be made from the Table A-1 for the sum of Re one. The first is that as the interest rate increases for any given year, the compound interest factor also increases. Thus, the higher the interest rate, the greater is the future sum. The second point is that for a given interest rate, the future sum of a rupee increases with the passage of time. Thus, the longer the period of time, the higher is the compound interest factor. However, it should be borne in mind that for an interest rate of zero per cent, the compound interest factor always equals 1 and, therefore, the future amount always equals the initial principal.

Alternatively, the calculation of the compounded value can be carried out using Microsoft Excel (Spreadsheet).

Spreadsheet Solution 2.1



	A	B	C	D	E	F	G	H	I
1	Interest rate	0.05							
2	Time	0	1	2	3				
3	Cash flow	–1,000							
4	Future value		1,050	1,102.50	1,157.63				
5									

Interest rate is entered in cell B1 as a decimal number 0.05. Periods for the time line are entered in row 2. Instead of entering values in all the cells in row 2, you can enter 0 in cell B2, the formula B2+1 in cell C2 and then copy the formula in the remaining cells of row 2. Cash flows are entered in row 3. The single cash flow in this example has been shown in cell B3. The formula in equation 2.1 has been entered in cell C4 as =-$B3*(1+$B1)^C2. The minus sign is used in the formula because the cash flow in cell B3 bears a negative sign. The formula is then copied in cells D4 and E4. Cell E4 shows that the future value of Rs. 1,000, compounded for 3 years at 5 per cent per year is Rs. 1,157.625.

Future Value can also be found using the function wizard in Microsoft Excel. The equation of this function in Excel format is FV(Rate, Nper, Pmt, Pv, Type). In this equation, Rate stands for rate of interest per period; Nper stands for number of payment periods; Pmt stands for payment made each period and Pv is the present value, or the lump-sum amount that a series of future payments is worth right now. If Pv is omitted, it is assumed to be 0 (zero), and you must include the Pmt argument. A Type code is to be entered to indicate the time at which the payments are due. The code is 0 if the payments are due at the end of the period and 1 if the payments are due in the beginning of the period.

To use the function wizard, put the cursor on cell E2 and click; click the function wizard, a window 'insert function' will appear; choose 'Financial' from the category of functions, a list of financial functions will appear; scroll down to FV and then click OK, you will see the FV dialogue box. Enter 0.05 or $B1 for Rate, C2 for Nper, 0 or leave blank for Pmt as there are no periodic payments, -1,000 or $B3 for Pv and 0 or leave blank to indicate that payments occur at the end of the period. When you click OK after entering the data, you get the future value of Rs. 1,050 after 1 period. Copy the formula of cell E2 in cells E3 and E4 to get the FV values for the years 2 and 3 respectively.

Semi-annual and Other Compounding Periods In the above examples, we have assumed annual compounding of interest at the end of the year. Very often the interest rates are compounded more than once in a year. Savings institutions, particularly, compound interests semi-annually, quarterly and even monthly.

Semi-annual compounding means two compounding periods within a year.

Semi-annual Compounding means that there are *two compounding periods* within the year. Interest is actually paid after every six months at a rate of one-half of the annual (stated) rate of interest.

Example 2.1

Assume Mr X places his savings of Rs 1,000 in a two-year time deposit scheme of a bank which yields 6 per cent interest compounded semi-annually. He will be paid 3 per cent interest compounded over four periods—each of six months' duration. Table 2.2 presents the calculations of the amount Mr X will have from the time deposit after two years.

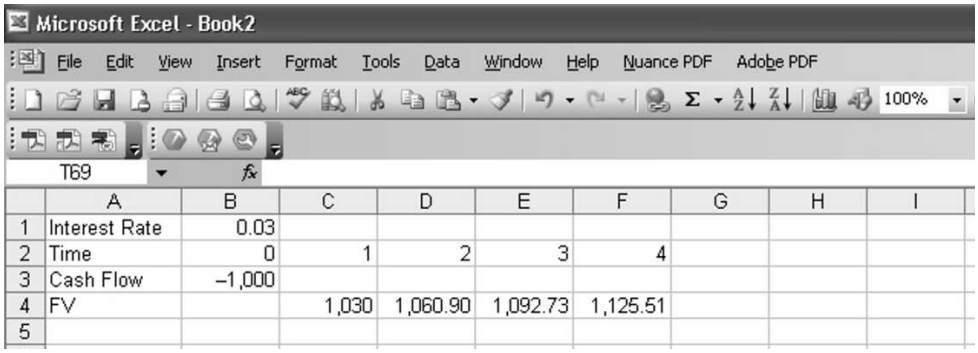
TABLE 2.2 Semi-annual Compounding

Year	*6 months*	*1 Year*	*18 months*	*2 years*
Beginning amount	Rs 1,000.00	Rs 1,030.00	Rs 1,060.90	Rs 1,092.73
Interest rate	0.03	0.03	0.03	0.03
Amount of interest	30.00	30.90	31.83	32.78
Beginning principal	1,000.00	1,030.00	1,060.90	1,092.73
Ending principal	1,030.00	1,060.90	1,092.73	1,125.51

Table 2.2 reveals that his savings will amount to Rs 1,060.90 and Rs 1,125.51 respectively at the end of the first and second years.

Spreadsheet Solution 2.2

In line with the earlier spreadsheet application, the spreadsheet can be straight away applied to solve the Example 2.1.



Quarterly compounding means four compounding periods in a year.

Quarterly Compounding means that there are *four compounding periods* within the year. Instead of paying the interest once a year, it is paid in four equal instalments after every three months. Using the above illustration, there will be eight compounding periods and the rate of interest for each compounding period will be 1.5 per cent, that is (1/4 of 6 per cent).

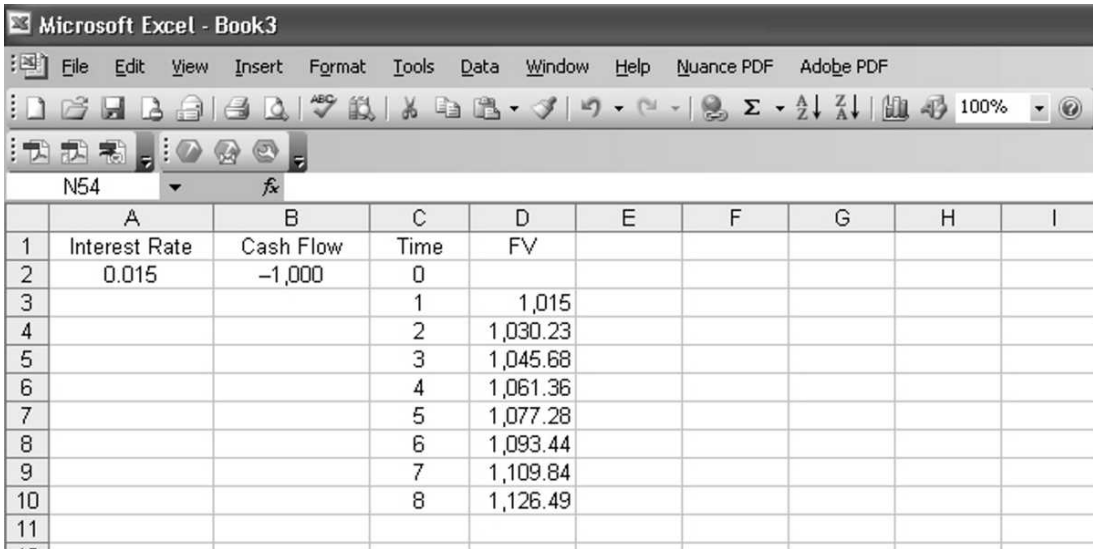
Table 2.3 presents the relevant calculations regarding the amount he will have at the end of two years, when interest is compounded quarterly. At the end of the first year, his savings will accumulate to Rs 1,061.363 and at the end of the second year he will have Rs 1,126.49.

TABLE 2.3 Quarterly Compounding

Period (months)	*Beginning amount*	*Interest factor*	*Amount of interest*	*Beginning principal*	*Ending principal*
3	Rs 1,000.000	0.015	Rs 15.000	Rs 1,000.000	Rs 1,015.000
6	1,015.000	0.015	15.225	1,015.000	1,030.225
9	1,030.225	0.015	15.453	1,030.225	1,045.678
12	1,045.678	0.015	15.685	1,045.678	1,061.363
15	1,061.363	0.015	15.920	1,061.363	1,077.283
18	1,077.283	0.015	16.159	1,077.283	1,093.442
21	1,093.442	0.015	16.401	1,093.442	1,109.843
24	1,109.843	0.015	16.647	1,109.843	1,126.490

Table 2.4 presents a comparative picture of Mr X's savings at the end of two years when they are compounded annually, half-yearly and quarterly. The table warrants the generalisation that the more frequently the interest is compounded, the greater is the amount of money accumulated. This is primarily because interest is earned more frequently.

Spreadsheet Solution 2.3



	A	B	C	D	E	F	G	H	I
1	Interest Rate	Cash Flow	Time	FV					
2	0.015	–1,000	0						
3			1	1,015					
4			2	1,030.23					
5			3	1,045.68					
6			4	1,061.36					
7			5	1,077.28					
8			6	1,093.44					
9			7	1,109.84					
10			8	1,126.49					
11									

TABLE 2.4 Comparison of Annual, Semi-annual and Quarterly Compounding

	Compounding period		
End of year	*Annual*	*Half-yearly*	*Quarterly*
1	Rs 1,060.00	Rs 1,060.90	Rs 1,061.36
2	1,123.60	1,125.51	1,126.49

The effect of compounding more than once a year can also be expressed in the form of a formula. Equation 2.1 can be modified as Eq. 2.2.

$$P\left\{1+\frac{i}{m}\right\}^{mn} = A \qquad \textbf{(2.2)}$$

in which m is the number of times per year compounding is made. For semi-annual compounding, m would be 2, while for quarterly compounding it would equal 4 and if interest is compounded monthly, weekly and daily, would equal 12, 52 and 365 respectively.

The general applicability of the formula can be shown as follows, assuming the same figures of Mr X's savings of Rs 1,000:

1. For semi-annual compounding, Rs 1,000 $\left\{1+\frac{0.06}{2}\right\}^{2\times 2}$ = Rs 1,000 $(1 + 0.03)^4$ = Rs 1,125.51

2. For quarterly compounding, Rs 1,000 $\left\{1+\frac{0.06}{4}\right\}^{4\times 2}$ = Rs 1,000 $(1 + 0.015)^8$ = Rs 1,126.49

The table of the sum of Re 1 (Table A-1) can also be used to simplify calculations when compounding occurs more than once a year. We are required simply to divide the interest rate by the number of times compounding occurs, that is $(i \div m)$ and multiply the years by the number of compounding periods per year, that is, $(m \times n)$. In our example, we have to look at Table A-1 for the sum of rupee one under the 3 per cent column and in the row for the fourth year when compounding is done semi-annually, the respective rate and year figures would be 1.5 per cent and the eighth year in quarterly compounding.

The compounding factor for 3 per cent and 4 years is 1.126 while the factor for 1.5 per cent and 8 years is 1.127. Multiplying each of the factors by the initial savings deposit of Rs 1,000, we find Rs.1,126 (Rs 1,000 × 1.126) for semi-annual compounding and Rs 1,127 (Rs 1,000 × 1.127) for qua-rterly compounding. The corresponding values found by the long method are Rs 1,125.51 and Rs 1,126.49 respectively. The difference can be attributed to the rounding off of values in Table A-1.

Future/Compounded Value of a Series of Payments So far we have considered only the future value of a single payment made at time zero. In many instances, we may be interested in the future value of a series of payments made at different time periods. For simplicity, we assume that the compounding time period is one year and payment is made at the end of each year. Suppose, Mr X deposits each year Rs 500, Rs 1,000, Rs 1,500, Rs 2,000 and Rs 2,500 in his

saving bank account for 5 years. The interest rate is 5 per cent. He wishes to find the future value of his deposits at the end of the 5th year. Table 2.5 presents the calculations required to determine the sum of money he will have.

TABLE 2.5 Annual Compounding of a Series of Payments

End of year	*Amount deposited*	*Number of years compounded*	*Compounded interest factor from Table A-1*	*Future value (2) × (4)*
1	*2*	*3*	*4*	*5*
1	Rs 500	4	1.216	Rs 608.00
2	1,000	3	1.158	1,158.00
3	1,500	2	1.103	1,654.50
4	2,000	1	1.050	2,100.00
5	2,500	0	1.000	2,500.00
				8,020.50

Column 3 of Table 2.5 indicates that since the deposits are made at the end of the year, the first deposit will earn interest for four years, the second for three years and so on. The last payment of Rs 2,500 comes at the end of the fifth year and, therefore, the future value remains Rs 2,500. The future value of the entire stream of payments is the sum of the individual future values, that is, Rs 8,020.50. The graphic presentation of these values is shown in the following time scale diagram which shows the equivalence of money sums (Fig. 2.1).

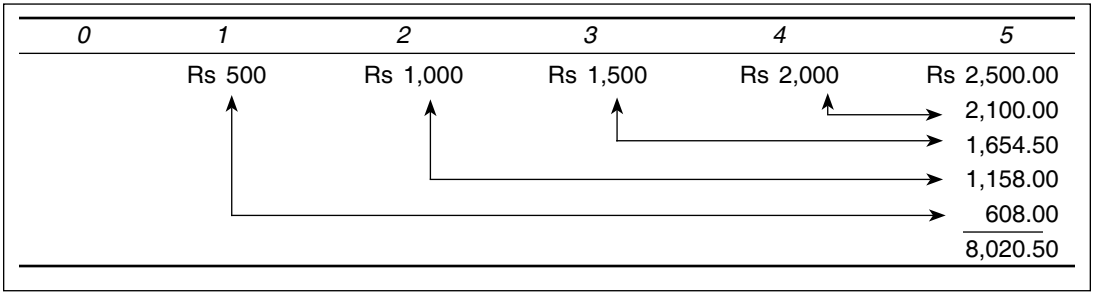


FIGURE 2.1 Graphic Illustration of Compounding Values

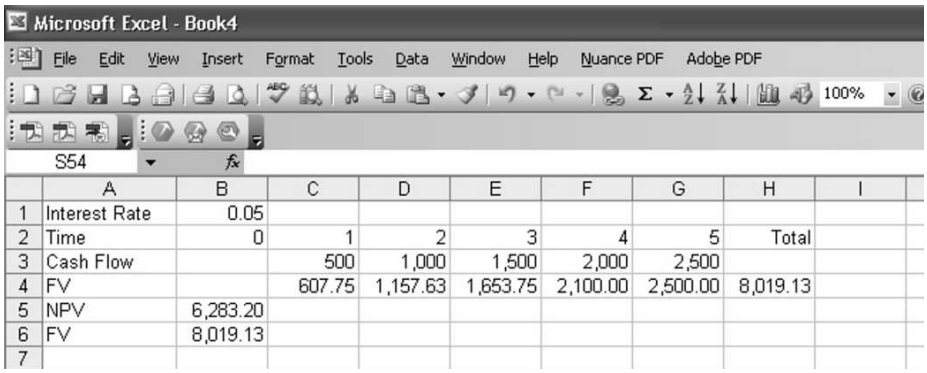
It may be noted here that we are making use of the compound interest formula for each payment separately. For instance, Rs 500 put in at the end of the first year compounds for four years, and has a future value of Rs 608 at 5 per cent interest [Rs $500(1 + 0.05)^4$]. Similarly, Rs.1,000 deposited at $n = 2$ compounds for 3 years and amounts to Rs 1,158 [Rs $1,000(1 + 0.05)^3$] and so on.

Future value of a series of payments can be calculated using the formula

$$FV_n = \sum_{t=1}^{n} CF_t(1 + i)^{n-t} \qquad \textbf{(2.2A)}$$

Where CF_t is the cash flow occurring at time t, i is the interest rate per period and n is the number of periods.

Spreadsheet Solution 2.4



	A	B	C	D	E	F	G	H	I
1	Interest Rate	0.05							
2	Time	0	1	2	3	4	5	Total	
3	Cash Flow		500	1,000	1,500	2,000	2,500		
4	FV		607.75	1,157.63	1,653.75	2,100.00	2,500.00	8,019.13	
5	NPV	6,283.20							
6	FV	8,019.13							
7									

In cell C4 of the spreadsheet, enter the formula =C3*(1+$B1)^($G2-C2). Copy this formula in cells D4 to G4. The sum of future values of each year's cash flow is calculated in cell H4 by entering the function =SUM(C4:G4).

The difference in the future value as per the numerical solution and as per the spreadsheet solution is due to approximations in the manual calculations.

Future value of a series of payments can also be calculated in an alternate way. First, the NPV of the cash flows is calculated using the NPV function from the function wizard. To use this function, there is a need to specify the interest rate and the series of payments. In the cell B5, enter the function =NPV(B1,C3:G3) to get the NPV. Then, the future value of the series of payments can be computed using the formula $=NPV(1+i)^n$. This step has been performed in cell B6 using the function =B5*(1+B1)^G2.

Annuity is a stream of equal annual cash flows.

Compound Sum of an Annuity An **annuity** is a stream of equal annual cash flows. Annuities involve calculations based upon the regular periodic contribution or receipt of a fixed sum of money. The calculations required to find the sum of an annuity on which interest is paid at a specified rate compounded annually are illustrated in Example 2.3.

Example 2.3

Mr X deposits Rs 2,000 at the end of every year for 5 years in his saving account paying 5 per cent interest compounded annually. He wants to determine how much sum of money he will have at the end of the 5th year.

Solution

Table 2.6 presents the relevant calculations.

TABLE 2.6 Annual Compounding of Annuity

End of year	*Amount deposited*	*Number of years compounded*	*Compounded interest factor from Table A-1*	*Future value (2) × (4)*
1	*2*	*3*	*4*	*5*
1	Rs 2,000	4	1.216	Rs 2,432
2	2,000	3	1.158	2,316
3	2,000	2	1.103	2,206
4	2,000	1	1.050	2,100
5	2,000	0	1.000	2,000
				11,054

The calculations in this case can be cut short and simplified since the compound interest factor is to be multiplied by the same rupee amount (Rs 2,000) each year as shown in the following calculations:

Amount at the end of 5 years = Rs 2,000 (1.216) + Rs 2,000 (1.158) + Rs 2,000 (1.103) + Rs 2,000 (1.050) + Rs 2,000 (1.000)

Taking out the common factor Rs 2,000, = Rs 2,000 (1.216 + 1.158 + 1.103 + 1.050 + 1.000)

= Rs 2,000 (5.527) = Rs 11,054.

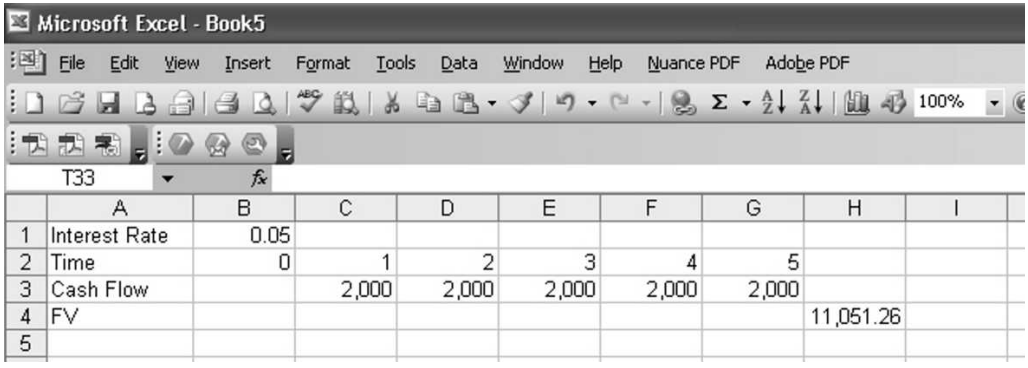
From the above, it follows that in order to find the sum of the annuity, the annual amount must be multiplied by the sum of the appropriate **compound interest factor** annuity (CVIFA). Such calculations are available for a wide range of *i* and *n*. They are given in Table A-2, labelled as the sum of an annuity table. To find the answer to the annuity question of Example 2.3, we are required to look for the 5 per cent column and the row for the fifth year and multiply the factor by the annuity amount of Rs 2,000. From the table we find that the sum of annuity of Re 1 deposited at the end of each year for 5 years is 5.526 (CVIFA). Thus, when multiplied by Rs 2,000 annuity (A) we find the total sum as Rs 11,052.

Compound/ future interest factor for an annuity is the multiplier used to calculate the future/ compound value of an annuity at a specified rate over a given period of time.

Symbolically, $Sn = CVIFA \times A$

where *A* is the value of annuity, and *CVIFA* represents the appropriate factor for the sum of the annuity of Re 1 and *Sn* represents the compound sum of an annuity. The answer which we get from the long method was Rs 11,054. This discrepancy can be attributed to the rounding off of values in Table A-2. Moreover, it may be noted that the sum of an annuity is always larger than the number of years the annuity runs, unless of course, when interest rate is zero; in the latter case it will equal the number of years.

Spreadsheet Solution 2.5



	A	B	C	D	E	F	G	H	I
1	Interest Rate	0.05							
2	Time	0	1	2	3	4	5		
3	Cash Flow		2,000	2,000	2,000	2,000	2,000		
4	FV							11,051.26	
5									

In Microsoft Excel, there is an inbuilt function, FV, for finding the future value of an annuity. The function has already been explained in Example 2.1. In cell H4, enter the function =FV(B1,G2,-2000,0,0) to get the future value of the annuity. The difference in future value as per the spreadsheet solution and as per the numerical solution is due to approximations.

Annuity tables are of great help in the field of investment banking as they guide the depositors and investors as to what sum an amount (X) paid for number of years, *n*, will accumulate to at a stated rate of compound interest. Let us illustrate. Mr X wishes to know the sum of money he will have in his saving account which pays 5 per cent interest at the end of 12 years if he deposits

Rs .1,000, at the end of each year for the next twelve years. The appropriate factor for the sum of a twelve-year annuity at 5 per cent as given in Table A-2 is 15.917. Multiplying this factor by Rs 1,000 deposit, we find the resultant sum to be Rs 15,917.

Present Value or Discounting Technique The concept of the present value is the exact opposite of that of compound value. While in the latter approach money invested now appreciates in value because compound interest is added, in the former approach (present value approach) money is received at some future date and will be worth less because the corresponding interest is lost during the period. In other words, the present value of a rupee that will be received in the future will be less than the value of a rupee in hand today. Thus, in contrast to the compounding approach where we convert present sums into future sums, in **present value** approach future sums are converted into present sums. Given a positive rate of interest, the present value of future rupees will always be lower. It is for this reason, therefore, that the procedure of finding present values is commonly called **discounting**. It is concerned with determining the present value of a future amount, assuming that the decision maker has an opportunity to earn a certain return on his money. This return is designated in financial literature as the discount rate, the cost of capital or an opportunity cost. These concepts are elaborated in Chapter 7. Let us illustrate the discounting procedure by an example (2.4).

Present value is the current value of a future amount. The amount to be invested today at a given interest rate over a specified period to equal the future amount.

Discounting is determining the present value of a future amount.

Example 2.4

Mr X has been given an opportunity to receive Rs 1,060 one year from now. He knows that he can earn 6 per cent interest on his investments. The question is: what amount will he be prepared to invest for this opportunity?

To answer this question, we must determine how many rupees must be invested at 6 per cent today to have Rs 1,060 one year afterwards.

Let us assume that P is this unknown amount, and using Eq. 2.1 we have: $P(1 + 0.06) = \text{Rs}\,1{,}060$

Solving the equation for P, $P = \dfrac{\text{Rs}\,1{,}060}{1.06} = \text{Rs}\,1{,}000$

Thus, Rs 1,000 would be the required investment to have Rs 1,060 after the expiry of one year. In other words, the present value of Rs 1,060 received one year from now, given the rate of interest of 6 per cent, is Rs 1,000. Mr X should be indifferent to whether he receives Rs 1,000 today or Rs 1,060 one year from today. If he can either receive more than Rs 1,060 by paying Rs 1,000 or Rs 1,060 by paying less than Rs 1,000, he would do so.

Mathematical Formulation Since finding present value is simply the reverse of compounding, the formula for compounding of the sum can be readily transformed into a present value formula. As shown in the preceding section, according to the compounding formula, $A = P(1 + i)^n$. Therefore, the present value equation becomes:

$$P = \frac{A}{(1+i)^n} = A\left\{\frac{1}{(1+i)^n}\right\} \qquad \textbf{(2.3)}$$

in which P is the present value for the future sum to be received or spent; A is the sum to be received or spent in future; i is interest rate, and n is the number of years. Thus, the present value of money is the reciprocal of the compounding value.

Present Value Tables In order to simplify the present value calculations, tables are readily available for various ranges of i and n. Table A-3 in the Appendix gives the **present value interest factors** (PVIF) for various discount rates and years. Since the factors in Table A-3 give the present value of one rupee for various combinations of *i* and *n*, we can find the present value of the future lump sum by multiplying it with the appropriate present value interest factor (PVIF) from Table A-3.

In terms of a formula, it will be:

$$P = A(PVIF) \qquad \textbf{(2.4)}$$

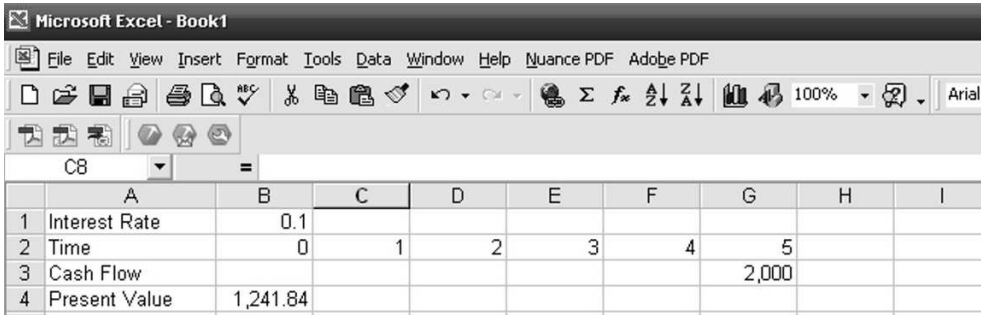
Present value interest factor is the multiplier used to calculate at a specified discount rate the present value of an amount to be received in a future period.

Example 2.5

Mr X wants to find the present value of Rs 2,000 to be received 5 years from now, assuming 10 per cent rate of interest. We have to look in the 10 per cent column of the fifth year in Table A-3. The relevant PVIF as per Table A-3 is 0.621.

Therefore, present value = Rs 2,000 (0.621) = Rs 1,242

Spreadsheet Solution



	A	B	C	D	E	F	G	H	I
1	Interest Rate	0.1							
2	Time	0	1	2	3	4	5		
3	Cash Flow						2,000		
4	Present Value	1,241.84							

Present value of a future cash flow can be found using the formula in equation 2.3. This formula has been entered in cell B4 as =G3/(1+B1)^G2. Cell B4 shows that the present value of Rs 2,000, discounted for 5 years at 10 per cent per year is Rs. 1,241.84. (This value is different from the value in the numerical solution due to approximations). Present Value can also be found using the PV function in Microsoft Excel. The inputs required by the PV function are similar to those of the FV function. The only difference is that there is need to provide present value (FV) instead of future value (PV).

Some points may be noted with respect to present values. First, the expression for the present value factor for *n* years at *i* per cent, $1/(1 + i)^n$ is the reciprocal or inverse of the compound interest factor for *n* years at *i* per cent, $(1 + i)^n$. This observation can also be confirmed by finding out the reciprocal of the relevant present value factor of Example 2.5. The reciprocal of 0.621 is 1.610. The compound interest factor from Table A-1 for 5 years at 10 per cent is 1.611. The difference is due to rounding off of values in Table A-1.

In other words, in Example 2.5, the sum of Rs 1,242 will be compounded to Rs 2,000 in five years at 10 per cent rate of interest [Rs 1,242 × 1.611) = Rs 2,000.862]. The difference of Re 0.862 is attributable to the fact that the table values are rounded figures. This indicates that both the methods, compounding and discounting of adjusting time value of money, yield identical results. Second, Table A-3 shows that the farther in the future a sum is to be received, the lower is its present value. See, for instance, the following extract from Table A-3:

Time (years)	*2*	*4*	*6*	*8*	*10*
5 per cent discount factor	0.907	0.823	0.711	0.677	0.614

Finally, the perusal of Table A-3 also reveals that the greater is the discount rate, the lower is its present value. Observe in this connection the following:

Discount rate	*4*	*8*	*12*	*16*	*20*
5 years time period	0.822	0.681	0.567	0.476	0.402

Thus, the higher the discount rate, the lower is the present value factor; and the longer the period of time, and correspondingly, the lower is the present value factor and *vice versa*. At the discount rate of zero per cent, the present value factor always equals one and, therefore, the future value of the funds equals their present value. But this aspect is only of academic importance as in actual practice the business firms can rarely, if ever, obtain the resources (capital) at zero rate of interest.

Present Value of a Series of Cash Flows So far we have considered only the present value of a single receipt at some future date. In many instances, especially in capital budgeting decisions, we may be interested in the present value of a series of receipts received by a firm at different time periods. Like compounding, in order to determine the present value of such a **mixed stream** of cash inflows, all that is required is to determine the present value of each future payment and then to aggregate them to find the total present value of the stream of cash flows. Symbolically,

Mixed stream is a stream of cashflows that reflects no particular pattern.

$$P = \frac{C_1}{(1+i)} + \frac{C_2}{(1+i)^2} + \frac{C_3}{(1+i)^3} + \ldots + \frac{C_n}{(1+i)^n} = \sum_{t=1}^{n} \frac{C_t}{(1+i)^t} \qquad \textbf{(2.5)}$$

in which P = the sum of the individual present values of separate cash flows; C_1, C_2, C_3 ... C_n, refer to cash flows in time periods 1, 2, 3 ... n.

This is the general form of the present value formula. To put the formula in a more practical perspective, we will have

$$P = C_1(IF_1) + C_2(IF_2) + C_3(IF_3) + \ldots + C_n(IF_n) = \sum_{t=1}^{n} C_t(IF_t) \qquad \textbf{(2.6)}$$

in which IF_1, IF_2, IF_3, ... IF_n represents relevant present value factors in different time periods, 1,2, 3 ... n.

If the time value of money is 10 per cent, we can easily find the present value of the following series of yearly payments (Example 2.6).

Example 2.6

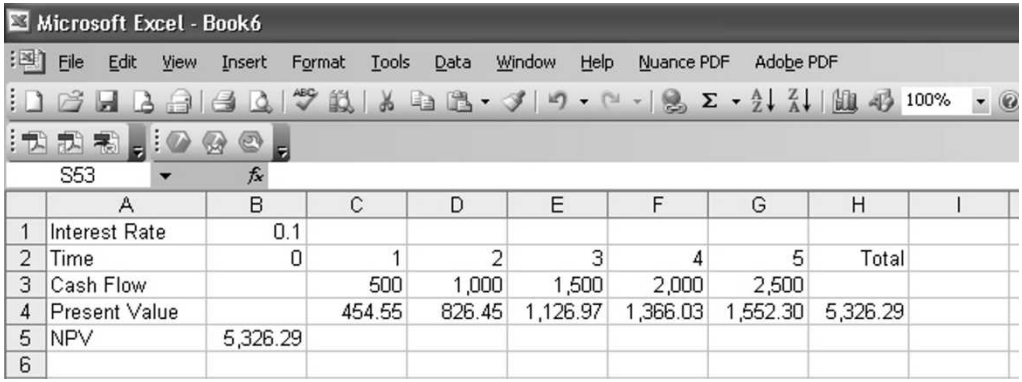
In order to solve this problem, the present value of each individual cash flow discounted at 10 percent for the appropriate number of years is to be determined. The sum of all these individual values is then calculated to get the present value of the total stream. The present value factors required for the purpose are obtained from Table A-3. The results are summarised in Table 2.7.

Year	*Cash flows*
1	Rs 500
2	1,000
3	1,500
4	2,000
5	2,500

TABLE 2.7 Present Value of a Mixed Stream of Cash Flows

Year end	*Cash flows*	*Present value factor (2) × (3)*	*Present value*
1	*2*	*3*	*4*
1	Rs 500	0.909	Rs 454.50
2	1,000	0.826	826.00
3	1,500	0.751	1,126.50
4	2,000	0.683	1,366.00
5	2,500	0.621	1,552.50
			5,325.50

Spreadsheet Solution 2.6



	A	B	C	D	E	F	G	H	I
1	Interest Rate	0.1							
2	Time	0	1	2	3	4	5	Total	
3	Cash Flow		500	1,000	1,500	2,000	2,500		
4	Present Value		454.55	826.45	1,126.97	1,366.03	1,552.30	5,326.29	
5	NPV	5,326.29							
6									

In cell C4 of the spreadsheet, enter the formula =C3/(1+B1)^C2. Copy this formula in cells D4 to G4. The sum of present values of each year's cash flow is calculated in cell H4 by entering the function =SUM(C4:G4). Present value of a series of payments can also be calculated by using the NPV function of Microsoft Excel. The function is entered in the cell B5. The results in cells H4 and B5 are identical.

Annuity We have already defined an annuity as a series of equal cash flows of an amount each time. Due to this nature of an annuity, a short cut is possible. Example 2.7 clarifies this method.

Example 2.7

Mr X wishes to determine the present value of the annuity consisting of cash inflows of Rs 1,000 per year for 5 years. The rate of interest he can earn from his investment is 10 per cent.

Solution

Table 2.8 shows the required calculations.

Table 2.8 shows the long way of determining the present value of annuity. This method is the same as the one adopted for mixed stream. This procedure yields a present value of Rs 3,791. However, calculations can be greatly cut short as the present value factor for each year is to be multiplied by the annual amount of Rs 1,000. This method of calculating the present value of the annuity can also be expressed as an equation:

P = Rs 1,000 (0.909) + Rs 1,000 (0.826) + Rs 1,000 (0.751) + Rs 1,000 (0.683) + Rs 1,000 (0.621)

= Rs 3,790.

TABLE 2.8 Long Method for Finding Present Value of an Annuity of Rs 1,000 for Five Years

Year end	*Cash flows*	*Present value factor*	*Present value (2) × (3)*
1	*2*	*3*	*4*
1	Rs 1,000	0.909	Rs 909.00
2	1,000	0.826	826.00
3	1,000	0.751	751.00
4	1,000	0.683	683.00
5	1,000	0.621	621.00
			3,790.00

Simplifying the equation by taking out 1,000 as common factor outside the equation,

P = Rs 1,000 (0.909 + 0.826 + 0.751 + 0.683 + 0.621) = Rs 1,000 (3.790) = Rs 3,790

Present value interest factor for an annuity is the multiplier to calculate the present value of an annuity at a specified discount rate over a given period of time.

Thus, the present value of an annuity can be found by multiplying the annuity amount by the sum of the present value factors for each year of the life of the annuity. Such ready-made calculations are available in Table A-4. This table presents the sum of present values for an annuity (PVIFA)/ annuity discount factor (ADF) of Re 1 for wide ranges of interest rates, i, and number of years, n. From Table A-4 the sum ADF for five years at the rate of 10 per cent is found to be 3.791. Multiplying this factor by annuity amount (C) of Rs 1,000 in this example gives Rs 3,791. This answer is the same as the one obtained from the long method.

Now we can write the generalised formula to calculate the present value of an annuity:

$$P = \frac{C_1}{(1+i)} + \frac{C_2}{(1+i)^2} + \frac{C_3}{(1+i)^3} + \ldots + \frac{C_n}{(1+i)^n}$$

$$= C\left\{\frac{1}{(1+i)} + \frac{1}{(1+i)^2} + \frac{1}{(1+i)^3} + \ldots + \frac{1}{(1+i)^n}\right\} = C\left\{\sum_{t=1}^{n} \frac{1}{(1+i)^t}\right\} \qquad \textbf{(2.7)}$$

The expression within brackets gives the appropriate annuity discount factor. Therefore, in more practical terms the method of determining present value is

$$P = C\,(ADF) = \text{Rs } 1{,}000\ (3.791) = \text{Rs } 3{,}791$$

It may be noted that the interest factor for the present value of an annuity is always less than the number of years the annuity runs, whereas in case of compounding the relevant factor is larger than the number of years the annuity runs. The facts given in Example 2.7 can be shown graphically (Fig. 2.2).

In Microsoft Excel, there is an inbuilt function, PV, for finding the present value of an annuity. In cell B4, enter the function =PV(B1,G2,-1000,0,0) to get the present value of the annuity.

Table A-4 can be easily applied to other problems relating to annuity also as shown in Example 2.8.

Example 2.8

The ABC company expects to receive Rs 1,00,000 for a period of 10 years from a new project it has just undertaken. Assuming a 10 per cent rate of interest, how much would be the present value of this annuity?

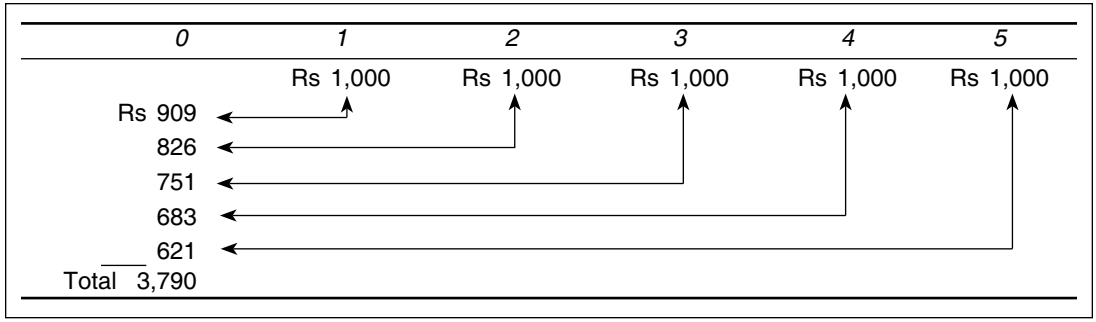


FIGURE 2.2 Graphic Illustration of Present Values

Spreadsheet Solution 2.7

Microsoft Excel - Book7

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T48

	A	B	C	D	E	F	G	H	I
1	Interest Rate	0.1							
2	Time	0	1	2	3	4	5		
3	Cash Flow		1,000	1,000	1,000	1,000	1,000		
4	PV	3,790.79							
5									

Solution

The appropriate ADF (annuity discount factor) of a 10 year annuity at 10 per cent is to be found from the 10th row (representing time period) against the 10 per cent interest column from Table A-4. This value is 6.145. Multiplying this factor by the annuity amount of Rs.1,00,000, we find that the sum of the present value of annuity is Rs 6,14,500.

Let us take an example to clarify how the problems involving varying cash inflows are to be worked out (Example 2.9).

Example 2.9

If ABC company expects cash inflows from its investment proposal it has undertaken in time period zero, Rs 2,00,000 and Rs 1,50,000 for the first two years respectively and then expects annuity payment of Rs 1,00,000 for the next eight years, what would be the present value of cash inflows, assuming a 10 per cent rate of interest?

Solution

We can solve the problem by applying the long method of finding the present values for each year's amount by consulting Table A-3. But we would like to apply the short-cut procedure as most of the payments are part of an annuity. Table 2.9 presents the relevant calculations:

It may be noted that the present values (PV) of Rs 2,00,000 and Rs 1,50,000 (uneven cash flows) received at the end of the first and second years respectively are to be determined with reference to Table A-3. The present value of subsequent cash inflows of Rs. 1,00,000 each for 8 years is found in Table A-4. The value of an annuity of Rs 1,00,000 for 8 years is found to be Rs 5,33,500. The most important point to note here is that Rs 5,33,500 is the present value

TABLE 2.9 Present Value of Uneven Cash Inflows Having Annuity

1.	Present value of Rs 2,00,000 due in year 1 = (Rs 2,00,000 × 0.909)[a]	= Rs 1,81,800
	Present value of Rs 1,50,000 due in year 2 = (Rs 1,50,000 × 0.826)[a]	= Rs 1,23,900
2.	Present value of eight year annuity with Rs 1,00,000 receipts:	
	(A) Present value at the beginning of year 3 = Rs 1,00,000 (5.335)[b]	= Rs 5,33,500
	(B) Present value at the beginning of year 1 = Rs 5,33,500 (0.826)	= Rs 4,40,671[c]
3.	Present value of total series = Rs 7,46,371	

[a] Present value factor at 10 per cent from Table A-3.

[b] Present value factor at 10 per cent from Table A-4.

[c] (6.145 − 1.736) × Rs 1,00,000

at the beginning of the third year (end of year 2). Therefore, its present worth in time period zero would obviously be less than Rs 5,33,500. This amount would have to be discounted back for two years at 10 percent. The present value factor for 2 years at 10 per cent discount is 0.826. Multiplying this sum by Rs 5,33,500 we get Rs 4,40,671. When the present values of the first two payments are added to the present value of the annuity component, we obtain the sum of the present value of the entire investment. For a better understanding of the problem, a graphic representation of the procedure of calculating the present value (PV) of such a problem has been given in Fig. 2.3.

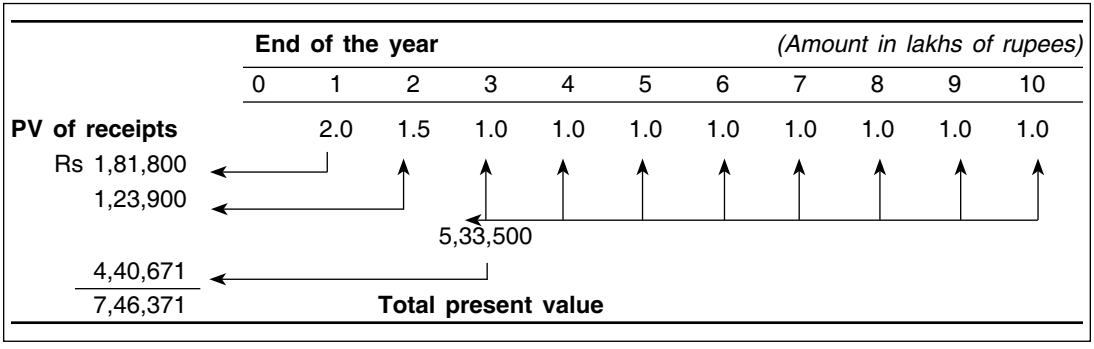

FIGURE 2.3 Graphic Presentation of Present Value of Mixed Streams

Spreadsheet Solution 2.8

Microsoft Excel - Book1

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N21

	A	B	C	D	E	F	G	H
1	Interest Rate	0.1						
2	Time	0	1	2	3 to 10	Total		
3	Cash Flow		2,00,000	1,50,000	1,00,000			
4	PV at the end of year 2				5,33,492.62			
5	PV a the end of year 0		1,81,818.18	1,23,966.94	4,40,902.99	7,46,688.12		
6								
7								

The problem is solved in two steps. First, the present values of cash flows for years 3 to 10 is found in cell E4 using the function =PV(B1,8, -100000,0,0). In the next step, the present value of this cash flow is found at the end of year 0 using the formula =E4/(1+B1)^2 in cell E5. The present values of cash flows in year 1 is found using the formula =C3/(1+B1)^C2 in cell C5. This formula is then copied to cell D5. Finally, the total present value is found in cell F5 using the formula =SUM(C5:E5).

Present Value of an Infinite Life Annuity (Perpetuities) An annuity that goes on for ever is called a **perpetuity**. The present value of a perpetuity of Rs C amount is given by the formula:

Perpetuity is an annuity with an indefinite life, making continuous annual payments.

$$C/i \qquad \textbf{(2.8)}$$

This is because as the length of time for which the annuity is received increases, the annuity discount factor also increases but if the length goes on extending, this increase in the annuity factor slows down. In fact, as annuity life becomes infinitely long ($n \to \Phi$), the annuity discount factor approaches an upper limit. Such a limit is $1/i$. In other words, the appropriate factor is found by merely dividing 1 by the discount rate. The validity of this method can be seen by looking at the facts in Table A-4 for discount rates of 8, 12, 16 and 20 percent for a period of 50 years. As the number of years approaches 50, the value of these factors approaches, 12.23, 8.31, 6.25 and 5.00 respectively. Substituting 0.08, 0.12, 0.16 and 0.20 into our upper discount limit formula of $1/i$, we find the factors for finding the present value of perpetuities at these rates as 12.5, 8.33, 6.25 and 5.00.

*E*xample 2.10

Mr X wishes to find out the present value of investments which yield Rs 500 in perpetuity, discounted at 5 per cent. The appropriate factor can be calculated by dividing 1 by 0.05. The resulting factor is 20. That is to be multiplied by the annual cash inflow of Rs 500 to get the present value of the perpetuity, that is, Rs 10,000. This should, obviously, be the required amount if a person can earn 5 per cent on investments. It is so because if the person has Rs 10,000 and earns 5 per cent interest on it each year, Rs 500 would constitute his cash inflow in terms of interest earnings, keeping intact his initial investments of Rs 10,000.

Practical Applications of Compounding and Present Value Techniques

In the preceding sections we have outlined compounding and discounting techniques. These techniques have a number of important applications, relevant to the task of the financial manager and investors. Some of these are illustrated here.

1. A financial manager is often interested in determining the size of annual payments to accumulate a future sum to repay an existing liability at some future date or to provide funds for replacement of an existing machine/asset after its useful life. Consider Example 2.11.

*E*xample 2.11

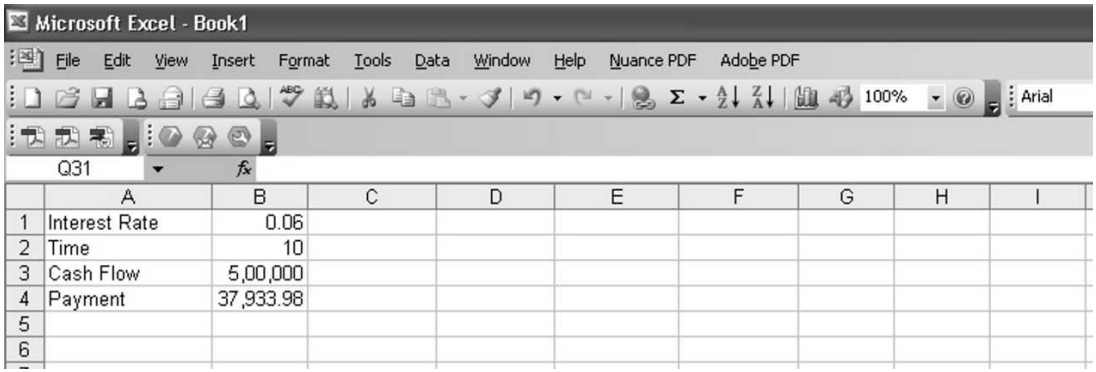
Company XYZ is establishing a sinking fund to retire Rs 5,00,000, 8 per cent debentures, 10 years from today. The company plans to put a fixed amount into the fund each year for 10 years. The first payment will be made at the end of the current year. The company anticipates that the funds will earn 6 per cent a year. What equal annual contributions must be made to accumulate Rs 5,00,000, 10 years from now?

*S*olution

The solution to this problem is closely related to the process of finding the compounded sum of an annuity. Table A-2 indicates that the annuity factor for 10 years at 6 per cent is 13.181. That is, one rupee

invested at the end of each year for 10 years will accumulate to Rs 13.181 at the end of the 10th year. In order to have Rs 5,00,000 the required amount would be Rs 5,00,000 ÷ 13.181 = Rs 37,933.39. If Rs 37,933.39 is deposited at the end of each year for ten years, there will be Rs 5,00,000 in the account.

Spreadsheet Solution 2.9



	A	B	C	D	E	F	G	H	I
1	Interest Rate	0.06							
2	Time	10							
3	Cash Flow	5,00,000							
4	Payment	37,933.98							
5									
6									

To find out the sinking fund payment, Excel function PMT can be used. The equation of this function in Excel format is PMT (rate, nper, PV, FV, type). Enter the rate of interest in cell B1, number of years in cell B2, and the amount to be accumulated in cell B3. In cell B4 enter the function =PMT(B1,B2,0,-B3,0). Since sinking fund accumulation represents a future value, the PV is to be entered as 0 and the sum to be accumulated is entered as FV. The result would be the amount of the sinking fund payment.

2. When the amount of loan taken from financial institutions or commercial banks is to be repaid in a specified number of equal annual instalments, the financial manager will be interested in determining the amount of the annual instalment. Consider Example 2.12.

Example 2.12

A limited company borrows from a commercial bank Rs 10,00,000 at 12 per cent rate of interest to be paid in equal annual end-of-year instalments. What would the size of the instalment be? Assume the repayment period is 5 years.

Solution

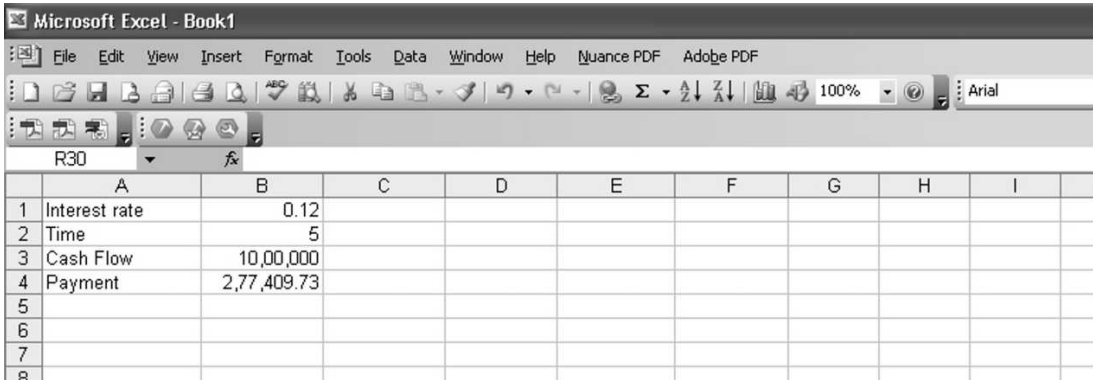
The problem relates to loan amortisation. The loan amortisation process involves finding out the future payments over the term of the loan whose present value at the interest rate just equals the initial principal borrowed. In this case, the company has borrowed Rs 10,00,000 at 12 per cent. In order to determine the size of the payments, the 5-year annuity discounted at 12 per cent that has a present value of Rs 10,00,000 is to be determined.

Present value, P, of an n year annuity of amount C is found by multiplying the annual amount, C, by the appropriate annuity discount factor (ADF) from Table A-4, that is, $P = C$ (ADF), or $C = P$/ADF in which P is the amount of loan, that is, (Rs 10,00,000), ADF is the present value of an annuity factor corresponding to 5 years and 12 per cent. This value is 3.605 as seen from Table A-4. Substituting the values, we have

$$C = \text{Rs } 10,00,000/3.605 = \text{Rs } 2,77,393$$

Thus, Rs 2,77,393 is to be paid at the end of each year for 5 years to repay the principal and interest on Rs 10,00,000 at the rate of 12 per cent.

Spreadsheet Solution 2.10



	A	B	C	D	E	F	G	H	I
1	Interest rate	0.12							
2	Time	5							
3	Cash Flow	10,00,000							
4	Payment	2,77,409.73							
5									
6									
7									

The solution is similar to that in the previous example. There is only one difference. In the preceding example, the sum to be accumulated represented a future value. In this problem, the loan represents a present value. While using the PMT function, PV is to be entered as B3 and FV is to be entered as 0. The entry in cell B4 will be =PMT(B1,B2,-B3,0,0). The result would be the amount of annual installment.

3. An investor may often be interested in finding the rate of growth in dividend paid by a company over a period of time. It is because growth in dividends has a significant bearing on the price of the shares. In such a situation compound interest tables are used. Let us illustrate it by an Example (2.13).

Example 2.13

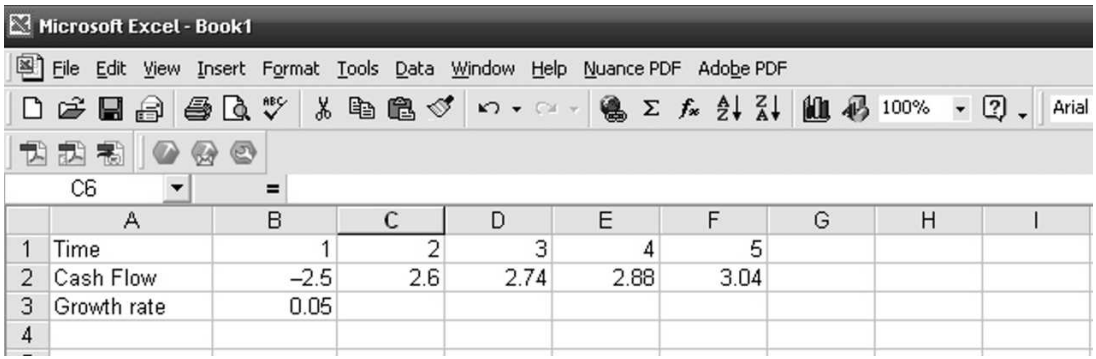
Mr X wishes to determine the rate of growth of the following stream of dividends he has received from a company:

Year	*Dividend (per share)*	
1	Rs 2.50	
2	2.60 }	1
3	2.74 }	2
4	2.88 }	3
5	3.04 }	4

Solution

Growth has been experienced for four years. In order to determine this rate of growth, the amount of dividend received in year 5 has been divided by the amount of dividend received in the first year. This gives us a compound factor which is 1.216 (Rs 3.04 ÷ Rs 2.50). Now, we have to look at Table A-1 which gives the compounded values of Re 1 at various rates of interest (for our purpose the growth rate) and number of years. We have to look to the compound factor 1.216 against fourth year in the row side. Looking across year 4 of Table A-1 shows that the factor for 5 per cent is exactly 1.216; therefore, the rate of growth associated with the dividend stream is 5 per cent.

Spreadsheet Solution 2.11



	A	B	C	D	E	F	G	H	I
1	Time	1	2	3	4	5			
2	Cash Flow	–2.5	2.6	2.74	2.88	3.04			
3	Growth rate	0.05							
4									

To find out the growth rate, the Excel function RATE can be used. The equation of this function in Excel format is RATE (nper, PMT, PV, FV, Type, Guess). The initial figure is entered as a negative figure as has been done in cell B2. In cell B3, the function is entered as =RATE((F1-B1),0,B2,F2,0). The 'guess' input is to be left blank. The result would be the growth rate.

4. To determine the current values of debentures, the present value Tables A-3 and A-4 can be of immense use. The cash flow from a debenture consists of two parts: first, interest inflows at periodic intervals, say, semi-annually or annually and, second, the repayment of the principal on maturity. Since the interest payments on a debenture are made periodically throughout its life, it is easy to calculate the present value of this annuity type interest inflow by consulting Table A-4 and the present value of the face value of the debentures can be ascertained by discounting it at the market rate of interest by consulting Table A-3. The sum of the two values so obtained will be current worth of a debenture. If the interest is paid after six months, the factors are obtained for one-half of the discount rate and the number of years is doubled. Consider Example 2.14.

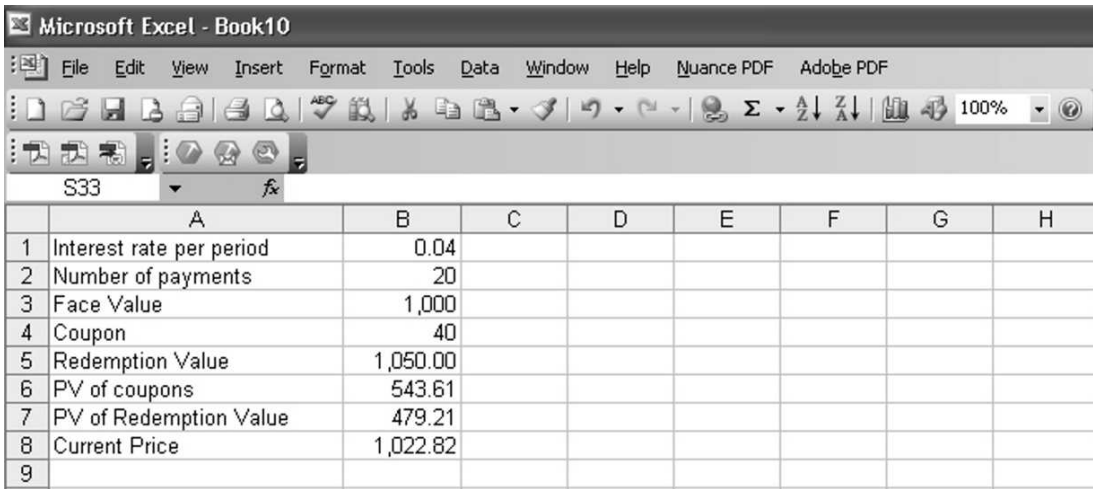
Example 2.14

Suppose a particular debenture pays interest at 8 per cent per annum. The debenture is to be paid after 10 years at a premium of 5 per cent. The face value of the debenture is Rs 1,000. Interest is paid after every six months. What is the current worth of the debenture, assuming the appropriate market discount rate on debentures of similar risk and maturity is equal to the debenture's coupon rate, that is, 8 per cent?

Solution

Since the interest is compounded semi-annually over 10 years, the relevant compounding period equals to 20 and the discount rate will be one-half (4 per cent) of the yearly interest of 8 per cent. In other words, the investor will have an annuity of Rs 40 (4 per cent of Rs 1,000) for a compounding period of 20 years. The present value factor for 20 years and 4 per cent from Table A-4 is 13.59 which, when multiplied by Rs 40, gives us a present value for the interest cash flows of Rs 543.60. The present value of a maturity value of Rs 1,050 (as the debenture is to be redeemed at 5 per cent premium) will be found by multiplying Rs 1,050 by the factor for the present value of Re 1 to be received 20 years from now at 4 per cent. The relevant present value factor from Table A-3 is 0.456. Multiplied by Rs 1,050 maturity value, it gives us a present sum of Rs 478.8. The total value of the debentures would be equal to the total of these two values, that is, Rs 543.60 + Rs 478.8 = Rs 1,022.4.

Spreadsheet Solution 2.12


Microsoft Excel - Book10

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S33

	A	B	C	D	E	F	G	H
1	Interest rate per period	0.04						
2	Number of payments	20						
3	Face Value	1,000						
4	Coupon	40						
5	Redemption Value	1,050.00						
6	PV of coupons	543.61						
7	PV of Redemption Value	479.21						
8	Current Price	1,022.82						
9								

Enter the interest rate per period in cell B1. Since the yearly rate of interest is 8 per cent and is payable half-yearly, the interest rate per period will be 4 per cent. Over a period of 10 years, 20 coupon payments will be received. Therefore, 20 will be entered in cell B2. The face value of the debenture is entered in cell B3. Coupon per period is calculated in cell B4 using the formula =B1*B3. In cell B5, the redemption value of the debenture will be entered. Cell B6 calculates the present value of coupon payments using the Excel function PV. The present value of the redemption value is calculated in cell B7 using the formula =B5/(1+B1)^B2. The current price is the sum of cells B6 and B7 and this is calculated in cell B8 using the formula =SUM(B6:B7).

SECTION 2 VALUATION OF LONG-TERM SECURITIES

The preceding sections have discussed the time value of money. These concepts are applied in this section to determine the value of long-term securities with particular reference to bonds, preference shares and equity shares. The value of a long-term security is the present value of cash flow stream promised to, and expected by, the investor, discounted at a required rate of return (ROR) duly adjusted for the risk involved.

Valuation of Bonds/Debentures

A bond/debenture is a long-term debt instrument used by the government/ government agency (ies) and business enterprises to raise a large sum of money. A detailed account of the main attributes of bonds is given in Chapter 23. Most bonds, particularly corporate bonds **(i)** pay interest half-yearly (semi-annually) at a stated coupon interest rate, **(ii)** have an initial maturity of 10-years and **(iii)** have a par/face value of Rs 1,000 that must be repaid at maturity. **Par value** is the value on the face of the bond. It represents the amount the entity borrows and promises to repay at the time of maturity. **Coupon rate** is the specified interest rate. The interest payable

Par value is value on the face of the bond.

Coupon rate is the specified interest rate available on a security.

Maturity period is the number of years after which the par/ specified value is payable to the bondholders.

to the bondholder is equal to par value × coupon rate. **Maturity period** refers to the number of years after which the par value is payable to the bondholder. To illustrate, a firm has issued a 10 per cent coupon interest rate, 10-year bond with a Rs 1,000 par value that pays interest semi-annually. A bondholder would have the contractual right to **(1)** Rs 100 annual interest (0.10, coupon rate interest × Rs 1,000, par value) paid as Rs 50 (½ × Rs 100) at the end of every 6 months and **(2)** Rs 1,000 par value at the end of the 10th year. We illustrate in this Section the valuation of bonds with reference to **(i)** basic bond valuation, **(ii)** yield to maturity, and **(iii)** semi-annual interest and bond values.

Basic Bond Valuation The value of a bond is the present value of the contractual payments its issuer (corporate) is obliged to make from the beginning till maturity. The appropriate discount rate would be the required return commensurate with risk and the prevailing interest rate. Symbolically,

$$B = I\left[\sum_{t=1}^{n}\frac{1}{(1+k_d)^t}\right] + M \times \left[\frac{1}{(1+k_d)^n}\right] \quad \textbf{(2.9)}$$

$$= I \times (PVIFA_{k_d,n}) + M \times (PVIF_{k_d,n}) \quad \textbf{(2.9-A)}$$

where

B = value of the bond at $t = 0$
I = annual interest paid
n = number of years to maturity (term of the bond)
M = par/maturity value
k_d = required return on the bond

Example 2.15

For the data given above and assuming interest is paid annually, compute the value of the bond.

Solution

$$B_0 = [\text{Rs } 100 \times (PVIFA_{10,10}) + \text{Rs } 1{,}000\ (PVIF_{10,10})]$$
$$= (\text{Rs } 100 \times 6.145) + (\text{Rs } 1{,}000 \times 0.386)$$
$$= \text{Rs } 614.5 + \text{Rs } 386 = \text{Rs } 1{,}000$$

The bond value is equal to the par value. As a general proposition, **when the required return is equal to the coupon rate, the bond value equals the par value**. However, the market value of the bond is rarely equal to its par value. Several external factors over which bondholders or issuers have no control tend to affect bond values. We discuss below the impact of two factors on bond values, namely, **(i)** required return and **(ii)** time to maturity.[1]

Discount is the amount by which a bond sells below its par/face value.

Premium is the amount by which a bond sells at a value higher than its par/face value.

Impact of Required Return on Bond Values When the requried return on a bond differs from its coupon rate, the value of a bond would differ from its par/face value. The reason for the differences in the required return and the coupon interest rate may be **(i)** change in the basic cost of long-term funds or **(ii)** change in the basic risk of the firm. When the required return (RR) is more than the coupon rate of interest (CR), the bond value would be less than its par value, that is, the bond would sell at a **discount** equal to (M – B). Conversely, in case the RR is less than CR, the bond value would be more than the par value, that is, the bond would sell at a **premium** equal to (B – M). Consider Example 2.16.

Example 2.16

Assuming for the facts in Example 2.15 the required return is (i) 12 per cent and (ii) 8 per cent, find the value of the bond.

Solution

(i) B = [Rs 100 × $(PVIFA_{12,10})$ + Rs 1,000 × $(PVIF_{12,10})$]
= [(Rs 100 × 5.650) + (Rs 1,000 × 0.322)
= Rs 565 + Rs 322 = Rs 887

The bond would sell at a discount of Rs 113 (Rs 887 – Rs 1,000)

(ii) B = [Rs 100 × $(PVIFA_{8,10})$ + Rs 1,000 × $(PVIF_{8,10})$]
= [(Rs 100 × 6.710) + (Rs 1,000 × 463)
= Rs 671 + Rs 463 = Rs 1,134

The bond would sell at a premium of Rs 134 (Rs 1,134 – Rs 1,000).

Impact of Maturity on Bond Value When the required return (RR) is different from the coupon rate of interest (CR), the time to maturity would affect value of bonds even though the RR remains constant till maturity. The relationship among **(i)** time to maturity, **(ii)** the RR and **(iii)** the bond value are related to **(a)** constant RR and **(b)** changing RR.

Constant Required Returns In such a situation the value of the bond would approach its par value as the passage of time moves the value of the bond closer to maturity.

Changing Required Returns The shorter the time period until a bond's maturity, the less responsive is its market value to a given change in the required return. In other words, short maturities have less "interest rate risk" than do long maturities when all other features, namely, CR, par value and frequency of interest payment, are the same.[2]

TABLE 2.10 Bond Values for Various Required Returns

Required returns (k_d)	*Bond value (B)*	*Status*
12	Rs 887	Discount
10	1,000	At par
8	1,134	Premium

To illustrate, the results relating to the bonds values for various required returns of the computations in Examples 2.15 and 2.16 are summarised in Table 2.10.

The main conclusion is that **the shorter the time to maturity, the smaller the impact on bond value caused by a given change in the required return**.

Yield to Maturity (YTM) The **YTM** is the rate of return that investors earn if they buy a bond at a specific price and hold it until maturity. It assumes that the issuer of the bond makes all due interest payments and repayments of principal as contracted/promised. The YTM on a bond whose current price equals its par/face value (i.e. purchase price = maturity value) would always be equal to its coupon interest rate. In case the bond value differs from the par value, the YTM would differ from the CR. Assuming annual interest payments, the YTM can be computed using Equation 2.9-A. Consider Example 2.17.

Yield to maturity (YTM) is the rate of return an investor earns on a bond held till maturity.

Example 2.17

The bonds of the Premier Company Ltd (PCL) are currently selling for Rs 10,800. Assuming **(i)** coupon rate of interest, 10 per cent, **(ii)** par value, Rs 10,000, **(iii)** years to maturity, 10 years and **(iv)** annual interest payment, compute the YTM.

Solution

Substituting the values in Equation 2.9-A.

Rs 10,800 = [Rs 1,000 × ($PVIFAk_{d,10}$) + Rs 10,000 × ($PVIFAk_{d,10}$)]

If k_d = 10 per cent, that is, equal to the coupon rate, the value of the bond would be Rs 10,000. Since the value of the bond is Rs 10,800, the k_d must be less than 10 per cent. Using 9 per cent discount rate (k_d), we get

Rs 1,000 × ($PVIFA_{9,10}$) + Rs 10,000 ($PVIF_{9,10}$)

= (Rs 1,000 × 6.418) + (Rs 10,000 × 0.422)

= Rs 6,418 + Rs 4,220 = Rs 10,638

Since the value of the bond (Rs 10,638) at k_d = 9 per cent is less than Rs 10,800 (current market price), we try a lower rate of discount (k_d). Using 8 per cent, we get

(Rs 1,000 × 6.710) + (Rs 10,000 × 0.463)

= Rs 6,710 + Rs 4,630 = Rs 11,340

Since the bond value (Rs 11,340) is higher than the current price of Rs 10,800, the k_d (*YTM*) must be between 8 and 9 per cent. The exact value can be found by interpolation, as discussed below.

(i) Difference between the bond values at 8 and 9 per cent = Rs 702 (Rs 11,340 – Rs 10,638)

(ii) Difference between desired value (Rs 10,800) and the value with the lower, k_d = Rs 540(Rs 11,340 – Rs 10,800)

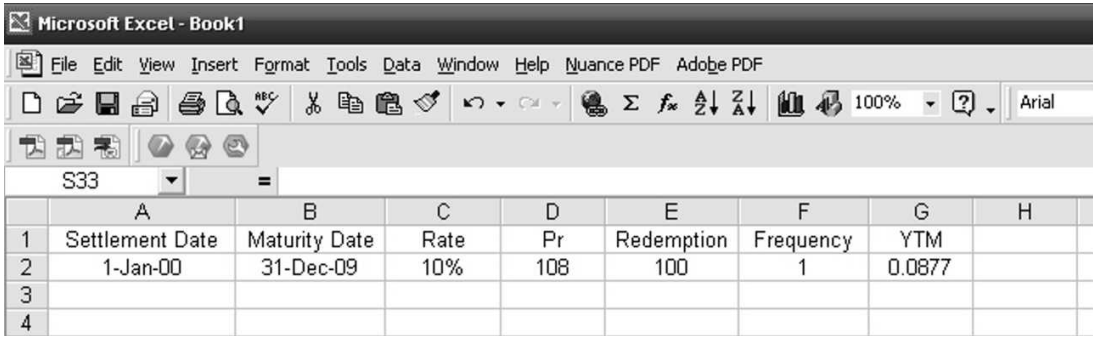
(iii) Percent of the difference/distance across the discount rate range , 8-9 per cent, that is, divide the value from step (i) by the value found in step (ii) = 0.77 (Rs 540 ÷ Rs 702)

(iv) Multiplying the per cent in (iii) by the interval width of 1 per cent (9-8) per cent = 0.77 per cent (0.77 × 1%)

(v) Adding the value in (iv) to the interest rate associated with the lower end of the interval/interest rate = 8.77 per cent (8 + 0.77).
Thus, the *YTM* = 8.77 per cent

Spreadsheet Solution 2.13

Alternatively, the Yield-to-Maturity (YTM) can be calculated using the yield function of the MS-Excel. To use the yield function, you need to click on the function tab in MS Excel, a window will appear; select Financial from the category of the functions, a list of financial functions will appear; scroll the list down and click on the function YIELD, a window listing the inputs required will appear.



	A	B	C	D	E	F	G	H
1	Settlement Date	Maturity Date	Rate	Pr	Redemption	Frequency	YTM	
2	1-Jan-00	31-Dec-09	10%	108	100	1	0.0877	
3								
4								

Else, you can directly enter the formula in the formula bar as =YIELD(settlement,maturity,rate,pr,redemption, frequency,[basis]). To solve the above example, relevant data has been entered in the spreadsheet. Since the excel function requires settlement and maturity dates instead of time period to maturity. We have chosen two dates representing the period of 10 years, i.e., bonds time left to maturity. The settlement

and maturity dates have been entered in cells A2 and B2 respectively. Interest rate has been entered in cell C2. Notably, the other two inputs (Pr and redemption) need to be written per 100 rupees. Therefore, the current price has been written as 108 instead of 10800 and the redemption value has been written as 100 instead of 10000. The last input frequency denotes the frequency of coupon payment in the year, e.g., annual, semiannually etc. The input needed is 1 for annual payment, 2 for semiannual payments and so on. Finally, we have calculated the YTM by using the excel function in cell G2. The answer we get is the same as determined by the manual calculations, i.e., 0.0877 or 8.77%.

Semiannual Interest and Bond Values The procedure to value bonds paying interest semiannually (half-yearly) is similar to that illustrated in Chapter 2 for compounding interest more frequently than annually. However, here we have to find out the present value. The following steps are involved in computing the value of a bond when interest is paid semiannually:

- Convert annual interest, I, to semiannual interest by dividing it by 2.
- Convert the number of years to maturity, n, to the number of 6-month periods to maturity by multiplying n by 2.
- Convert the required stated return for similar-risk bonds that also pay half-yearly interest from an annual rate, K_d, to a semiannual rate by dividing it by 2.

Symbolically,

$$B = \frac{I}{2} \times [PVIFAk_{d/2,2n}] + M \times [PVIFk_{d/2,\ 2n}] \qquad \textbf{(2.10)}$$

Example 2.18

For facts in Example 2.17, assume **(i)** the bonds of the firm pay interest semiannually, **(ii)** the required stated return is 14 per cent for similar-risk bonds that also pays half-yearly interest. Compute the value of the bond.

Solution

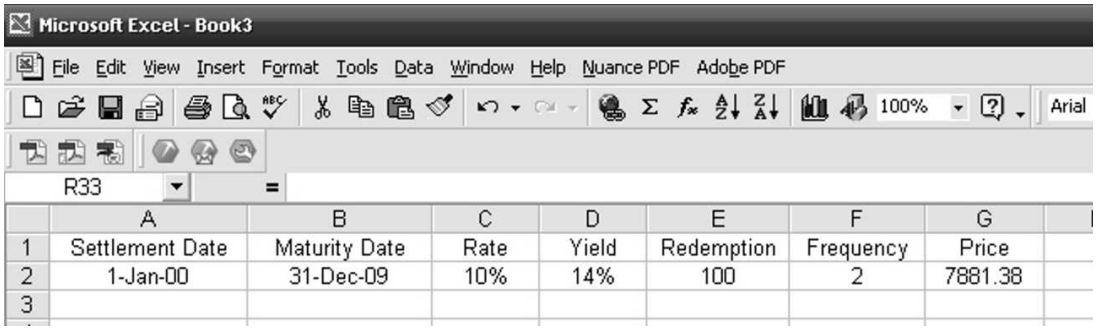
Substituting the values in Equation 2.10, we get

$$\begin{aligned} B &= (\text{Rs } 1{,}000 \div 2) \times [PVIFA_{14/2 \times 2;10}] + \text{Rs } 10{,}000 \times [PVIF_{14/2,\ 2 \times 10}] \\ &= (\text{Rs } 1{,}000/2) \times (PVIFA_{7,20}) + \text{Rs } 1{,}000 \times (PVIF_{7,20}) \\ &= (\text{Rs } 500 \times 10.594) + (\text{Rs } 1{,}000 \times 0.258) \\ &= \text{Rs } 5{,}297 + \text{Rs } 2{,}580 = \text{Rs } 7{,}877 \end{aligned}$$

The value of a bond selling at a discount is lower when semiannual interest is used compared to annual interest. For bonds selling at a premium, the value with semiannual interest is greater than with annual interest.

Spreadsheet Solution 2.14

The value of bond can be calculated by using PRICE function of the MS Excel.



	A	B	C	D	E	F	G
1	Settlement Date	Maturity Date	Rate	Yield	Redemption	Frequency	Price
2	1-Jan-00	31-Dec-09	10%	14%	100	2	7881.38
3							

The function PRICE is similar to the function YIELD as the inputs needed are nearly the same. This function requires YTM (Yld) instead of current price of the bond. The required return on the other bond in the same risk class can be treated as YTM. It is important to note that the function requires redemption value per 100 rupees, the price generated is also per 100 rupees of face value. The price of the bond has been determined in cell G2 using the formula =PRICE(settlement, maturity,rate,yld,redemption,frequency,[basis]). The price per 10,000 rupees of face value can be determined by multiplying the price with 100. The different in the prices is because of approximations in the manual calculations.

Valuation of Preference Shares

Preference shares, like debentures, are usually subject to fixed rate of return/dividend. In case of no stated maturity, their valuation is similar to perpetual bonds. Symbolically,

$$V = \sum_{t=1}^{n} \frac{D_p}{(1+k_p)^t} \text{ or } \frac{D_p}{k_p} \tag{2.11}$$

The valuation of redeemable preference shares is given by Equations 2.12 and 2.13.

$$V = \sum_{t=1}^{n} \frac{D_p}{(1+k_p)^t} \text{ or } \frac{MV}{(1+k_p)^n} \tag{2.12}$$

$$= D_p(PVIFAk_{p,n}) + MV(PVIF_{pv,n}) \tag{2.13}$$

Valuation of Ordinary Shares

Expected return is the return that is expected to be earned on a given security over an infinite time horizon.

The ordinary/equity shareholders buy/hold shares in expectation of periodic cash dividends and an increasing share value. They would buy a share when it is undervalued (i.e. its true value is more than its market price) and sell it when its market price is more than its true value (i.e. it is overvalued). The value of a share is equal to the present value of all future dividends it is expected to provide over an infinite time horizon. symbolically,

$$P = \frac{D_1}{(1+K_e)^1} + \frac{D_2}{(1+K_e)^2} + \ldots + \frac{D_\infty}{(1+K_e)^\infty} \tag{2.14}$$

where P = value of shares
D_t = per share dividend expected at the end of year, t
K_e = required return on share

Zero growth model is an approach to dividend valuation that assumes a constant, non-growing dividend stream.

The equation is designed to compute the value of shares with reference to the expected growth pattern of future dividends and the appropriate discount rate. We illustrate below the computation of value of shares with reference to **(i)** zero growth, **(ii)** constant growth and **(iii)** variable growth.

Zero Growth Model This approach to dividend valuation assumes a constant non-growing dividend stream. With zero growth in dividends, the value of share would equal the present value of a perpetuity of dividends (D_1) discounted at K_e. Symbolically,

$$P = D_1 \times \sum_{t=1}^{\infty} \frac{1}{(1+K_e)^t} = D_1(PVIFA_{Ke,\infty}) = D_1 \times \frac{1}{K_e} = \frac{D_1}{K_e} \tag{2.15}$$

where D_1 = constant dividend per share
K_e = required return of investors

Constant growth model assumes that dividend will grow at a constant rate that is less than the required rate.

Example 2.19

The per share dividend of Premier Instruments Ltd (PIL) remains constant indefinitely at Rs 10. Assuming a required rate of return of 16 per cent, compute the value of the PIL's shares.

Solution

$$P = \frac{D_1}{K_e} = \frac{\text{Rs } 10}{0.16} = \text{Rs } 62.5$$

Gordon model is the common name for the constant growth modal widely cited in dividend valuation.

Constant Growth Model/Gordon Model According to this approach, dividends are assumed to grow at a constant rate which is less than the required rate. This model is primarily known as the Gordon Model. The value of a share is given by Equation (2.16).

$$P = \frac{D_0 \times (1+g)^1}{(1+K_e)^1} + \frac{D_0 \times (1+g)^2}{(1+K_e)^2} + \ldots + \frac{D_0 \times (1+g)^\infty}{(1+K_e)^\infty} \qquad \textbf{(2.16)}$$

Required rate/ return is a specified return required by investors for a given level of risk.

or $$P = \frac{D_1}{K_e - g} \qquad \textbf{(2.17)}$$

Where P = value of share K_e = required rate g = growth rate in dividend
This is illustrated in Example 2.20

Example 2.20

The Premier Instruments Ltd (PIL) had paid the following dividends per share.

Year	*Dividend per share*	*Year*	*Dividend per share*
6	Rs 2.80	3	2.24
5	2.58	2	2.10
4	2.40	1	2.00

Assuming a 16 per cent required return, and Rs 3 per share dividend in year 7 (D_1) compute the value of the shares of PIL.

Solution

$$P = \frac{D_1}{K_e - g}$$

The expected constant rate of dividend growth, g, would be equal to the annual growth rate of dividends.

$$g = D_6 = D_1 \times (1+g)^5$$

$$\frac{D_1}{D_6} = \frac{1}{(1+g)^5} = PVIF_{g,5}$$

$$PVIF = \frac{\text{Rs } 2}{\text{Rs } 2.80} = 0.714$$

Number of years of growth: year 6 – year 1 = 5
The *PVIF* closest to 0.714 (Table A-3) = 0.713 (at 7 per cent). Therefore, g = 7 per cent

$$P = \frac{\text{Rs } 3}{(0.16 - 0.07)} = \frac{\text{Rs } 3}{0.09} = \text{Rs } 33.3 \text{ per share}$$

Variable growth model is a dividend valuation approach that allows for a change in the dividend growth rate.

Variable Growth Model As a dividend valuation approach, this model incorporates a change in the dividend growth rate. Assuming g_1 = initial growth rate and g_2 = the subsequent growth rate occurs at the end of year N, the value of the shares can be determined as follows:[3]

Step 1: Compute the value of cash dividends at the end of each year (D_t) during the initial growth period (years 1 – N). Symbolically,

$$D_t = D_0 \times (1 + g_1)^t = D_0 \times PVIFg_{1,t}$$

Step 2: Compute the present value of the dividends expected during the initial growth period. Symbolically,

$$\sum_{t=1}^{N} \frac{D_0 \times (1+g)^t}{(1+K_e)^t} = \sum_{t=1}^{N} \frac{D_t}{(1+K_e)^t} = \sum_{t=1}^{N} (D_t \times PVIFk_{e,t})$$

Step 3: Find the value of the share at the end of the initial growth year, $P_N = (D_N + 1) \div (K_e - g_2)$. This is the present value of all dividends expected from year $N + 1$ onwards assuming a constant dividend growth rate, g_2. The present value of P_N would represent the value today of all dividends expected to be received from year $N + 1$ to infinity. Symbolically,

$$\frac{1}{(1+K_e)^N} \times \frac{D_N + 1}{K_e - g_2} = PVIFk_{e,N} \times P_N$$

Step 4: Add the present value components found in Steps 2 and 3 to find the value of share, P given in Equation 2.15.

$$P = \sum_{t=1}^{N} \frac{D_0 \times (1+g_1)^t}{(1+K_e)^t} + \left[\frac{1}{(1+K_e)^N} \times \frac{D_N + 1}{K_e - g_2} \right] \qquad \textbf{(2.20)}$$

$$\begin{pmatrix} \text{Present value of div-} \\ \text{idends during initial} \\ \text{growth period} \end{pmatrix} + \begin{pmatrix} \text{Present value of price} \\ \text{of share at the end of} \\ \text{initial growth period} \end{pmatrix}$$

We illustrate (Example 2.21) the computation of the value of shares with only one growth rate change.

Example 2.21

The most recent (year zero, Y_0) annual dividend paid by the Premier Instruments Ltd (PIL) is Rs 3 per share. An annual increase of 10 per cent (g_1) is expected over the next three years ($Y_1 - 3$). At the end of 3 years (Y_3), the dividend growth rate would slow down to 5 per cent for ever (g_2). Assuming 15 per cent required rate of return, compute the current value of the shares of the PIL.

Solution

Step 1: Present value of cash dividends, $Y_1 - 3$

Year-end (t)	$D_0 = D_{Y0}$	$PVIF_{10,t}$	D_t [(1) × (2)]	$PVIF_{15,t}$	Present value of dividends [(3) × (4)]
	(1)	*(2)*	*(3)*	*(4)*	*(5)*
Y_1	Rs 3	1.100	Rs 3.30	0.870	Rs 2.87
Y_2	3	1.210	3.63	0.756	2.75
Y_3	3	1.331	4.00	0.658	2.63
					8.25

Step 2: Sum of present value of dividends = $\sum_{t=1}^{3} \frac{D_0 \times (1+g_1)^t}{(1+K_e)^t}$ = Rs 8.25

Step 3: Value of shares at the end of the initial growth period ($N = Y_3$)

$$D_{N+1} = D_{Y4}$$

$$D_{Y4} = D_{Y3} \times (1 + 0.05) = \text{Rs } 4 \times 1.05 = \text{Rs } 4.2$$

By using D_{Y4} = Rs 4.2, $K_e = 0.15$ and $g_2 = 0.05$, the value of shares at end - Y_3, P_{Y3}

$$= \frac{D_{Y4}}{K_e - g_2} = \frac{\text{Rs } 4.2}{0.15 - 0.05} = \frac{\text{Rs } 4.2}{0.10} = \text{Rs } 42$$

Conversion of present value of Rs 42 at the end of Y_3 to current value (Y_0) = $PVIF_{Ke,N} \times P_N$

$$= PVIF_{15,3} \times P_{Y3} = 0.658 \times \text{Rs } 42$$

$$= \text{Rs } 27.64$$

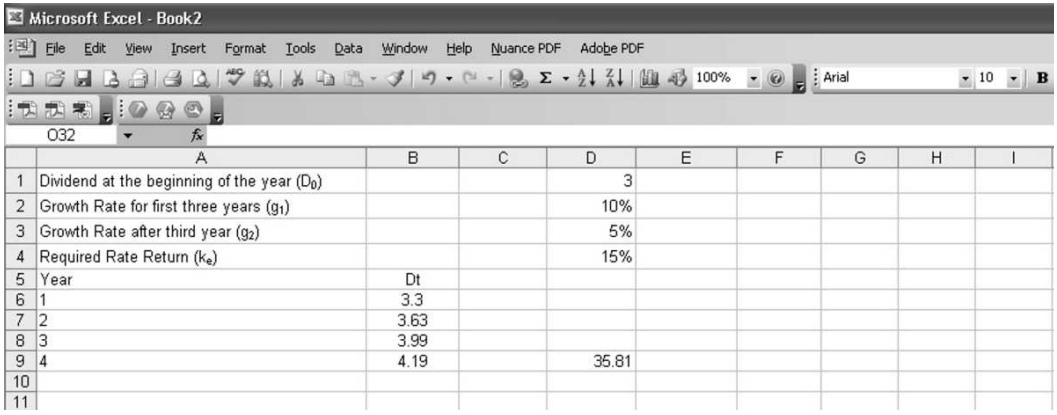
Step 4: Current (end-Y_0) value of shares of PIL:

$$= \text{Rs } 8.25 + \text{Rs } 27.64 = \text{Rs } 35.89$$

Thus, the share is currently worth Rs 35.89 per share.

Spreadsheet Solution 2.15

The value of a share can be calculated by using MS Excel as well.



	A	B	C	D	E	F	G	H	I
1	Dividend at the beginning of the year (D_0)			3					
2	Growth Rate for first three years (g_1)			10%					
3	Growth Rate after third year (g_2)			5%					
4	Required Rate Return (k_e)			15%					
5	Year	Dt							
6	1	3.3							
7	2	3.63							
8	3	3.99							
9	4	4.19		35.81					
10									
11									

The data related to the initial dividend, initial growth rate, continuing growth rate and required rate of return has been entered in cells D1 to D4 respectively. The dividend at the end of year 1 has been

calculated in cell B6 by using formula =D$1*(1+D$2)^A6. This formula has been copied to cells D7 and D8 for the dividends at the end of years 2 and 3 respectively. Since the growth rate for the year 4 and subsequent years has changed, the dividend for year 4 has been calculated by using the formula =B8*(1+D3). Finally, the value of a share has been determined using the formula =NPV(D4,B6:B8)+((B9/(D4-D3))/(1+D4)^3). The formula can be decomposed into two components. The first component represents the value of share based on the dividends for the first three years growing at 10%. This has been determined using NPV formula. The other component of the share value represents the continuing value based on the dividends fourth year onwards growing at 5%. This has been determined by using valuation formula and has been discounted to the time zero period or beginning of the year 1.

SECTION 3 RISK AND RETURN

Section one of the chapter has discussed compounding and discounting techniques of time value of money. These concepts were applied in the preceding section to determine the value of different securities. The value of a security is viewed as the present value of the cashflow stream provided to the investor, discounted at a required rate of return appropriate for the risk involved. The two key determinants of security prices/values are risk and return. The financial managers must understand how to measure and price financial risk. This section presents a framework for an explicit and quantitative understanding of these concepts and the nature of relationship between them.

The return and risk related to a single asset is examined first. The subsequent discussion covers these concepts *vis-a-vis* portfolio/collection of assets. The relationship between risk and return is considered later. A brief description of the capital asset pricing model which provides the key link between these two variables is also presented.

Risk and Return of a Single Asset

Return is the actual income received plus any change in market price of an asset/ investment.

Definition of Return and Risk ***Return*** The (rate of) **return** on an asset/ investment for a given period, say a year, is the annual income received *plus* any change in market price, usually expressed as a per cent of the opening market price. Symbolically, the one-period actual (expected) return, R

$$= \frac{D_t + (P_t - P_{t-1})}{P_{t-1}} \qquad \textbf{(2.21)}$$

where D_t = annual income/cash dividend at the end of time period, t

P_t = security price at time period, t (closing/ending security price)

P_{t-1} = security price at time period, $t - 1$ (opening/beginning security price)

Example 2.22

If the price of a share on April 1 (current year) is Rs 25, the annual dividend received at the end of the year is Re 1 and the year-end price on March 31 is Rs 30, the rate of return = [Re 1 + (Rs 30 – Rs 25)]/ Rs 25 = 0.24 = 24 per cent. The rate of return of 24 per cent has two components:

(i) ***Current yield***, i.e. annual income ÷ beginning price = Re 1/Rs 25 = 0.04 or 4 per cent and **(ii)** ***Capital gains/loss*** = (ending price – beginning price) ÷ beginning price = (Rs 30 – Rs 25)/ 25 = 0.20 = 20 per cent.

Risk The variability of the actual return from the expected returns associated with a given asset/investment is defined as **risk**. The greater the variability, the riskier the security (e.g. shares) is said to be. The more certain the return from an asset (e.g. T-bills), the less the variability and, therefore, the less the risk.

Risk is the variability of actual return from the expected return associated with a given asset.

Measurement of Risk The risk associated with a single asset is assessed from both a ***behavioural*** and a ***quantitative/statistical*** **point** of view. The behavioural view of risk can be obtained by using **(i)** sensitivity analysis and **(ii)** probability (distribution). The statistical measures of risk of an asset/security are **(1)** standard deviation and **(2)** coefficient of variation.

Sensitivity Analysis takes into account a number of possible outcomes/returns estimates while evaluating an asset/assessing risk. In order to have a sense of the variability among return estimates, a possible approach is to estimate the worst (pessimistic), the expected (most likely) and the best (optimistic) return associated with the asset. Alternatively, the level of outcomes may be related to the state of the economy, namely, recession, normal and boom conditions. The difference between the optimistic and the pessimistic outcomes is the **range** which, according to the sensitivity analysis, is the basic measure of risk. The greater the range, the more variability (risk) the asset is said to have. Consider the facts in Table 2.11.

Sensitivity analysis is a behavioural approach to assess risk using a number of possible return estimates to obtain a sense of the variability among outcomes.

Range is a measure of risk which is found by subtracting the pessimistic (worst) outcome from the optimistic (best) outcome.

TABLE 2.11 Sensitivity Analysis (Amount in Rs crore)

Particulars	*Asset X*	*Asset Y*
Initial outlay (t = 0)	50	50
Annual return (per cent):		
Pessimistic	14	8
Most likely	16	16
Optimistic	18	24
Range (optimistic-pessimistic)	4	16

On the basis of the range of annual returns, asset *Y* is more risky.

The sensitivity analysis provides more than one estimate of return (range) to assess the risk involved, but it is a crude/rough basis of risk assessment.

Probability Distribution The risk associated with an asset can be assessed more accurately by the use of **probability distribution** than sensitivity analysis. The probability of an event represents the likelihood/percentage chance of its occurrence. For instance, if the expectation is that a given outcome (return) will occur seven out of ten times, it can be said to have a seventy per cent (0.70) chance of happening; if it is certain to happen,

Probability distribution is a model that relates probabilities to the associated outcome.

Probability is the chance that a given outcome will occur.

the **probability** of happening is 100 per cent (1). An outcome which has probability of zero will never occur.

Based on the probabilities assigned (probability distribution of) to the rate of return, the **expected value** of the return can be computed. The expected rate of return is the weighted average of all possible returns multiplied by their respective probabilities. Thus, probabilities of the various outcomes are used as weights. The expected return, $\bar{R}$

$$= \sum_{i=1}^{n} R_i \times Pr_i \qquad \textbf{(2.22)}$$

where R_i = return for the ith possible outcome
Pr_i = probability associated with its return
n = number of outcomes considered

The expected rate of return calculation using the returns for assets X and Y are presented in Table 2.12.

TABLE 2.12 Expected Rates of Returns (Probability Distribution)

Possible outcomes	*Probability*	*Returns (per cent)*	*Expected returns [(2) × (3)]*
(1)	*(2)*	*(3)*	*(4)*
Asset X			
Pessimistic (recession)	0.20	14	2.8
Most likely (normal)	0.60	16	9.6
Optimistic (boom)	0.20	18	3.6
	1.00		16.0
Asset Y			
Pessimistic (recession)	0.20	8	1.6
Most likely (normal)	0.60	16	9.6
Optimistic (boom)	0.20	24	4.8
	1.00		16.0

Standard deviation meaures the dispersion around the expected value.

Standard Deviation of Return Risk refers to the dispersion of returns around an expected value. The most common statistical measure of risk of an asset is the **standard deviation** from the mean/expected value of return. It represents the square root of the average squared deviations of the individual returns from the **expected returns**. Symbolically, the standard deviation, σ

Expected value of a return is the most likely return on a given asset/security.

$$= \sqrt{\sum_{i=1}^{n} (R_i - \bar{R})^2 \times Pr_i} \qquad \textbf{(2.23)}$$

Table 2.13 presents the calculation of the standard deviation for the return of asset X and asset Y.

TABLE 2.13 Standard Deviation of Returns

			Asset X			
i	R_i	$\bar{R}$	$R_i - \bar{R}$	$(R_i - \bar{R})^2$	Pr_i	$(R_i - \bar{R})^2 \times Pr_i$
1	14%	16%	(–2)%	4%	0.20	0.80%
2	16	16	0	0	0.60	0
3	18	16	2	4	0.20	0.80
						1.6

$$\sigma r_x = \sqrt{\sum_{i=1}^{3}(R_i - \bar{R})^2 \times Pr_i} = \sqrt{1.6} = 1.26 \text{ per cent}$$

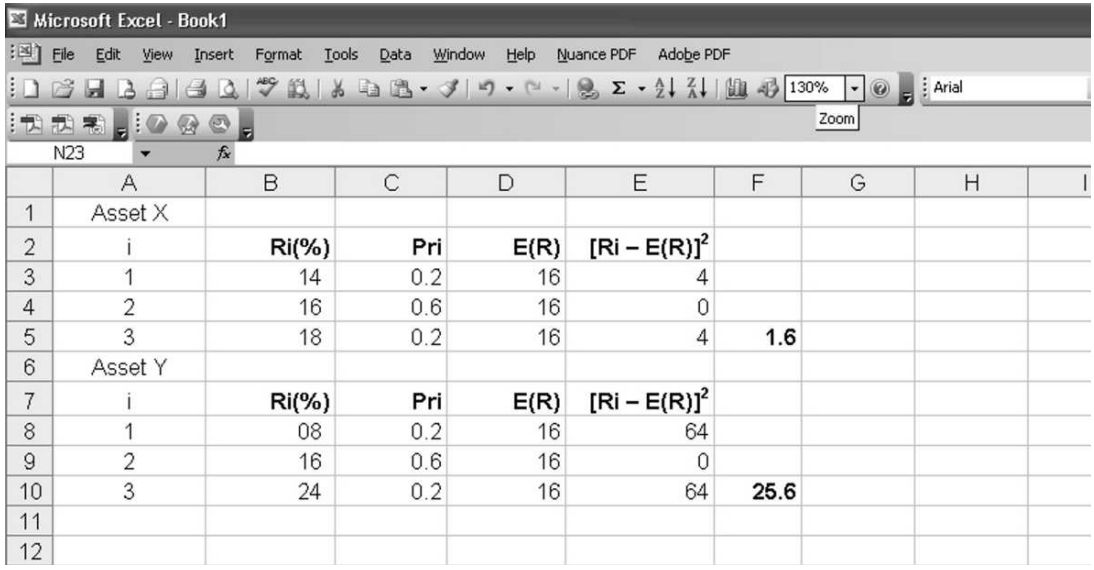
			Asset Y			
1	8	16	(–8)	64	0.20	12.8
2	16	16	0	0	0.60	0
3	24	16	8	64	0.20	12.8
						25.6

$$\sigma r_y = \sqrt{25.6} = 5.06 \text{ per cent}$$

The greater the standard deviation of returns, the greater the variability/dispersion of returns and the greater the risk of the asset/investment. However, standard deviation is an absolute measure of dispersion and does not consider variability of return in relation to the expected value. It may be misleading in comparing the risk surrounding alternative assets if they differ in size of expected returns.

Spreadsheet Solution 2.16

Alternatively, the calculation of risk can be carried out using Microsoft Excel (Spreadsheet). For the purpose, relevant data have been entered in the spreadsheet.



	A	B	C	D	E	F	G	H	I
1	Asset X								
2	i	**Ri(%)**	**Pri**	**E(R)**	**[Ri – E(R)]^2**				
3	1	14	0.2	16	4				
4	2	16	0.6	16	0				
5	3	18	0.2	16	4	**1.6**			
6	Asset Y								
7	i	**Ri(%)**	**Pri**	**E(R)**	**[Ri – E(R)]^2**				
8	1	08	0.2	16	64				
9	2	16	0.6	16	0				
10	3	24	0.2	16	64	**25.6**			
11									
12									

The data on returns for asset X has been entered in the cells B3 to B5. The associated probabilities have been entered in cells C3 to C5 and expected returns have been entered in cells D3 to D5. The squared deviation for the cell E3 has been calculated by using the formula =(B3-D3)^2. The calculation has been extended to the other two cells D4 and D5 by copying/ dragging the formula to these cells. Finally, the variance has been calculated using the formula =SUMPRODUCT(C3:C5,E3:E5) in cell F5. We can see that answer is the same as found in Table 3.3. The same steps have been repeated to get the variance for Asset Y.

Coefficient of variation is a measure of relative dispersion used in comparing the risk of assets with differing expected returns.

Coefficient of Variation is a measure of *relative dispersion* (risk) or a measure of **risk per unit of expected return**. It converts standard deviation of expected values into relative values to enable comparison of risks associated with assets having different expected values. The **coefficient of variation** (*CV*) is computed by dividing the standard deviation, σ_r, for an asset by its expected value, $\overline{R}$. Symbolically,

$$CV = \frac{\sigma_r}{\overline{R}} \qquad \textbf{(2.24)}$$

The coefficient of variations for assets *X* and *Y* are respectively, 0.079 (1.26% ÷ 16%) and 0.316 (5.06% ÷ 16%).

The larger the *CV*, the larger the relative risk of the asset. As a rule, the use of the coefficient of variation for comparing asset risk is the best since it considers the relative size (expected value) of assets.

Portfolio means a combination of two/more securities (assets).

Risk and Return of a Portfolio

A portfolio means a combination of two/more securities (assets). As investors construct a portfolio of investments rather invest in a single asset, this section extends the analysis of risk and return associated with single investments to portfolio investments.

Portfolio Expected Return The expected return on a portfolio is the weighted average of the expected returns of the securities comprising the portfolio. The weights are equal to the proportion of total funds in each security. Symbolically, the expected return of a portfolio, $\overline{K}_p$,

$$= \sum_{j=1}^{m} W_j \, K_j \qquad \textbf{(2.25)}$$

where W_j = the proportion invested in security, *j*,
K_j = expected return for security, *j*,
m = total number of securities in the portfolio

Example 2.23

To illustrate, the expected returns for two securities, *X* and *Y*, are 16 and 12 per cents respectively. If the proportion of portfolio invested in the two securities are 0.35 and 0.65, the expected portfolio return = [(0.35) × 0.16 + (0.65) × 0.12] = 0.134 or 13.4 per cent.

Portfolio Risk Conceptually, the risk of a portfolio can be measured in much the same way as the risk of a single asset. But their computation is to be differentiated as portfolio holdings confer certain benefits to investors as compared to holding of single assets. Portfolio

investments provide an opportunity to diversify investments. Successful diversification may make the risk of a portfolio investment less than the risk of the individual assets. Therefore, the portfolio standard deviation, as a measure of risk, is not the simple weighted average of individual security standard deviations mainly because of the correlation/covariance between the return on different securities constituting the portfolio.

Correlation/Covariance In order to diversify risk to have an efficient portfolio, that is, maximum return for a given level of risk or to minimise risk for a given level of return, the correlation between returns on different securities is significant. The degree of correlation among securities included in a portfolio has an important bearing on portfolio risk.

Correlation is a statistical measure of the degree to which security returns move together. Positive correlation means that they move together; negative correlation suggests that they move in opposite directions and zero correlation shows that they show no tendency to vary together in either positive or negative linear fashion. The coefficient of variation has a range of ±1 for perfectly positive and perfectly negative correlations.

Correlation is a statistical measure of the degree to which security returns move together.

The correlation between security returns complicates calculation of portfolio standard deviation, but it provides for the possibility of reducing some risk without reducing potential return through diversification. Low correlation leads to low portfolio risk.

Diversification Diversification through combination of securities can be used to reduce overall risk of a portfolio. By combining assets that have a negative (or low positive) correlation with existing assets, overall risk of the portfolio can be reduced. By combining negatively correlated assets, the overall variability of returns (risk) can be reduced. Even if the assets are not negatively correlated, the lower the positive correlation between them, the lower the resulting risk.

The combination of assets with positively correlated returns cannot reduce the overall portfolio risk below the risk of the least risky asset, while the creation of a portfolio by combining two assets that are perfectly negatively correlated can reduce the portfolio's total risk to level below that of either of the component assets which in certain situations may be zero. Combining assets with correlations falling between perfect positive and perfect negative can, therefore, reduce the overall risk of a portfolio.[1]

The effect of diversification on overall portfolio risk is shown in Table 2.14.

TABLE 2.14 Returns, Expected Values and Standard Deviations for Asset A, B and C and Portfolios AB and AC

Year	*Assets*			*Portfolio*	
	A	*B*	*C*	*AB*[@]	*AC*[@@]
1	10%	18%	10%	14%	10%
2	12	16	12	14	12
3	14	14	14	14	14
4	16	12	16	14	16
5	18	10	18	14	18
Expected return	14	14	14	14	14
Standard deviation	2.83	2.83	2.83	0	2.83

[@]consisting of 50 per cent of assets *A* and *B* is perfectly negatively correlated.

[@@]consisting of 50 per cent of assets *A* and *B* is perfectly positively correlated.

Interpretation In portfolio *AB*, with perfect negative correlation between assets *A* and *B*, a combination in equal proportion results in zero per cent risk as reflected in the standard deviation. The risk in portfolio *AC* (standard deviation = 2.83) is not affected.

In brief, two assets can be combined in a way that the portfolio has less risk than that of either of the assets independently, without any loss of return. The more negative (or less positive) the correlation between asset returns, the greater the risk-reducing benefits of diversification. In no case will creating portfolio of assets result in greater risk than that of the riskiest asset included in the portfolio.[2]

Systematic risk is caused by risk factors that affect the overall market/all securities.

Unsystematic risk is unique to a particular company/industry/security.

Risk Return Trade-off The preceding discussions have shown that diversification through a combination of securities that are not perfectly positively correlated helps to lessen the risk of a portfolio. Total portfolio risk has two components: **(i)** systematic/non-diversifiable/unavoidable risk and **(ii)** unsystematic/diversifiable/avoidable. The ***systematic risk*** is caused by risk factors that affect the overall market/all securities. Even an investor who holds a well-diversified portfolio is exposed to this type of risk. The ***unsystematic risk*** is unique to a particular company/industry/security. This kind of risk can be reduced by diversification and through efficient diversification can be even eliminated. Therefore, the important risk is the systematic risk. Investors can expect compensation for bearing this type of risk, but not for bearing unsystematic risk. There is, thus, a trade-off between risk and return. It is this logic that is behind the capital asset pricing model.

CAPM provides a framework for basic risk-return trade-offs in portfolio management.

Capital-Asset Pricing Model (CAPM) It is a model that describes the relationship/trade-off between risk and expected/required return. It explains the behaviour of security prices and provides a mechanism to assess the impact of a proposed security investment on investors' overall portfolio risk and return. The CAPM provides a framework for basic risk-return trade-offs in portfolio management. It enables drawing certain implications about risk and the size of risk premium necessary to compensate for bearing risk.

Assumptions The basic assumptions of CAPM are related to **(i)** the efficiency of the markets and **(ii)** investor preferences.

In an efficient capital market, investors are well informed, transaction costs are low, there are negligible restrictions on investment, no investor is large enough to influence the market price of a share and investors are in general agreement about the likely performance of individual securities and their expectations are based on a one-year common ownership (holding) period.

Investors are assumed to prefer to invest in securities with the highest return for a given level of risk or the lowest risk for a given level of return, return and risk being measured in terms of expected value and standard deviation respectively.

Types of Risk A security/asset risk, as discussed earlier, has two components: **(1)** diversifiable/unsystematic/avoidable, **(2)** non-diversifiable/systematic/unavoidable. The unsystematic risk is firm-specific (unique) such as strikes, regulatory action and so on and can, therefore, be reduced/eliminated through efficient diversification. However, systematic risk which is caused by factors affecting all firms, such as war, inflation, political developments and so on, cannot

be avoided. The market portfolio represents the limit to attainable diversification because individual investors cannot hold a more diversified portfolio than the market portfolio. Thus, all the risk associated with the market portfolio is systematic/unavoidable. The only relevant risk, is therefore, the non-diversifiable risk.

Beta is an index of the degree of responsiveness/ comovenent of security return with market return.

Model The CAPM links the ***relevant*** (systematic) risk and returns of all assets/securities. The measure/index of systematic risk is *Beta coefficient* (**b**). It measures the sensitivity of return of a security to changes in returns on the market portfolio. In other words, the *beta-coefficient* is an index of the degree of responsiveness/comovenent of security return with market return. From the point of risk, individual investments may be risk-free whose return over the holding period is known with certainty such as rate on treasury bills (risk-free return). The other type of investment is the shares on which returns are uncertain. The expected return on such investments less the risk-free return is the *excess* return. Beta coefficient represents the change in the excess return on the individual security over the changes in excess return on the market portfolio. The beta for the market portfolio is equal to 1 by definition. It is, thus, an index of the systematic risk of an individual security relative to that of market portfolio.

The interpretation of $b = 1$ is that excess return for the security vary proportionately with excess returns for the market portfolio, that is, the security has the same systematic risk as the market as a whole. A $b > 1$ (say, 2) means more unavoidable risk (twice) for the security than the market as a whole. If $b < 1$ (say, 0.5), the security has less (half) systematic risk *vis-a-vis* the market portfolio.

The beta of a portfolio is simply a weighted average of the individual security betas in the portfolio, the weights being the proportion of total portfolio market values represented by each security. Thus, the beta of a security represents its contribution to the risk of a highly diversified portfolio of securities.

The beta of a security is computed according to Equation 2.26.

$$K_j = a_j + b_j K_m + e_j \tag{2.26}$$

where K_j = the required/expected return on asset, j

a_j = the intercept that equals the risk free rate, R_f

e_j = random error term, which reflects the diversifiable risk of asset, j

b_j = the beta coefficient which equals

$$\frac{C_{ov}(K_j, K_m)}{\sigma_m^2},$$

where

$C_{ov}(K_j, K_m)$ = covariance of the return on asset j, K_j, and market portfolio, K_m. It is equal to

$$\sum_{t=1}^{n} (K_{jt} - K_j)\ (K_{mt} - K_m)/(n-1)$$

σ_m^2 = variance of the return on the market portfolio

K_m = required rate of return on the market portfolio of securities

Equation Given beta as the index of relevant (systematic) risk, the CAPM is given by Equation 2.27.

$$K_j = R_f + b_j \times (K_m - R_f) \tag{2.27}$$

where

K_j = the required rate of return on asset, j
R_f = the rate of return on a risk-free asset
b_j = the beta coefficient of systematic (relevant) risk for asset j
K_m = the required rate of return on the market portfolio of assets, that is, the average rate of return on all assets.

Example 2.24

To illustrate, an asset, X has a beta (b_x) of 2. The risk-free return (R_f) on Government of India's treasury bills are 9 per cent. If the return on the market portfolios is 14 per cent, the required rate of return (K_x) = 0.09 + [2 × (0.14 – 0.09)] = 0.09 + 0.10 = 19 per cent.

The CAPM has two components: (1) the risk-free rate (R_f) and (2) risk premium [$b_j \times (K_m - R_f$), that is, the market risk premium since it represents the premium the investors must receive to bear the average amount of risk associated with holding of the market portfolio of assets. In the preceding illustration, the market risk premium of 5 per cent (0.14 – 0.09), adjusted for security/asset index of risk (beta) of 2, results in a risk premium of 10 per cent (2 × 0.05). Thus, the higher the beta, the greater the required return and *vice versa*, other things being equal.

Summary

- Money has time value. A rupee today is more valuable than a rupee a year hence. A rupee a year hence has less value than a rupee today. Money has, thus, a future value and a present value. Although alternatives can be assessed by either compounding to find future value or discounting to find present value, financial managers rely primarily on present value techniques as they are at zero time ($t = 0$) when making decisions.
- Future value relies on compound interest to measure the value of future amounts. When interest is compounded, the initial principal/deposit in one period, along with the interest earned on it, becomes the beginning principal of the following period and so on. Interest can be compounded annually, semi-annually (half-yearly), quarterly, monthly and so on. The more frequently interest is compounded, the larger the future amount that would be accumulated and the higher the effective interest rate. The interest rate formula and the basic equation for the future value of a single amount are given below:
  (i) Basic formula of compounding: $A = P(1 + i)^n$
  (ii) Compounding more than once a year: $P[1 + i/n]^{mn} = A$
  (iii) Compounded sum of an annuity: $Sn = CVIFA \times A$
- Present value represents an opposite of future value. The present value of a future amount is the amount of money today equivalent to the given future amount on the basic of a certain return on the current amount. The interest factor formula and the basic equation of the present value are given below:
  (i) Basic formula: $A[1/(1 + i)^n]$
  (ii) Present value of a series of cash flows: $= \sum_{t=1}^{N} \frac{C_t}{(1+i)^t} = \sum_{t=1}^{n} C_t (IF_t)$

(iii) Present value of an annuity: $C\left[\sum_{t=1}^{N}\frac{1}{(1+i)^t}\right]$

- The annual deposit to accumulate a given future sum can be found by solving the equation for the future value of an annuity for the annual payment. A loan can be amortised into equal payments by solving the equation for the present value of an equity for the annual payment. Interest or growth rates can be estimated by finding the unknown interest in the equation for the present value of either a single amount or an annuity.
- Valuation is the process that links risk and return to determine the worth of an asset/security. The key inputs in the valuation process are expected returns (cash flows), their timing/pattern and the risk (required return).
- The value of a security is the present/discounted value of all future cashflows associated with it over the relevant/specified period. Symbolically,

$$V = \frac{A_1}{(1+k)^1} + \frac{A_2}{(1+k)^2} + \ldots + \frac{A_n}{(1+k)^n}$$

$$= [(A_1 \times PVIF_{k,1}) + (A_2 \times PVIF_{k,2}) + \ldots\ldots\ldots + (A_n \times PVIF_{k,n})]$$
$$= A \times PVIFA_{(k,n)}$$

- The value of a bond is the present value of the contractual payments by its issuer from the beginning till maturity. Symbolically,

$$B = I\left[\sum_{t=1}^{n}\frac{1}{(1+k_d)^d}\right] + M \times \left[\frac{1}{(1+k_d)^d}\right]$$

$$= I \times (PVIFAk_{d,n}) + M \times (PVIFk_{d,n})$$

- The value of a share is equal to the present value of all future dividends over an indefinite period of time. Symbolically,

$$P = \frac{D_1}{(1+K_e)^1} + \frac{D_2}{(1+K_e)^2} + \ldots + \frac{D_\infty}{(1+K_e)^\infty}$$

- With zero growth in dividends

$$P = \frac{D_1}{K_e}$$

- With constant growth in dividends

$$P = \frac{D_1}{K_e - g}$$

- With variable growth in dividends

$$P = \sum_{t=1}^{n}\frac{D_0 \times (1+g)^t}{(1+K_e)^t} + \left[\frac{1}{(1-K_e)^n} \times \frac{D_N + 1}{K_e - g_2}\right]$$

- Risk refers to the variability of expected returns associated with a given security or asset.
- The absolute return on an investment for a given period of time, say a year, consists of annual income plus change in the market price of the investment (capital appreciation or loss); total annual income (loss) in terms of the rate of return is expressed as a percentage of the opening market value of the investment.

- The two major concerns of an investor, while choosing a security (asset) as an investment, are the expected return from holding the security and the risk that the realised return may fall short of the expected return. Two commonly used approaches to assess risk from a behavioural point of view are sensitivity analysis and probability distribution. To obtain a more concrete measure of risk, two statistical measures of variability of return, namely, standard deviation and coefficient of variation, can be used.
- The term, portfolio refers to the collection of securities/assets held by an investor for investment purposes. The risk of a portfolio is measured in much the same way as the risk of a single asset. However, in the context of a portfolio, the risk of any single proposed investment in a security/asset is not to be viewed independent of other assets/securities already held; additional investments are considered in the light of their effect on the risk and return of the portfolios as a whole. The correlation among assets in portfolio affects the overall risk of the portfolio. The assets (or securities) whose returns are negatively correlated provides the best combination to minimise overall risk. In a way, the concept of correlation constitutes an integral part of the process of diversification that is used to develop an efficient portfolio of assets/securities. An efficient portfolio is a maximum return portfolio, at a given level of risk.
- Diversification through a combination of securities that are not perfectly positively correlated helps to reduce the overall risk of a portfolio. Total portfolio risk has two components: **(i)** systematic/non-diversifiable/unavoidable risk and **(ii)** unsystematic/diversifiable/avoidable risk. The systematic risk is caused by factors that affect all the securities/overall market. Therefore, even an investor who holds a well-diversified portfolio is exposed to this type of risk. In contrast, the unsystematic risk is unique to a particular company/industry/security. This kind of risk can be reduced by diversification and can be eliminated even completely through efficient diversification.
- The non-diversifiable risk is the only relevant risk for which the investors are to be compensated. The higher is such a risk, the higher is the required/expected return of the investor. This risk-return trade-off is the theme of the capital asset pricing model (CAPM). The non-diversifiable risk is measured by beta coefficient. The CAPM uses beta to relate a security's risk relative to the market to determine the security's/asset's required rate of return.

References

1. Gitman, L.J., Principles of Managerial Finance, *Harper & Row*, New York, 1997, p. 119.
2. *Ibid,* p. 121.

Practical Problems

P.2.1 An investor deposits Rs 100 in a bank account for 5 years at 8 per cent interest. Find out the amount which he will have in his account if interest is compounded **(a)** annually **(b)** semi-annually (6-monthly), **(c)** quarterly and **(d)** continuously.

Solution $F_n = P(1 + i/m)^{n \cdot m} = P \times \text{FVIF}_{i/m,\, n \cdot m}$

(a) Annual compounding ($m = 1$): F_5 = Rs 100 $(1 + 0.08/1)^5$ = Rs 100 (1.4693) = Rs 146.93

(b) Semi-annual compounding ($m = 2$): F_5 = Rs 100 $(1 + 0.08/2)^{5 \times 2} = P \times \text{FVIF}_{4,10}$ = Rs 100(1.4802) = Rs 148.02

(c) Quarterly compounding ($m = 4$): F_5 = Rs 100 $(1 + 0.08/4)^{5 \times 4} = P \times \text{FVIF}_{2,20}$ = Rs 100(1.4859) = Rs 148.59

(d) Continuous compounding: $F_n = P \times e^{i \times n} = F_5$ = Rs 100 $(2.71828)^{0.08 \times 5}$ = Rs 100 $(2.71828)^{0.4}$ = Rs 100 (1.4918) = Rs 149.18

P.2.2 If the discount/required rate is 10 per cent, compute the present value of the cashflow streams detailed below: **(a)** Rs 100 at the end of year 1; **(b)** Rs 100 at the end of year 4; **(c)** Rs 100 at the end of **(i)** year 3 and **(ii)** year 5 and **(d)** Rs 100 for the next 10 years (for years 1 through 10).

Solution $P = F_n[1/(1+i)^n] = F_n \times \text{PVIF}_{i,n}$

(a) Rs 100 at the end of year 1 = Rs $100[1/(1.10)^1]$ = Rs 100 × $\text{PVIF}_{10,1}$ = Rs 100 × 0.9091 = Rs 90.91.

(b) Rs 100 at the end of year 4 = Rs $100[1/(1.10)^4]$ = Rs 100 × $\text{PVIF}_{10,4}$ = Rs 100 × 0.683 = Rs 68.3

(c) Rs 100 at the end of (i) year 3 and (ii) year 5 = Rs $100[1/(1.10)^3]$ + Rs $100[1/(1.10)^5]$ = (Rs 100 × $\text{PVIF}_{10,3}$) + (Rs 100 × $\text{PVIF}_{10,5}$) = (Rs 100 × 0.7513) + (Rs 100 × 0.6209) = Rs 75.13 + Rs 62.09 = Rs 137.22.

(d) Rs 100 for the next 10 years (annuity)
$P_n = A \times \text{PVIFA}_{i,n}$ = Rs 100 × $\text{PVIFA}_{10,10}$ = Rs 100(6.1446) = Rs 614.46.

P.2.3 Compute the present/discounted value of the following future cash inflows, assuming a required rate of 10 per cent: **(a)** Rs 100 a year for years 5 through 10 and **(b)** Rs 100 a year for years 1 through 3, nil in years 4 through 5 and Rs 100 a year for years 6 through 10.

Solution

(a) P = Rs 100($\text{PVIFA}_{10,10}$) − Rs 100($\text{PVIFA}_{10,4}$) = Rs 100(6.1446) − Rs 100(3.1699) = Rs 614.46 − Rs 316.99
= Rs 297.47.

(b) P = Rs 100($\text{PVIFA}_{10,3}$) + [Rs 100($\text{PVIFA}_{10,10}$) − Rs 100($\text{PVIFA}_{10,5}$)] = (Rs 100 × 2.4869) + [(Rs 100 × 6.1446) − (Rs 100 × 3.7908)] = Rs 248.69 + (Rs 614.46 − Rs 379.08) = Rs 248.69 + Rs 235.38
= Rs 484.07.

P.2.4 An executive is about to retire at the age of 60. His employer has offered him two post-retirement options: **(a)** Rs 20,00,000 lump sum, **(b)** Rs 2,50,000 for 10 years. Assuming 10 per cent interest, which is a better option?

Solution $P_n = A \times \text{PVIFA}_{i,n} = P_{10}$ = Rs 2,50,000($\text{PVIFA}_{10,10}$) = Rs 2,50,000(6.1446) = Rs 15,36,150. Since the lumpsum of Rs 20,00,000 is worth more now, the executive should opt for it.

P.2.5 Compute the present value of a perpetuity of Rs 100 year if the discount rate is 10 per cent.

Solution Present value of a perpetuity = A/i = Rs 100/0.10 = Rs 1,000.

P.2.6 ABC Ltd has Rs 10 crore bonds outstanding. Bank deposits earn 10 per cent per annum. The bonds will be redeemed after 15 years for which purpose ABC Ltd wishes to create a sinking fund. How much amount should be deposited to the sinking fund each year so that ABC Ltd would have in the sinking fund Rs 10 crore to retire its entire issue of bonds?

Solution $A = S_n/\text{FVIFA}_{i,n} = S_{15}$ = Rs 10 crore/$\text{FVIFA}_{10,15}$ = Rs 10 crore/31.772 = Rs 3,14,742.54.

P.2.7 ABC Ltd has borrowed Rs 30,00,000 from Canbank Home Finance Ltd to finance the purchase of a house for 15 years. The rate of interest on such loans is 24 per cent per annum. Compute the amount of annual payment/instalment.

Solution $P_n = A \times \text{PVIFA}_{i,n}$
$A = P_n/\text{PVIFA}_{i,n} = P_{15}$ = Rs 30,00,000/$\text{PVIFA}_{24,15}$ = Rs 30,00,000/4.0013 = Rs 7,49,756.32.

P.2.8 XYZ Ltd has borrowed Rs 5,00,000 to be repaid in fival equal annual payments (interest and principal both). The rate of interest is 16 per cent. Compute the amount of each payment.

Solution $A = P_n/\text{PVIFA}_{i,n} = P_5/\text{PVIFA}_{16,5}$ = Rs 5,00,000/3.2743 = Rs 1,52,704.39

P.2.9 Assume the rate of interest is 12 per cent. Compute the annual percentage/effective rate (AP/ER) if interest is paid **(a)** annually, **(b)** semi-annually, **(c)** quarterly and **(d)** monthly. What are the implications of more frequent payments of interest?

Solution $AP/ER = (1 + r/m)^m - 1.0$

(a) Interest paid at the end of the year (m = 1):
$AP/ER = (1 + 0.12/1)^1 - 1.0 = 1.12 - 1.0 = 0.12 = 12$ per cent

(b) Interest paid at the end of each 6-month period (m = 2):
$AP/ER = (1 + 0.12/2)^2 - 1.0 = (1.06)^2 - 1.0 = 1.1236 - 1.0 = 0.1236 = 12.36$ per cent.

(c) Interest paid at the end of each quarter (m = 4):
$AP/ER = (1 + 0.12/42^4 - 1.0 = (1.03)^4 - 1.0 = 1.1255 - 1.0 = 0.1255 = 12.55$ per cent.

(d) Interest paid at the end of each month (m = 12):
$AP/ER = (1 + 0.12/12)^{12} - 1.0 = (1.01)^{12} - 1.0 = 1.1268 - 1.0 = 0.1268 = 12.68$ per cent.

Implications: More frequent payments increase the effective annual cost (AP/ER) paid by the borrower-company.

P.2.10 The earnings of Fairgrowth Ltd were Rs 3 per share in year 1. They increased over a 10-year period to Rs 4.02. Compute the rate of growth or compound annual rate of growth of the earnings per share.

Solution

$$F_n = P \times \text{FVIF}_{i,n}$$
$$\text{FVIF}_{i,n} = F_n/P$$
$$\text{FVIF}_{i,10} = \text{Rs } 4.02/\text{Rs } 3 = 1.340$$

According to Table-1 (Appendix), an FVIF of 1.340 at 10 years is at 3 per cent interest. The compound annual rate of growth in earnings per share is, therefore, 3 per cent.

P.2.11 Mr *X* has Rs 1,00,000 to deposit in a bank account for 3 years. Assuming **(i)** annual compounding, **(ii)** semi-annual compounding and **(iii)** quarterly compounding at a stated annual interest rate of 4 per cent, compute **(a)** the amount he would have at the end of the third year, leaving all interest paid on deposits in the bank, **(b)** the effective rate of interest he would earn on each alternative, and **(c)** which plan should he choose?

Solution

(a) (i) Compound/future value (FV_3) = Rs 1,00,000 × FVIFA (4,3)
= Rs 1,00,000 × 1.125 = Rs 1,12,500

(ii) FV_3 = Rs 1,00,000 × FVIFA (4/2, 2 × 3) = Rs 1,00,000 × FVIFA (2,6)
= Rs 1,00,000 × 1.126 = Rs 1,12,600

(iii) FV_3 = Rs 1,00,000 × FVIFA (4/4,3) = Rs 1,00,000 × PVIFA (1,12)
= Rs 1,00,000 × 1.127 = Rs 1,12,700

(b) (i) Effective rate of interest = $(1 + 4\%1)^1 - 1 = (1.04)^1 - 1$
$= 1.04 - 1 = 0.04 = 4$ per cent

(ii) $= (1 + 4\%/2)^2 - 1 = (1.02)^2 - 1 = 1.0404 - 1$
$= 0.0404 = 4.04$ per cent

(iii) $= (1 + 4\%/4)^4 - 1 = (1 + 0.01)^4 - 1 = 1.0406 - 1 = 0.0406 = 4.06$ per cent.

(c) Mr. *X* should choose alternative (iii). The quarterly compounding of interest has resulted in the highest future value as a result of the corresponding highest effective rate of interest.

Review Questions

2.1 'Cash flows of two years in absolute terms are uncomparable.' Give reasons in support of your answer.

2.2 Define the following terms and phrases:

(a) Compound sum of an annuity

(b) Present value of a future sum

(c) Present value of an annuity
(d) Perpetuity
(e) Annuity
(f) Discount rate

2.3 What happens to the effective rate of interest as the frequency of compounding is increased?

2.4 As a financial consultant, will you advise your client to have term deposit in a commercial bank which pays 8 per cent interest compounded semi-annually or 8 per cent interest compounded annually? Why?

2.5 What effect do **(a)** increasing rate of interest and **(b)** increasing time period have on **(i)** the present value of a future sum and **(ii)** the future value of the present sum? Why?

2.6 For a given interest rate and a given number of years, is the factor for the sum of an annuity larger or smaller than the interest factor for the present value of the annuity?

2.7 Can annuity tables be used for all types of cash flows?

2.8 Explain the mechanics of calculating the present value of a mixed stream that includes an annuity.

2.9 'The finance manager should take account of the time value of money in order to make a correct and objective financial decision.' Elucidate the statement with the help of suitable illustrations.

2.10 Explain briefly the growth model for stock valuation.

2.11 Write a brief note on the valuation of bonds.

2.12 How is the valuation of preference shares different from that of bonds?

2.13 Explain the sensitivity approach for dealing with asset risk. Describe the role of range as an aid in sensitivity analysis.

2.14 Outline the relationship between the size of standard deviation and the degree of asset risk.

2.15 'The coefficient of variation is superior to standard deviation as a basis for comparing the risk associated with different assets'. Comment.

2.16 Why is the correlation between asset returns in a portfolio important?

2.17 'Diversification of risk in the asset selection process allows the investor to combine risky assets in a way that risk of a portfolio is less than the risk of the individual assets'. Elaborate. What is an efficient portfolio?

2.18 Differentiate between diversifiable and non-diversifiable risk. Why is the nondiversifiable risk the only relevant risk?

2.19 Explain, with illustrations, the capital asset pricing model' (CAPM).

Examination Questions

Theory Questions

2.1 Why is the consideration of time important in financial decision making? How can time be adjusted? (*Delhi University, 2011*)

2.2 Explain with example the compounding technique and the discounting technique in relation to the time value of money. (*Calcutta University, 2006, 2010*)

2.3 Write short note on time value of money.
(*Calcutta University, 2009, Pune University, 2008, 2009*)

2.4 Explain the concept of time value of money with example. (*Calcutta University, 2008*)

2.5 How do financial decisions involve risk-return trade-off? (*Delhi University, 2008*)

2.6 Explain the concept of risk-return trades off in financial decision-making.(*Delhi University, 2005*)

2.7 (a) Explain security market line in relation to risk and return. What type of risk is compensated by the risk premium?

(b) What is time value of money? Explain the possible reasons for time preference of money. *(Calcutta University, 2004)*

2.8 (a) Critically examine the Capital Asset Pricing Model (CAPM) of computation of cost of equity. What generalisations can you make from CAPM?

(b) (i) Distinguish between non-diversifiable risk and diversifiable risk. (ii) Explain the significance of beta in relation to CAPM. How would you compute it. *(Calcutta University, 2003)*

2.9 Why is the consideration of time important in financial decision making? How can time be adjusted? *(Delhi University, 2000)*

2.10 Which of the following statements are correct and which are false? Give briefly the reasons for your answers.

(a)The techniques of compounding and discounting are identical. *(Delhi University, 1998)*

(b) Money has no time value. *(Delhi University, 1997, 1999)*

(c) The total interest received will be same irrespective of the fact whether compounding is done yearly or quarterly. *(Delhi University, 2000)*

2.11 (a) What is security market line (SML)? How does it differ from capital market line (CML)?

(b) State the equation for determining the required rate of return as per the capital assets pricing model and explain each of the variables contained in it. *(Calcutta University, 2000)*

Numerical Questions

2.1 Mr. Rajan needs Rs 10,000 to buy a mobile handset next year. Money fetches 7% per annum in fixed interest market. How much amount Mr. Rajan should invest today to achieve the goal? (*Pune University, 2010*)

Solution

= Rs 10,000 × PVIF for one year 7% (Table A-3) = Rs 10,000 × 0.935 = Rs 9,350.

Mr. Rajan should invest Rs 9,350 today to have Rs 10,000 after one year; Rs 9,350 would compound to Rs 10,000 after one year.

2.2 How many years will be required to double the investment if interest is 8% per annum available in the market? (*Pune University, 2010*)

Solution

Table A-1 indicates that Re 1 compounds to Rs 1.999 in 9 years at 8% rate of interest. Thus, 9 years will be required to double the investment at 8% rate of interest per annum.

2.3 Mr. Ram deposits Rs 10,000 for 3 years at 10%. What is the compound value of his deposit. (*Bangalore University*)

Solution

P(CVIF for 3 years at 10%) = A, where, P = Amount deposited; CVIF = Compounded value interest factor of Re 1 at 10% for 3 years (as per Table A-1); A = Compounded value

Compounded value = Rs 1,000 (1.331) = Rs 1,331

2.4 (a) Shubha invested Rs 10,000 at an interest of 12% p.a. for 3 years. Compute future value of investments assuming interest is compounded quarterly.

(b) Naba is offered either to receive Rs 5,000 one year from now or Rs 7,000 five years from now. Which one Naba will accept and why if discount rate is 10%? Given, present value of Re 1 at 10% are .909 and .621 for 1st and 5th year respectively. (*Calcutta University, 2007*)

Solution

(a) Future value of investment = Amount of investment (X) FVIF (compounded on quarterly basis for 3 years) = Rs 10,000 × 1.4262 = Rs 14,262

(b) (i) PV of Rs 5,000 received after one year

PV_0 = Rs 5,000 × 0.909 = Rs 4,545

(ii) PV of Rs 7,000 received after 5 years

PV_0 = Rs 7,000 × 0.621 = Rs 4,347

Recommendation: Naba should prefer to opt the receipt of Rs 5,000 after one year as it has higher present value.

2.5 Calculate the compound value of Rs 10,000 at the end of three years at 12% rate of interest when the interest is calculated on (a) yearly basis and (b) quarterly basis. (*Punjab University, 2006*)

Solution

Compounded value = $P \times$ CVIF at 12% for 3 years

where, P = Principal sum at the beginning of period, Rs 10,000

CVIF = Compound value interest factor for 3 years at 12% (as per Table A-1), 1.405

(a) Compounded value (yearly basis) = Rs 10,000 × 1.405 = Rs 14,050

(b) Compounded value (quarterly basis) means that there are 12 compounding periods (in 3 years) and the rate of interest would be ¼ of 12% = 3%

Compounded value (quarterly basis) = $P \times$ CVIF at 3% for 12 periods

= Rs 10,000 × 1.426 = Rs 14,260

2.6 Fill in the gaps:

Cash inflow	*PV factor*	*PV of inflows*
(i) Rs 25,000	—	Rs 22,725
(ii) —	0.822	22,180
(iii) 15,000	—	12,390

(*Pune University, 2006*)

Solution

(i) PV factor = Rs 22,725/Rs 25,000 = 0.909

(ii) Cash inflows = Rs 12,180/0.822 = Rs 14,817.50

(iii) PV factor = Rs 12,390/Rs 15,000 = 0.826

2.7 As an investment manager you are given the following information:

Investment in equity shares of	*Initial price*	*Dividends*	*Market price at the end of the year*	*Beta risk factor*
C. Infer India Ltd.	Rs 28	Rs 4	Rs 60	0.7
Godrej India Ltd.	42	4	75	0.6
Exxon Ltd	62	4	145	0.5
D. Government bonds Risk-free return may be considered at 16%	600	96	610	0.99

You are required to calculate:

(i) Expected rate of return of each security in portfolio using capital asset pricing model.

(ii) Average expected return of the portfolio. *(Calcutta University, 2003)*

Solution

(i) Calculation of expected return on market portfolio:

Investments	*Investment*	*Dividends*	*Capital gains*
A. Equity share of			
Infer India Ltd.	Rs 28	Rs 4	Rs 32
Godrej India Ltd	42	4	33
Exxon Ltd	62	4	83
B. Government bonds	600	96	10
Total	732	108	158

Expected rate of return on market portfolio

= [(Dividends earned + Capital appreciation)/Initial investment] × 100

= [(Rs 108 + Rs 158)/732] × 100 = 36.33 per cent

Now, we can calculate the expected rate of return on individual portfolio, by applying the formula of CAPM

$$K_e = R_f + b\ (K_m - R_f)$$

Infer India Ltd = 16 + 0.7 (36.33 – 16) = 30.23 per cent

Godrej India Ltd = 16 + 0.6 (36.33 – 16) = 28.19 per cent

Exxon Ltd = 16 + 0.5 (36.33 – 16) = 26.16 per cent

Government bonds

= 16 + 0.99 (36.33 – 16) = 36.12 per cent

(ii) The average return of the portfolio is calculated as follows:

(30.23 + 28.19 + 26.16 + 36.12)/4 = 30.17 per cent

2.8 (a) You as a portfolio manager of SUN F & C Mutual fund are considering purchasing the equity shares of LML Co. Ltd. The current price per share is Rs 30. You expect the dividend a year hence to be Rs 3. You expect the price per share of the LML Co. Ltd a year hence to have following probability distributions:

Price a year hence	*Probabilities*
Rs 30	0.4
33	0.4
36	0.2

What is the expected return if Rs 3,000 is invested in shares of the Co.? (b) The risk free return is 8 per cent and the return on market portfolio is 12 per cent. If the required return on a share is 15 per cent, what is its beta? *(Calcutta University, 2002)*

Solution

(a) Determination of expected return

Initial price	*Market price at the end of the year*	*Dividends per share*	*Capital gains*	*Total return*
Rs 30	Rs 30	Rs 3	0	3
30	33	3	3	6
30	36	3	6	9

Expected return:

= 3/30 × 0.4 + 6/30 × 0.4 + 9/30 × 0.2

= 0.04 + 0.08 + 0.06 = 0.18 or 18 per cent

= Rs 3,000 × 0.18 = Rs 540

(b) R_f = 8 per cent

R_m = 12 per cent

R_j = 15 per cent

$R_j = R_f + b\ (R_m - R_f)$

15 = 8 + b (12 – 8)

15 = 8 + b(4)

7 = b(4)

b = 7/4 = 1.75

2.9 As an investment manager you are given the following information:

Investment in	*Initial price*	*Dividends*	*Market price at the end of the year*	*Beta factor*
A. Equity shares of				
L&T Ltd.	Rs 250	Rs 20	Rs 500	0.8
H LL Ltd	350	20	600	0.7
P& G Ltd.	450	20	1,350	0.5
B. 14% GOI Bonds	1,000		1,005	0.99
Risk free rate of return 14%				

You are required to calculate:

(i) Expected rate of returns of portfolio in each using capital asset pricing model (CAPM).

(ii) Average return of portfolio. *(Calcutta University, 2001)*

Solution

(i) Calculation of expected return on market portfolio:

Investment	*Investment*	*Dividends*	*Capital gains*
A. Equity shares of			
L&T Ltd	Rs 250	20	250
HLL Ltd	350	20	250
P&G Ltd	450	20	900
B. 14% GOI Bonds	1,000	140	5
Total	2,050	200	1,405

Expected rate of return on market portfolio

= [(Dividends earned + Capital appreciation)/Initial investment] × 100

= [(Rs 200 + Rs 1,405)/Rs 2,050] × 100 = 78.29 per cent

Now, we can calculate the expected rate of return on individual portfolio, by applying the formula of CAPM

$$K_e = R_f + b\ (k_m - R_f)$$

L&T Ltd = 14 + 0.8 (78.29 – 14) = 65.43 per cent

HLL Ltd = 14 + 0.7 (78.29 – 14) = 59 per cent

P&G Ltd = 14 + 0.5 (78.29 – 14) = 46.14 per cent

14% GOI Bonds

= 14 + 0.99 (78.29 – 14) = 77.65 per cent

(ii) The average return of the portfolio is calculated as follows:

(65.43 + 59 + 46.14 + 77.65)/4 = 62.05 per cent

2.10 Return on market portfolio has a standard deviation of 20 per cent and covariance between the returns on the market portfolio and that of security A is 800.

What is the beta of security A? *(Calcutta University, 2000)*

Solution

$$\beta = \frac{\text{Cov. a market}}{\acute{o}^2 \text{ mkt}} = 800/(20)^2 = 800/400 = 2$$

beta of security A is 2.

PART 2

FINANCIAL ANALYSIS

PART TWO OF THE BOOK IS DEVOTED TO THE DISCUSSION OF FINANCIAL ANALYSIS. THE PREPARATION AND USE OF THE CASH FLOW STATEMENT IS COVERED IN CHAPTER 3. CHAPTER 4 DISCUSSES THE TECHNIQUES TO ANALYSE THE BALANCE SHEET AND PROFIT AND LOSS ACCOUNT.

Chapter

3

Cash Flow Statement

Learning Objectives

1. Explain the concept of cash flow statement
2. Determine cash inflows and cash outflows transactions
3. Understand the usefulness of cash flow statement
4. Explain the operating, financing and investing activities
5. Discuss adjustment of depreciation, amortisation, other non-cash expenses, non-operating expenses and incomes to determine cash flow from operating activities
6. Examine 'T' account approach to facilitate preparation of cash flow statement
7. Illustrate preparation of cash flow statement
8. Illustrate cash flow statement as per AS–3

INTRODUCTION

The balance sheet and income statement/profit and loss account are the traditional basic financial statements of a business enterprise. A balance sheet shows the financial position of the a firm as at the last day of the accounting period. An income statement focuses on financial performance (profit or loss) due to the operating activities of a firm during the period. Revenues recorded in income statement do not reflect cash inflows as the debtors may pay later. Likewise, some of the expenses shown in income statement may be non-cash expenses (depreciation, amortisation etc.) and some may not be paid in full (goods purchased on credit, salaries payable etc). Thus, the period's profit or loss does not bear direct relationship to the cash flows associated with the period's operations. It does not evidently provide information about the investing and financing activities of the firm during the accounting period.

This chapter describes the third financial statement a company is required to prepare, namely, the cash flow statement. The objective of the cash-flow statement is to provide information about the cash flows associated with operating, investing and financing activities of the firm during the accounting period. The information is significant to the stakeholders of a company. Dividends payable to the shareholders obviously are dependent on cash flows; interest payment

and debt repayment to the lenders require the availability of cash; payment to the employees, suppliers and taxes in time is contingent upon the company's ability to generate adequate cash flows to meet these financial obligations.[1] For these reasons, cash flow statement (CFS) is the third major financial statement of a company. Section 1 outlines the meaning, sources and uses of cash, and usefulness of the CFS. The preparation of CFS is covered in Section 2. Its preparation in conformity with the AS-3 is illustrated in Section 3. The main points are summarised in the last Section.

SECTION 1 MEANING, SOURCES AND USES OF CASH AND ITS USEFULNESS

Meaning

Cash flow statement is a statement which indicates sources of cash inflows and transactions of cash outflows of a firm during an accounting period. The activities/transactions which generate cash inflows are known as sources of cash and activities which cause cash outflows are known as uses of cash. It is appropriately termed as *"**Where Got Where Gone Statement**"*.

It may be emphasised that the information contained in the CFS are objective and, hence, more credible and reliable *vis-à-vis* the other financial statements. The reason is that ***cash is cash*** and the amounts of cash flows are not affected by the subjective judgments and estimates that are normally made in revenues, expenses and other accruals.[2] The CFS is a financial document as it leaves no scope for any maneuvering on the amounts of cash inflows and cash outflows.

Sources and Uses of Cash

Exhibit 3.1 shows major items of cash inflows and cash outflows.

EXHIBIT 3.1 Cash Flow Statement of Hypothetical Limited

Particulars	*Amounts*
(I) Sources of Cash Inflows:	
(1) Business operations/operating activities	
(2) Non-business/operating activities (interest/dividend received)	
(3) Sale of long-term assets (plant, building and equipment)	
(4) Issue of additional long-term securities (equity, preference shares and debentures)	
(5) Additional long-term borrowings (banks and financial institutions)	
(6) Others sources (specify them)	
(II) Sources of Cash Outflows:	
(1) Purchase of long-term assets (plant and machinery, land and building, office equipments and furniture)	
(2) Redemption of preference shares and debentures	
(3) Repurchase of equity shares	
(4) Repayment of long-term borrowings	
(5) Cash dividends paid to shareholders (preference and equity)	
(6) Others items (specify)	
Net Increase (Decrease) in Cash **[I - II]**	

Usefulness

The cash flow statement helps to provide answers to users to some of the important questions related to the company such as the following:

- How much cash has been generated from normal business operating activities/operations of a company?
- What have been the other premier financing activities of the firm through which cash has been raised? What has happened to cash so obtained?
- How much cash has been spent on investment activities, say, on purchase of new plant and equipments?
- How was the redemption of preference shares and debentures accomplished?
- Have long-term sources of cash (internally generated plus raised externally) adequate to finance purchase of new long-term/fixed assets?
- What has been the proportion of debt and equity for cash raised from outside?
- Why are dividends not larger?
- Is the company borrowing to pay cash dividends?
- Has the liquidity position of the company improved?

Thus, the CFS enables the management to see whether the long-term funds are adequate to finance major fixed assets expansion. A situation in which short-term sources (bank overdraft, temporary loans, etc.) constitute the bulk of sources for long-term purposes may not be desirable. Such a pattern of financing is likely to cause problems for the firm to meet its current liabilities in future. Besides, the CFS also indicates the extent of reliance on external resources *vis-a-vis* the internal sources. Thus, the CFS clearly highlights the firm's financing and investment activities.

The CFS, when prepared on a projected basis, has immense potential/utility as a tool of financial planning. It shows the effect of various financing and investment decisions on future cashflows. If the implementation of the decision results in excessive or inadequate cash, steps may be taken to improve the situation or review the decisions. For instance, if the cash position is expected to deteriorate, funds may be raised by borrowing or issuing new equity shares. If the required amount is not feasible to be raised, plans for acquisition of assets may be postponed or alternative operative plans can be developed to ensure that the desired future level of business operations, expansion, and so on, are achieved. Thus, the CFS enables the management to revise/review its investments, operations and financing activities so as to conform to the desired financial inflow and outflow of resources. Above all, the long-term lenders can use the statement as a means of estimating the firm's ability to service their debts.

SECTION 2 PREPARATION OF CASH FLOW STATEMENT

You will remember that the balance sheet and income statement are prepared from the ledger account balances of a company. In contrast, the cash flow statement is derived from these two financial statements. The CFS explains factors which have caused changes in assets, liabilities and shareholders' funds between the opening and closing dates of the accounting period. Therefore, the CFS can be prepared by **(i)** finding the difference in amounts among the various items (say, changes in long-term liabilities, long-term assets) between the comparative balance

sheets and then **(ii)** analysing the causes of difference. The analysis, in some cases, is facilitated by the use of 'T; accounts. The preparation of CFS is illustrated in Example 3.1.

Example 3.1

Given below are the balance sheets as on March 31, previous year and current year, and a statement of income and reconciliation of earnings for the current year of Electronics Ltd (EL). The only item in the plant and machinery account sold during the year was a specialised machine that originally cost Rs 15,00,000. The accumulated depreciation on this machine at the time of sale was Rs 8,00,000. The machine was sold for Rs 6,00,000 and full payment was received in cash. Electronics Ltd. purchased patents for Rs.16,00,000 during the year. Besides cash purchases of plant and equipment, the assets of another company were also purchased for Rs 1,00,00,000 payable in fully paid-up shares, issued at par; the assets purchased being goodwill, Rs 30,00,000 and plant, Rs 70,00,000.

Comparative Balance Sheets

Particulars	*March 31 Previous Year (Rs lakh)*	*March 31 Current Year (Rs lakh)*
Cash	74	37
Sundry debtors	54	47
Inventories	312	277
Prepaid expenses	6	4
Land	60	60
Patents	55	65
Plant and machinery	420	550
Less: Accumulated depreciation	(105)	(120)
Goodwill	—	30
Total Assets	876	950
Sundry creditors	86	102
Provision for income tax	89	17
Debentures	220	60
Equity capital	250	560
Retained earnings	231	211
Total Liabilities	876	950

Statement of Income and Reconciliation of Earnings for Current Year

Particulars		*Amount (Rs lakh)*
Net sales		1,977
Less: Cost of goods sold		1,480
Gross profit		497
Less: Operating expenses (includes depreciation on plant and machinery and amortisation of patents)		486
Less: Interest on debentures		14
Net loss from operations		(3)
Add: Retained earnings (previous year)		231
		228
Less: Dividend paid	16	
Less: Loss on sale of assets	1	17
Retained earnings (March 31, current year)		211

From the foregoing information, prepare a cash-flow statement for Electronics Ltd.

Solution

Cash Flow Statement of Electronics Limited the current year

Particulars		*Amount (in Rs lakh)*
(A) Sources of cash inflows		
Business operations		
Cash from customers/debtors (1)*	Rs1,984	
Less payment to creditors (2)*	(1,429)	
Less operating expenses (5)*	(455)	
Less interest on debentures	14	
Less taxes paid (Rs 89- Rs17)	72	
Sale of machine		14
Issue of equity share capital (8)*		6
		210
		230
(B) Cash outflows		
Purchase of long-term assets		
Plant and machinery (6)*		75
Patents		16
Redemption of debentures (7)*		160
Dividends paid to equity shareholders		16
		267
(C) Net decrease in cash (B-A)		37
Cash at beginning of year		37
Cash at year-end		74

Note: Figures in brackets refer to working note number.

Working Notes

(A) Determination of cash from business operation requires recasting of income statement from accrual basis to cash basis. Exclusion of non-cash items, namely, depreciation and amortisation is obvious. The less obvious is the computation of cash inflows from debtors/customers and cash payments to creditors for goods purchased and expenses. The following working notes provide these required inputs.

(1) Cash Receipts from Debtors:

Sundry Debtors Account

(Amount in Rs lakh)

Particulars	*Amount*	*Particulars*	*Amount*
To Balance b/f (opening balance)	54	By Cash (receipts from debtors,	
To Net sales (assumed credit sales)	1,977	balancing figure)	1,984
		By Balance c/d	47
	2,031		2,031

Alternatively

(in Rs lakh)

Net sales	1,977
Add debtors due at the beginning of current year	54
Total amount receivable from debtors	2,031
Less debtors due at the end of current year	(47)
Cash receipts from debtors during current year	1,984

(2) Cash Payment to Creditors

Sundry Creditors Account

(Amount in Rs lakh)

Particulars	*Amount*	*Particulars*	*Amount*
To Cash (payments to creditors, balancing figure)	1,429	By Balance b/f (opening balance)	86
To Balance c/d	102	By purchases* (assumed credit)	1,445
	1,531		1,531

*Cost of goods sold = Opening stock + Purchases – Closing stock
= Rs 1,480 = Rs 312 + Purchases – Rs 277
= Rs 1,480 – Rs 312 + Rs 277 = Rs 1,445 (Purchases)

Alternatively

(Amount in Rs lakh)

Credit purchases	1,445
Add sundry creditors at the beginning of year	86
Total amount due/payable to creditors	1,531
Less sundry creditors at the year-end	(102)
Cash payment to creditors during the year	1,429

(3) Determination of Depreciation Charges

(a) T-Account Approach

Accumulated Depreciation Account

(Amount in Rs lakh)

Particulars	*Amount*	*Particulars*	*Amount*
To Machine (accumulated depreciation written off on machine sold)	8	By Balance b/f	105
To Balance c/d	120	By P&L A/c (depreciation amount charged during the year, balancing figure)	23
	128		128

(b) Statement Approach

(Amount in Rs lakh)

Opening balance at the beginning of year	105
Less depreciation written off on plant sold during current year	(8)
	97
Closing balance	120
Difference represents current year depreciation	23

(4) Determination of Amortisation Charges

Patent Account

(Amount in Rs lakh)

Particulars	*Amount*	*Particulars*	*Amount*
To Balance b/f	55	By Amortisation (balancing figures)	6
To Cash (purchases)	16	By Balance c/d	65
	71		71

(5) Determination of Cash Operating Expenses

(Amount in Rs lakh)

Total operating expenses	486
Less depreciation (as it does not cause current cash outflow)	(23)
Less amortisation (non-cash expense)	(6)
Operating expenses (other than depreciation and amortization)	457
Less prepaid expenses (already paid in previous year)	(6)
Add expenses paid in advance in current year	4
Operating expenses paid in cash	455

(B) Likewise, changes in *long term assets*, in particular, plant and machinery require a more careful analysis to ascertain cash obtained from their sales and cash used in their acquisition because the straight difference of the two years values do not indicate either purchase or sale. Such assets are subject to depreciation. Therefore, depreciation amount should be adjusted to ascertain the amount of such assets purchased/sold.

(6) Purchase of Plant and Machinery

(a) T-Account Approach

Plant and Machinery Account (Gross Basis)

(Amount in Rs lakh)

Particulars	*Amount*	*Particulars*	*Amount*
To Balance b/f	420	By Cash (sale value)	6
To Equity share capital	70	By Loss (P&L A/c)	1
To Cash (purchases, balancing figure)	75	By Accumulated depreciation (on plant sold)	8
		By Balance c/d	550
	565		565

(b) Statement Approach

(Amount in Rs lakh)

Opening balance of plant and machinery	420
Less original purchase price of plant sold (Rs 6 + 1 + 8)	15
	405
Closing balance	550
Difference represents purchases	145
Less purchases against issue of share capital	70
Cash purchases of plant	75

(c) Equation Approach

Opening balance of plant and machinery (PM) + Purchases of PM during the year – *Initial* acquisition cost of PM sold during the year = Closing balance of PM

(5.1)

Rs 420 + Purchases – Rs 15 = Rs 550

Purchases = Rs 550 – Rs 420 + 15 = Rs 145

Cash purchases = Total purchases Rs 145 – Purchases through issue of equity share capital Rs 75 = Rs 70

OR

(a) T-Account Approach

Plant and Machinery (Net Basis)

(Amount in Rs lakh)

Particulars	*Amount*	*Particulars*	*Amount*
To Balance b/f (Rs 420 – 105)	315	By Depreciation(charged during current year)	23
To Equtiy share capital	70	By Cash	6
To Cash (purchases, balancing figure	75	By P&L A/c (loss on sale of machine)	1
		By Balance c/d (Rs 550 – 120)	430
	460		460

(b) Statement Approach

(Amount in Rs lakh)

Opening balance of plant and machinery	Rs 315
Less book value of plant sold	7
Less depreciation charged during the year	23
	285
Closing balance	430
Difference represents purchases	145
Less purchases against issue of share capital	70
Cash purchase of plant	75

(c) Equation Approach

Opening balance of PM + Purchases of PM during the year – Book value of PM sold during the year – Depreciation charges during the year = Closing balance of PM

(5.2)

Rs 315 + Purchases – Rs 7 – Rs 23 = Rs 430

Purchases = Rs 430 – Rs 315 + Rs 7 + Rs 23 = Rs 145

Cash purchases = Total purchases Rs 145 = Purchases through issue of equity share capital Rs 75 = Rs 70

(C) Treatment of changes in long-term liabilities are the easiest to deal. They relate to (i) fresh issue of shares and debentures or their redemption and (ii) additional long-term borrowings or their repayment. The increase is indicative of additional issue of securities or additional borrowings and, hence, is a source of cash.

The decrease represents repayment and, therefore, is use of cash, that is, cash outflow. However, if the increase in securities, say, in equity capital is caused due to issue of bonus shares, it is not a source of cash. Likewise, if increase in shares is an outcome of (i) payment for purchase of plant and machinery, land and building or any other asset and (ii) conversion of debentures into shares, such transactions do not affect cash inflow and are excluded.

(7) Redemption of Debentures

	(Amount in Rs lakh)
Opening balance (at the year beginning)	220
Closing balance (at year-end)	60
Decrease in balance represents edemption of debentures	160

(8) Issue of Equity Share Capital for Cash

	(Amount in Rs lakh)
Closing balance at current year-end	560
Less opening balance	250
Increase in balance represents additional issue	310
Less payment for goodwill (Rs 30) and for plant (Rs 70) by equity capital	100
Difference indicates additional cash raised through equity capital	210

It is emphasised that the amount of cash from business operations (in preparation of the CFS of Electronics Limited) has been determined using 'T' accounts extensively. Alternatively, cash from business operation can be computed by another approach. This approach uses less of 'T' account and involves two steps: (i) to determine working capital from business operations by excluding depreciation, amortisation, loss/gain on sale of long-term assets, non-operating incomes and (ii) to adjust the working capital from business operations by changes in current liabilities and current assets (except cash).

The rules for relating the changes in current assets and current liabilities to the profit and loss account in the computation of a flow of cash from operations are summarised below.

1. **All the increases in current assets excluding cash and decreases in current liabilities which increase working capital decrease cash**. The decrease in current liabilities takes place when they are paid in cash. For instance, decrease in creditors, bank overdrafts, bills payable and dividends payable will occur due to their payment. A word of explanation is necessary to show the negative impact of increase in current assets on cash. For instance, an increase in sundry debtors takes place when credit sales are greater than cash collections from them; inventories increase when the cost of goods purchased is more than the cost of goods sold. Increase in prepaid expenses involves payment of more cash than is required for their current services. Evidently, increase in current assets decreases cash.
2. **From the first follows the second rule—all decreases in current assets other than cash and increases in current liabilities which cause a decrease in working capital increase cash.** Debtors would decrease when cash collections are more than current credit sales. Inventories would decrease because cost of goods sold is more than cost of goods purchased; decrease in prepaid expenses reflects that the firm has paid less for services than are currently used.

   Exhibits 3.2 and 3.3 show the procedure for determining cash from business operations.

EXHIBIT 3.2 Cash From Business Operations (Direct Method)

(A) Sales revenues
(B) *Less:* Expenses using working capital
Cost of raw materials used (or cost of goods sold)
Wages and salary expenses
Others manufacturing expenses (excluding depreciation)
Office expenses
Selling and distribution expenses
Interest
Income tax
(C) Working capital from business operations
(D) Adjustment to convert to cash basis
(i) *Add*: Decrease in WC (–CA or +CL)
Decrease in current assets other than cash (item-wise)
Increase in current liabilities (item-wise)
(ii) *Less*: Increase in WC (+CA or –CL)
Increase in current assets other than cash (item-wise)
Decrease in current liabilities (item-wise)
(E) Cash flow from business operations

EXHIBIT 3.3 Cash From Business Operation (Indirect Method)

(**A**) Net income (or loss) as shown by profit and loss account
(**B**) *Add:* Depreciation expenses;
Amortisation of goodwill, patents and other intangible assets;
Amortisation of discount on debentures or share issue expenses;
Amortisation of extraordinary losses occurred in previous years;
Loss on sale of non-current assets;
(**C**) *Less:* Amortisation of premium received on debentures;
Profit on sale of equipment (already included under sources)
Profit on revaluation of non-current assets (does not contribute to working capital)
Dividends and interest received on investments (reported separately).
(**A** + **B** – **C**) = Working capital from business operations.
(D) Adjustment to convert to cash basis:
(i) *Add*: Decrease in WC (–CA or +CL)
Decrease in current assets other than cash (item wise)
Increase in current liabilities (item-wise)
(ii) *Less*: Increase in WC (+CA or –CL)
Increase in current assets other than cash (item-wise)
Decrease in current liabilities (item-wise)
(**E**) Cash flow from business operations

Cash from business operations has been computed in Exhibited 3.4 and 3.5 for Electronics Limited using Exhibits 3.2 and 3.3 respetively.

EXHIBIT 3.4 Cash From Business Operation [Based on Exhibit 3.2]

		(Amount in Rs lakh)
Net sales		1,977
Less cost of goods sold	1,480	
Less operating expenses (other than depreciation and amortization)	457	
Less interest on debentures	14	1,951
Working capital from business operations		26
Add (Decrease in WC i.e. - CA or + CL):		
Debtors	7	
Inventories	35	
Prepaid expenses	2	
Creditors	16	60
Less (increase in WC i.e. - CA or – CL)		
Provision for income-taxes		(72)
Cash from business operation		14

EXHIBIT 3.5 Cash From Business Operations [Based on Exhibit 3.3]

Net loss as per income statement		(3)
Add depreciation on plant and machinery		23
Add amortisation on patents		6
Working capital from business operations		26
Add (Decrease in WC i.e. – CA or + CL)		
Debtors	7	
Inventories	35	
Prepaid expenses	2	
Creditors	16	60
Less (increase in WC i.e. – CA or – CL)		
Provision for income-taxes		(72)
Cash from business operations		14

Example 3.2

From the following information furnished to you relating to plant and equipment account of Hypothetical Ltd., determine cash obtained from sale of old plant and equipment.

Particulars	*Previous year (Rs thousand)*	*Current year (Rs thousand)*
Plant and equipment (gross)	100	125
Accumulated depreciation	20	30
Additional information:		
(i) Loss on sale of plant and equipment		1
(ii) Depreciation charged during the year on plant and equipment		14
(iii) Purchase of new plant during the year		35

Solution

Equations 3.1 and 3.3 can be used to determine the required information to ascertain the sale proceeds from old plant and equipment (*PE*).

(i) Opening balance of *PE* (+) Purchases of *PE* during the year (–) Initial acquisition cost of *PE* sold during the year = Closing balance of *PE* (3.1)

= Rs 1,00,000 + Rs 35,000 – x = Rs 1,25,000

= x = Rs 1,35,000 – Rs 1,25,000 = Rs 10,000 (Purchase price of *PE* sold)

(ii) Opening balance of accumulated depreciation, *AD* + Depreciation charged during the year – *AD* written off on the *PE* sold during the year = Closing balance of *AD* (3.2)

= Rs 20,000 + Rs 14,000 – x = Rs 30,000

= x = Rs 34,000 – Rs 30,000 = Rs 4,000 (*AD* on *PE* sold)

The following information relating to the plant and equipment that has been sold is, thus, available:

Gross book value (purchase cost)	Rs 10,000
Accumulated depreciation	4,000
Net book value (Rs 10,000 – Rs 4,000)	6,000
Therefore, sale proceeds of plant (Rs 6,000 – Rs 1,000 loss)	5,000

The preceding information can also be obtained by preparing ledger accounts.

Plant and Equipment Account

Particulars	*Amount (Rs thousand)*	*Particulars*	*Amount (Rs thousand)*
Opening balance	100	Acquisition cost of sold plant (balancing figure)	10
Cash purchase of new plant	35	Closing balance	125
	135		135

Accumulated Depreciation Account

Total depreciation on sold plant (balancing figure)	4	Opening balance	20
Closing balance	30	Depreciation expenses charged during the year	14
	34		34

SECTION 3 AS-3—CASH FLOW STATEMENT

The Institute of Chartered Accountants of India (ICAI) issued the Accounting Standard (AS-3) relating to the preparation of cash flow statement (CFS) for accounting periods commencing on or after April 1, 2001 for enterprises **(i)** which have either turnover of more than Rs 50 crore in a financial year or **(ii)** the shares of which are listed in stock exchange (i.e. the listed companies) in India or outside India or **(iii)** enterprises which are in the process of listing their equity or debt securities as evidenced by the Board of Directors' resolution in this regard. The CFS of listed companies should be presented as per the *indirect method* prescribed in AS-3. This Section explains and illustrates the CFS mandated by the ICAI.

Objectives

Information about the cash flows of an enterprise is useful in providing users of financial statements with a basis to assess the ability of the enterprise to generate cash and cash-equivalents

and the needs of the enterprise to utilise those cash flows. The economic decisions that are taken by users require an evaluation of the ability of an enterprise to generate cash and cash-equivalents and the timing and certainty of their generation.

The **CFS** deals with the provision of information about the historical changes in cash and cash-equivalents of an enterprise by means of a cash flow statement which classifies cash flows during the period among **(i)** operating, **(ii)** investing and **(iii)** financing activities.

Benefits of Cash Flow Operation

A cash flow statement, when used in conjunction with the other financial statements, provides information that enables users to evaluate the changes in net assets of an enterprise, its financial structure (including its liquidity and solvency), and its ability to affect the amounts and timing of cash flows in order to adapt to changing circumstances and opportunities. Cash flow information is useful in assessing the ability of the enterprise to generate cash and cash-equivalents and enables users to develop models to assess and compare the present value of the future cash flows of different enterprises. It also enhances the comparability of the reporting of operating performance by different enterprises because it eliminates the effects of using different accounting treatments for the same transactions and events.

Cashflow statement (CFS) provides a summary of operating, investment and financing cashflows and reconciles them with changes in its cash and cash- equivalents (marketable securities) during the period.

Definitions Associated with Cash Flow

Cash It consists of cash in hand and demand deposits with banks.

Cash Equivalents These are short-term highly liquid investments that are readily convertible into known amounts of changes in value. They have short maturity, say, of three months or less from the date of acquistion, for example, treasury bills.

Cash Flows These are inflows and outflows of cash and cash-equivalents.

Operating Activities Cash inflows from operating activities primarily accrue from the major revenue producing activities (i.e., sale of goods and rendering of services) of the enterprise. Therefore, they generally result from the transactions and other events that enter into the determination of net profit or loss. Examples of cash flows from operating activities are as follows:

Operating cashflows are directly related to production and sale of the firm's products/services.

- Cash receipts from the sale of goods and the rendering of services
- Cash receipts from royalties, fees, commissions, and other revenues
- Cash payments to suppliers for goods and services
- Cash payments to and on behalf of employees
- Cash receipts and cash payments of an insurance enterprise for premiums and claims, annuities and other policy benefits
- Cash payments or refunds of income taxes unless they can be specifically identified with financing and investing activities
- Cash receipts and payments relating to futures contracts, forward contracts, option contracts, and swap contracts when the contracts are held for dealing or trading purpose

Since the focus is on determining cash flows due to business/operating activities, non-operating expenses as well as non-operating incomes are excluded. In other words, both interest/dividend receipts and interest/dividend payments are excluded.

Investment flows are cashflows associated with purchase/sale of both fixed assets and business interests.

Investing Activities The **investing activities** relate to the acquisition and disposal of long-term assets and other investments not included in cash-equivalents. Their separate disclosure is important as they represent the extent to which expenditures have been made for resources intended to generate future income and cash flows. The principal items covered under this category of activities are as follows:

- Cash payments to acquire fixed assets (including intangibles). These payments include those relating to capitalised research and development costs and self-constructed fixed assets
- Cash receipts from disposal of fixed assets (including intangibles)
- Cash payments to acquire shares, warrants or debt instruments of other enterprises and interests in joint ventures
- Cash receipts from disposal of shares, warrants, or debt instruments of other enterprises and interests in joint ventures
- Cash advances and loans made to third parties
- Cash receipts from the repayment of advances and loans made to third parties

Financing flows are cash flows that result from debt/equity financing transactions and include incurrence and repayment of debt cashflows from the sale of shares and cash outflows to purchase shares or pay dividend.

Financing Activities The **financing activities** report the changes in the size and composition of the share/owner's capital and debt of the enterprise. Their separate disclosure is useful in predicting claims on future cash flows by providers of funds (both capital and borrowings) to the enterprise. Examples of cash flows arising from financing activities are as follows:

- Cash proceeds from issue of shares or other similar instruments
- Cash proceeds from issue of debentures, loans, notes, bonds and other short-term or long-term borrowings
- Cash repayments of amounts borrowed
- Buy-back of shares
- Redemption of preference shares
- Dividend/interest paid

Reporting Cash Flows

From Operating Activities An enterprise is required to report cash flows from operating activities using either direct method or indirect method.

Direct Method Under this method, gross cash receipts and gross cash payments for the major items are disclosed, such as cash receipts from customers and cash paid to suppliers.

Indirect Method Under the indirect method, profit and loss account is adjusted for **(i)** the effects of transactions of non-cash nature such as depreciation, amortisation, deferred taxes, loss on sale of fixed assets and unrealised foreign exchange gains and losses, **(ii)** changes during the period in inventories and operating receivables and payables, and **(iii)** for all other items for which the cash effects are shown either in financing or investing activities.

From Investing and Financing Activities An enterprise is required to report separately major classes of gross cash receipts and gross cash payments arising from investing and financing activities. The cash flows from operating, financing and investing activities are to be reported on a *net* basis.

Treatment of Some Major Items

While most of the items (to be included in the CFS) are self-explanatory in nature, some transactions/items merit more explanation. These relate to **(i)** foreign currency, **(ii)** extraordinary items, **(iii)** interest, **(iv)** dividends, **(v)** taxes on income, **(vi)** deferred taxes, **(vii)** investments in subsidiaries, associates and joint ventures, **(viii)** acquisitions and disposals of subsidiaries and other business units, **(ix)** non-cash transactions and **(x)** other disclosures.

Foreign Currency Cash Flows Cash flows arising from transactions in a foreign currency should be recorded in an enterprise's reporting currency by applying to the foreign currency amount the exchange rate between the reporting currency and the foreign currency at the date of the cash flow. A rate that approximates the actual rate may be used if the result is substantially the same as would arise if the rates at the dates of the cash flows were used.

The effect of changes in exchange rates on cash and cash-equivalents held in a foreign currency are to be reported as a separate part of the reconciliation of the changes in cash and cash-equivalents during the period.

Evidently, unrealised gains and losses arising from changes in foreign exchange rates are not cash flows.

Extraordinary Items Extraordinary items are unusual in nature, not frequent in occurrence and are material in amount. The cash flows associated with extraordinary items are disclosed separately as arising from operating, investing or financing activities in the CFS, to enable users to understand their nature and effect on the present and future cash flows of the enterprise. Examples include attachment of the property of the enterprise and insurance proceeds from earthquake disaster settlement.

Interest In general, cash flows arising from interest paid should be classified as cash flows from financing activities, say interest on loans/debts; interest paid on working capital loan and any other loan taken to finance operating activities are to be shown as a part of operating activities. Unless stated otherwise, interest paid is to be reported with financing activities. The reason is that they are cost of obtaining financial resources.

Interest received from short-term investments (classified as cash equivalents) are to be reckoned as cash inflows from operating activities.

Dividends While dividends paid are classified as financing activities as they are cost of obtaining financial resources, dividends received on investments constitute a part of investment activities. The reason is that they are the returns on investments.

Taxes on Income Taxes paid on income as well as tax refunds are usually classified as cash flows from operating activities. In the event of their specific indentification with investment or financing activities, the tax cash flow is classified as an investing or financing activity as appropriate.

Deferred Taxes There can be differences in the amount of taxes payable, determined on the basis of financial accounting *vis-à-vis* tax accounting. One such item which can cause this

distortion relates to the treatment of depreciation. For instance, for income-tax reporting, the machine may be subject to higher rate of depreciation compared to financial accounting. This lowers the taxes payable in the early years of machine purchased and increases the taxes payable in the latter years. **Deferred taxes are to be treated just like other expenses on accrual basis.** Deferring tax liabilities to the future years is referred to as deferred taxes. As a result, increase in deferred tax liabilities are considered as cash inflows and decrease as cash outflows.

Investments in Subsidiaries, Associates and Joint Ventures Enterprises having investments in susbsidiaries, associates and joint ventures are required to report in the CFS the cash flows between themselves and the investee/joint venture, for example, cash flows relating to dividends and advances.

Acquisitions and Disposals of Subsidiaries and Other Business Units The aggregate cash flows arising from acquisitions and from disposals of subsidiaries or other business units should be presented separately and classified as investing activities.

An enterprise should disclose, in aggregate, in respect of both acquisition and disposal of subsidiaries or other business units during the period, each of the following: **(i)** the total purchase or disposal consideration; and **(ii)** the portion of the purchase of disposal consideration discharged by means of cash and cash-equivalents.

Non-Cash Transactions Investing and financing transactions that do not require the use of cash or cash-equivalents should be excluded from a cash flow statement. Such transactions should be disclosed elsewhere in the financial statements in a way that provides all the relevant information about these investing and financing activities. Examples of non-cash transactions are: **(i)** the acquisition of assets/an enterprise by means of issue of shares and/or debentures, **(ii)** conversion of debt into equity and **(iii)** issue of bonus shares.

Other Disclosures An enterprise should disclose, together with a commentary by management, the amount of significant cash and cash-equivalent balances held by the enterprise that are not available for use by it. Examples include cash and cash-equivalent balances held by a branch of the enterprise that operates in a country where exchange controls or other legal restrictions apply as a result of which the balances are not available for use by the enterprise.

Exhibits 3.6 to 3.7 show the procedure of the preparation of the cash flow statement as per AS-3.

EXHIBIT 3.6 Direct Method Cash Flow Statement

Cashflow From Operating Activities
Cash receipts from customers
Cash paid to suppliers and employees
Cash generated from operations
Income tax
Cash flow before extraordinary items
Proceeds from earthquake disaster settlement
Net cash from operating activities
Cashflow From Investing Activities
Purchase of fixed assets
Proceeds from sale of equipments

(*Contd.*)

(*Contd.*)

Interest received
Dividends received
Net cash from investing activities
Cashflow From Financing Activities
Proceeds from issuance of share capital
Proceeds from long-term borrowings
Repayments of long-term borrowings
Interest paid
Dividends paid
Net cash used in financing activities
Net Increase in Cash and Cash-equivalents*
Cash and cash-equivalents at the beginning of a period
Cash and cash-equivalents at the end of a period

*Consists of cash on hand and balance with banks, investment in money market (short-term) investments and effect of exchange rate changes.

EXHIBIT 3.7 Indirect Method Cash Flow Statement

Cashflow From Operating Activities
Net profit before taxation, and extraordinary items
Adjustment for
• Depreciation
• Foreign exchange loss
• Interest income
• Dividend income
• Interest expense
Operating profit before working capital changes
Decrease/(increase) in sundry debtors
Decrease/(increase) in inventories
Increase/(decrease) in sundry creditors
Cash generated from operations
Income tax paid
Cash flow before extraordinary items
Proceeds from earthquake disaster settlement
Net cash from operating activities
Cashflow From Investing Activities
Purchase of fixed assets
Proceeds from sale of equipment
Interest received
Dividends received
Net cash from investing activities
Cashflow From Financing Activities
Proceeds from issuance of share capital
Proceeds from long-term borrowings
Repayment of long-term borrowings
Interest paid
Dividends paid
Net cash used in financing activities
Net Increases in Cash and Cash-equivalents
Cash and cash-equivalents at the beginning of a period
Cash and cash-equivalents at the end of a period

For the Electronics Ltd. in Example 3.1, the cash flow statement as per AS-3 is shown in Exhibits 3.8 and 5.9.

EXHIBIT 3.8 Cash Flow Statement of Electronics Limited for the Current Year (Direct Method)

(Amount in Rs lakh)

Particulars		*Amount*
Cash Flows From Operating Activities		
Cash receipts from customers	1,984[1]	
Cash paid to suppliers and employees	1,884[2]	
Cash generated from operations	100	
Income taxes paid	(72)	
Net cash from operating activities		28*
Cash Flows From Investing Activities		
Purchase of plant and machinery	(75)	
Purchase of patents	(16)	
Proceeds from sale of plant	6	
Net cash used in investing activities		(85)
Cash Flows From Financing Activities		
Proceeds from issuance of equity share capital	210	
Repayment of debentures (Rs 220 – 60)	(160)	
Interest paid to debenture-holders	(14)	
Dividends paid	(16)	20
Net decrease in cash balance (Rs 85 – 48)		(37)
Less		
Cash and cash equivalents at beginning of the year		74
Cash and cash equivalents at end of the year		37

* It may be recalled that cash from operating activities (shown in Section II) was Rs 14; the difference of Rs 14 (Rs 28 as per AS – 3 and Rs 14 as per CFS) is due to exclusion of interest payment on debentures (Rs 14); this interest payment is shown under financing activities.

Working Notes

(Amount in Rs lakh)

(1) Cash receipts from debtors and customers:	
Debtors at the beginning of the year	54
Add: Net sales during the year	1,977
Total sum receivable	2,031
Less: Debtors at the end of the year	47
Total	1,984
(2) Cash paid to suppliers and employees:	
Cost of goods sold	1,480
Add: Operating expenses excluding depreciation and amortisation (Rs 486 – 23 – 6)	457
Add: Curent year prepaid expenses	4
Less Previous year prepaid expenses	(6)
	455
Add: Creditors at the beginning of the year	86
Add: Inventories at the end of the year	277
Less: Creditors at the end of the year	(102)
Less: Inventories at the beginning of the year	(312)
Total	1,884

EXHIBIT 3.9 Cash Flow Statement of Electronics Limited for the current year (Indirect Method)

(Amount in Rs lakh)

Particulars	*Amount*	
Cash flows From Operating Activities		
Net loss before taxation and extra-ordinary items	(4)	
Adjustments for:		
Depreciation	23	
Amortisation of patent	6	
Interest expenses	14	
Loss on sale of assets	1	
Operating profit before working capital changes	40	
Add: Decrease in debtors	7	
Add: Decrease in inventories	35	
Add: Prepaid expenses	2	
Add: Increase in creditors	16	
Cash generated from operations	100	
Less: Income-tax paid	72	
Net cash from operating activities		28
Cash flows From Investing Activities		
Purchase of plant and machinery	(75)	
Purchase of patents	(16)	
Proceeds from sale of plant	6	
Net cash used in investing activities		(85)
Cash flows From Financing Activities		
Proceeds from issuance of equity share capital	210	
Repayment of debentures (220 – 60)	(160)	
Interest paid to debentureholders	(14)	
Dividends paid	(16)	20
Net decrease in cash balance (78 – 41)		(37)
Cash and cash equivalents at beginning of the year		74
Cash and cash equivalents at end of the year		37

The statement highlights that the firm does not have enough funds from its operating activities (Rs 28 lakh) and financing activities (Rs 20 lakh) to cater to investment requirement of Rs 85 lakh, causing decline in cash (Rs 37 lakh).

Summary

- Cash flow statement indicates sources of cash inflows and transactions of cash outflows of a firm during a period. It is also called "Where-Got Where-Gone" statement. The statement provides answers to many important questions related to financial position of an enterprise.
- The major sources of cash inflows are cash from: **(i)** business operations, **(ii)** non-business operations (like interest, dividend etc), **(iii)** sale proceeds of long-term assets, **(iv)** raising additional share capital and **(v)** long-term borrowings. The principal uses of cash are: **(i)** purchase of long-term assets, **(ii)** redemption of preference shares/debentures, **(iii)** repayment of long-term borrowings and **(iv)** payment of dividends.

- Cash flow statement (CFS) is an important tool of financial analysis. It clearly highlights the firm's operating, financing and investment activities. It enables the management to assess whether the firm has adequate long-term funds to finance major fixed assets expansion.
- Preparation of cash flow statement is mandatory for all the listed companies as well as for all enterprises which have turnover of more than Rs 50 crore in a financial year.
- The CFS shows the sources and uses of cash in terms of three components: **(i)** operating, **(ii)** financing and **(iii)** investing activities. The cash flows from each of these categories are to be reported on net basis.
- Cash flows from operating activities result from the major revenue producing activities of a firm. Accordingly, the income statement constitutes the main source of data. The major operating items are **(i)** cash receipts from customers, **(ii)** cash paid to suppliers and employees, **(iii)** income-tax and **(iv)** proceeds from extraordinary items.
- The items included in financing activities are: **(i)** proceeds from issue of share capital, **(ii)** proceeds from long-term borrowings, **(iii)** redemption of preference shares/debentures, **(iv)** repayment of long-term borrowings and **(v)** payment of interest and dividend to debenture-holders/lenders and shareholders respectively.
- Cash flows representing investment activities relate to capital expenditures incurred with intent to generate future earnings as cash flows and includes: **(i)** purchase of new fixed assets, **(ii)** proceeds from sale of existing fixed assets and **(iii)** interest and dividend received on investments made.

References

1. Anthony, R. N. et al., *Accounting: Text and Cases,* (Tata McGraw-Hill, New Delhi), 2003, p.339.
2. *Ibid.,* p. 339.

Practical Problems

P.3.1 Answer the following:

(a) A company sold building for cash at Rs 100 lakh. The profit and loss account has shown Rs 40 lakh profit on sale of building. How will you report it in cash flow statement (based on AS-3)

(b) From the following information, determine cash received from debtors during current year:

Debtors in the beginning of current year	Rs 100 lakh
Total sales	2,000
Cash sales	500
Debtors at the end of current year	300

(c) Determine cash paid to suppliers/creditors from the following data during current year:

Cost of goods sold	Rs 480 lakh
Opening stock	30
Closing stock	50
Creditors at the beginning of year	60
Creditors at the end of the year	90
Cash purchases	40

(d) From the following **(i)** determine the gross amount of plant and machinery purchased and **(ii)** depreciation charged during the current year.
- Plant assets (net of depreciation) at year-end Rs 285 lakh and at the year-beginning Rs 127 lakh.
- Gross plant assets increased by Rs 186 lakh even through machine costing initially Rs 58 lakh with book value of Rs 38 lakh was sold at loss of Rs 25 lakh.

(e) Account balances relating to equipment during 2009–10 are as follows:

Particulars	*April 1, 2009*	*March 31, 2010*
Equipment	Rs 2,00,000	Rs 4,00,000
Less: Accumulated depreciation	50,000	70,000

Equipment with an original cost of Rs 40,000, having an accumulated depreciation of Rs 20,000, were sold at a gain of Rs 5,000. Determine: **(i)** Cash provided by the sale of equipment; **(ii)** Cash used to acquire equipment; **(iii)** Depreciation expense on equipment during 2009–10.

(f) Would your answer for **(e) (i), (ii) and (iii)** be different if the equipment were sold at a loss of Rs 5,000?

Solution

(a) Cashflows from Investing Activities:
Proceeds from sale of building Rs 100 lakh.

(b) Cash Receipts from Debtors:

Debtors at the beginning of current year	Rs 100 lakh
Plus credit sales (Rs 2,000 – Rs 500)	1,500
Total sum receivable from debtors	1,600
Less debtors at the end of current year	300
Cash received from debtors	1,300

(c) **(i)** Determination of Credit Purchases:
- Cost of goods sold = Opening stock + Purchases (x) – Closing stock
  Rs 480 lakh = Rs 30 lakh + x – Rs 50 lakh
  x = Rs 480 lakh – Rs 30 lakh + Rs 50 lakh = Rs 500 lakh
- Credit purchases = Rs 500 lakh – Rs 40 lakh = Rs 460 lakh

(ii) Determination of Payment to Creditors:

Creditors at the beginning of year	Rs 60 lakh
Plus credit purchases	460
Total sum payable	520
Less creditors at the year-end	90
Payment to creditors	430

(d) **(i)** Plant and Machinery Purchased:

Net increase in gross value	Rs 186 lakh
Add initial cost of plant sold	58
	244

(ii) Depreciation Charges:

Plant assets (net) at year beginning	Rs 127 lakh
Plus purchase cost of new plant	244
Less book value of plant sold	(38)
	333
Closing balance	285
Difference represents depreciation	48

(e) **(i)** Cash From the Sale of Equipment

Original cost of the sold equipment	Rs 40,000
Less: Accumulated depreciation on the sold equipment	(20,000)
Net book value	20,000
Plus: Gain on the sold equipment	5,000
Cash proceeds from sale of equipment	25,000

(ii) Cash Spent on Purchase of Equipment

Balance of equipment on April 1, 2009 (gross)	Rs 2,00,000
Less: Gross book value of the sold equipment	(40,000)
Balance of equipment on March 31, 2010 without purchases	1,60,000
Actual balance as on March 31, 2010 of equipment	4,00,000
Difference representing purchases made during 2009–10	2,40,000

(iii) Determination of Depreciation Amount Charged to the P&L A/c During 2010:

Balance of accumulated depreciation (1.4.2009)	Rs 50,000
Less: Writing-off depreciation on sold equipment during 2009–10	(20,000)
Balance of accumulated depreciation without additional depreciation during 2009–10	30,000
Actual balance as on March 31, 2010 of accumulated depreciation	70,000
Difference representing depreciation amount charged during 2009–10	40,000

(f) Answers for parts **(e)(ii)** and **(e)(iii)** would remain unchanged. However, cash provided by the sale of equipment would be reduced by Rs 10,000. The relevant calculations would be as follows:

Net book value	Rs 20,000
Less loss on sale of equipment	(5,000)
	15,000

P.3.2 Compute cash provided from operations during the year 2012, from the following data:

Particulars	*April 1, 2011*	*March 31, 2012*
Sundry debtors	Rs 30,000	Rs 40,000
Sundry creditors	48,000	30,000
Outstanding expenses	3,000	6,000
Outstanding income	1,000	1,000
Stock in trade	55,000	60,000
Prepaid expenses	3,000	2,000
Accumulated depreciation (no retirements during the year)	50,000	60,000

(*Contd.*)

(*Contd.*)

Provision for doubtful accounts	1,500	2,000
Dividends payable	—	3,000
Bills receivable	10,000	12,000
Bills payable	8,000	6,000
Net income (as per profit and loss account)	—	80,000

Solution

Determination of Cash From Operations:

Net income as per P&L A/c			Rs 80,000
Add Depreciation			10,000
Working capital from business operations			90,000
Less: Transactions other than cash, increasing working capital:			
(i) Increase in current assets:			
Sundry debtors		Rs 10,000	
Outstanding income		500	
Stock-in-trade		5,000	
Bills receivable		2,000	(17,500)
(ii) Decrease in current liabilities:			
Sundry creditors		18,000	
Bills payable		2,000	(20,000)
Add: Transactions other than cash, decreasing working capital:			
(i) Decrease in current assets:		1,000	1,000
Prepaid expenses			
(ii) Increase in current liabilities:			
Outstanding expenses		3,000	
Provision for doubtful accounts		500	
Dividends payable		3,000	6,500
Cash from operations			60,000

P.3.3 From the following summary cash account of Y Ltd., prepare cash flow statement for the current year ended March 31 in accordance with AS-3 using the direct method. The company does not have any cash equivalents.

Summary Cash Account
for the Current Year Ended March 31

	Rs ('000)		*Rs ('000)*
Opening balance	50	Payment to suppliers	2,000
Issue of equity shares	300	Purchase of fixed assets	200
Receipts from customers	2800	Overhead expenses	200
Sale of fixed assets	100	Wages and salaries	100
		Taxation	250
		Dividend	50
		Repayment of bank loan	300
		Closing balance	150
	3,250		3,250

Solution

Cash Flow Statement of Y Ltd.
as per AS-3 for the Current Year ended March 31

		Amount
Cash flows from operating activities:		
Cash receipts from customers	Rs 28,00,000	
Cash paid to suppliers	(20,00,000)	
Wages and salaries	(1,00,000)	
Overhead expenses	(2,00,000)	
Cash generated from operations	5,00,000	
Income tax paid	2,50,000	
Net cash from operating activities		Rs 2,50,000
Cash flows from investing activities:		
Purchase of fixed assets	(2,00,000)	
Sale of fixed assets	1,00,000	
Net cash used in investing activities		(1,00,000)
Cash flows from financing activities:		
Issue of equity shares	3,00,000	
Repayment of bank loan	(3,00,000)	
Dividend	(50,000)	
Net cash used in financing activities		(50,000)
Net increase in cash and cash-equivalent		1,00,000
Cash and cash equivalent at beginning of year		50,000
Cash and cash equivalent at the end of year		1,50,000

P.3.4 Charatlal, the president and majority shareholder, was a superb operating executive. He was an imaginative, aggressive marketing man and an ingenious, creative production man. But he had little patience with financial matters. After examining the most recent balance sheet and income statement, he muttered, "We have enjoyed ten years of steady growth, this year was our most profitable year. Despite this, we are in the worst cash position in our history. Just look those current liabilities in relation to our available cash! This whole picture of the more you make, the poorer you get, just does not make sense. These statements must be cockeyed."

The balance sheets (in lakh of rupees) of Charat Engineering Ltd. are given below:

	March 31			*March 31*	
Assets	*Current Year*	*Previous year*	*Liabilities*	*Current year*	*Previous year*
Cash	2	10	Current liabilities	105	30
Receivables (net)	60	30			
Inventories	100	50	Long-term debt	150	—
Plan assets (net of accumulated depreciation)	300	100	Stockholder's equity	207	160
Total assets	462	190	Total equities	462	190

Net income before taxes, Rs 81 lakh. Taxes paid are Rs 27 lakh. Net income was Rs 54 lakh. Cash dividend paid were Rs 7 lakh. Depreciation was Rs 20 lakh. Fixed assets were purchase for Rs 220 lakh, Rs 150 lakh of which was financed via the issuance of long-term debt outright for cash.

Using cash flow statement (based on AS-3), write a short memorandum to Mr Charatlal, explaining why there is such squeeze for cash. Show working.

Solution

Cash Flow Statement of Charat Engineering Ltd. (Indirect Method)

Particulars		*Amount in Rs lakh*
Cashflow from operating activities:		
Net profit before taxation and extraordinary items	Rs 81	
Adjustment for		
Depreciation	20	
Operating profit before working capital changes	101	
Increase in receivables (net)	(30)	
Increase in inventories	(50)	
Increase in current liabilities	75	
Cash generated from operations	96	
Income tax paid	27	
Net cash from operating activities		69
Cashflow from investing activities:		
Purchase of fixed assets	(220)	(220)
Net cash used for investing activities		
Cashflow from financing activities:		
Issuance of long-term debt	150	
Dividends paid	(7)	
Net cash from financing activities		143
Net decrease in cash		(8)
Cash at the beginning of current year		10
Cash at the end of the year		2

Memorandum: The squeeze for cash has resulted from major fixed assets expansion programme. The cash flow statement highlights that the company does not have enough funds from operating activities (Rs 69 lakh) and financing activities (Rs 143 lakh) to cater to investment requirements of Rs 220 lakh, causing decline in cash of Rs 8 lakh.

P.3.5 Prepare a statement from the following financial information of ABC company, to explain the causes of increase in cash despite the firm incurring losses.

(Amount in Rs lakh)

Income statement		
Sales		Rs 600.0
Dividends from investment in another company		3.6
		603.6
Expenses		
Cost of goods sold	Rs 400	
Depreciation	50	
Other operating expenditure	175	
Interest	1.6	
Loss on sale of plant (sale value, Rs 7.2)	3.0	629.6
Net loss		(26)

(Amount in Rs lakh)

Retained earnings	
Beginning balance	Rs 50
Net loss	(26)
Dividends	(16)
Ending balance	8

(Amount in Rs lakh)

Position statement

	Previous year	*Current year*
Cash	Rs 19.2	Rs 43.2
Sundry debtors	28.6	16.8
Inventory	33.0	22.0
Prepayments	2.2	1.8
Investments	18.0	18.0
Land	15.0	15.0
Plant and machinery	119.8	110.4
Accumulated depreciation	(75.2)	(78.4)
Total assets	160.6	148.8
Accounts payable	18.2	10.2
Accrued liabilities	1.2	2.4
Dividends payable	1.2	2.2
Debentures	12.0	16.0
Equity capital	50.0	60.0
Preference share capital	28.0	50.0
Retained earnings	50.0	8.0
Total liabilities	160.6	148.8

Solution

Cash Flow Statement of ABC Company (Indirect Method)

Particulars		*Amount (in Rs lakh)*
Casflow from operating activities:		
Net loss before extraordinary items	(Rs 26)	
Adjustment for		
Depreciation	50	
Interest expenses	1.6	
Loss on sale of plant	3.0	
Dividend income	(3.6)	
Operating profit before working capital changes	25.0	
Decrease in sundry debtors	11.8	
Decrease in inventories	11.0	
Decrease in prepayments	0.4	
Decrease in accounts payable	(8.0)	
Increase in accrued liabilities	1.2	
Net cash from operating activities		41.4
Cash flow from investing activities:		
Purchase of plant and machinery	(47.6)	
Sale of plant	7.2	
Dividends received	3.6	
Net cash used in investing activities		(36.8)
Cash from financing activities:		
Proceeds from issuance of equity share capital	10	
Proceeds from issuance of preference share capital	22	

(*Contd.*)

(*Contd.*)

Proceeds from debentures	4	
Dividends paid to shareholders	(15)	
Interest paid on debentures	(1.6)	
Net cash from financing activities		19.4
Increase in cash		24.0
Cash at the beginning of current year		19.2
Cash at the end of current year		43.2

Working Notes

(i) *Accumulated depreciation account*

To Plant (accumulated deprecation on plant sold) (balancing figure)	Rs 46.8	By Balance b/d	Rs 75.2
To Balance c/d	78.4	By P&L A/c (depreciation of the current year)	50.0
	125.2		125.2

(ii) *Gross value of plant sold*

Cash A/c	Dr	Rs 7.2	
P&L A/c (Loss)	Dr	3.0	
Accumulated depreciation A/c	Dr	46.8	
To plant			Rs 57.0

(iii) *Purchase of plant* *Plant account*

To Balance b/f	Rs 119.8	By Cash	Rs 7.2
To Plant purchased (balancing figure)	47.6	By P&L A/c	3.0
		By Accumulated depreciation A/c	46.8
		By Balance c/d	110.4
	167.4		167.4

(iv) *Dividends paid* = Rs 1.2 payable of previous year + Rs 16 of current year – Rs 2.2 dividends payable at current year-end = Rs 15

Review Questions

RQ.3.1 Indicate whether the following statements are True or False.

(i) Cash from business operations can be determined from income statement.

(ii) Working capital from business operations can be determined from profit and loss account.

(iii) Sources of cash should always be more than uses of cash, in the context of cash flows statement.

(iv) Interest paid on debentures is a part of operating activities.

(v) Interest received on two-months deposits in bank is shown under investing activities.

(vi) Sources of cash and uses of cash are to be equal.

(vii) Cash flows are inflows and outflows of cash and cash-equivalents.

(viii) Revaluation of building affects cashflows.

(ix) Sale proceeds from machinery, being a source of finance, form part of financing activities.

(x) Cash flow statement is mandatory for all business firms.

(xi) In normal circumstances, a firm has positive cash from operations and negative cash flow from investing activities.

[Answers: (i) False (ii) True (iii) False (iv) False (v) False (vi) False (vii) True (viii) False (ix) False (x) False (xi) False]

RQ.3.2 Fill in the following blanks with right answer:

(i) Cash flow statement (based on AS-3) indicates change in _____ (cash/bank/cash and cash-equivalents).

(ii) Decrease in creditors _____ (Decreases/Increases) cash.

(iii) Interest received on long-term investments is shown under _____ (Operating/Financing/Investing activities).

(iv) Decrease in inventory _____ (Decreases/Increases) cash.

(v) Increase in pre-paid expenses _____ (Decreases/Increases) cash.

(vi) Cash payments to suppliers for goods and services are shown under _____ (Operating/Financing/Investing activities).

(vii) Cash-flow statement (based on AS-3) for listed companies should be presented as per the _____ (Indirect/Direct) method.

(viii) Cash payments to acquire long-term assets form part of _____ (Financing/Investing activities).

(ix) Buy back of shares is shown under (Financing/Investing activities).

(x) Dividends paid to shareholders are classified as _____ (Financing/Investing activities).

[Answers: (i) cash and cash-equivalents (ii) decreases (iii) investing activities (iv) increases (v) decreases (vi) operating (vii) indirect (viii) investing (ix) financing (x) financing]

RQ.3.3 From the following financial information, select non-cash investing, financing and operating activities:

- Redemption of debentures by converting into equity shares
- Buy back of equity shares
- Purchase of fixed assets in exchange of preference shares
- Depreciation on fixed assets
- Increase in debtors
- Loss on sale of plant
- Decrease in inventories
- Amortisation of patents
- Issuance of equity share for cash
- Bonus shares

[Answer: (Non-cash activities)
Investing: Purchase of fixed assets in exchange of preference shares.
Financing: (i) Redemption of debentures by converting into equity shares (ii) Issue of preference shares for purchase of fixed assets (iii) Bonus shares.
Operating: (i) Depreciation on fixed assets (ii) Amortisation of patents (iii) Loss on sale of plant]

RQ.3.4 "The analysis of cash flow statement in any organisation can be very useful to the management." Elucidate the statement.

RQ.3.5 The cash flow statement is as useful to shareholders and lenders as to management. Explain.

RQ.3.6 Name three activities in which cash flows are classified as per Accounting Standard 3. Also give three examples of transactions covered in these activities.

RQ.3.7 Describe in brief the procedure of determining cash flow from operating activities as per indirect method of AS-3. Take an appropriate example to illustrate your answer.

RQ.3.8 Explain with example the two methods of determining cash provided by operating activities.

RQ.3.9 Explain why decrease in current liabilities decrease cash and decrease in current assets increase cash.

RQ.3.10 "Depreciation is a non-cash expense. Still it is an integral part of cash flows". Explain.

RQ.3.11 Write short notes on the following

(i) Cash-equivalents

(ii) Extra-ordinary items

(iii) Treatment of interest and dividends received in cash flow statement (based on AS-3).

(iv) Major non-cash items.

Examination Questions

Theory Questions

3.2 Discuss the managerial uses of funds flow statement. *(Bharatiyar University, April 2003)*

3.3 Write short note on difference between funds flow statement and cash flow statement. *(Gujarat University, March–April 2003)*

3.1 Distinguish between funds flow statement and cash flow statement. *(Bharatiyar University, April 2001)*

3.4 Choose the correct answer:

1. Cash flow statement deals with
   (a) Change in capital (b) Reasons for change in cash movement
   (c) Only the generation of cash in the business (d) None of the above.
   (Bharatiyar University, April 2003)
2. Which one of the following is not a source of fund?
   (a) Issue of debentures (b) Sale of fixed assets
   (c) Preliminary expenses written off (d) None of the above.
   (Bharatiyar University, April 2001)
3. The most popularly used view of 'Fund' is
   (a) Cash (b) Net working capital
   (c) All financial resources (d) None of the above
4. Fund flow occurs when a transaction affects
   (a) Current account items only (b) Non-current account times only
   (c) Both current account as well as non-current account item
   (d) None of the above *(Bharatiyar University, November 2001)*

Numerical Questions

3.1 Find out sources and application of funds in the following transactions:

Particulars	*Balance on (Rs in Lacs)*	
	1.1.09	*1.1.08*
Machinery (at cost)	18.70	12.50
Accumulated depreciation	0.70	0.30
Cost price of machine sold for Rs 20,000 (accumulated depreciation Rs 0.40 lacs)	1.70	
Depreciation provided during the year 0.80 Lacs.		

(*Pune University, 2010*)

Solution

Source of cash (under investing activities)	
Sale price of machine	Rs 20,000
Application of cash (under investing activities)	
Machinery at cost on 1.1.09	18,70,000
Less (opening balance Rs 12.50 lakh at cost minus cost	
Price of machine sold Rs 1.70 lakh)	10,80,000
Purchase of new machine (cash spent)	7,90,000

3.2 Ram & Co. presents the following information. You are required to calculate funds from operations.

Profit and Loss A/C

To operating expenses	Rs 1,00,000	By gross profit	Rs 2,00,000
To depreciation	55,000	By gain on sale of plant	20,000
To discount allowed	1,000		
To goodwill	12,000		
To net profit	52,000		
	2,20,000		2,20,000

(Bharathiar University, April 2003)

Solution

Determination of Funds from Business Operation

Gross profit	Rs 2,00,000
Less expenses using working capital:	
Operating expenses	1,00,000
Discount allowed	1,000
	99,000
Alternatively:	
Net profit	Rs 52,000
Add amortisation of goodwill	12,000
Add depreciation	55,000
Less gain on sale of plant	(20,000)
	99,000

3.3 From the following you are required to calculate cash from operations.

	1997	*1998*
Debtors	Rs 50,000	Rs 47,000
Bills receivable	10,000	12,500
Creditors	20,000	25,000
Bills payable	8,000	6,000
Outstanding expenses	1,000	1,200
Profit made during the year		1,30,000

(Bharathiar University, April 2003)

Solution

Determination of Cash from Business Operations

Profit made during the year		Rs 1,30,000*
Add decrease in working capital (–CA or +CL)		
Debtors	Rs 3,000	
Creditors	5,000	
Outstanding expenses	200	8,200
Less increase in working capital (+CA or –CL)		
Bills receivable	Rs 2,500	
Bills payable	2,000	(4,500)
Cash from business operations		1,33,700

*assumed equivalent to funds from business operations due to non-availability of data such as depreciation, amortisation, and so on.

3.4 From the following balance sheet of Prem & Company for the year ended on 31st December 1994 and 1995 prepare a statement of sources and application of funds and schedule of changes in working capital.

Liabilities	*1994*	*1995*	*Assets*	*1994*	*1995*
Share capital	Rs 4,00,000	Rs 5,75,000	Plant	Rs 75,000	Rs 1,00,000
Creditors	1,06,000	70,000	Stock	1,21,000	1,36,000
Profit and loss	14,000	31,000	Debtors	1,81,000	1,70,000
			Cash	1,43,000	2,70,000
	5,20,000	6,76,000		5,20,000	6,76,000

(Bharathiar University, April 2003)

Solution

(i) Statement of sources and application of funds of Prem & Company
for the year ending 31st December, 1995

(A) Sources of funds:	
Funds from business operations	
Increase in profit & loss (Rs 31,000 – Rs 14,000)	Rs 17,000
Issue of long-term liabilities	
Share capital (Rs 5,75,000 – Rs 4,00,000)	1,75,000
	1,92,000
(B) Application of funds:	
Purchase of fixed assets:	
Plant (Rs 1,00,000 – Rs 75,000)	25,000
(C) Increase in net working capital (A – B)	1,67,000

(ii) Schedule of Changes in Working Capital

Particulars	*31st December*		*Working capital*	
	1994	*1995*	*Increase*	*Decrease*
Current assets				
Stock	Rs 1,21,000	Rs 1,36,000	Rs 15,000	
Debtors	1,81,000	1,70,000		Rs 11,000
Cash	1,43,000	2,70,000	1,27,000	
	4,45,000	5,76,000		

(*Contd.*)

(*Contd.*)

Current liabilities				
Creditors	1,06,000	70,000	36,000	
Net working capital (NWC)	3,39,000	5,06,000		
Increase in NWC	1,67,000	—		1,67,000
	5,06,000	5,06,000	1,78,000	1,78,000

3.5 Statement of financial position of Ram Seth are given below:

	1.1.94	*31.12.94*		*1.1.94*	*31.12.94*
Accounts payable	Rs 29,000	Rs 25,000	Cash	Rs 40,000	Rs 30,000
Capital	7,39,000	6,15,000	Debtors	20,000	17,000
			Stock	8,000	13,000
			Building	1,00,000	80,000
			Fixed assets	6,00,000	5,00,000
	7,68,000	6,40,000		7,68,000	6,40,000

(i) There were no drawings.
(ii) There were no purchase or sale of either buildings or fixed assets.
Prepare cash flow statement *(Bharathiar University, April 2003)*

Solution

Cash Flow Statement of Ram Seth
for the year ending 31st December, 1994

(A) Sources of cash:			
Cash from business operations:			
Net loss (Rs 7,39,000 – Rs 6,15,000)		(Rs 1,24,000)	
Add depreciation on building (Rs 1,00,000 – Rs 80,000)		20,000	
Add depreciation on fixed assets (Rs 6,00,000 – Rs 5,00,000)		1,00,000	
Funds from business operations		(4,000)	
Add decrease in working capital (–CA or + CL) other than cash			
Debtors		3,000	
Less increase in working capital (+ CA or –CL)			
Stock	Rs 5,000		
Accounts payable	4,000	(9,000)	(10,000)
(B) Uses of cash:			Nil
(C) Decrease in cash (Rs 40,000 – Rs 30,000)			(10,000)

3.6 You have recently joined as a finance manager in Alpha Ltd. The top management has asked you to analyse the funds flow statement of the Company for the last financial year and submit a report. You are primarily asked to reflect on the financing policy of the company. Given below is the funds flow statement for 2000-2001.

Sources of funds	*Rs in lakh*
Increase in 7 year 11% debentures	200
Funds from operations	320
Increase in 10% public deposits	150
Increase in bank cash credit	500
Total sources	1,170

(*Contd.*)

(*Contd.*)

Application of funds	**Rs in lakh**
Increase in fixed assets	800
Repayment of 9% term loans	100
Increase in investment	100
Increase in working capital	170
Total application	1,170

(Mumbai University, Nov. 2001)

Solution

It appears that the company does not follow the sound financing policy. The sound financing pattern warrants that the long-term funds should be used to finance major fixed assets expansion. Since bank cash credit, *per-se,* is a short-term source of finance, its *net* long-term funds raised of Rs 250 lakh, i.e., (Rs 350 lakh—repayment of 9 per cent term loans) and internally generated funds from business operations of Rs 320 lakh, taken together (Rs 570 lakh) fall short of its long-term funds requirement of Rs 800 lakh to finance purchase of new fixed assets. In other words, the firm has taken the risk of using bank cash credit to meet the long-term business needs.

Further, the firm should/could have avoided the investments made of Rs 100 lakh, given the fact that the firm does not have surplus funds. Non-payment of dividend also seems to be due to shortage of funds.

Unless the company is convinced of the renewal of bank cash credit for a number of years, it should substitute bank cash credit by raising more long-term funds. Raising additional equity seems to be one such option in this regard as the firm's profitability is likely to improve due to major asset expansion.

3.7 The following are the summarized balance sheets of Kevin India Ltd. as on 31 March, 2000 and 2001.

Particulars	*2000 Amount*	*2001 Amount*
Liabilities		
Share capital	2,00,000	2,50,000
General reserve	50,000	60,000
Profit and loss	30,500	30,600
Bank loan (long-term)	70,000	—
Sundry creditors	1,50,000	1,35,200
Provision for taxation	30,000	35,000
	5,30,500	5,10,800
Assets		
Land and buildings	2,00,000	1,90,000
Machinery	1,50,000	1,69,000
Stock	1,00,000	74,000
Sundry debtors	80,000	64,200
Cash	500	800
Bank	—	7,800
Goodwill	—	5,000
	5,30,500	5,10,800

Additional information during the year ended 31st March, 2001:

(i) Dividend of Rs 23,000 was paid.

(ii) Assets of another company were purchased for a consideration of Rs 45,000 payable in shares. The following assets were purchased: Stock Rs 20,000 and machinery Rs 25,000.

(iii) Machinery was further purchased for Rs 8,000.

(iv) Depreciation written off on machinery Rs 12,000.

(v) Income-tax provided during the year was Rs 33,000.
(vi) Loss on sale of machinery Rs 200 was written off to general reserve.
You are required to prepare a cash flow statement. *(Mumbai University, Nov 2001)*

Solution

Cash Flow Statement of Kevin India Ltd.
for the year ending March 31, 2001

(A) Sources of cash	
Cash from business operations[1]	Rs 77,300
Sale of non-current asset:	
Machinery[2]	1,800
Land and building (sale at book value assumed)	10,000
Issue of long-term liabilities shares issued (stock)	20,000
	1,09,100
(B) Uses of cash	
Purchase of fixed assets:	
Machinery	8,000
Payment of long-term liabilities bank loan	70,000
Recurring payment to investors dividends	23,000
	1,01,000
(C) Increase in cash + bank balances (A – B)	8,100[4]

Assumptions:(1) The company has issued shares of Rs 50,000 to purchase the assets of another company. The break-up of Rs 50,000 relates to stock Rs 20,000, machinery Rs 25,000 and goodwill Rs 5,000 (balancing figure).
(2) Part of land and building has been sold at Rs 10,000 with no profit no loss.

Working Notes

(i) Cash from business operations:

Increase in profit and loss account		Rs 100
Add transfer to general reserves		10,200[3]
Add depreciation on machinery		12,000
Add dividends paid		23,000
		45,300
Funds from business operations		
Add decrease in working capital (–CA or +CL) Other than cash and bank		
Provision for taxation		
Stock		
Sundry debtors	Rs 5,000	
Less increase in working capital (+CA or –CL)	26,000	
Sundry creditors	15,800	46,800
Cash from business operations		
	Rs 14,800	(14,800)
		77,300

(2) Sale value of machinery:
Opening balance of machinery + purchases of machinery (–) depreciation during the year (–) book value of machine sold (x) = Closing balance
= Rs 1,50,000 + Rs 33,000 – Rs 12,000 – x = Rs 1,69,000
= Rs 1,71,000 – Rs 1,69,000 = x or x = Rs 2,000
Sale value = Rs 2,000 – Loss Rs 200 = Rs 1,800

(3) Amount transferred to general reserves:

Opening balance + amount transferred (x) – reserves utilized during the year = closing balance

= Rs 50,000 + x – Rs 200 = Rs 60,000

x = Rs 60,000 – Rs 50,000 + Rs 200 = Rs 10,200

(4) Change in cash/bank balance during the year

Closing balance (Rs 800 + Rs 7,800)	Rs 8,600
Less opening balance	500
	8,100

3.8 The summarised balance sheet of A.J. Ltd. for the years ended 31st March, 2002 and 31st March, 2001 were as follows:

(All figures in Rs '000)

Liabilities	*As on 31-3-02*	*As on 31-3-01*	*Assets*	*As on 31-3-02*	*As on 31-3-01*
Share capital	500	500	Land & building	200	180
General reserve	220	200	Plant and machinery	276	210
P&L A/c	32	40	Other fixed assets	45	30
Bank loan (term loan)	100	—	Investment	50	50
Creditors	172	158	Stock	190	200
Provision for taxation	30	45	Debtors	195	170
			Bank	98	103
	1,054	943		1,054	943

The following additional information is given to you:

(i) Dividend amount of Rs 30,000 was paid during the year.

(ii) Provision for tax made during the year was Rs 12,000.

(iii) Machinery with a book value of Rs 15,000 was sold at a loss of Rs 3,000.

(iv) Investments costing Rs 10,000 was sold for Rs 12,000.

(v) Depreciation provided—

on land and buildings Rs 5,000

on plant and machinery Rs 20,000

Prepare cash flow statement during the year ended 31st March, 2002.

(Mumbai University, Nov 2001)

Solution

Cash Flow Statement of A.J. Ltd.

for the year ending March 31, 2002

(A) Source of cash:		
Cash from business operations[1]		Rs 52,000
Sale of non-current assets:		
Machinery (Rs 15,000 book value – Rs 3,000 loss)		12,000
Investments (assumed long-term)		12,000
Issue of long-term liabilities:		
Bank loan (term loan, assumed long-term)		1,00,000
		1,76,000
(B) Uses of cash:		
Purchases of fixed assets/non-current assets:		
Land and building[2]	Rs 25,000	
Plant and machinery[3]	1,01,000	
Investments[4]	10,000	
Other fixed assets (Rs 45,000 – Rs 30,000)	15,000	1,51,000

(*Contd.*)

(*Contd.*)

Recurring payment to investors:	
Dividends paid	30,000
	1,81,000
(C) Decrease in bank balance (B – A)	5,000

* (Rs 1,03,000 on 31st March, 2001 – Rs 98,000 as on 31st March 2002)

Working Notes

(i)	Cash from business operations:		
	Decrease in profit and loss account		(Rs 8,000)
	Add transfer to general reserve		20,000
	Add depreciation on land and buildings		5,000
	Add depreciation on plant and machinery		20,000
	Add loss on sale of plant and machinery		3,000
	Add dividends paid		30,000
	Less profit on sale of investments (already shown as source)		(2,000)
	Funds from business operations		68,000
	Add decrease in working capital (–CA or +CL) other than bank balance		
	Stock	Rs 10,000	
	Creditors	14,000	24,000
	Less increase in working capital (+CA or –CL)		
	Debtors	Rs 25,000	
	Provisions for taxation	15,000	(40,000)
			52,000

(ii) Purchases of land and building:
Opening balance Rs 1,80,000 – depreciation Rs 5,000 + purchases (x) = Closing balance Rs 2,00,000
x = Rs 2,00,000 – Rs 1,80,000 + Rs 5,000 = Rs 25,000

(iii) Purchases of plant and machinery:
Opening balance Rs 2,10,000 – depreciation Rs 20,000 – book value of machinery sold Rs 15,000 + purchases (x) = Closing balance Rs 2,76,000
x = Rs 2,76,000 – Rs 2,10,000 + Rs 20,000 + Rs 15,000 = Rs 1,01,000

(iv) Purchase of investments:
Opening balance Rs 50,000 – book value of investments sold Rs 10,000 + purchases (x) = closing balance Rs 50,000
x = Rs 50,000 – Rs 50,000 + Rs 10,000 = Rs 10,000

3.9 The following are the balance sheets of M/s *X* Ltd. as on 31st March 2002 and 2003:

	2002	*2003*
Liabilities		
Share capital	Rs 4,00,000	Rs 5,20,000
Reserves	1,00,000	1,00,000
Profit and loss account	79,380	82,440
Bank overdraft	1,19,020	—
Sundry creditors	79,000	82,270
Bills payable	67,560	23,050
Provision for taxation	80,000	1,00,000
Total	9,24,960	9,07,760

(*Contd.*)

(*Contd.*)

Assets		
Buildings	2,97,000	2,88,500
Machinery	2,25,900	2,32,400
Stock	2,22,080	1,94,740
Sundry debtors	1,74,980	1,46,720
Cash	5,000	5,400
Goodwill	—	40,000
Total	9,24,960	9,07,760

The following additional information is given:

(i) During 2003 an interim dividend of Rs 52,000 was paid.

(ii) Assets of another company were purchased for a consideration of Rs 1,20,000 payable in fully paid shares of *X* Ltd. The following assets were purchased: Stock Rs 44,000, Machinery Rs 36,000.

(iii) Machinery was further purchased for Rs 11,200.

(iv) Income tax paid during the year amounted to Rs 50,000.

(v) The net profit for the year before tax was Rs 1,25,060.

Prepare a statement of sources and application of funds for the year 2003 and a schedule setting out the changes in working capital. *(Mumbai University, Nov 2001)*

Solution

(I) Statement of Sources and Application of Funds of ***X*** Ltd.

for the year 31st March, 2003

(A) Sources of funds (working capital):		
Funds from business operations		Rs 1,04,260[1]
Issue of long-term liabilities:		
Equity share capital issued (purchase of stock)		44,000
		1,48,260
(B) Application of funds:		
Purchase of non-current assets:		
Machinery (for cash)		11,200
Recurring payment to investors:		
Interim dividend paid		52,000
		63,200
(C) Increase in net working capital (A – B)		85,060

Working Notes:

(1) Funds from business operations:

Increase in profit and loss account	Rs 3,060
Add interim dividends paid	52,000
Add depreciation on machinery	40,700 [2]
Add depreciation on buildings (Rs 2,97,000 – Rs 2,88,500)	8,500
	1,04,260

(2) Depreciation on machinery

Opening balance of machinery Rs 2,25,900 + machinery purchased Rs 36,000 + Rs 11,200 – depreciation charged (x) = closing balance Rs 2,32,400

Rs 2,25,900 + Rs 36,000 + Rs 11,200 – Rs 2,32,400 = x (depreciation charged)

Depreciation charged (x) = Rs 40,700

(ii) Statement of Changes in Working Capital

Particulars	*31st March*		*Working capital*	
	2002	*2003*	*Increase*	*Decrease*
Current assets				
Stock	Rs 2,22,080	Rs 1,94,740		Rs 27,340
Sundry debtors	1,74,980	1,46,720		28,260
Cash	5,000	5,400	Rs 400	
	4,02,060	3,46,860		
Current liabilities				
Bank overdraft	1,19,020	—	1,19,020	
Sundry creditors	79,000	82,270		3,270
Bills payabl	67,560	23,050		
Provision for taxation	80,000	1,00,000		20,000
	3,45,580	2,05,320	44,510	
Net working capital (NWC)	56,480	1,41,540		
Increase in NWC	85,060	—		85,060
	1,41,540	1,41,540	1,63,930	1,63,930

Chapter

4

Financial Statements Analysis

Learning Objectives

1. Understand the meaning and rationale of ratio analysis
2. Discuss and interpret liquidity ratios
3. Explain and interpret capital structure ratios
4. Analyse profitability ratios
5. Illustrate and interpret efficiency ratios
6. Identify integrated ratios
7. Analyse the common size statements
8. Describe the importance and limitations of ratio analysis

INTRODUCTION

A basic limitation of the traditional financial statements comprising the balance sheet and the profit and loss account is that they do not give all the infor-mation related to the financial operations of a firm. Nevertheless, they provide some extremely useful information to the extent that the balance sheet mirrors the financial position on a particular date in terms of the structure of assets, liabilities and owners' equity, and so on and the profit and loss account shows the results of operations during a certain period of time in terms of the revenues obtained and the cost incurred during the year. Thus, the financial statements provide a summarised view of the financial position and operations of a firm. Therefore, much can be learnt about a firm from a careful examination of its financial statements as invaluable documents/performance reports. The analysis of financial statements is, thus, an important aid to financial analysis.

The focus of financial analysis is on key figures in the financial statements and the significant relationship that exists between them. The analysis of financial statements is a process of evaluating the relationship between component parts of financial statements to obtain a better understanding of the firm's position and performance.[1] The first task of the financial analyst is to select the information relevant to the decision under consideration from the total information contained in the financial statements. The second step is to arrange the information in a way to highlight significant relationships. The final step is interpretation and drawing of inferences and conclusions. *In brief, financial analysis is the process of selection, relation and evaluation.*[2]

The present chapter is devoted to an in-depth analysis of financial statements and its use for decision making by various parties interested in them. The focus of the Chapter is on ratio analysis as the most widely used technique of financial statement analysis (Section 1). Section 2 of the Chapter discusses common-size statements as method of analysis of financial statements. The importance of ratio analysis and its limitations are briefly outlined in Section 3. The major points are summarised in the last Section of the Chapter.

SECTION I RATIO ANALYSIS

Meaning and Rationale

Ratio analysis is a systematic use of ratios to interpret/assess the performance and status of the firm.

Ratio analysis is a widely-used tool of financial analysis. It can be used to compare the risk and return relationships of firms of different sizes. It is defined as the systematic use of ratio to interpret the financial statements so that the strengths and weaknesses of a firm as well as its historical performance and current financial condition can be determined. The term ratio refers to the numerical or quantitative relationship between two items/variables. This relationship can be expressed as **(i)** percentages, say, net profits are 25 per cent of sales (assuming net profits of Rs 25,000 and sales of Rs 1,00,000), **(ii)** fraction (net profit is one-fourth of sales) and **(iii)** proportion of numbers (the relationship between net profits and sales is 1:4). These alternative methods of expressing items which are related to each other are, for purposes of financial analysis, referred to as ratio analysis. It should be noted that computing the ratios does not add any info-rmation not already inherent in the above figures of profits and sales. What the ratios do is that they reveal the relationship in a more meaningful way so as to enable equity investors, management and lenders make better investment and credit decisions.

The rationale of ratio analysis lies in the fact that it makes related information comparable. A single figure by itself has no meaning but when expressed in terms of a related figure, it yields significant inferences. For instance, the fact that the net profits of a firm amount to, say, Rs 10 lakhs throws no light on its adequacy or otherwise. The figure of net profit has to be considered in relation to other variables. How does it stand in relation to sales? What does it represent by way of return on total assets used or total capital employed? If, therefore, net profits are shown in terms of their relationship with items such as sales, assets, capital employed, equity capital and so on, meaningful conclusions can be drawn regarding their adequacy. To carry the above example further, assuming the capital employed to be Rs 50 lakh and Rs 100 lakh, the net profits are 20 per cent and 10 per cent respectively. Ratio analysis, thus, as a quantitative tool, enables analysts to draw quantitative answers to questions such as: Are the net profits adequate? Are the assets being used efficiently? Is the firm solvent? Can the firm meet its current obligations and so on?

Basis of Comparison

Ratios, as shown above, are relative figures reflecting the relationship between variables. They enable analysts to draw conclusions regarding financial operations. The use of ratios, as a tool of financial analysis, involves their comparison, for a single ratio, like absolute figures, fails to reveal the true position. For example, if in the case of a firm, the return on capital employed is 15 per cent in a particular year, what does it indicate? Only if the figure is related to the

fact that in the preceding year the relevant return was 12 per cent or 18 per cent, it can be inferred whether the profitability of the firm has declined or improved. Alternatively, if we know that the return for the industry as a whole is 10 per cent or 20 per cent, the profitability of the firm in question can be evaluated. Comparison with related facts is, therefore, the basis of ratio analysis. Four types of comparisons are involved: **(i)** trend ratios, **(ii)** interfirm comparison, **(iii)** comparison of items within a single year's financial statement of a firm, and **(iv)** comparison with standards or plans.

Trend ratios involve a comparison of the ratios of a firm over time, that is, present ratios are compared with past ratios for the same firm. The comparison of the profitability of a firm, say, year 1 through 5 is an illustration of a trend ratio. Trend ratios indicate the direction of change in the performance–improvement, deterioration or constancy–over the years.

Trend ratios involve evaluation of financial performance over a period of time using finanical ratio analysis.

The **interfirm comparison** involving comparison of the ratios of a firm with those of others in the same line of business or for the industry as a whole reflects its performance in relation to its competitors.

Other types of comparison may relate to comparison of items within a single year's financial statement of a firm and comparison with standards or plans.

Interfirm comparison involves comparison of different firms' financial ratios at the same point of time; involves comparison of a firm's ratios to those of others in its industry or to industry average.

Types of Ratios

Ratios can be classified into six broad groups: **(i)** Liquidity ratios, **(ii)** Capital structure/leverage ratios, **(iii)** Profitability ratios, **(iv)** Activity/Efficiency ratios, **(v)** Integrated analysis of ratios and **(vi)** Growth ratios.

Liquidity Ratios The importance of adequate liquidity in the sense of the ability of a firm to meet current/short-term obligations when they become due for payment can hardly be overstressed. In fact, liquidity is a prerequisite for the very survival of a firm. The short-term creditors of the firm are interested in the short-term solvency or liquidity of a firm. But liquidity implies, from the viewpoint of utilisation of the funds of the firm, that funds are idle or they earn very little. A proper balance between the two contradictory requirements, that is, liquidity and profitability, is required for efficient financial management. The **liquidity ratios** measure the ability of a firm to meet its short-term obligations and reflect the short-term financial strength/solvency of a firm. The ratios which indicate the liquidity of a firm are: **(i)** net working capital, **(ii)** current ratios, **(iii)** acid test/quick ratios, **(iv)** super quick ratios, **(v)** turnover ratios, **(vi)** defensive-interval ratios and **(vii)** cash flow from operations ratio.

Liquidity ratio is the ability of a firm to satisfy its short-term obligations as they become due.

Net Working Capital **Net working capital** (NWC) represents the excess of current assets over current liabilities. The term current assets refers to assets which in the normal course of business get converted into cash without dimunition in value over a short period, usually not exceeding one year or length of operating/cash cycle whichever is more. Current liabilities are those liabilities which at the inception are required to be paid in short period, normally a year. Although NWC is really not a ratio, it is frequently employed as a measure of a company's liquidity position. An enterprise should have sufficient NWC in order

Net working capital is a measure of liquidity calculated by subtracting current liabilities from current assets.

to be able to meet the claims of the creditors and the day-to-day needs of business. The greater is the amount of NWC, the greater is the liquidity of the firm. Accordingly, NWC is a measure of liquidity. Inadequate working capital is the first sign of financial problems for a firm.

There is, however, no predetermined criterion as to what constitutes adequate NWC. Moreover, the size of the NWC is not an appropriate measure of the liquidity position of a firm as shown in Table 4.1:

TABLE 4.1 Net Working Capital

Particulars	*Company A*	*Company B*
Total current assets	Rs 1,80,000	Rs 30,000
Total current liabilities	1,20,000	10,000
NWC	60,000	20,000

If the size of NWC is a measure of liquidity, Company A must be three times as liquid as Company B. However, a deeper probe would show that this is not so. A comparison of current liabilities and current assets of both the firms shows that for each rupee of current liability, B has Rs 3 of current assets, while A has only Rs 1.50. Thus, while A has three times the NWC of B, the current assets of the former are only 1.5 times its current liabilities as compared to 3 times in case of the latter. Obviously, from the viewpoint of the ability to meet its current obligations, firm B is in a better position than firm A. Another limitation of NWC, as a measure of liquidity, is that a change in NWC does not necessarily reflect a change in the liquidity position of a firm. Witness Table 4.2.

TABLE 4.2 Change in Net Working Capital

Particulars	*End-year 1*	*End-year 2*
Current assets	Rs 1,00,000	Rs 2,00,000
Current liabilities	25,000	1,00,000
NWC	75,000	1,00,000

Although the NWC has gone up for the firm in Table 4.2 from Rs 75,000 to Rs 1,00,000, that is, by Rs 25,000 or 33.3 per cent between two points of time, there is, in reality, a deterioration in the liquidity position. In the first year, the firm had Rs 4 of current assets for each rupee of current liabilities; but by the end of the second year the amount of current assets for each rupee of current liabilities declined to Rs 2 only, that is, by 50 per cent. For these reasons, NWC is not a satisfactory measure of the liquidity of a firm for inter-firm comparison or for trend analysis.[3] A better indicator is the current ratio.

Current ratio is a measure of liquidity calculated dividing the current assets by the current liabilities.

Current Ratio The **current ratio** is the ratio of total current assets to total current liabilities. It is calculated by dividing current assets by current liabilities:

$$\text{Current ratio} = \frac{\text{Current assets}}{\text{Current liabilities}} \qquad \textbf{(4.1)}$$

The current assets of a firm, as already stated, represent those assets which can be, in the ordinary course of business, converted into cash within a short period of time, normally not

exceeding one year and include cash and bank balances, marketable securities, inventory of raw materials, semi-finished (work-in-progress) and finished goods, debtors net of provision for bad and doubtful debts, bills receivable and prepaid expenses. The current liabilities defined as liabilities which are short-term maturing obligations to be met, as originally contemplated, within a year, consist of trade creditors, bills payable, bank credit, provision for taxation, dividends payable and outstanding expenses. The current ratio for firms A and B of Table 4.1 are shown in Table 4.3.

TABLE 4.3 Current Ratio

Particulars	*Firm A*	*Firm B*
$\frac{\text{Current assets}}{\text{Current liabilities}}$	$= \frac{\text{Rs } 1,80,000}{\text{Rs } 1,20,000}$	$= \frac{\text{Rs } 30,000}{\text{Rs } 10,000}$
	= 3 : 2 (1.5 : 1)	3 : 1

Rationale The current ratio of a firm measures its short-term solvency, that is, its ability to meet short-term obligations. As a measure of short-term/current financial liquidity, it indicates the rupees of current assets (cash balance and its potential source of cash) available for each rupee of current liability/obligation payable. *The higher the current ratio, the larger is the amount of rupees available per rupee of current liability, the more is the firm's ability to meet current obligations and the greater is the safety of funds of short-term creditors.* Thus, current ratio, in a way, is a measure of margin of safety to the creditors.

The need for safety margin arises from the inevitable unevenness in the flow of funds through the current assets and liabilities account. If the flows were absolutely smooth and uniform each day so that inflows exactly equalled absolutely maturing obligations, the requirement of a safety margin would be small. The fact that a firm can rarely count on such an even flow requires that the size of the current assets should be sufficiently larger than current liabilities so that the firm would be assured of being able to pay its current maturing debt as and when it becomes due. Moreover, the current liabilities can be settled only by making payment whereas the current assets available to liquidate them are subject to shrinkage for various reasons, such as bad debts, inventories becoming obsolete or unsaleable and occurrence of unexpected losses in marketable securities and so on. The current ratio measures the size of the short-term liquidity 'buffer'. A satisfactory current ratio would enable a firm to meet its obligations even when the value of the current assets declines.

Interpretation In the case of company A in the above example, the current ratio is 1.5 : 1. It implies that for every one rupee of current liabilities, current assets of one-and-half rupees are available to meet them. In other words, the current assets are one-and-half times the current liabilities. The current ratio of 3 : 1 for company B signifies that current assets are three-fold its short-term obligations. The liquidity position, as measured by the current ratio, is better in the case of B as compared to A. This is because the safety margin in the former (200 per cent) is substantially higher than in the latter (50 per cent). A slight decline in the value of current assets will adversely affect the ability of firm A to meet its obligations and, therefore, from the viewpoint of creditors, it is a more risky venture. In contrast, there is a sufficient cushion in firm B and even with two-thirds shrinkage in the value of its assets, it will be able to meet its obligations in full. For the creditors the firm is less risky. The interpretation is: *in interfirm comparison, the firm with the higher current ratio has better liquidity/short-term solvency.*

It is important to note that a very high ratio of current assets to current liabilities may be indicative of slack management practices, as it might signal excessive inventories for the current requirements and poor credit management in terms of overextended accounts receivable. At the same time, the firm may not be making full use of its current borrowing capacity.[5] Therefore, a firm should have a reasonable current ratio.

Although there is no hard and fast rule, conventionally, a current ratio of 2 : 1 (current assets twice current liabilities) is considered satisfactory. The logic underlying the conventional rule is that even with a drop-out of 50 per cent (half) in the value of current assets, a firm can meet its obligations, that is, a 50 per cent margin of safety is assumed to be sufficient to wardoff the worst of situations. The firm A of our example, having a current ratio of 1.5 : 1, can be interpreted, on the basis of the conventional rule, to be inadequately liquid from the point of view of its ability to always satisfy the claims of short-term creditors. The firm B, of course, is sufficiently liquid as its current ratio is 3 : 1. The rule of thumb (a current ratio of 2 : 1) cannot, however, be applied mechanically. What is a satisfactory ratio will differ depending on the development of the capital market and the availability of long-term funds to finance current assets, the nature of industry and so on.

In capital-rich countries, where long-term funds from the capital market are available in abundance, firms depend on current liabilities for financing a relatively small part of their current asset requirements and it is not unusual for a firm to finance two-thirds to three-quarters of its current assets by long-term sources.[6] This policy of relying to a limited extent on short-term credit (current liabilities) is probably to avoid the difficulty in which the firms may be put by the creditors in times of temporary adversity. In underdeveloped countries, there is no alternative to relying heavily on short-term financing. Yet, in view of the risk which such a practice entails, the firms would be well advised to keep the current liabilities within reasonable limits and finance a certain minimum part of the current assets by long-term sources.

Another factor which has a bearing on the current ratio is the nature of the industry. For in-stance, public utility companies generally have a very low current ratio, as normally such companies have very little need for current assets. The wholesale dealers, on the other hand, purchasing goods on cash basis or on credit basis for a very short period but selling to retailers on credit basis, require a higher current ratio. If, in our above example, firm A is a public utility, its liquidity position can be interpreted to be satisfactory even though its current ratio is less than the conventional norm. Thus, the standard norm of current ratio (2 : 1) may vary from industry to industry. However, a ratio of less than 1 : 1 would certainly be undesirable in any industry as at least some safety margin is required to protect the interest of the creditors and to provide cushion to the firm in adverse circumstances.

The current ratio, though superior to NWC in measuring short-term financial solvency, is a rather crude measure of the liquidity of a firm. The limitation of current ratio arises from the fact that it is a *quantitative* rather than a *qualitative* index of liquidity. The term quantitative refers to the fact that it takes into account the total current assets without making any distinction between various types of current assets such as cash, inventories and so on. A qualitative measure takes into account the proportion of various types of current assets to the total current assets. A satisfactory measure of liquidity should consider the liquidity of the various current assets *per se*. As already mentioned, while current liabilities are fixed in the sense that they have to be paid in full in all circumstances, the current assets are subject to shrinkage in value, for example, possibility of bad debts, unsaleability of inventory and

so on. Moreover, some of the current assets are more liquid than others: cash is the most liquid of all; receivables are more liquid than inventories, the last being the least liquid as they have to be sold before they are converted into receivables and, then, into cash. A firm with a higher percentage of its current assets in the form of cash would be more liquid, in the sense of being able to meet obligations as and when they become due, than one with a higher percentage of slow moving and unsaleable inventory and/or slow paying receivables even though both have the same current ratio. In fact, the latter type of firm may encounter serious difficulties in paying its bills even though it may have a current ratio of 2 : 1, whereas the former may do well with a ratio lower than the conventional norm. Thus, the current ratio is not a conclusive index of the real liquidity of a firm. It fails to answer questions, such as, how liquid are the receivables and the inventory? What effect does the omission of inventory and prepaid expenses have on the liquidity of a firm? To answer these and related questions, an additional analysis of the quality of current assets is required. This is done in acid-test or quick ratio.

Acid-Test/Quick Ratio As observed above, one defect of the current ratio is that it fails to convey any information on the composition of the current assets of a firm. A rupee of cash is considered equivalent to a rupee of inventory or receivables. But it is not so. A rupee of cash is more readily available (i.e. more liquid) to meet current obligations than a rupee of, say, inventory. This impairs the usefulness of the current ratio. The acid-test ratio is a measure of liquidity designed to overcome this defect of the current ratio. It is often referred to as quick ratio because it is a measurement of a firm's ability to convert its current assets quickly into cash in order to meet its current liabilities. Thus, it is a measure of quick or acid liquidity.

Acid-test (quick) ratio is a measure of liquidity calculated dividing current assets minus inventory and prepaid expenses by current liabilities.

The **acid-test ratio** is the ratio between quick current assets and current liabilities and is calculated by dividing the quick assets by the current liabilities:

$$\text{Acid-test ratio} = \frac{\text{Quick assets}}{\text{Current liabilities}} \qquad \textbf{(4.2)}$$

The term **quick assets** refers to current assets which can be converted into cash immediately or at a short notice without diminution of value. Included in this category of current assets are **(i)** cash and bank balances; **(ii)** short-term marketable securities and **(iii)** debtors/receivables. Thus, the current assets which are excluded are: prepaid expenses and inventory. The exclusion of inventory is based on the reasoning that it is not easily and readily convertible into cash. Prepaid expenses by their very nature are not available to pay off current debts. They merely reduce the amount of cash required in one period because of payment in a prior period.[8] The acid-test ratio is calculated in Table 4.4.

TABLE 4.4 Acid-Test Ratio

Cash	Rs 2,000
Debtors	2,000
Inventory	12,000
Total current assets	16,000
Total current liabilities	8,000
(i) Current ratio	2 : 1
(ii) Acid-test ratio	0.5 : 1

Interpretation The acid-test ratio is a rigorous measure of a firm's ability to service short-term liabilities. The usefulness of the ratio lies in the fact that it is widely accepted as the best available test of the liquidity position of a firm. That the acid-test ratio is superior to the current ratio is evident from Table 4.4. The current ratio of the hypothetical firm is 2 : 1 and can certainly be considered satisfactory. This interpretation of the liquidity position of the firm needs modification in the light of the quick ratio. Generally, an acid-test ratio of 1:1 is considered satisfactory as a firm can easily meet all current claims. In the case of the hypothetical firm the quick ratio (0.5 : 1) is less than the standard/norm, the satisfactory current ratio notwithstanding. The interpretation that can be placed on the current ratio (2 : 1) and acid-test (0.5 : 1) is that a large part of the current assets of the firm is tied up in slow moving and unsaleable inventories and slow paying debts. The firm would find it difficult to pay its current liabilities. The acid-test ratio provides, in a sense, a check on the liquidity position of a firm as shown by its current ratio. The quick ratio is a more rigorous and penetrating test of the liquidity position of a firm. Yet, it is not a conclusive test. Both the current and quick ratios should be considered in relation to the industry average to infer whether the firm's short-term financial position is satisfactory or not.

A variation of this ratio,[9] may be super-quick/cash ratio. This ratio is calculated by dividing the super-quick assets by the current liabilities of a firm. The super-quick current assets are cash and marketable securities. This ratio is the most rigorous and conservative test of a firm's liquidity position. Further, it is suggested that it would be useful, for the management, if the liquidity measure also takes into account 'reserve borrowing power' as the firm's real debt paying ability depends not only on cash resources available with it but also on its capacity to borrow from the market at short notice.

The liquidity ratios are, no doubt, primarily relevant from the viewpoint of the creditors of the firm. In theory, therefore, the higher the liquidity ratios, the better is the firm. But high ratios have serious implications from the firm's point of view. High current and acid-test ratios would imply that funds have unnecessarily accumulated and are not being profitably utilised. Similarly, an unusually high rate of inventory turnover may indicate that a firm is losing business by failing to maintain an adequate level of inventory to serve the customer's needs. A rapid turnover of debtors may reflect strict credit policies that hold revenue below levels that could be obtained by granting more liberal credit terms.

Finally, while interpreting the short-term position of the firm by the creditors, it should be recognised that the management may be tempted to indulge in 'window-dressing' just before the financial statements are prepared so as to make the current financial position appear better than what it actually is. For instance, by postponing purchases, allowing inventories to fall below the normal levels, using all available cash to pay off current liabilities and pressing collection on debtors, the current and acid-test ratios, and debtors turnover ratios may be artificially improved. Even when no deliberate attempt has been made to present a good picture, the current financial position shown by the year-end financial statements is probably more favourable than at any other time of the year. This is particularly true when a firm adopts a natural business year that ends during an ebb in the seasonal swing of business activity. At the time of peak activity, debtors, inventories and current liabilities tend to be at higher levels. In such cases, an analysis of current financial position based solely on year-end data will tend to over-state a firm's average liquidity position.[10]

Leverage/Capital Structure Ratios The second category of financial ratios is leverage or capital structure ratios. The long-term lenders/creditors would judge the soundness of a firm on

the basis of the long-term financial strength measured in terms of its ability to pay the interest regularly as well as repay the instalment of the principal on due dates or in one lump sum at the time of maturity. The long-term solvency of a firm can be examined by using leverage or capital structure ratios. The leverage or capital structure ratios may be defined as financial ratios which throw light on the long-term solvency of a firm as reflected in its ability to assure the long-term lenders with regard to **(i)** periodic payment of interest during the period of the loan and **(ii)** repayment of principal on maturity or in predetermined instalments at due dates.

There are, thus, two aspects of the long-term solvency of a firm: **(i)** ability to repay the principal when due, and **(ii)** regular payment of the interest. Accordingly, there are two different, but mutually dependent and interrelated, types of leverage ratios. First, ratios which are based on the relationship between borrowed funds and owner's capital. These ratios are computed from the balance sheet and have many variations such as **(a)** debt-equity ratio, **(b)** debt-assets ratio, **(c)** equity-assets ratio, and so on. The second type of capital structure ratios, popularly called coverage ratios, are calculated from the profit and loss account. Included in this category are **(a)** interest coverage ratio, **(b)** dividend coverage ratio, **(c)** total fixed charges coverage ratio, **(d)** cash flow coverage ratio, and **(e)** debt services coverage ratio.

Debt-Equity Ratios The relationship between borrowed funds and owner's capital is a popular measure of the long-term financial solvency of a firm. This relationship is shown by the debt-equity ratios. This ratio reflects the relative claims of creditors and shareholders against the assets of the firm. Alternatively, this ratio indicates the relative proportions of debt and equity in financ-ing the assets of a firm. The relationship between outsiders' claims and owner's capital can be shown in different ways and, accordingly, there are many variants of the debt-equity (D/E) ratio.

Debt-equity ratio measures the ratio of long-term or total debt to shareholders equity.

One approach is to express the D/E ratios in terms of the relative proportion of long-term debt and shareholders' equity. Thus,

$$\text{D/E ratio} = \frac{\text{Long-term debt}}{\text{Shareholders' equity}} \qquad \textbf{(4.8)}$$

The debt considered here is exclusive of current liabilities. The shareholders' equity includes **(i)** equity and preference share capital, **(ii)** past accumulated profits but excludes fictitious assets like past accumulated losses, **(iii)** discount on issue of shares and so on.

Another approach to the calculation of the debt-equity ratio is to relate the total debt (not merely long-term debt) to the shareholders' equity. That is,

$$\text{D/E ratio} = \frac{\text{Total debt}}{\text{Shareholders' equity}} \qquad \textbf{(4.9)}$$

The D/E ratio is, thus, the ratio of total outside liabilities to owners' total funds. In other words, it is the ratio of the amount invested by outsiders to the amount invested by the owners of business.

The difference between this and the first approach is essentially in respect of the treatment of current liabilities. While the former excludes them, the latter includes them in the numerator (debt). Should current liabilities be included in the amount of debt to calculate the D/E ratio? While there is no doubt that current liabilities are short-term and the ability of a firm to meet such obligations is reflected in the liquidity ratios, their amount fluctuates widely during a

year and interest payments on them are not large, they should form part of the total outside liabilities to determine the ability of a firm to meet its long-term obligations for a number of reasons. For one thing, individual items of current liabilities are certainly short-term and may fluctuate widely, but, as a whole, a fixed amount of them is always in use so that they are available more or less on a long-term footing. Moreover, some current liabilities like bank credit, which are ostensibly short-term, are renewed year after year and remain by and large permanently in the business. Also, current liabilities have, like the long-term creditors, a prior right on the assets of the business and are paid along with long-term lenders at the time of liquidation of the firm. Finally, the short-term creditors exercise as much, if not more, pressure on management. The omission of current liabilities in calculating the D/E ratio would lead to misleading results.

How should preference share capital be treated? Should it be included in the debt or equity? The exact treatment will depend upon the purpose for which the D/E ratio is being computed. If the object is to examine the financial solvency of a firm in terms of its ability to avoid financial risk, preference capital should be clubbed with equity capital. If, however, the D/E ratio is calculated to show the effect of the use of fixed-interest/dividend sources of funds on the earnings available to the ordinary shareholders, preference capital should be clubbed with debt.

Interpretation The D/E ratio is an important tool of financial analysis to appraise the financial structure of a firm. It has important implications from the view-point of the creditors, owners and the firm itself. The ratio reflects the relative contribution of creditors and owners of business in its financing. A high ratio shows a large share of financing by the creditors of the firm; a low ratio implies a smaller claim of creditors. The D/E ratio indicates the margin of safety to the creditors. If, for instance, the D/E ratio is 1 : 2, it implies that for every rupee of outside liability, the firm has two rupees of owner's capital or the stake of the creditors is one-half of the owners. There is, therefore, a safety margin of 66.67 per cent available to the creditors of the firm. The firm would be able to meet the creditors claims even if the value of the assets declines by 66.67 per cent. Conversely, if the D/E ratio is 2 : 1, it implies low safety margin (one-third) for the creditors.

If the D/E ratio is high, the owners are putting up relatively less money of their own. It is danger signal for the creditors. If the project should fail financially, the creditors would lose heavily. Moreover, with a small financial stake in the firm, the owners may behave irresponsibly and indulge in speculative activity. If they are heavily involved financially, they will strain every nerve to make the enterprise a success. In brief, the greater the D/E ratio, the greater is the risk to the creditors.

A high debt-equity ratio has equally serious implications from the firm's point of view also. A high proportion of debt in the capital structure would lead to inflexibility in the operations of the firm as creditors would exercise pressure and interfere in management. Secondly, such a firm would be able to borrow only under very restrictive terms and conditions. Further, it would have to face a heavy burden of interest payments, particularly in adverse circumstances when profits decline. Finally, the firm will have to encounter serious difficulties in raising funds in future.

The shareholders of the firm would, however, stand to gain in two ways: **(i)** with a limited stake, they would be able to retain control of the firm and **(ii)** the return to them would be

magnified. With a larger proportion of debt in the financial structure, the earnings available to the owners would increase more than proportionately with an increase in the operating profits of the firm. This is because the debt carries a fixed rate of return and if the firm is able to earn on the borrowed funds a rate higher than the fixed-charge on loans, the benefit will go to the shareholders. This is illustrated in Table 4.5. Technically, this is referred to as **leverage** or **trading on equity**. The expression 'trading on equity' describes the practice of using borrowed funds carrying a fixed-charge in the expectation of obtaining a higher return to the equity-holders. The leverage can, of course, work in the opposite direction also, if the return on borrowed funds is less than the fixed charge.[11]

Trading on equity (leverage) is the use of borrowed funds in expectation of higher return to equity-holders.

A low D/E ratio has just the opposite implications. To the creditors, a relatively high stake of the owners implies sufficient safety margin and substantial protection against shrinkage in assets. For the company also, the servicing of debt is less burdensome and consequently its credit standing is not adversely affected, its operational flexibility is not jeopardised and it will be able to raise additional funds. The shareholders of the firm are deprived of the benefits of trading on equity or leverage.

TABLE 4.5 Trading on Equity

(Amount in Rs Thousand)

Particulars	*A*	*B*	*C*	*D*
(a) Total assets	1,000	1,000	1,000	1,000
Financing pattern:				
Equity capital	1,000	800	600	200
15% Debt	—	200	400	800
(b) Operating profit (EBIT)	300	300	300	300
Less: Interest	—	30	60	120
Earnings before taxes	300	270	240	180
Less: Taxes (0.35)	105	94.5	84	63
Earnings after taxes	195	175.5	156	117
Return on equity (per cent)	19.5	21.9	26	58.5

The preceding discussion should leave no doubt that both high and low D/E ratios are not desirable. What is needed is a ratio which strikes a proper balance between debt and equity. What is the reasonable relationship between debt and equity? There cannot be a rigid rule. It will de-pend upon the circumstances, prevailing practices and so on. The general proposition is: *other's money should be in reasonable proportion to the owner's capital and the owners should have sufficient stake in the fortunes of the enterprise.* For instance, in a capital-rich country, the practice is to use as little debt as possible. A D/E ratio of 1 : 3 is regarded as indicative of a fairly heavy debt; a ratio of 1 : 1 would indicate an extremely heavy and unsatisfactory debt situation.[12] In underdeveloped countries such standards cannot be expected. It was not unusual to find firms having a D/E ratio of 2 : 1 or even 3 : 1 in the case of joint stock enterprises in India. One reason for such heavy dose of debt was to be found in the fact that enterprises had to depend, by and large, on public financial institutions (PFIs) which provided most of the funds in the form of loans. This had made the financial structure of companies lopsided and, on canons of sound financing practices, highly imprudent. The borrowers were finding it extremely difficult to service the debt burden and the overdues of the financial institutions

rose unabated.[13] With the shift in the post-1991 period of dependence of the corporates on the capital market, their dependence on loans/debt has significantly declined.

Secondly, the D/E ratio cannot be applied mechanically without regard to the circumstances of each case, such as type and size of business, the nature of the industry and the degree of risk involved. For example, firms having a stable income such as an electricity company, can afford to have a higher D/E ratio. Similarly, capital intensive industries and firms producing a basic product, like cement, tend to use a larger proportion of debt. The tolerable D/E ratio of a new company would be much lower than for an established one.

Finally, there is an important issue whether to use book or market values to compute leverage ratio. Valuation models in finance are generally based on the market value of debt and equity. Therefore, the use of market values can make the D/E ratio a more useful analytical tool. For instance, if the market value of equity is higher than its book value, the market value based D/E ratio will be lower than the one using book value. This would imply that the firm can raise funds at attractive financial costs. The financial costs would be higher if the market value of equity is lower than its book value as equity capital can be issued at a discount to book value.

Debt to Total Capital Ratio The relationship between creditors' funds and owner's capital can also be expressed in terms of another leverage ratio. This is the debt to total capital ratio. Here, the outside liabilities are related to the total capitalisation of the firm and not merely to the shareholder's equity. Essentially, this type of capital structure ratio is a variant of the D/E ratio described above. It can be calculated in different ways.

One approach is to relate the long-term debt to the permanent capital of the firm. Included in the permanent capital are shareholders' equity as well as long-term debt. Thus,

$$\text{Debt to total capital ratio} = \frac{\text{Long-term debt}}{\text{Permanent capital}} \qquad \textbf{(4.10)}$$

Another approach to calculating the debt to capital ratio is to relate the total debt to the total assets of the firm. The total debt of the firm comprises long-term debt plus current liabilities. The total assets consist of permanent capital plus current liabilities. Thus,

$$\text{Debt to total assets/capital ratio} = \frac{\text{Total debt}}{\text{Total assets}} \qquad \textbf{(4.11)}$$

Proprietary ratio indicates the extent to which assets are financed by owners funds.

Still another variant of the D/E ratio is to relate the owner's/proprietor's funds with total assets. This is called the **proprietary ratio**. The ratio indicates the proportion of total assets financed by owners. Symbolically, it is equal to:

$$\frac{\text{Proprietor's funds}}{\text{Total assets}} \times 100 \qquad \textbf{(4.12)}$$

Finally, it may also be of some interest to know the relationship between equity funds (also referred to as net worth) and fixed-income bearing funds (preference shares, debentures and other borrowed funds). This ratio, called the **capital gearing ratio**, is useful when the objective is to show the effect of the use of fixed-interest/dividend source of funds on the earnings available to the equity shareholders.

Interpretation As the ratio is like the D/E ratio, it gives results similar to the D/E ratio in respect of capital structure of a firm. The first of these (Equation 4.10), indicates what proportion of the permanent capital of a firm consists of long-term debt. If the ratio for a firm is 1 : 2, it implies that one-third of the total permanent capital of the firm is in the form of long-term debts. Although no hard and fast rules exist, conventionally a ratio of 1 : 2 is considered to be satisfactory.

The second ratio (Equation 4.11) measures the share of the total assets financed by outside funds. The third variant (Equation 4.12) shows what portion of the total assets are financed by the owner's capital. A low ratio of debt to total assets is desirable from the point of the creditors/ lenders as there is sufficient margin of safety available to them. But its implications for the shareholders are that debt is not being exploited to make available to them the benefit of trading on equity. A firm with a very high ratio would expose the creditors to higher risk. The implications of the ratio of equity capital of total assets are exactly opposite to that of the debt to total assets. A firm should have neither a very high ratio nor a very low ratio.

Coverage Ratios The second category of leverage ratios are **coverage ratios**. These ratios are computed from information available in the profit and loss account. For a normal firm, in the ordinary course of business, the claims of creditors are not met out of the sale proceeds of the permanent assets of the firm. The obligations of a firm are normally met out of the earnings or operating profits. These claims consist of **(i)** interest on loans, **(ii)** preference dividend, and **(iii)** amortisation of principal or repayment of the instalment of loans or redemption of preference capital on maturity. The soundness of a firm, from the view-point of long-term creditors, lies in its ability to service their claims. This ability is indicated by the coverage ratios. The coverage ratios measure the relationship between what is normally available from operations of the firms and the claims of the outsiders. The important coverage ratios are: **(i)** interest coverage, **(ii)** dividend coverage, **(iii)** total coverage, **(iv)** total cashflow coverage, and **(v)** debt service coverage ratio.

Coverage ratios measure the firm's ability to pay certain fixed charges.

Interest Coverage Ratio It is also known as '**time-interest-earned ratio**'. This ratio measures the debt servicing capacity of a firm insofar as fixed interest on long-term loan is concerned. It is determined by dividing the operating profits or earnings before interest and taxes (EBIT) by the fixed interest charges on loans. Thus,

$$\text{Interest coverage} = \frac{\text{EBIT}}{\text{Interest}} \qquad \textbf{(4.13)}$$

Interest coverage (time-interest-earned) ratio measures the firm's ability to make contractual interest payments.

It should be noted that this ratio uses the concept of net profits before taxes because interest is tax-deductible so that tax is calculated after paying interest on long-term loan. This ratio, as the name suggests, indicates the extent to which a fall in EBIT is tolerable in that the ability of the firm to service its interest payments would not be adversely affected. For instance, an interest coverage of 10 times would imply that even if the firm's EBIT were to decline to one-tenth of the present level, the operating profits available for servicing the interest on loan would still be equivalent to the claims of the lenders. On the other hand, a coverage of five times would indicate that a fall in operating earnings only to upto one-fifth level can be tolerated. From the point of view of the lenders, the larger the coverage, the greater is the ability of the firm to handle fixed-charge lia-bilities and the more assured is the payment of

interest to them. However, too high a ratio may imply unused debt capacity. In contrast, a low ratio is a danger signal that the firm is using excessive debt and does not have the ability to offer assured payment of interest to the lenders.

Dividend Coverage Ratio It measures the ability of a firm to pay dividend on preference shares which carry a stated rate of return. This ratio is the ratio (expressed as x number of times) of net profits after taxes (EAT) and the amount of preference dividend. Thus,

$$\text{Dividend coverage} = \frac{\text{EAT}}{\text{Preference dividend}} \qquad \textbf{(4.14)}$$

It can be seen that although preference dividend is a fixed obligation, the earnings taken into account are after taxes. This is because, unlike debt on which interest is a charge on the profits of the firm, the preference dividend is treated as an appropriation of profit. The ratio, like the interest coverage ratio, reveals the safety margin available to the preference shareholders. As a rule, the higher the coverage, the better it is from their point of view.

Total fixed charge coverage ratios measure the firm's ability to meet all fixed payment obligations.

Total Fixed Charge Coverage Ratio While the interest coverage and preference dividend coverage ratios consider the fixed obligations of a firm to the respective suppliers of funds, that is, creditors and preference shareholders, the total coverage ratio has a wider scope and takes into account all the committed fixed obligations of a firm, that is, **(i)** interest on loan, **(ii)** preference dividend, **(iii)** lease payments, and **(iv)** repayment of principal. Symbolically,

$$\text{Total fixed charge coverage} = \frac{\text{EBIT} + \text{Lease payment}}{\text{Interest} + \text{Lease payments} + (\text{Preference dividend} + \text{Instalment of principal})/(1 - t)} \qquad \textbf{(4.15)}$$

Total Cashflow Coverage Ratio However, coverage ratios mentioned above, suffer from one major limitation, that is, they relate the firm's ability to meet its various financial obligations to its earnings. In fact, these payments are met out of cash available with the firm. Accordingly, it would be more appropriate to relate cash resources of a firm to its various fixed financial obligations. The ratio, so determined, is referred to as ***total cash flow coverage ratio***. Symbolically,

$$\text{Total cash flow coverage} = \frac{\text{EBIT} + \text{Lease Payments} + \text{Depreciation} + \text{Non-cash expenses}}{\text{Lease payment} + \text{Interest} + \dfrac{(\text{Principal repayment})}{(1-t)} + \dfrac{(\text{Preference dividend})}{(1-t)}} \qquad \textbf{(4.16)}$$

The overall ability of a firm to service outside liabilities is truly reflected in the total cash flow coverage ratio: the higher the coverage, the better is the ability.

Internally generated cash from operating activities (CFO) are required for investment as well as debt servicing. A typical firm requires funds both for growth, apart from replacement of existing fixed assets (in particular, plant and machinery) and servicing of debt. Accordingly, a firm's long-term solvency is a function of its ability **(i)** to finance the expansion and replacements needs of the business and **(ii)** to generate cash for servicing of debt.

Capital Expenditure Ratio measures the relationship between the firm's ability to generate CFO and its capital expenditure requirements. It is determined dividing CFO by capital expenditure. The higher the ratio, the better it is. The ratio greater than one indicates that the firm has cash to service debt as well as to make payment of dividends.

Debt-Service Coverage Ratio (DSCR) is considered a more comprehensive and apt measure to compute **debt service capacity** of a business firm. It provides the value in terms of the number of times the total debt service obligations consisting of interest and repayment of principal in instalments are covered by the total operating funds available after the payment of taxes: Earnings after taxes, EAT + Interest + Depreciation + Other non-cash expenditures like amortisation (OA). Symbolically,

Debt srvice capacity is the ability of a firm to make the contractual payments required on a scheduled basis over the life of the debt.

$$\text{DSCR} = \frac{\sum_{t=1}^{n} \text{EAT}_t + \text{Interest}_t + \text{Depreciation}_t + OA_t}{\sum_{t=1}^{n} \text{Instalment}_t} \qquad \textbf{(4.17)}$$

The higher the ratio, the better it is. A ratio of less than one may be taken as a sign of long-term solvency problem as it indicates that the firm does not generate enough cash internally to service debt. In general, lending financial institutions consider 2:1 as satisfactory ratio. Consider Example 4.5.

Example 4.5

Agro Industries Ltd has submitted the following projections. You are required to work out yearly debt service coverage ratio (DSCR) and the average DSCR: (Figures in Rs lakh)

Year	*Net profit for the year*	*Interest on term loan during the year*	*Repayment of term loan in the year*
1	21.67	19.14	10.70
2	34.77	17.64	18.00
3	36.01	15.12	18.00
4	19.20	12.60	18.00
5	18.61	10.08	18.00
6	18.40	7.56	18.00
7	18.33	5.04	18.00
8	16.41	Nil	18.00

The net profit has been arrived after charging depreciation of Rs 17.68 lakh every year.

Solution

TABLE 4.6 Determination of Debt Service Coverage Ratio *(Amount in lakh of rupees)*

Year	*Net profit*	*Depre-ciation*	*Interest*	*Cash available (col. 2+3+4)*	*Principal instalment*	*Debt obligation (col. 4 + col. 6)*	*DSCR [col. 5 ÷ col. 7 (No. of times)]*
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*
1	21.67	17.68	19.14	58.49	10.70	29.84	1.96
2	34.77	17.68	17.64	70.09	18.00	35.64	1.97
3	36.01	17.68	15.12	68.81	18.00	33.12	2.08
4	19.20	17.68	12.60	49.48	18.00	30.60	1.62
5	18.61	17.68	10.08	46.37	18.00	28.08	1.65
6	18.40	17.68	7.56	43.64	18.00	25.56	1.71
7	18.33	17.68	5.04	41.05	18.00	23.04	1.78
8	16.41	17.68	Nil	34.09	18.00	18.00	1.89
Average DSCR (DSCR ÷ 8)							1.83

Profitability Ratios Apart from the creditors, both short-term and long-term, also interested in the financial soundness of a firm are the owners and management or the company itself. The man-agement of the firm is naturally eager to measure its operating efficiency. Similarly, the owners invest their funds in the expectation of reasonable returns. The operating efficiency of a firm and its ability to ensure adequate returns to its shareholders/owners depends ultimately on the profits earned by it. The profitability of a firm can be measured by its profitability ratios. In other words, the profitability ratios are designed to provide answers to questions such as **(i)** is the profit earned by the firm adequate? **(ii)** what rate of return does it represent? **(iii)** what is the rate of profit for various divisions and segments of the firm? **(iv)** what are the earnings per share? **(v)** what was the amount paid in dividends? **(vi)** what is the rate of return to equity-holders? and so on.

Profitability ratios can be determined on the basis of either sales or investments. The profitability ratios in relation to sales are **(a)** profit margin (gross and net) and **(b)** expenses ratio. Profitability in relation to investments is measured by **(a)** return on assets, **(b)** return on capital employed, and **(c)** return on shareholders' equity.

Profitability Ratios Related to Sales These ratios are based on the premise that a firm should earn sufficient profit on each rupee of sales. If adequate profits are not earned on sales, there will be difficulty in meeting the operating expenses and no returns will be available to the owners. These ratios consist of **(i)** profit margin, and **(ii)** expenses ratios.

Profit Margin The profit margin measures the relationship between profit and sales. As the profits may be gross or net, there are two types of profit margins: Gross profit margin and Net profit margin.

Gross profit margin measures the percentage of each sales rupee remaining after the firm has paid for its goods.

Gross Profit Margin is also known as gross margin. It is calculated by dividing gross profit by sales. Thus,

$$\text{Gross profit margin} = \frac{\text{Gross profit}}{\text{Sales}} \times 100 \qquad \textbf{(4.18)}$$

If the sales of a firm amount to Rs 40,00,000 and its gross profit is Rs 10,00,000, the gross margin would be 25 per cent (Rs 10,00,000 ÷ Rs 40,00,000). If the gross margin (25 per cent) is deducted from 100, the result (75 per cent) is the ratio of cost of goods sold to sales. The former measures profits in relation to sales, while the latter reveals the relationship between cost of production and sale price.

Gross profit is the result of the relationship between prices, sales volume and costs. A change in the gross margin can be brought about by changes in any of these factors. The gross margin represents the limit beyond which fall in sales prices are outside the tolerance limit. Further, the gross profit ratio/margin can also be used in determining the extent of loss caused by theft, spoilage, damage, and so on in the case of those firms which follow the policy of fixed gross profit margin in pricing their products.

A high ratio of gross profit to sales is a sign of good management as it implies that the cost of production of the firm is relatively low. It may also be indicative of a higher sales price without a corresponding increase in the cost of goods sold. It is also likely that cost of sales might have declined without a corresponding decline in sales price. Nevertheless, a very high and rising gross margin may also be the result of unsatisfactory basis of valuation of stock, that is, overvaluation of closing stock and/or undervaluation of opening stock.

A relatively low gross margin is definitely a danger signal, warranting a careful and detailed analysis of the factors responsible for it. The important contributory factors may be (i) a high cost of production reflecting acquisition of raw materials and other inputs on unfavourable terms, inefficient utilisation of current as well as fixed assets, and so on; and (ii) a low selling price resulting from severe competition, inferior quality of the product, lack of demand, and so on. A thorough investigation of the factors having a bearing on the low gross margin is called for.

Net profit margin measures the percentage of each sales rupee remaining after all costs and expenses including interest and taxes have been deducted.

A firm should have a reasonable gross margin to ensure adequate coverage for operating ex-penses of the firm and sufficient return to the owners of the business, which is reflected in the net profit margin.

Net Profit Margin is also known as net margin. This measures the relationship between net profits and sales of a firm. Depending on the concept of net profit employed, this ratio can be computed in three ways:

1. Operating profit ratio = $\frac{\text{Earnings before interest and taxes (EBIT)}}{\text{Net sales}}$ **(4.19)**

2. Pre-tax profit ratio = $\frac{\text{Earnings before taxes (EBT)}}{\text{Net sales}}$ **(4.20)**

3. Net profit ratio = $\frac{\text{Earnings after interest and taxes (EAT)}}{\text{Net sales}}$ **(4.21)**

The net profit margin is indicative of *management's ability to operate the business with sufficient success not only to recover from revenues of the period, the cost of merchandise or services, the expenses of operating the business (including depreciation) and the cost of the borrowed funds, but also to leave a margin of reasonable compensation to the owners for providing their capital at risk. The ratio of net profit (after interest and taxes) to sales essentially expresses the cost price effectiveness of the operation.*[14]

A high net profit margin would ensure adequate return to the owners as well as enable a firm to withstand adverse economic conditions when selling price is declining, cost of production is rising and demand for the product is falling.

A low net profit margin has the opposite implications. However, a firm with a low profit margin, can earn a high rate of return on investments if it has a higher inventory turnover. This aspect is covered in detail in the subsequent discussion. The profit margin should, therefore, be evaluated in relation to the turnover ratio. In other words, the overall rate of return is the product of the net profit margin and the investment turnover ratio. Similarly, the gross profit margin and the net profit margin should be jointly evaluated. The need for joint analysis arises because the two ratios may show different trends. For example, the gross margin may show a substantial increase over a period of time but the net profit margin may **(i)** have remained constant, or **(ii)** may not have increased as fast as the gross margin, or **(iii)** may actually have declined. It may be due to the fact that the increase in the operating expenses individually may behave abnormally. On the other hand, if either as a whole or individual items of operating expenses decline substantially, a de-crease in gross margin may be associated with an improvement in the net profit margin.

Expenses Ratio Another profitability ratio related to sales is the **expenses ratio**. It is computed by dividing expenses by sales. The term 'expenses' includes **(i)** cost of goods sold, **(ii)** administrative expenses, **(iii)** selling and distribution expenses, **(iv)** financial expenses but excludes taxes, dividends and extraordinary losses due to theft of goods, good destroyed by fire and so on.

There are different variants of expenses ratios. That is,

1. $$\text{Cost of goods sold ratio} = \frac{\text{Cost of goods sold}}{\text{Net sales}} \times 100 \quad \textbf{(4.22)}$$

2. $$\text{Operating expenses ratio} = \frac{\text{Adminsitrative expenses + Selling expenses}}{\text{Net sales}} \times 100 \quad \textbf{(4.23)}$$

3. $$\text{Administrative expenses ratio} = \frac{\text{Adminsitrative expenses}}{\text{Net sales}} \times 100 \quad \textbf{(4.24)}$$

4. $$\text{Selling expenses ratio} = \frac{\text{Selling expenses}}{\text{Net sales}} \times 100 \quad \textbf{(4.25)}$$

5. $$\text{Operating ratio} = \frac{\text{Cost of goods sold + Operating expenses}}{\text{Net sales}} \times 100 \quad \textbf{(4.26)}$$

6. $$\text{Financial expenses ratio} = \frac{\text{Financial expenses}}{\text{Net sales}} \times 100 \quad \textbf{(4.27)}$$

Interpretation The expenses ratio is closely related to the profit margin, gross as well as net. For instance, if the operating profit margin is deducted from 100 per cent, the resultant is the operating ratio. Alternatively, when the operating ratio is subtracted from 100 per cent, we get the operating profit margin. If the sales and total non-financial expenses of a firm are Rs 40,00,000 and Rs 32,00,000 respectively, the *operating ratio* would be 80 per cent. It implies that total operating expenses including cost of goods sold consume 80 per cent of the sales revenues of the firm and 20 per cent is left for meeting interest, tax and dividends obligations as also retaining profits for future expansion. *The cost of goods sold ratio* shows what

percentage share of sales is consumed by cost of goods sold and, conversely, what proportion is available for meeting expenses such as selling and general distribution expenses as well as financial expenses consisting of taxes, interest and dividends, and so on.

The expenses ratio is, therefore, very important for analysing the profitability of a firm. It should be compared over a period of time with the industry average as well as firms of similar type. As a working proposition, a low ratio is favourable, while a high one is unfavourable. The implication of a high expenses ratio is that only a relatively small percentage share of sales is available for meeting financial liabilities like interest, tax and dividends, and so on. An analysis of the factors responsible for a low ratio may reveal changes in the selling price or the operating expenses. It is likely that individual items may behave differently. While some operating expenses may show a rising trend, others may record a fall. The specific expenses ratio for each of the items of operating cost may be calculated. These ratios would identify the specific cause. To illustrate, an increase in selling expenses, may be due to a number of reasons: **(i)** general rise in selling expenses, **(ii)** inefficiency of the marketing department leading to uncontrolled promotional and other expenses, **(iii)** growing competition, **(iv)** ineffective advertising, **(v)** inefficient utilisation of resources, and the like.

A low operating ratio is by and large a test of operational efficiency. In case of firms whose major source of income and expenses are non-operating, the operating ratio, however, cannot be used as a yardstick of profitability.

To conclude, the profitability ratios based on sales are an important indicator of the operational efficiency of a manufacturing enterprise. However, they suffer from a serious limitation in that they are not useful from the viewpoint of the owners of the firm. Consider Example 4.6.

Example 4.6

From the following information of a firm, determine (i) gross profit margin and (ii) net profit margin.

1.	Sales	Rs 2,00,000
2.	Cost of goods sold	1,00,000
3.	Other operating expenses	50,000

Solution

(i) Gross profit margin $= \dfrac{\text{Rs } 1,00,000}{\text{Rs } 2,00,000} = 50$ per cent

(ii) Net profit margin $= \dfrac{\text{Rs } 50,000}{\text{Rs } 2,00,000} = 25$ per cent

The operating efficiency of the firm is fairly good. Assume, however, that the investments are Rs 10,00,000. The return on investments works out to be 5 per cent only. From the owner's point of view, rate of return on investments is a better measure of testing the profitability of a firm.

Profitability Ratios Related to Investments

Return on Investments (ROI) As already observed, the profitability ratios can also be computed by relating the profits of a firm to its investments. Such ratios are popularly termed as return on investments (ROI). There are three different concepts of investments in vogue in financial literature: assets, capital employed and shareholders' equity. Based on each of them, there are three broad categories of ROIs. They are **(i)** return on assets, **(ii)** return on capital employed and **(iii)** return on shareholders' equity.

Return on investments (ROI) measures the overall effectiveness of management in generating profits with its available assets.

Return on Assets (ROA) Here, the profitability ratio is measured in terms ofthe relationship between net profits and assets. The ROA may also be called profit-to-asset ratio. There are various possible approaches to define net profits and assets, according to the purpose and intent of the calculation of the ratio. Depending upon how these two terms are defined, many variations of ROA are possible.

The concept of net profit may be **(i)** net profits after taxes, **(ii)** net profits after taxes plus interest, and **(iii)** net profits after taxes plus interest minus tax savings.[15] Assets may be defined as **(i)** total assets, **(ii)** fixed assets, and **(iii)** tangible assets. Accordingly, the different variants of the RAO are:

1. $$\text{Return on assets (ROA)} = \frac{\text{Net profit after taxes}}{\text{Average total assets}} \times 100 \quad \textbf{(4.28)}$$

The ROA based on this ratio would be an underestimate as the interest paid to the lenders is excluded from the net profits. In point of fact, the real return on the total assets is the net earnings available to owners (EAT) and interest to lenders as assets are financed by owners as well as creditors. A more reliable indicator of the true return on assets, therefore, is the net profits inclusive of interest. It reports the total return accruing to all providers of capital (debt and equity).

2. $$\text{ROA} = \frac{\text{Net profit after taxes + Interest}}{\text{Average total assets}} \times 100 \quad \textbf{(4.29)}$$

3. $$\text{ROA} = \frac{\text{Net profit after taxes + Interest}}{\text{Average tangible assets}} \times 100 \quad \textbf{(4.30)}$$

4. $$\text{ROA} = \frac{\text{Net profit after taxes + Interest}}{\text{Average fixed assets}} \times 100 \quad \textbf{(4.31)}$$

These measures, however, may not provide correct results for inter-firm comparisons particularly when these firms have markedly varying *capital structures* as interest payment on debt qualifies for tax deduction in determining net taxable income. Therefore the effective cash outflows is less than the actual payment of interest by the amount of tax shield on interest payment. As a measure of *operating performance*, therefore, Equations 4.29 to 4.31 should be substituted by the following.

$$\text{ROA} = \frac{\text{EAT} + (\text{Interest} - \text{Tax advantage on interest}) \text{ or After tax interest cost}}{\text{Average total assets/Tangible assets/Fixed assets}} \quad \textbf{(4.32)}$$

This equation correctly reports the operating efficiency of firms as if they are all equity-financed.

The ROA measures the profitability of the total funds/ investments of a firm. It, however, throws no light on the profitability of the different sources of funds which finance the total assets. These aspects are covered by other ROIs.

Return on Capital Employed (ROCE) The ROCE is the second type of ROI. It is similar to the ROA except in one respect. Here the profits are related to the total capital employed. The term capital employed refers to long-term funds supplied by the lenders and owners of the firm. It can be computed in two ways. First, it is equal to non-current liabilities (long-term

liabilities) plus owners' equity. Alternatively, it is equivalent to net working capital plus fixed assets. Second, it is equal to long-term funds minus investments made outside the firm. Thus, the capital employed basis provides a test of profitability related to the sources of long-term funds. A comparison of this ratio with similar firms, with the industry average and over time would provide sufficient insight into how efficiently the long-term funds of owners and lenders are being used. The higher the ratio, the more efficient is the use of capital employed.

The ROCE can be computed in different ways, using different concepts of profits and capital employed. Thus,

1. $$\text{ROCE} = \frac{\text{EBIT}}{\text{Average total capital employed}} \times 100 \quad \textbf{(4.33)}$$

2. $$\text{ROCE} = \frac{\text{Net profit after taxes} + \text{Interest} - \text{Tax advantage on interest}}{\text{Average total capital employed}} \times 100 \quad \textbf{(4.34)}$$

3. $$\text{ROCE} = \frac{\text{Net profit after taxes} + \text{Interest} - \text{Tax advantage on interest}}{\text{Average total capital employed}} \times 100 \quad \textbf{(4.35)}$$

Return on Shareholders' Equity This profitability ratio carries the relationship of return to the sources of funds yet another step further. While the ROCE expresses the profitability of a firm in relation to the funds supplied by the lenders and owners taken together, the return on shareholders' equity measures exclusively the return on the owners' funds.

Return on shareholders equity measures the return on the owners (both preference and equity shareholders) investment in the firm.

The shareholders of a firm fall into two broad groups: preference shareholders and equity shareholders. The holders of preference shares enjoy a preference over equity shareholders in respect of receiving dividends. In other words, from the net profits available to the shareholders, the preference dividend is paid first and whatever remains belongs to the ordinary shareholders. The profitability ratios based on shareholders' equity are termed as *return on shareholders' equity*. There are several measures to calculate the return on shareholders equity: **(i)** Rate of return on **(a)** total shareholders' equity and **(b)** equity of ordinary shareholders; **(ii)** earnings per share; **(iii)** dividends per share; **(iv)** dividend–pay-out ratio; **(v)** dividend and earnings yield; and **(vi)** price-earnings ratio.

Return on Total Shareholders' Equity According to this ratio, profitability is measured by dividing the net profits after taxes (but before preference dividend) by the average total shareholders' equity. The term shareholders' equity includes **(i)** preference share capital; **(ii)** ordinary shareholders' equity consisting of **(a)** equity share capital, **(b)** share premium, and **(c)** reserves and surplus less accumulated losses. The ordinary shareholders' equity is also referred to as net worth. Thus,

$$\text{Return on total shareholders' equity} = \frac{\text{Net profit after taxes}}{\text{Average total shareholders' equity}} \times 100 \quad \textbf{(4.36)}$$

The ratio reveals how profitably the owners' funds have been utilised by the firm. A comparison of this ratio with that of similar firms as also with the industry average will throw light on the relative performance and strength of the firm.

Return on ordinary shareholders' equity measures the return on the total equity funds of ordinary shareholders.

Return on Ordinary Shareholders' Equity (Net Worth) While there is no doubt that the preference shareholders are also owners of a firm, the real owners are the ordinary shareholders who bear all the risk, participate in management and are entitled to all the profits remaining after all outside claims including preference dividends are met in full. The profitability of a firm from the owners' point of view should, therefore, in the fitness of things be assessed in terms of the return to the ordinary shareholders. The ratio under reference serves this purpose.

It is calculated by dividing the profits after taxes and preference dividend by the average equity of the ordinary shareholders.
Thus,

$$\text{Return on equity funds} = \frac{\text{Net profit after taxes} - \text{Preference dividend}}{\text{Average ordinary shareholders' equity or net worth}} \times 100 \quad \textbf{(4.37)}$$

This is probably the single most important ratio to judge whether the firm has earned a satis-factory return for its equity-holders or not. Its adequacy can be judged by **(i)** comparing it with the past record of the same firm, **(ii)** inter-firm comparison, and **(iii)** comparisons with the overall industry average. The rate of return on ordinary shareholders' equity is of crucial significance in ratio analysis vis-a-vis from the point of the owners of the firm.

Earnings Per Share (EPS) measures the profit available to the equity shareholders on a per share basis, that is, the amount that they can get on every share held. It is calculated by dividing the profits available to the equity shareholders by the number of the outstanding shares. The profits available to the ordinary shareholders are represented by net profits after taxes and preference dividend. Thus,

$$\text{EPS} = \frac{\text{Net profit available to equity-holders}}{\text{Number of ordinary shares outstanding}} \quad \textbf{(4.38)}$$

Earnings Per Share (EPS) is a widely used ratio. Yet, EPS as a measure of profitability of a firm from the owner's point of view, should be used cautiously as it does not recognise the effect of increase in equity capital as a result of retention of earnings. In other words, if EPS has increased over the years, it does not necessarily follow that the firm's profitability has improved because the increased profits to the owners may be the effect of an enlarged equity capital as a result of profit retentions, though the number of ordinary shares outstanding still remains constant. Another limitation of EPS is that it does not reveal how much is paid to the owners as dividend, nor how much of the earnings are retained in the business. It only shows how much earnings *theoretically* belong to the ordinary shareholders (per share basis).

As a profitability ratio, the EPS can be used to draw inferences on the basis of **(i)** its trends over a period of time, **(ii)** comparison with the EPS of other firms, and **(iii)** comparison with the industry average.

Cash Earnings Per Share is computed using cash flows from business operations as the numerator. This value is determined by adding non-cash expenses, such as depreciation and amortisation to net profits available to equity owners. Thus,

$$\text{Cash EPS} = \frac{\text{Net profit available to equity–owners} + \text{Depreciation} + \text{Amortisation} + \text{Non-cash expenses}}{\text{Number of equity shares outstanding}} \quad \textbf{(4.39)}$$

The ratio indicates the cash generating ability (per equity share) of the firm. Like EPS, cash EPS should be used with caution. It is beset with all the limitations associated with EPS measure.

Book Value Per Share represents the equity/claim of the equity shareholder on a per share basis. It is computed dividing net worth (equity share capital + reserves and surplus – accumulated losses) by the number of equity shares outstanding (at balance sheet date), as shown in Equation 4.40)

$$\text{Book value per share} = \frac{\text{Net worth}}{\text{Number of equity shares outstanding}} \quad \textbf{(4.40)}$$

This ratio is sometimes used as a benchmark for comparisons with the market price per share. However, the book value per share has a serious limitation as a valuation tool as it is based on the historical costs of the assets of a firm. There may be a significant difference between the market value of assets from the book value of assets (as per balance sheet). Besides, there may be hidden assets or other intangible assets of uncertain value.

Price-to-Book Value Ratio Also known as price to book (P/B) ratio, measures the relationship between the market price of an equity share (MPS) with book value per share (BPS). Thus,

$$\text{P/B ratio} = \frac{\text{MPS}}{\text{BPS}} \quad \textbf{(4.41)}$$

The P/B ratio is significant in predicting future stock returns. For instance, Fama and French observed that the P/B ratio (along with size) was the best predictor of future stock returns[18]. Firms with low P/B ratios had consistently higher returns compared to the firms with high P/B ratios.

Dividend Per Share (DPS) is the dividends paid to the equity shareholders on a per share basis. In other words, DPS is the net distributed profit belonging to the ordinary shareholders divided by the number of ordinary shares outstanding. That is,

$$\text{DPS} = \frac{\text{Dividend paid to ordinary shareholders}}{\text{Number of ordinary shares outstanding}} \quad \textbf{(4.42)}$$

The DPS would be a better indicator than EPS as the former shows what exactly is received by the owners. Like the EPS, the DPS also should not be taken at its face value as the increased DPS may not be a reliable measure of profitability as the equity base may have increased due to increased retention without any change in the number of outstanding shares.

Dividend Pay-out (D/P) Ratio is also known as pay-out ratio. It measures the relationship between the earnings belonging to the ordinary shareholders and the dividend paid to them. In other words, the D/P ratio shows what percentage share of the net profits after taxes and preference dividend is paid out as dividend to the equity-holders. It can be calculated by dividing the total dividend paid to the owners by the total profits/earnings available to them. Alternatively, it can be found out by dividing the DPS by the EPS. Thus,

Dividend payout (D/P) ratio measures the proportion of dividends paid to earning available to shareholders.

1. $$\text{D/P ratio} = \frac{\text{Total dividend (cash dividend) to equityholders}}{\text{Total net profit belonging to equityholders}} \times 100 \quad \textbf{(4.43)}$$

2. $$\text{D/P} = \frac{\text{Dividend per ordinary share (DPS)}}{\text{Earnings per share (EPS)}} \times 100 \quad \textbf{(4.44)}$$

If the D/P ratio is subtracted from 100, retention ratio is obtained. The ratio indicates what percentage share of the net profits are retained in the business. To illustrate, if the net earnings after taxes and preference dividends are Rs 5,00,000 and the dividend paid to the ordinary shareholders amount to Rs 3,00,000, the D/P = 60 per cent. This implies that 40 per cent of the profits of the firm are retained (retention ratio) and 60 per cent distributed as dividends. Similarly, if the DPS is Rs 2 and EPS Rs 5, the D/P is 60 per cent. While 60 per cent profits are used to pay dividends, 40 per cent are ploughed back.

The D/P ratio is an important and widely-used ratio. The pay-out ratio can be compared with the trend over the years or an inter-firm and intra-industry comparison would throw light on its adequacy.

Earnings and Dividend Yield is closely related to the EPS and DPS. While the EPS and DPS are based on the book value per share, the yield is expressed in terms of the market value per share. The earnings yield may be defined as the ratio of earnings per share to the market value per ordinary share. Similarly, the dividend yield is computed by dividing the cash dividends per share by the market value per share. That is,

1. $$\text{Earnings yield} = \frac{\text{EPS}}{\text{Market value per share}} \times 100 \quad \textbf{(4.45)}$$

2. $$\text{Dividend yield} = \frac{\text{DPS}}{\text{Market value per share}} \times 100 \quad \textbf{(4.46)}$$

The earnings yield is also called the earning-price ratio.

Price/Earnings (P/E) ratio measures the amount investors are willing to pay for each rupee of earnings; the higher the ratio, the larger the investors confidence in the firm's future.

Price Earnings (P/E) Ratio is closely related to the earnings yield/earnings price ratio. It is actually the reciprocal of the latter. This ratio is computed dividing the market price of the shares by the EPS. Thus,

$$P/E \text{ ratio} = \frac{\text{Market price of share}}{\text{EPS}} \quad \textbf{(4.47)}$$

The *P/E* ratio reflects the price currently being paid by the market for each rupee of currently reported EPS. In other words, the P/E ratio measures investors' expectations and the market appraisal of the performance of a firm. In estimating the earnings, therefore, only normally sustainable earnings associated with the assets are taken into account. That is, the earnings are adjusted for income from, say, discontinued operations and extraordinary items as well as many other items not expected to occur. This ratio is popularly used by security analysts to assess a firm's performance as expected by the investors.

Activity Ratios Activity ratios are concerned with measuring the efficiency in asset management. These ratios are also called **efficiency ratios** or **asset utilisation ratios.** The

efficiency with which the assets are used would be reflected in the speed and rapidity with which assets are converted into sales. The greater is the rate of turnover or conversion, the more efficient is the utilisation of assets, other things being equal. For this reason, such ratios are also designated as turnover ratios. Turnover is the primary mode for measuring the extent of efficient employment of assets by relating the assets to sales. An activity ratio may, therefore, be defined as a test of the relationship between sales (more appropriately with cost of sales) and the various assets of a firm. Depending upon the various types of assets, there are various types of activity ratios.

Activity ratios measure the speed with which various accounts/assets are converted into sales or cash.

Inventory (or Stock) Turnover Ratio This ratio indicates the number of times inventory is replaced during the year. It measures the relationship between the cost of goods sold and the inventory level. The ratio can be computed in two ways.

Inventory (stock) turnover measures the activity/liquidity of inventory of a firm; the speed with which inventory is sold.

First, it is calculated dividing the cost of goods sold by the average inventory. Symbolically,

$$\text{Inventory turnover} = \frac{\text{Cost of goods sold}}{\text{Average inventory}} \qquad \textbf{(4.48)}$$

The average inventory figure may be of two types. In the first place, it may be the monthly inventory (stock) average. The monthly average can be found by adding the opening inventory of each month from, in case of the accounting year being a calendar year, January through January and dividing the total by thirteen. If the firm's accounting year is other than a calendar year, say a financial year, (April to March), the average level of inventory can be computed by adding the opening inventory of each month from April through April and dividing the total by thirteen.[19] This approach has the advantage of being free from bias as it smoothens out the fluctuations in inventory level at different periods. This is particularly true of firms in seasonal industries. However, a serious limitation of this approach is that detailed month-wise information may present practical problems of collection for the analyst. Therefore, average inventory may be obtained by using another basis, namely, the average of the opening inventory and the closing inventory.

Not only are there difficulties in getting detailed information regarding inventory level, but data may also not be readily available to an analyst in respect of the cost of goods sold. To solve the problem arising out of non-availability of the required data, the second approach to the computation of inventory turnover ratio is based on the relationship between sales and closing inventory. Thus, alternatively,

$$\text{Inventory turnover} = \frac{\text{Sales}}{\text{Closing inventory}} \qquad \textbf{(4.49)}$$

In theory, this approach is not a satisfactory basis as it is not logical. For one thing, the numerator (sales) and the denominator (inventory) are not strictly comparable as the former is expressed in terms of market price, the latter is based on cost. Secondly, the closing inventory figures are likely to be underestimates as firms traditionally have lower inventory at the end of the year. The net effect will be that the ratio given by this approach will be higher than the one given by the first approach. Thus the ratio has built-in bias to show better utilisation of inventory.

In brief, of the two approaches to calculating the inventory turnover ratio, the first which relates the cost of goods sold to the average inventory is theoretically superior as it is logically consistent. The merit of the second approach is that it is free from practical problems of computation.

Interpretation The inventory/stock turnover ratio measures how quickly inventory is sold. It is a test of efficient inventory management. To judge whether the ratio of a firm is satisfactory or not, it should be compared over a period of time on the basis of trend analysis. It can also be compared with the level of other firms in that line of business as well as with industry average.

In general, a high inventory turnover ratio is better than a low ratio. A high ratio implies good inventory management. Yet,a very high ratio calls for a careful analysis. It may be indicative of underinvestment in, or very low level of, inventory. A very low level of inventory has serious implications. It will adversely affect the ability to meet customer demand as it may not cope with its requirements. That is, there is a danger of the firm being out of stock and incurring high 'stock out cost'. It is also likely that the firm may be following a policy of replenishing its stock in too many small sizes. Apart from being costly, this policy may retard the production process as sufficient stock of materials may not be available.

Similarly, a very low inventory turnover ratio is dangerous. It signifies excessive inventory or overinvestment in inventory. Carrying excessive inventory involves cost in terms of interest on funds locked up, rental of space, possible deterioration and so on. A low ratio may be the result of inferior quality goods, overvaluation of closing inventory, stock of unsaleable/obsolete goods and deliberate excessive purchases in anticipation of future increase in their prices and so on.

Thus, a firm should have neither too high nor too low inventory turnover. To avoid both 'stock out costs' associated with a high ratio and the costs of carrying excessive inventory with a low ratio, what is suggested is a reasonable level of this ratio. The firm would be well advised to maintain a close watch on the trend of the ratio and significant deviations on either side should be thoroughly investigated to locate the factors responsible for it. The computation of the turnover for the individual components of the inventory may be useful in this context. Such ratios can be computed in respect of raw materials and work-in-progress. Thus,

$$\text{Raw materials turnover} = \frac{\text{Cost of raw materials used}}{\text{Average raw material inventory}} \quad \textbf{(4.50)}$$

$$\text{Work-in-progress turnover} = \frac{\text{Cost of goods manufactured}}{\text{Average work-in-progress inventory}} \quad \textbf{(4.51)}$$

Average collection period is the average amount of time needed to collect accounts receivable.

Receivables (Debtors) Turnover Ratio and Average Collection Period The second major activity ratio is the **receivables or debtors turnover ratio**. Allied and closely related to this is the average collection period. It shows how quickly receivables or debtors are converted into cash. In other words, the debtors turnover ratio is a test of the liquidity of the debtors of a firm.

The liquidity of a firm's receivables can be examined in two ways: **(i)** debtors/receivables turnover; **(ii)** average collection period.

The debtors turnover shows the relationship between credit sales and debtors of a firm. It can be calculated in two ways:

1. Debtor turnover = $\frac{\text{Credit sales}}{\text{Average debtors + Average bills receivable (B/R)}}$ **(4.52)**

This approach requires two types of data. First, credit sales, which may not be readily available to the analyst. Similarly, the computation of the figure of average debtors and bills receivable involves practical difficulties. In theory, these figures should be measured, as in the case of average inventory, on the basis of the monthly average. Since this type of information is not likely to be available to the analyst, the alternative is to use the average of the opening and closing balances of debtors and bills receivable.

To avoid the difficulty arising out of the non-availability of information in respect of credit sales and average debtors and bills receivable, the alternative method is to calculate the debtors turnover in terms of the relationship between total sales and closing balance of debtors. Thus,

2. Debtors turnover[18] = $\frac{\text{Total sales}}{\text{Debtors + Bills receivable}}$ **(4.53)**

The first approach to the computation of the debtors turnover is superior in that the question of the speed of conversion of sales into cash arises only in the case of credit sales. The effect of adopting the second approach would be to inflate the receivables turnover ratio and deflate the collection period.

The second type of ratio for measuring the liquidity of a firm's debtors is the average collection period. This is, in fact, interrelated with, and dependent upon, the receivables turnover ratio. It is calculated dividing the days in a year by the debtors turnover. Thus,

$$\text{Average collection period} = \frac{\text{Months (days) in a year}}{\text{Debtors turnover}} \quad \textbf{(4.54)}$$

$$\text{Alternatively} = \frac{\text{Months (days) in a year } (\times) \text{ (Average Debtors + Average B/R)}}{\text{Total credit sales}} \quad \textbf{(4.55)}$$

Example 4.7

The credit sales of a firm in a year amount to Rs 12,00,000. The outstanding amount of debtors at the beginning and end of the year were Rs 1,40,000 and Rs 1,60,000 respectively. Determine the debtor turnover ratio and the average collection period.

Solution

1. Debtor turnover ratio $= \frac{\text{Rs } 12,00,000}{(\text{Rs } 1,40,000 + \text{Rs } 1,60,000)/2} = 8$ (times per year)

2. **(i)** Average debt collection period = $\frac{12 \text{ months}}{8} = 1.5$ months

(ii) (12 months × Rs 1,50,000)/Rs 12,00,000 = 1.5 months.

We can get the debtor turnover dividing the months (days) in the year by the average collection period (i.e. 12 ÷ 1.5 = 8). Likewise, if we divide the months (days) in the year by the debtor turnover ratio, we get the average collection period (12 ÷ 8 = 1.5).

Interpretation This ratio indicates the speed with which debtors/accounts receivable are being collected. A turnover ratio of 8 signifies that debtors get converted into cash 8 times

in a year. The collection period of 1.5 months or 45 days implies that debtors on an average are collected in 45 days. Thus, it is indicative of the efficiency of trade credit management. The higher the turnover ratio and the shorter the average collection period, the better is the trade credit management and the better is the liquidity of debtors, as short collection period and high turnover ratio imply prompt payment on the part of debtors. On the other hand, low turnover ratio and long collection period reflect delayed payments by debtors. In general, therefore, short collection period (high turnover ratio) is preferable.

It is not, however, very prudent for a firm to have either a very short collection period or a very long one. A very long collection period would imply either poor credit selection or an inadequate collection effort. The delay in the collection of receivables would mean that, apart from the interest cost involved in maintaining a higher level of debtors, the liquidity position of the firm would be adversely affected. Moreover, there is the likelihood of a large number of accounts receivable becoming bad debts. Similarly, too short a period of average collection or too high a turnover ratio is not necessarily good. While it is true that it avoids the risk of receivables being bad debt as well as the burden of high interest on outstanding debtors, it may have an adverse effect on the volume of sales of the firm. Sales may be confined to only such customers as make prompt payments. The credit and collection policy of the firm may be very restrictive. Without reasonable credit, sales will be severely curtailed. Thus, a firm should have neither a very low nor a very high receivables turnover ratio; it should maintain it at a reasonable level. The reasonableness of the collection period can be judged in either of the following two ways.

First, the collection period of a firm can be compared with the industry practices of trade credit. Any notable deviation may result from **(i)** a more or less liberal policy of extending trade credit, or **(ii)** better/poor quality of receivables. A liberal trade credit policy may be aimed at augmenting sales.

Second, it may be more appropriately examined in relation to the credit terms and policy of the firm itself. In our example, the average collection period is 45 days or 1.5 months. This should be compared with the credit terms/period normally allowed by the firm. If the normal credit period, let us assume, as extended by the firm is 40-45 days, it means the firm is able to collect its receivables well within the due dates. If, however, the credit period normally allowed is 1 month or 30 days, it means that the debtors are outstanding for a period longer than warranted by the firm's credit policy. This may be a reflection on the efficiency of the credit collection department: it has made either poor credit selection or inadequate collection effort. The management should investigate the reasons for the difficulties in the collection of receivables.

Ageing schedule enables analysts to identify slow paying debtors.

A related aspect of the average collection period is the **ageing schedule**. While the former is concerned with the liquidity of debtors/receivables as a whole, the latter analyses them in a disaggregative manner by dividing the outstanding debtors on the basis of the duration during which they have been outstanding. The usefulness of the ageing schedule lies in the fact that it enables the analyst to identify the slow paying debtors in respect of whom the firm may have to encounter a serious collection problem. A hypothetical ageing schedule for the firm of our example, with an average collection period of 1.5 months is given in Table 4.7.

TABLE 4.7 Ageing Schedule

Outstanding period of debtors (1)	*Amount outstanding* (2)	*Percentage of total* (3)
Up to 30 days (1 month)	Rs 2,00,000	20
31-45 days (1.5 months)	2,00,000	20
46-60 days (2 months)	4,00,000	40
Above 60 days (more than two months)	2,00,000	20
	10,00,000	100

It can be seen from Table 4.7 that almost 60 per cent of the receivables are overdue as they remain outstanding beyond the average collection period of 45 days. Moreover, almost one-fifth of the outstanding debtors remain uncollected for more than 60 days. The ageing schedule, thus, supplements the collection period by showing how long the debtors are outstanding.

Assets Turnover Ratio This ratio is also known as the investment turnover ratio. It is based on the relationship between the cost of goods sold[19] and assets/investments of a firm. A reference to this was made while working out the overall profitability of a firm as reflected in its earning power. Depending upon the different concepts of assets employed, there are many variants of this ratio.

Assets turnover indicates the efficiency with which firm uses all its assets to generate sales.

Thus,

1. $$\text{Total assets turnover} = \frac{\text{Cost of goods sold}}{\text{Average total assets}} \quad \textbf{(4.56)}$$

2. $$\text{Fixed assets turnover} = \frac{\text{Cost of goods sold}}{\text{Average fixed assets}} \quad \textbf{(4.57)}$$

3. $$\text{Capital turnover} = \frac{\text{Cost of goods sold}}{\text{Average capital employed}} \quad \textbf{(4.58)}$$

4. $$\text{Current assets turnover} = \frac{\text{Cost of goods sold}}{\text{Average current assets}} \quad \textbf{(4.59)}$$

5. $$\text{Working capital turnover ratio} = \frac{\text{Cost of goods sold}}{\text{Net working capital}} \quad \textbf{(4.60)}$$

Here, the total assets and fixed assets are net of depreciation and the assets are exclusive of fictitious assets like debit balance of profit and loss account and deferred expenditures and so on.

The assets turnover ratio, howsoever defined, measures the efficiency of a firm in managing and utilising its assets. The higher the turnover ratio, the more efficient is the management and utilisation of the assets while low turnover ratios are indicative of underutilisation of available resources and presence of idle capacity. In operational terms, it implies that the firm can expand its activity level (in terms of production and sales) without requiring additional capital investments. In the case of high ratios, the firm would normally be required, other things being equal, to make additional capital investments to operate at higher level of activity. To determine the efficiency of the ratio, it should be compared across time as well as with

the industry average. In using the assets turnover ratios one point must be carefully kept in mind. The concept of assets/fixed assets is net of depreciation. As a result, the ratio is likely to be higher in the case of an old and established company as compared to a new one, other things being equal. The turnover ratio is in such cases likely to give a misleading impression regarding the relative efficiency with which assets are being used. It should, therefore, be cautiously used.

Integrated Analysis of Ratios The ratios discussed so far measure a firm's liquidity, solvency, efficiency of operations and profitability independent of one another. However, there exists interrelationship among these ratios. This aspect is brought out by integrated analysis of ratios. The disaggregation of ratios can reveal certain major economic and financial aspects, which otherwise would have been ignored. For instance, significant changes in profitability measured in terms of return on assets (ROA) and return on equity (ROE) are understood better through an analysis of its components.

The various profitability ratios discussed eariler throw light on the profitability of a firm from the viewpoint of **(i)** the owners of the firm, and **(ii)** the operating efficiency of the firm. The ratios covered under the rate of return to the equity-holders fall under the first category. The operating efficiency of a firm in terms of the efficient utilisation of the resources is reflected in net profit margin. It has been observed that although a high profit margin is a test of better performance, a low margin does not necessarily imply a lower rate of return on investments if a firm has higher investments/assets turnover. Therefore, the overall operating efficiency of a firm can be assessed on the basis of a combination of the two. The combined profitability is referred to as earning power/return on assets (ROA) ratio. The **earning power** of a firm may be defined as the overall profitability of an enterprise. This ratio has two elements: **(i)** profitability on sales as reflected in the net profit margin, and **(ii)** profitability of assets which is revealed by the assets/investment turnover. The earning power (ROA ratio) of a firm can be computed by multiplying the net profit margin and the assets turnover. Thus,

Earning power is the overall profitability of a firm; is computed by multiplying net profit margin and assets turnover.

$$\text{Earning power} = \text{Net profit margin} \times \text{Assets turnover} \qquad \textbf{(4.61)}$$

where, Net profit margin = Earning after taxes/Sales

Asset turnover = Sales/Total assets

$$\text{Earning power} = \frac{\text{Earnings after taxes}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Total assets}} = \frac{\text{EAT}}{\text{Total assets}} \qquad \textbf{(4.62)}$$

The basic elements of the earning power of a firm are portrayed in Figure 4.1. This chart is known as the Du Pont Chart.

The ROA ratio is a central measure of the overall profitability and operational efficiency of a firm. It shows the interaction of profitability and activity ratios. It implies that the performance of a firm can be improved either by generating more sales volume per rupee of investment or by increasing the profit margin per rupee of sales. Consider Example 4.8.

Example 4.8

Assume that there are two firms, A and B, each having total assets amounting to Rs 4,00,000, and average net profits after taxes of 10 per cent, that is, Rs 40,000, each. Firm A has sales of Rs 4,00,000, whereas the sales of firm B aggregate Rs 40,00,000. Determine the ROA of firms A and B.

Table 4.8 shows the ROA based on two components.

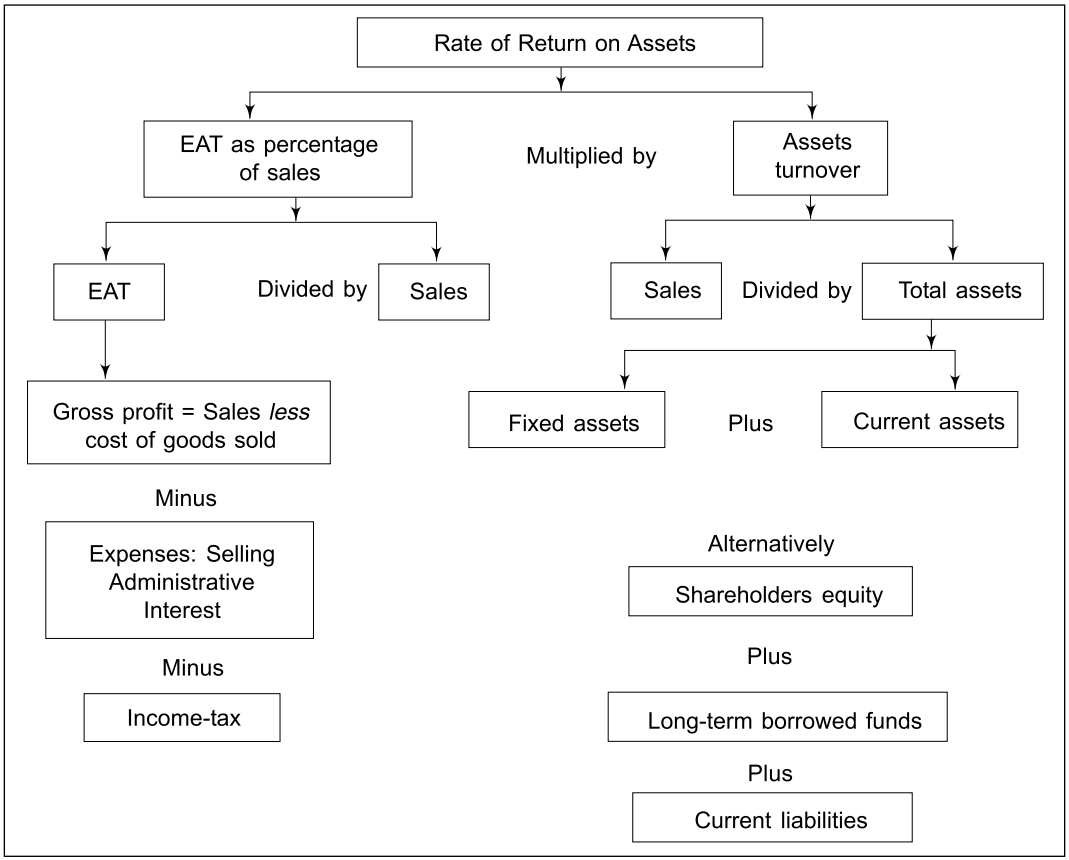


FIGURE 4.1 Du Pont Chart

Solution

TABLE 4.8 Return on Assets (ROA) of Firms A and B

Particulars	*Firm A*	*Firm B*
1. Net sales	Rs 4,00,000	Rs 40,00,000
2. Net profit	40,000	40,000
3. Total assets	4,00,000	4,00,000
4. Profit margin (2 ÷ 1) (per cent)	10	1
5. Assets turnover (1 ÷ 3) (times)	1	10
6. ROA ratio (4 × 5) (per cent)	10	10

Thus, the ROA of firms A and B is identical. While firm A has higher profit margin, B firm has higher assets turnover. Thus, the earning power is affected by two variables, namely, profit margin and assets turnover. Assets turnover ratio can further be segregated into inventory turnover, debtors turnover and fixed assets turnover ratios. Likewise, profit margin can be decomposed into gross profit, operating profit, profit before taxes and so on.

The usefulness of the integrated analysis lies in the fact that it presents the overall picture of the performance of a firm as also enables the management to identify the factors which have a bearing on profitability. In Example 4.8, if firm B could improve its profit margin even marginally, say, from 1 per cent to 2 per cent, its earning power (ROA) will be doubled, assuming sales are not affected. Similarly, firm A can double its earning power simply by a marginal increase in its investment turnover, as it indicates that the assets are used more efficiently, that is, more sales per rupee of investments. The two components of this ratio, namely, the profit margin and the investment turnover ratio, individually do not give an overall view as the former ignores the profitability of investments, while the latter fails to consider the profitability on sales.

SECTION 2 COMMON SIZE STATEMENTS

Common size statement expresses assets and liabilities as per cent of total assets and expenes and profits as per cent of sales.

Ratio analysis apart, another useful way of analysing financial statements is to convert them into common size statements by expressing absolute rupee amounts into percentages. When this method is pursued, the income statement exhibits each expense item or group of expense items as a percentage of net sales, and net sales are taken at 100 per cent. Similarly, each individual asset and liability classification is shown as a percentage of total assets and liabilities respectively. Statements prepared in this way are referred to as **common-size statements.**

Common-size comparative statements prepared for one firm over the years would highlight the relative changes in each group of expenses, assets and liabilities. These statements can be equally useful for inter-firm comparisons, given the fact that absolute figures of two firms of the same industry are not comparable. Financial statements and common-size statements of the Hypothetical Ltd are presented in Example 4.9.

Example 4.9

The accompanying balance sheet and profit and loss account relate to Hypothetical Ltd. Convert these into common-size statements.

Balance Sheet as at March 31 *(Amount in lakh of rupees)*

Particulars	*Previous Year*	*Current Year*
Liabilities		
Equity share capital (of Rs 10 each)	240	240.0
General reserves	96	182.0
Long-term loans	182	169.5
Creditors	67	52.0
Outstanding expenses	6	—
Other current liabilities	9	6.5
	600	650.0
Assets		
Plant [net of accumulated depreciation]	402	390
Cash	54	78
Debtors	60	65
Inventories	84	117
	600	650

Income Statement for the Year Ended March 31 *(Amount in lakh of rupees)*

Particulars	*Previous year*	*Current year*
Gross sales	370	480
Less: Returns	20	30
Net sales	350	450
Less: Cost of goods sold	190	215
Gross profit	160	235
Less: Selling, general and administrative cost	50	72
Operating profit	110	163
Less: Interest expenses	20	17
Earning before taxes	90	146
Less: Taxes	31.5	51.5
Earning after taxes	58.5	94.9

Solution

Income Statement (Common-size) for the Years Ended March 31 ***(Percentages)***

Particulars	*Previous year*	*Current year*
Net sales	100.0	100.0
Cost of goods sold	54.3	47.8
Gross profit	45.7	52.2
Selling, general and administrative expenses	14.3	16.0
Operating profit	31.4	36.2
Interest	5.7	3.8
Earnings before taxes	25.7	32.4
Taxes	9.0	11.4
Earnings after taxes (EAT)	16.7	21.0

Balance Sheets (Common-size as at March 31) *(Percentages)*

Particulars	*Previous year*	*Current year*
Owners' equity:		
Equity share capital	40.0	36.9
General reserves	16.0	28.0
	56.0	64.9
Long-term borrowings:		
Loan	30.3	26.1
Current liabilities:		
Creditors	11.2	8.0
Outstanding expenses	1.0	
Other liabilities	1.5	1.0
	13.7	9.0
Total liabilities	100.0	100.0
Fixed assets:		
Plant (net of accumulated depreciation)	67.0	60.0
Current assets:		
Cash	9.0	12.0
Debtors	10.0	10.0
Inventories	14.0	18.0
	33.0	40.0
Total assets	100.0	100.0

These percentage figures bring out clearly the relative significance of each group of items in the aggregative position of the firm. For instance, in the current year the EAT of Hypothetical Ltd has increased to 21 per cent from 16.7 per cent in the previous year. This improvement in profitability can mainly be traced to the decrease of 6.5 per cent in the cost of goods sold, reflecting im-provement in efficiency of manufacturing operations. The decrease in financial overheads (interest) by 1.9 per cent during the current year can be traced to the repayment of a part of long-term loans. Further analysis indicates that profitability would have been more but for an increase in operating expenses ratio by 1.7 per cent.

The common-size balance sheets show that current assets as a percentage of total assets have increased by 7 per cent over previous year. This increase was shared by inventories (4 per cent) and cash (3 per cent); the share of debtors remained unchanged at 10 per cent. The proportion of current liabilities (mainly due to creditors) was also lower at 9 per cent in the current year compared to 13.7 per cent in the previous year. These facts signal overall increase in the liquidity position of the firm. Further, the share of long-term debt has also declined and owners' equity has gone up from 56 per cent in the previous year to 64.9 per cent in the current year.

SECTION 3 IMPORTANCE AND LIMITATIONS OF RATIO ANALYSIS

Importance

As a tool of financial management, ratios are of crucial significance. The importance of ratio analysis lies in the fact that it presents facts on a comparative basis and enables the drawing of inferences regarding the performance of a firm. Ratio analysis is relevant in assessing the performance of a firm in respect of the following aspects: **(i)** liquidity position, **(ii)** long-term solvency, **(iii)** operating efficiency, **(iv)** overall profitability, **(v)** inter-firm comparison, and **(vi)** trend analysis.

Liquidity Position With the help of ratio analysis conclusions can be drawn regarding the liquidity position of a firm. The liquidity position of a firm would be satisfactory if it is able to meet its current obligations when they become due. A firm can be said to have the ability to meet its short-term liabilities if it has sufficient liquid funds to pay the interest on its short-maturing debt usually within a year as well as to repay the principal. This ability is reflected in the liquidity ratios of a firm. The liquidity ratios are particularly useful in credit analysis by banks and other suppliers of short-term loans.

Long-term Solvency Ratio analysis is equally useful for assessing the long-term financial viability of a firm. This aspect of the financial position of a borrower is of concern to the long-term creditors, security analysts and the present and potential owners of a business. The long-term solvency is measured by the leverage/capital structure and profitability ratios which focus on earning power and operating efficiency. Ratio analysis reveals the strengths and weaknesses of a firm in this respect. The leverage ratios, for instance, will indicate whether a firm has a reasonable proportion of various sources of finance or if it is heavily loaded with debt in which case its solvency is exposed to serious strain. Similarly, the various profitability ratios would reveal whether or not the firm is able to offer adequate return to its owners consistent with the risk involved.

Operating Efficiency Yet another dimension of the usefulness of the ratio analysis, relevant from the viewpoint of management, is that it throws light on the degree of efficiency in the management and utilisation of its assets. The various activity ratios measure this kind of opera-

tional efficiency. In fact, the solvency of a firm is, in the ultimate analysis, dependent upon the sales revenues generated by the use of its assets–total as well as its components.

Overall Profitability Unlike the outside parties which are interested in one aspect of the financial position of a firm, the management is constantly concerned about the overall profitability of the enterprise. That is, they are concerned about the ability of the firm to meet its short-term as well as long-term obligations to its creditors, to ensure a reasonable return to its owners and secure optimum utilisation of the assets of the firm. This is possible if an integrated view is taken and all the ratios are considered together.

Inter-firm Comparison Ratio analysis not only throws light on the financial position of a firm but also serves as a stepping stone to remedial measures. This is made possible due to interfirm comparison and comparison with industry averages. A single figure of a particular ratio is meaningless unless it is related to some standard or norm. One of the popular techniques is to compare the ratios of a firm with the industry average. It should be reasonably expected that the performance of a firm should be in broad conformity with that of the industry to which it belongs. An interfirm comparison would demonstrate the firm's position *vis-a-vis* its competitors. If the results are at variance either with the industry average or with those of the competitors, the firm can seek to identify the probable reasons and, in that light, take remedial measures.

Trend Analysis Finally, ratio analysis enables a firm to take the time dimension into account. In other words, whether the financial position of a firm is improving or deteriorating over the years. This is made possible by the use of trend analysis. The significance of a trend analysis of ratios lies in the fact that the analysts can know the direction of movement, that is, whether the movement is favourable or unfavourable. For example, the ratio may be low as compared to the norm but the trend may be upward. On the other hand, though the present level may be satisfactory but the trend may be a declining one.

Limitations

Ratio analysis is a widely used tool of financial analysis. Yet, it suffers from various limitations. The operational implication of this is that while using ratios, the conclusions should not be taken on their face value. Some of the limitations which characterise ratio analysis are **(i)** difficulty in comparison, **(ii)** impact of inflation, and **(iii)** conceptual diversity.

Difficulty in Comparison One serious limitation of ratio analysis arises out of the difficulty associated with their comparability. One technique that is employed is interfirm comparison. But such comparisons are vitiated by different procedures adopted by various firms. The differences may relate to:

- Differences in the basis of inventory valuation (e.g. last in first out, first in first out, average cost and cost);
- Different depreciation methods (i.e. straight line vs written down basis);
- Estimated working life of assets, particularly of plant and equipment;
- Amortisation of intangible assets like goodwill, patents and so on;
- Amortisation of deferred revenue expenditure such as preliminary expenditure and discount on issue of shares;
- Capitalisation of lease;
- Treatment of extraordinary items of income and expenditure; and so on.

Secondly, apart from different accounting procedures, companies may have different accounting periods, implying differences in the composition of the assets, particularly current assets. For these reasons, the ratios of two firms may not be strictly comparable.

Another basis of comparison is the industry average. This presupposes the availability, on a comprehensive scale, of various ratios for each industry group over a period of time. If, however, as is likely, such information is not compiled and available, the utility of ratio analysis would be limited.

Impact of Inflation The second major limitation of the ratio analysis as a tool of financial analysis is associated with price level changes. This, in fact, is a weakness of the traditional financial statements which are based on historical costs. An implication of this feature of the financial statements as regards ratio analysis is that assets acquired at different periods are, in effect, shown at different prices in the balance sheet, as they are not adjusted for changes in the price level. As a result, ratio analysis will not yield strictly comparable and, therefore, dependable results. To illustrate, there are two firms which have identical rates of returns on investments, say 15 per cent. But one of these had acquired its fixed assets when prices were relatively low, while the other one had purchased them when prices were high. As a result, the book value of the fixed assets of the former type of firm would be lower, while that of the latter higher. From the point of view of profitability, the return on the investment of the firm with a lower book value would be overstated. Obviously, identical rates of returns on investment are not indicative of equal profitability of the two firms. This is a limitation of ratios.

Conceptual Diversity Yet another factor which influences the usefulness of ratios is that there is difference of opinion regarding the various concepts used to compute the ratios. There is always room for diversity of opinion as to what constitutes shareholders' equity, debt, assets, profit and so on. Different firms may use these terms in different senses or the same firm may use them to mean different things at different times.

Reliance on a single ratio for a particular purpose may not be a conclusive indicator. For instance, the current ratio alone is not a adequate measure of short-term financial strength; it should be supplemented by the acid-test ratio, debtors turnover ratio and inventory turnover ratio to have a real insight into the liquidity aspect.

Finally, ratios are only a post-mortem analysis of what has happened between two balance sheet dates. For one thing, the position in the interim period is not revealed by ratio analysis. Moreover, they give no clue about the future.

In brief, ratio analysis suffers from some serious limitations. The analyst should not be carried away by its oversimplified nature, easy computation with a high degree of precision. The reliability and significance attached to ratios will largely depend upon the quality of data on which they are based. They are as good as the data itself. Nevertheless, they are an important tool of financial analysis.

Summary

- Ratio analysis is a widely used tool of financial analysis. It is defined as the systematic use of ratio to interpret the financial statements so that the strengths and weaknesses of a firm, as well as its historical performance and current financial condition, can be determined.

- Ratios make the related information comparable. A single figure by itself has no meaning, but when expressed in terms of a related figure, it yields significant inferences. Thus, ratios are *relative figures* reflecting the relationship between related variables. Their use as tools of financial analysis involves their comparison as single ratios, like absolute figures, are not of much use. Three types of comparisons are generally involved: namely, **(i)** trend analysis, **(ii)** inter firm comparison, and **(iii)** comparison with standards or industry average.
- Trend analysis involves comparison of a firm over a period of time, that is, present ratios are compared with past ratios for the same firm. The comparison of the profitability ratios of a firm, say, year 1 to year 5, is an illustration of a trend analysis. It indicates the direction of change in the performance – improvement, deterioration or constancy – over the years.
- Interfirm comparison involves comparing the ratios of a firm with those of others in the same lines of business or for the industry as a whole. It reflects the firm's performance in relation to its competitors. Other types of comparisons may relate to the comparison of items within a single year's financial statement of firm and comparison with standards or plans.
- Ratios can broadly be classified into six groups: **(i)** liquidity, **(ii)** capital structure or leverage, **(iii)** profitability, **(iv)** activity, **(v)** integrated and **(vi)** growth.
- Liquidity ratios measure the ability of a firm to meet its short-term obligations and reflect its short-term financial strength or solvency. The important liquidity ratios are **(a)** current ratio, and **(b)** quick or acid test ratio.

  Current ratio is the ratio of total current assets (CAs) to total current liabilities (CLs). A satisfactory current ratio would enable a firm to meet its obligations, even if the value of its CAs decline. It is, however, a quantitative index of liquidity as it does not differentiate among the components of CAs, such as cash and inventory which are not equally liquid.

  The quick or acid test ratio takes into consideration the differences in the liquidity of the components of CAs. It represents the ratio between quick CAs and the total CLs. It is a rigorous measure and superior to the current ratio. However, both these ratios should be used as complementary to each other to analyse the liquidity position of a firm.

  The main liquidity ratios are computed as follows: **(i)** Current ratio = Current assets/Current liabilities. **(ii)** Acid test ratio = (Current assets – Stock – Pre-paid expenses)/Current liabilities. **(iii)** Super-quick ratio = (Cash + Marketable securities)/Current liabilities.
- The capital structure or leverage ratios throw light on the long-term solvency of a firm. This is reflected in its ability to assure the long-term creditors with regard to periodic payment of interest and the repayment of loan on maturity, or in pre-determined instalments at due dates. There are two types of such ratios: **(a)** debt-equity or debt-assets, and **(b)** coverage.

  The first type is computed from the balance sheet and reflects the relative contribution or stake of owners and creditors in financing the assets of the firm. In other words, such ratios reflect the safety margin to the long-term creditors.

  The second category of such ratios is based on the income statement, which shows the number of times the fixed obligations are covered by earnings before interest and taxes or cash inflows. In other words, they indicate the extent to which a fall in operating profit or cash inflows is tolerable, in that the ability to repay would not be adversely affected.

  The important leverage ratios are: **(i)** Debt/equity ratios = Total debt (long-term debt + current liabilities)/Shareholders' funds. **(ii)** Debt to total capital ratio = Total debt/Permanent capital (shareholder's funds + long-term debt). **(iii)** Debt to total assets ratio = Total debt/Total assets. **(iv)** Proprietary ratio = Owner's funds/Total assets. **(v)** Capital gearing ratio = (Preference share capital + Debentures + Other borrowed funds)/Equity funds (net worth). **(vi)** Interest coverage ratio (times-interest earned) = Earnings before interest and taxes (EBIT/Interest. **(vii)** Dividend coverage ratio = Earnings after taxes (EAT)/Preference

dividend (D_p). **(viii)** Total coverage ratio $= \dfrac{\text{EBIT + Lease payment}}{\text{Interest lease payment} + \left(\dfrac{D_p}{1-t}\right) + \dfrac{\text{Instalment of principal}}{(1-t)}}$

(ix) Cash flow coverage ratio $= \dfrac{\text{EBIT + Lease payment + Depreciation}}{\text{Interest Lease payment} + \left(\dfrac{D_p}{1-t}\right) + \dfrac{\text{Instalment of principal}}{(1-t)}}$.

(x) Debt service coverage ratio $= \dfrac{\sum_{t=1}^{n} \text{EAT}_t + \text{Depreciation}_t + \text{Interest}_t + \text{Other non} - \text{cash expenses}_t}{\sum_{t=1}^{n} \text{Principal}_t + \text{Interest}_t}$

- The profitability of a firm can be measured by the profitability ratios. Such ratios can be computed either from sales or investment.

  The profitability ratios based on sales are **(a)** profit margin (gross and net), and **(b)** expenses or operating ratios. They indicate the proportion of sales consumed by operating costs and the proportion available to other expenses.

  The profitability ratios related to investments include **(i)** return on assets, **(ii)** return on capital employed, and **(iii)** return on shareholders' equity, including earnings per share, dividend per share, dividend-payout ratio, earning and dividend yield.

  The procedure of calculating profitability ratios based on sales are: **(i)** Gross profit ratio/margin = Gross profit (sales – cost of goods sold)/Net sales. **(ii)** Operating profit ratio/margin = EBIT/Net sales. **(iii)** Net profit ratio/margin = Earnings after taxes (EAT)/Net sales. **(iv)** Cost of goods sold ratio = Cost of goods sold/Net sales. **(v)** Operating expenses ratio = (Administrative expenses + Selling expenses)/Net sales. **(vi)** Administrative expenses ratio = Administrative expenses/Net sales. **(vii)** Selling expenses ratio = Selling expenses/Net sales. **(viii)** Operating ratio = (Cost of goods sold + Operating expenses)/Net sales.

  Ratios related to total investment are calculated as follows: **(i)** Return on total assets = (*EAT* + Interest – Tax advantage on interest)/Average total assets. **(ii)** Return on capital employed = (EAT + Interest – Tax advantage on interest)/Average total capital employed. **(iii)** Return on shareholders' equity = EAT/Average total shareholders' equity. **(iv)** Return on equity funds = (EAT – Preference dividend)/Average ordinary shareholders' equity (net worth). **(v)** Earnings per share (EPS) = Net profit available to equity shareholders' (EAT – D_p)/Number of equity shares outstanding (*N*) **(vi)** Dividends per share (DPS) = Dividend paid to ordinary shareholders/ Number of ordinary shares outstanding (*N*). **(vii)** Earnings yield = EPS/Market price per share. **(viii)** DPS/Market price per share. **(ix)** Dividend payment/payout (D/P) ratio = DPS/EPS. **(x)** Price-earnings (P/E) ratio = Market price of a share/EPS. **(xi)** Book value per share = Ordinary shareholders' equity/Number of equity shares outstanding.
- The activity ratios (also known as efficiency or turnover ratios) are concerned with measuring the efficiency in asset management. The efficiency with which assets are managed/used is reflected in the speed and rapidity with which they are converted into sales. Thus, the activity ratios are a test of relationship between sales/cost of goods sold and assets. Depending upon the type of assets, activity ratios may be **(a)** inventory/stock turnover, **(b)** receivables/debtors turnover, and **(c)** total assets turnover.

  The first of these indicates the number of times inventory is replaced during the year or how quickly the goods are sold. It is a test of efficient inventory management.

The second category of turnover ratios indicates the efficiency of receivables management and shows how quickly trade credit is collected.

The total assets turnover represents the ratio of total assets to sales/cost of goods sold. It reveals the efficiency in managing and utilizing the total assets.

The computation procedure of these ratios is as follows: **(i)** Raw material turnover = Cost of raw materials used/Average raw materials inventory. **(ii)** Work-in-process turnover = Cost of goods manufactured/Average work-in-process inventory. **(iii)** Finished goods inventory turnover = Cost of goods sold/Average finished goods inventory. **(iv)** Debtors turnover ratio = Total credit sales/(Average debtors + Averages bills receivable). **(v)** Average collection period = Months (days) in year/Debtors turnover ratio. **(vi)** Total assets turnover = Cost of goods sold/Average total assets. **(vii)** Fixed assets turnover = Cost of goods sold/Average fixed assets. **(viii)** Current assets turnover = Cost of goods sold/Average current assets. **(ix)** Working capital turnover ratio = Cost of goods sold/Average net working capital. If data about cost of goods sold are not available, sales figures are used in the numerator.

- Integrated ratios provide better insight about financial and economic analysis of a firm. For instance of the rate of return on assets (ROA) can be decomposed in to net profit margin (EAT/Sales) and assets turnover (Sales/Total assets).
- Preparation of common-size financial statements is an extension of ratio analysis. These statements convert absolute sums into more easily understood percentages of some base amount. It is sales in the case of income statement and totals of assets and liabilities in the case of the balance sheet.
- Ratio analysis in view of its several limitations should be considered only as a tool for analysis rather than as an end in itself. The reliability and significance attached to ratios will largely hinge upon the quality of data on which they are based. They are as good or as bad as the data itself. Nevertheless, they are an important tool of financial analysis.

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3. It is, of course, useful in certain situations. In brief, NWC, as a measure of liquidity, is useful for purposes of internal control.
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11. This aspect has been discussed in great detail in Chapter 19.
12. Bryce, M D, *op. cit.*, p 254.
13. For a detailed account please refer to Khan, M Y, *Indian Financial System*, TMH, New Delhi, 2007.
14. Helfert, E A, *Techniques of Financial Analysis*, Richard D Irwin, Homewood Ill. 1972, p 53, Used with the permission of Richard D Irwin, USA.

15. Suggested by Spiller, E A, *op. cit.*, pp 653-54. This figure of profit represents what might have been earned if all assets had been financed by equity capital.
16. Fama, E and K R French, "The Cros-section of Expected Stock Returns, *Journal of Finance* (June, 1992), pp 427-66.
17. Metcalf and Titard, *op. cit.*, p 174.
18. Deduction should not be made in respect of provision for bad and doubtful debts.
19. If the information regarding the cost of goods sold is not available, the figure of sales can be used.

Practical Problems

P.4.1 The Avon Ltd has a capital of Rs 10,00,000; its turnover is 3 times the capital and the net profit margin on sales is 6 per cent. What is the return on investment?

Solution Rate of return on investment
= Margin of profit × Capital/Investment turnover

$$= \frac{\text{Net profit}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Capital}} = 0.06 \times 3 = 18 \text{ per cent}$$

P.4.2 B Raj Ltd sells goods on cash as well as credit (though not on deferred instalment terms). The following particulars are extracted from their books of accounts for the current year-end.

Total gross sales	Rs 1,00,000
Cash sales (included in above)	20,000
Sales returns	7,000
Total debtors at the end	9,000
Bills receivable	2,000
Provision for doubtful debts at the end of the year	1,000
Total creditors at the end	10,000

Calculate the average collection period.

Solution Total net credit sales = Gross sales – Cash sales – Sales returns = Rs 1,00,000 – Rs 20,000 – Rs 7,000 = Rs 73,000

$$\text{Debtors turnover} = \frac{\text{Credit sales}}{\text{Debtors + Bills receivable}} = \frac{\text{Rs } 73{,}000}{\text{Rs } 11{,}000} = \frac{73}{11}$$

$$\text{Average collection period} = \frac{365 \text{ days}}{\text{Debtors turnover } (73/11)} = 55 \text{ days}$$

P.4.3 The following are the ratios relating to the activities of National Traders Ltd:

Debtors velocity (months)	3
Stock velocity (months)	8
Creditors velocity (months)	2
Gross profit ratio (%)	25

Gross profit for the current year ended December 31 amounts to Rs 4,00,000. Closing stock of the year is Rs 10,000 above the opening stock. Bills receivable amount to Rs 25,000 and bills payable to Rs 10,000. Find out: **(a)** Sales, **(b)** Sundry debtors, **(c)** Closing stock, and **(d)** Sundry creditors.

Solution

(a) Determination of sales: $\text{Sales} = \dfrac{\text{Rs } 4{,}00{,}000}{25} \times 100 = \text{Rs } 16{,}00{,}000$

(b) Determination of sundry debtors: Debtors velocity is 3 months. In other words, debtors' collection period is 3 months, or debtors' turnover ratio is 4. Assuming all sales to be credit sales and debtors turnover ratio being calculated on the basis of year-end figures,

$$\text{Debtors turnover ratio} = \frac{\text{Credit sales}}{\text{Closing debtors + Bills receivable}}$$

or

$$\text{Closing debtors + Bills receivable} = \frac{\text{Credit sales}}{\text{Debtors turnover ratio}} = \frac{\text{Rs } 16{,}00{,}000}{4} = \text{Rs } 4{,}00{,}000$$

Closing debtors= Rs 4,00,000 – Rs 25,000 = Rs 3,75,000

(c) Determination of closing stock: Stock velocity of 8 months signifies that the inventory holding period is 8 months, stock turnover ratio is 1.5 = (12 months ÷ 8).

$$\text{Stock turnover} = \frac{\text{Cost of goods sold (Sales} - \text{Gross profit)}}{\text{Average stock}}$$

$$1.5 = \frac{\text{Rs } 12{,}00{,}000}{\text{Average stock}}$$

$$\text{Average stock} = \frac{\text{Rs } 12{,}00{,}000}{1.5} = \text{Rs } 8{,}00{,}000$$

$$\text{Closing stock} - \text{Opening stock} = \text{Rs } 10{,}000 \quad (1)$$

$$\frac{\text{Closing stock + Opening stock}}{2} = \text{Rs } 8{,}00{,}000 \quad (2)$$

$$\text{Closing stock + Opening stock} = \text{Rs } 16{,}00{,}000 \quad (3)$$

or

Subtracting (1) from (3) we have,

$$2 \text{ Opening stock} = \text{Rs } 15{,}90{,}000$$

$$\text{Opening stock} = \text{Rs } 7{,}95{,}000$$

Therefore, $\text{Closing stock} = \text{Rs } 8{,}05{,}000$

(d) Determination of sundry creditors: Creditors velocity of 2 months signifies that the credit payment period is 2 months. In other words, creditors' turnover ratio is 6(12 months ÷ 2). Assuming all purchases to be credit purchases and creditors turnover is based on year-end figures,

$$\text{Creditors turnover ratio} = \frac{\text{Credit purchases}}{\text{Creditors + Bills payable}}$$

$$6 = \frac{\text{Rs } 12{,}10{,}000}{\text{Creditors + Rs } 10{,}000}$$

$$\text{Creditors + Rs } 10{,}000 = \frac{\text{Rs } 12{,}10{,}000}{6} = \text{Rs } 2{,}01{,}667$$

$$\text{Creditors} = \text{Rs } 2{,}01{,}667 - \text{Rs } 10{,}000 = \text{Rs } 1{,}91{,}667$$

Credit purchases are calculated as follows:

Cost of goods sold = Opening stock + Purchases – Closing stock
Rs 12,00,000 = Rs 7,95,000 + Purchases – Rs 8,05,000
Rs 12,00,000 + Rs 10,000 = Purchases
Rs 12,10,000 = Purchases (credit).

P.4.4 From the following details, prepare the balance sheet of ABC Ltd:

Stock turnover	6
Capital turnover ratio	2
Fixed assets turnover ratio	4
Gross profit (%)	20
Debt collection period (months)	2
Creditors payment period (days)	73

The gross profit was Rs 60,000. Closing stock was Rs 5,000 in excess of the opening stock.

Solution

Balance sheet

Liabilities		*Assets*	
Capital	Rs 1,20,000	Closing stock	Rs 42,500
Creditors	49,000	Debtors	50,000
		Fixed assets	60,000
		Cash (balancing figure)	16,500
	1,69,000		1,69,000

Working Notes

1. Gross profit ratio $= \frac{\text{Gross profit}}{\text{Sales}} \times 100$

$$20 = \frac{\text{Rs } 60{,}000}{\text{Sales}} \times 100$$

Sales = Rs 3,00,000

Cost of goods sold = Sales – Gross profit = Rs 3,00,000 – Rs 60,000 = Rs 2,40,000

2. Stock turnover $= \frac{\text{Cost of goods sold}}{\text{Average stock}}$

$$6 = \frac{\text{Rs } 2{,}40{,}000}{\text{Average stock}}$$

$$\text{Average stock} = \frac{\text{Rs } 2{,}40{,}000}{6} = \text{Rs } 40{,}000$$

$$\frac{\text{Opening stock} + \text{Closing stock}}{2} = \text{Rs } 40{,}000$$

Closing stock – Opening stock = Rs 5,000

Solving two equations simultaneously:

Closing stock + Opening stock = Rs 80,000
Closing stock – Opening stock = Rs 5,000

Subtracting equation 2 from equation 3, we have

2 Opening stock = Rs 75,000

Opening stock = Rs 37,500

Therefore, Closing stock = Rs 42,500

3. Capital turnover ratio $= \frac{\text{Cost of Sales}}{\text{Capital}}$

$$2 = \frac{\text{Rs } 2{,}40{,}000}{\text{Capital}}$$

$$\text{Capital} = \text{Rs } 1{,}20{,}000$$

4. Fixed assets turnover ratio $= \frac{\text{Cost of Sales}}{\text{Fixed assets}}$

$$4 = \frac{\text{Rs } 2{,}40{,}000}{\text{Fixed assets}}$$

$$\text{Fixed assets} = \frac{\text{Rs } 2{,}40{,}000}{4} = \text{Rs } 60{,}000$$

5. Debt collection period = 2 months

$$\text{Debtor turnover ratio} = \frac{12 \text{ months}}{\text{Debt collection period}} = \frac{12}{2} = 6$$

Or

$$\text{Debtors turnover ratio} = \frac{\text{Credit sales}}{\text{Average debtors}}$$

Assuming sales to be credit sales and debtors turnover ratio is based on year-end figures, we have:

$$\text{Debtors} = \frac{\text{Rs } 3{,}00{,}000}{6} = \text{Rs } 50{,}000$$

6. Creditors payment period = 73 days

$$\text{Creditors turnover ratio} = \frac{365 \text{ days}}{\text{Creditors payment period}} = \frac{365 \text{ days}}{73 \text{ days}} = 5.$$

Assuming all purchases to be credit purchases, the amount of purchases is determined as follows:

Cost of goods sold = Opening stock + Purchases – Closing stock

Rs 2,40,000 = Rs 37,500 + Purchases – Rs 42,500

Rs 2,40,000 + Rs 42,500 – Rs 37,500 = Purchases

Rs 2,45,000 = Purchases

Assuming creditors turnover ratio is based on the year-end figure, the amount of creditors is as follows:

$$\text{Creditors turnover ratio} = \frac{\text{Credit purchases}}{\text{Closing creditors}}$$

$$5 = \frac{\text{Rs } 2{,}45{,}000}{\text{Closing creditors}}$$

$$\text{Rs } 49{,}000 = \text{Creditors}$$

P.4.5 Alpha Manufacturing Company Ltd has drawn up the following profit and loss account for the year ended March 31.

To Opening stock	Rs 26,000	By Sales	Rs 1,60,000
To Purchases	80,000	By Closing stock	38,000
To Wages	24,000		
To Manufacturing expenses	16,000		
To Gross profit c/d	52,000		
	1,98,000		1,98,000
To Selling and distribution expenses	4,000	By Gross profit b/d	52,000
To Administrative expenses	22,800	By Compensation for acquisition of land	4,800
To Value of furniture lost by fire	800		
To General expenses	1,200		
To Net profit	28,000		
	56,800		56,800

You are required to find out the operating ratio and the ratio of operating net profit to net sales.

Solution

$$\text{Operating ratio} = \frac{\text{Cost of goods sold + Selling and distribution expenses + Administrative expenses + General expenses}}{\text{Sales}} \times 100$$

$$= \frac{\text{Rs } 1{,}08{,}000 + \text{Rs } 4{,}000 + \text{Rs } 22{,}800 + \text{Rs } 1{,}200}{\text{Rs } 1{,}60{,}000} \times 100 = 85 \text{ per cent}$$

Ratio of operating profit to net sales would be 15 per cent = 100 per cent - operating ratio, i.e. 85 per cent.

Alternatively, $\text{Operating ratio} = \frac{\text{Operating profit}}{\text{Sales}} \times 100 = \frac{\text{Rs } 24{,}000}{\text{Rs } 1{,}60{,}000} \times 100 = 15 \text{ per cent}$

Operating profit = Net profit + Non-operating expenses and/or losses – Non-operating incomes and/or profits

= Rs 28,000 + Rs 800 – Rs 4,800 = Rs 24,000

P.4.6 You are presented with the following figures prepared from the audited balance sheet of Fair Dealings Ltd.

Particulars	*Year 1*	*Year 2*	*Year 3*
Assets			
Debtors	Rs 30,000	Rs 50,000	Rs 60,000
Stock	50,000	50,000	70,000
Plant and equipment	12,000	15,000	20,000
Buildings	10,000	10,000	10,000
	1,02,000	1,25,000	1,60,000
Liabilities			
Bank	11,000	26,000	39,000
Trade creditors	25,000	30,000	50,000
Profit and loss A/c	10,000	13,000	15,000
Paid up capital (Rs 10 per shares, Rs 7.50 paid)			

(*Contd.*)

(*Contd.*)

	56,000	56,000	56,000
	1,02,000	1,25,000	1,60,000
Sales	1,00,000	1,50,000	1,50,000
Gross profit	25,000	30,000	25,000
Net profit	5,000	7,000	5,000
Dividend paid	4,000	4,000	3,000

The opening stock at the beginning of year 1 was Rs 4,000. You are required to show in respect of each year the following ratios and comment on the changes in the profitability, liquidity and financial position of the company:

(i) Current ratio,
(ii) Ratio of debtors to turnover,
(iii) Stock turnover rate.

Solution

(i) Current ratio $= \dfrac{\text{Current assets}}{\text{Current liabilities}}$

Year 1 Rs 80,000 ÷ Rs 36,000 = 2.22
Year 2 1,00,000 ÷ 56,000 = 1.80
Year 3 1,30,000 ÷ 89,000 = 1.46

(ii) Ratio of debtors to turnover $= \dfrac{\text{Sales}}{\text{Average debtors}}$

Year 1 Rs 1,00,000 ÷ Rs 30,000 = 3.33
Year 2 1,50,000 ÷ 40,000 = 3.75
Year 3 1,50,000 ÷ 55,000 = 2.73

(**Note:** Since the opening balance of debtors is not given for year 1, the year-end figures are used).

(iii) Stock turnover rate $= \dfrac{\text{Cost of goods sold}}{\text{Average stock}}$

Year 1 Rs 75,000 ÷ Rs 27,000 = 2.78
Year 2 1,20,000 ÷ 50,000 = 2.40
Year 3 1,25,000 ÷ 60,000 = 2.08

In order to comment on the changes in the profitability, liquidity and financial position of the company, we have to compute some additional ratios:

(a) Profitability ratios:

(i) Gross profit ratio $= \dfrac{\text{Gross profit}}{\text{Sales}} \times 100$

Year 1 Rs 25,000 ÷ Rs 1,00,000 = 25 per cent
Year 2 30,000 ÷ 1,50,000 = 20 per cent
Year 3 25,000 ÷ 1,50,000 = 16.7 per cent

(ii) Net profit ratio $= \dfrac{\text{Net profit}}{\text{Sales}} \times 100$

Year 1 Rs 5,000 ÷ Rs 1,00,000 = 5.0 per cent
Year 2 7,000 ÷ 1,50,000 = 4.7 per cent
Year 3 5,000 ÷ 1,50,000 = 3.3 per cent

The profitability ratios show that the profitability of the company has been consistently declining since year 1. The margin of profit on sales has declined from 25 per cent in year 1 to 16.7 per

cent in year 3, the corresponding figures for net profit margin on sales being 5 per cent and 3.3 per cent for year 1 and year 3 respectively.

(b) Liquidity ratios:

$$\text{Acid test ratio} = \frac{\text{Quick assets}}{\text{Current liabilities}}$$

Year 1 Rs 30,000 ÷ Rs 36,000 = 0.83
Year 2 50,000 ÷ 56,000 = 0.90
Year 3 60,000 ÷ 89,000 = 0.67

The liquidity ratios (current ratio and acid test ratio) indicate that considerable deterioration has occurred in the liquidity position of the company. In year 1, the current ratio was 2.22 and the acid-test ratio 0.83. The current ratio was much higher than the standard requirement of 2 and the acid-test ratio was reasonably satisfactory. It was 0.83 compared to the requirement of 1.0. Thus, the company's ability to meet short-term liabilities was adequate in year 1. But, by year 3, both these ratios declined considerably in as much as they went much below the desired standard figures. Clearly, the company's ability to make payments for current liabilities is weak at present. It is also implicit in the increase in bank overdraft to Rs 39,000 from Rs 11,000. The decrease in the liquidity ratios is caused by **(i)** increase in the collection period of debtors to 134 days in year 3 from 110 days in year 1 and **(ii)** increase in the inventory holding period as reflected in the decrease in the inventory turnover figure, the relevant figures for year 1 and year 3 being 131 days and 182 days respectively. The deterioration in liquidity position is also reflected in the increase in the D/E as well as the D/A ratios.

(c) Financial position:

(i) $\text{Debt-equity (D/E) ratio} = \frac{\text{Debt}}{\text{Equity}} \times 100$

Year 1 (Rs 36,000 ÷ Rs 66,000) × 100 = 54.5 per cent
Year 2 (56,000 ÷ 69,000) × 100 = 81.2 per cent
Year 3 (89,000 ÷ 71,000) × 100 =125.4 per cent

(ii) $\text{Debt to asset (D/A) ratio} = \frac{\text{Debt}}{\text{Assets}} \times 100$

Year 1 (Rs 36,000 ÷ Rs 1,02,000) × 100 = 35.0 per cent
Year 2 (56,000 ÷ 1,25,000) × 100 = 44.8 per cent
Year 3 (89,000 ÷ 1,60,000) × 100 = 55.6 per cent

P.4.7 From the ratios and other data set forth below for the Auto Accessories Ltd, indicate your interpretation of the company's financial condition:

Particulars	*Year 3*	*Year 2*	*Year 1*
Current ratio (per cent)	302	278	265
Acid-test ratio	99	110	155
Working capital turnover (times)	3.25	3.00	2.75
Receivable turnover (times)	7.2	8.41	9.83
Collection period (days)	50	43	37
Inventory to working capital (per cent)	110	100	95
Inventory turnover (times)	5.41	6.01	6.11
Income per equity share (Rs)	2.5	4.05	5.10
Net income to net worth (per cent)	7	8.5	11.07
Operating expenses to net sales (per cent)	25	23	22
Sales increase during the year (per cent)	23	16	10
Cost of goods sold to net sales (per cent)	73	71	70
Dividend per share (Rs)	3	3	3
Fixed assets to net worth (per cent)	22.7	18.0	16.4
Net profit on net sales (per cent)	2.0	5.09	7.03

Solution The interpretation of the financial condition of Auto Accessories Ltd, as revealed by the ratios and other data, yields the following inferences:

(i) Declining profitability is evident from the following:

(a) Decrease in gross profit ratio from 30 in year 1 to 27 per cent in year 3, **(b)** decrease in net profit ratio from 7 in year 1 to 2 in year 3 and **(c)** decrease in rate of return on net worth from 11.1 per cent in year 1 to 7 per cent in year 3. This is in spite of increase in sales from 10 per cent in year 1 to 23 per cent in year 3.

In interpreting the profitability of the company, another relevant factor is the expenses ratios. The ratio of cost of goods sold to net sales has gone up from 70 to 73 per cent during the period. Likewise, there has been an increase in operating expenses ratio from 22 to 25 per cent. The high inventories as reflected in lower inventory turnover ratio of 5.41 in year 3 as compared to 6.11 in year 1 have also adversely affected the profit margin.

As a consequence, the EPS has declined by more than 50 per cent during year 1-3 from Rs 5.1 in year 1 to Rs 2.5 in year 3.

(ii) The emerging liquidity position of the company appears to be highly satisfactory. The current ratio has increased from 2.65 in year 1 to 3.02 in year 3. Though, the acid-test ratio has declined from 1.55 1 to 0.99, it meets the standard. The company is unlikely to encounter any serious difficulty in paying the short-term obligations as and when they become due for payment.

However, the management should realise that the policy relating to collection of debt is not sound as reflected in the declining trend of receivables turnover from 9.83 in year 1 to 7.2 in year 3. In other words, the average debt collection period has increased from 37 days to 50 days. There is carelessness either **(i)** in collecting the payments from debtors, or **(ii)** in extending credit sales to customers leading to an increase in bad debts and thereby an increase in the expenses ratio. Further, the inventory holding period requires investigation as the consistent increase in the current ratio and the consistent decrease in the acid-test ratio result from large accumulation of inventories. The excessive investment in current assets seem to be affecting the rate of return.

The investment in fixed assets appears excessive as shown by a consistent increase in the ratio of fixed assets to net worth. However, the overinvestment in fixed assets is not as clear as the overinvestment in working capital.

The stable dividend policy of the company is commendable and is likely to have a salutary effect on the market price of its shares.

In conclusion, the firm's financial position has not become so bad that it cannot be cured. What is required is a thorough probe into overinvestment in working capital, particularly inventories and fixed assets.

P.4.8 While working in a financial institution, you have come across the following statements. Give your views and comments on these statements with the necessary arguments.

(a) 'The sales of company A have been growing at a faster rate than those of company B. The profitability of company A must, therefore, be greater than that of company B.'

(b) 'From the viewpoint of equity shareholders, debt in the capital structure affects both the risk and the profitability of the firm.'

(c) 'Firm X and firm Y have the same expected sales volume for next year and they are identical in every respect except that the firm X has a greater proportion of fixed costs. If sales are expected to increase (decrease), firm X will have greater (lower) profit from operations than firm Y.'

(d) 'Assume Calico has a profit margin of 20 per cent and Mafatlal has a profit margin of 25 per cent. It is, therefore, obvious that Mafatlal is a better investment than Calico.'

(e) 'Firm A is aggressively making capital expenditure and firm B is not. Firm A is clearly more efficient and profitable than firm B.'

Solution **(a)** The profitability of a company is a product of two factors: (i) margin of profit on sales, and (ii) assets turnover. Symbolically, it is equal to $\frac{\text{Net income}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Total assets}}$ *or* Margin of net profit × Assets turnover

Accordingly, the profitability of company A need not necessarily be greater than that of company B. The answer hinges on the margin of profit of company A. If the margin of profit on sales of both the companies is equal, the profitability of company A would certainly be greater than that of B; because of higher sales company A would cause a higher assets turnover *vis-a-vis* company B (assuming the size of total assets of companies A and B is equal). If the margin of profit of company B is greater than that of A, profitability of company B may be even greater than that of company A. For instance, the margin of profit on sales of company A is 2 per cent and that of company B is 4 per cent. Let us assume further the assets turnover of company A is 8 while that of company B is 5. Due to increased sales, the total rate of return would be 16 per cent of company A, while that of Company B would be 20 per cent.

(b) Debt in the capital structure certainly affects both the risk and profitability from the point of view of equity-holders. If the company's earnings rate is greater than the interest rate paid on debt, the company is said to have favourable leverage as it enhances the rate of return available to equityholders. Conversely, if the rate of interest paid on debt exceeds the company's earning rate, the company is said to have unfavourable leverage as it will depress the rate of return available to equity holders. Let us take a simple example to make the point clear:

Total assets	Rs 20,000
Equity capital	10,000
10% Debt	10,000
Net income before interest and taxes	5,000
Tax rate (%)	35

Profit and loss statement

Net income before interest and taxes	Rs 5,000
Less: Interest on debt	1,000
Net income	4,000
Less: Taxes (0.35)	1,400
Net income available to equityholders	2,600
Rate of return on equity capital (per cent)	26

The company is increasing the profitability of equity holders by employing debt in the capital structure. In the absence of debt, the rate of return would have been 16.25 per cent [(Rs 5,000 – Rs 1,750 taxes) ÷ Rs 20,000].

If the net income before interest and taxes is Rs 1,500 only, the use of debt would work against the interest of equityholders, as shown by the following calculations:

Net income before interest and taxes	Rs 1,500
Less: Interest on debt	1,000
Net income	500
Less: Taxes	175
Net income available to equityholders	325
Rate of return on equity capital (per cent)	3.25

In the absence of debt, the rate of return on equity capital would have been 4.9 per cent [Rs 1,500 – Rs 525] ÷ Rs 20,000.

The use of debt in the company's capital structure increases the financial risk of equityholders, as the use of debt increases the variability of the shareholders' returns and probability of insolvency if the firm fails to make the payment of interest and repayment of the principal in time.

(c) The profit of firm X need not necessarily be higher than that of Y. The answer hinges on the margin of safety and amount of fixed costs of firms X and Y. Let us take an example.

	Firms	
Particulars	*X*	*Y*
Sales	Rs 1,00,000	Rs 1,00,000
P/V ratio (%)	50	50
Fixed cost	40,000	20,000
Net profit	10,000	30,000

Net profit X, (Sales, Rs 1,00,000 – Variable cost, Rs 50,000 – Fixed cost, Rs 40,000) = Rs 10,000. Net profit, Y (Sales, Rs 1,00,000 – Variable cost, Rs 50,000 – Fixed cost, Rs 20,000) = Rs 30,000. If sales increase by 20 per cent,

Particulars	*X*	*Y*
Sales	Rs 1,20,000	Rs 1,20,000
Less: Variable cost (1 – P/V ratio)	60,000	60,000
Contribution	60,000	60,000
Less: Fixed costs	40,000	40,000
	20,000	20,000

(d) Mafatlal need not necessarily be a better investment than Calico for the following reasons:

(i) Profitability is also affected by turnover of total assets and not by margin of profit only. The assets turnover of Calico may be greater than Mafatlal's.

(ii) The degree of financial risk in Mafatlal due to the use of debt may be more than that in Calico. Therefore, the required rate of return on equity capital of Mafatlal would be more than that of Calico affecting the market value of their shares.

(iii) Calico may be pursuing a stable dividend policy as against an unstable dividend policy by Mafatlal.

(iv) The future prospects of the two companies may be different.

The above factors taken together determine the quality of investments.

(e) The answer rests on the existing position of firm B and the rate of return earned by company A on capital expenditures. If company A is investing in such proposals which will add to the net present value of the shareholders' wealth, they will certainly add to the efficiency and profitability of firm A. But if the firm B has already made such investments in the past, the company A need not necessarily be more efficient and profitable than firm B.

P.4.9 Towards the end of previous year, the directors of *A* Ltd decided to expand the business. The annual accounts of the company for the previous year and current year are summarised as given:

Particulars	*Previous year*		*Current year*	
Sales: Cash	Rs 30,000		Rs 32,000	
Credit	2,70,000	Rs 3,00,000	3,42,000	Rs 3,74,000
Cost of goods sold		2,36,000		2,98,000
Gross margin		64,000		76,000
Expenses:				
Warehousing		13,000		14,000
Transport		6,000		10,000
Administration		19,000		19,000
Selling		11,000		14,000

(*Contd.*)

(*Contd.*)

Debenture interest		–		2,000
		49,000		59,000
Net profit		15,000		17,000
Fixed assets (*less* depreciation)		30,000		40,000
Current assets:				
Stock	60,000		94,000	
Debtors	50,000		82,000	
Cash	10,000	1,20,000	7,000	1,83,000
Less: Current liabilities (trade creditors)		50,000		76,000
Net current assets		70,000		1,07,000
		1,00,000		1,47,000
Share capital		75,000		75,000
Reserves and undistributed profit		25,000		42,000
Debentures		–		30,000
		1,00,000		1,47,000

You are infromed that, **(a)** all sales were from stocks in the company's warehouse, **(b)** the range of merchandise was not changed and buying prices remained steady throughout the 2 years, **(c)** the stocks as on April 1 previous year was Rs 40,000 and **(d)** the debenture loan was received on April 1 current year and fixed assets were purchased on that date.

You are required to work out the following accounting ratios for both the years.

(i) Gross profit ratio
(ii) Operating expenses to sales
(iii) Operating profit ratio
(iv) Capital turnover ratio
(v) Stock turnover ratio
(vi) Net profit to capital employed ratio and
(vii) Debtors collection period (in days).

Your answer should give the figures calculated to one decimal place, together with possible reasons for changes in the ratios for 2 years. Ratios relating to capital employed should be based on the capital at the end of the year. Ignore taxation.

Solution

(i) Gross profit ratio (gross profit/sales) × 100

Previous year (Rs 64,000/Rs 3,00,000) × 100 = 21.3 per cent

Current year (Rs 76,000/Rs 3,74,000) × 100 = 20.3 per cent

The gross profit ratio has declined by 1 per cent. The possible reasons may be **(i)** decrease in unit selling price, **(ii)** increase in direct expenses other than purchases and value of stock and/or **(iii)** any combination of **(i)** and **(ii)**.

(ii) Operating expenses to sales (OES) ratio

Previous year (Rs 49,000/Rs 3,00,000) × 100 = 16.3 per cent

Current year (Rs 57,000/Rs 3,74,000) × 100 = 15.2 per cent

Operating expenses may not change *pari passu* with sales as such expenses are partly fixed in nature. As a result, the OES ratio has fallen in current year in spite of increase in sales. For instance, administration expenses remained unchanged (at Rs 19,000) resulting in a decline in administration expenses ratio from 6.3 to 5.1 per cent. The warehousing expenses have similarly fallen from 4.3 to 3.7 per cent. These cost savings have been partly offset by increase in transport expenses ratio (from 2 per cent to

2.7 per cent and selling expenses ratio from 3.7 to 3.8 per cent) presumably caused by additional transport expenses and selling expenses due to market expansion and tapping of more distant customers.

(iii) Operating profit ratio (EBIT/sales) × 100

Previous year (Rs 15,000/Rs 3,00,000) × 100 = 5 per cent

Current year (Rs 19,000/Rs 3,74,000) × 100 = 5.1 per cent

The increase in operating profit ratio by 0.1 per cent is the result of **(i)** decrease in operating expenses ratio by 1.1 per cent (increase in profits) and **(ii)** decrease in gross profit ratio by 1 per cent. It implies that there is virtually no gain to the company from increased sales.

(iv) Capital turnover ratio (sales/capital employed)

Previous year (Rs 3,00,000/Rs 1,00,000) = 3 times

Current year (Rs 3,74,000/Rs 1,47,000) = 2.5 times

The reduction in capital turnover ratio signifies that the company is unable to employ the additional funds as profitably as the existing funds. The expected increase in sales does not seem to have materialised.

(v) Stock turnover ratio (cost of goods sold/average stock)

Previous year (Rs 2,36,000/Rs 50,000) = 4.7 times

Current year (Rs 2,98,000/Rs 77,000) = 3.9 times

The increase in sales was less than proportionate increase in stock.

(vi) Net profit to capital employed ratio [(net profit + interest)/capital employed] × 100

Previous year (Rs 15,000/Rs 1,00,000) × 100 = 15 per cent

Current year (Rs 19,000/Rs 1,47,000) × 100 = 12.9 per cent

The company seems to have failed to maintain the earning rate on the funds employed.

(vii) Debtors' collection period (debtors/average credit sales per day)

Previous year (Rs 50,000/Rs 739.7) = 68 days

Current year (Rs 82,000/Rs 937) = 88 days

The increase in debtors' collection period implies relaxation in credit terms to promote sales, in particular, to penetrate new market/customers.

To sum up, the expansion of the business does not seem to have yielded the anticipated benefits.

Mini Case

4.C.1 You have been supplied data for the Supreme Plastic Company Ltd, and its industry averages:

1. Determine the indicated ratios for the Supreme Plastic Company.
2. Indicate the company's strengths and weaknesses as shown by your analysis.

Balance sheet as at March 31

Liabilities	*Amount*	*Assets*	*Amount*
Equity share capital	Rs 12,00,000	Net fixed assets	Rs 6,05,000
10% Debentures	2,30,000	Cash	2,20,000
Sundry creditors	1,65,000	Sundry debtors	2,75,000
Bills payable	2,20,000	Stock	8,25,000
Other current liabilities	1,10,000		
	19,25,000		19,25,000

Statement of profit for the year ending March 31, current year

Sales	Rs 27,50,000	
Less: Cost of goods sold:		
Materials	Rs 10,45,000	
Wages	6,60,000	
Factory overheads	3,24,500	20,29,500
Gross profit		7,20,500
Less: Selling and distribution expenses		2,75,000
Less: Administrative and general expenses		3,07,000
Earnings before interest and taxes		1,38,500
Less: Interest		23,000
Earnings before taxes		1,15,500
Less: Income taxes (0.35)		40,425
Net profit		75,075

Ratios

Ratios	*Industry*	*Supreme Plastic*
Current assets/current liabilities	2.4	
Sales/debtors	8.0	
Sales/stock	9.8	
Sales/total assets	2.0	
Net profit/sales (per cent)	3.3	
Net profit/total assets (per cent)	6.6	
Net profit/net worth (per cent)	12.7	
Total debt/total assets (per cent)	63.5	

Solution

(1) Determination of ratios

Ratios	*Computation*	*Indicated result*	*Industry*
Current assets / Current liabilities	Rs 12,20,000 / Rs 4,95,000	2.7	2.4
Sales / Debtors	27,50,000 / 2,75,000	10.0	8.0
Sales / Stock	27,50,000 / 8,25,000	3.3	9.8
Sales / Total assets	27,50,000 / 19,25,000	1.4	2.0
Net profit / Sales (per cent)	75,075 / 27,50,000	2.7	3.3

(*Contd.*)

(*Contd.*)

Net profit / Total assets (per cent)	75,075 / 19,25,000	3.9	6.6
Net profit / Equity share capital	75,075 / 12,00,000	6.3	12.7
Total debt / Total assets	7,25,000 / 19,25,000	37.7	63.5

2. The level of stock maintained by Supreme Plastics is alarmingly high in that it is almost three times the industry average. The other turnover ratios are in conformity with that of the industry. In fact, current ratios and debtors turnover reflecting debt collection period of the company are better than those of the industry.

The greatest weakness of the company is the high level of inventories. It has caused a steep decline in the total assets turnover. The cost of carrying stocks is likely to adversely affect the profit margin. As a result of its low turnover and profit margin, the company's rate of return on net worth is less than one-half of the industry. The rate of return on equity capital of the company is also low because the company is using relatively less debt, i.e. 37.7 per cent as against the industry average of 63.5 per cent.

Review Questions

RQ.4.1 (a) Indicate whether the following statements are true or false:

(i) Current ratio and acid-test ratio of a business firm are virtually the same; this implies that the firm has low investment in inventory.

(ii) A company's current ratio is 2.0. If it uses cash to pay creditors, this transaction would cause a decrease in current ratio.

(iii) Solvency ratios measure the firm's ability to cater to the obligations arising out of long-term debt.

(iv) Equity funds are greater than equity capital in a loss-incurring firm.

(v) In general, low turnover ratios are desirable.

(vi) Earnings yield is determined dividing EPS by acquisition price per equity share.

(vii) Return on equity funds is determined by dividing EAT by average net worth.

(viii) It is conceptually correct to determine stock turnover ratio (finished goods) by dividing cost of goods sold by average stock.

[Answers: (i) True, (ii) False, (iii) True, (iv) False, (v) False, (vi) False, (vii) False, (viii) True]

(b) Fill in the blanks with the correct answer (out of the choices provided).

(i) An analyst applied the DuPont System to the following data of a company: (a) equity turnover 4.2, (b) net profit margin 5.5%, (c) total assets turnover 2.0 and (d) dividend payout ratio 30%; the company's rate of return on equity _____ is (11%/23.1%).

(ii) Four-times stock turnover ratio implies _____ months inventory holding period (3/4).

(iii) The following information is given about a company: (a) current assets Rs 900 lakh and current liabilities Rs 450 lakh in current year and (b) current assets Rs 1,100 lakh

and current liabilities Rs 530 in previous year. The approximate percentage decrease in current ratio is _____ (0.04%/4.0%) .

(iv) Presently, current assets and current liabilities of a company are Rs 16 lakh and Rs 8 lakh respectively. The current ratio will _____ (increase/decrease) on purchase of new machinery of Rs 6 lakh.

(v) Purchase of treasury bills will (weaken/not affect) acid-test ratio.

(vi) Assume that the company's existing debt-equity ratio is 2:1, the ploughing back of profits by a company will _____ (increase/decrease) it.

(vii) A two-months debtor collection period implies that debtors turnover ratio is _____ (6 times/2 times).

(viii) _____ is a more rigorous test of the solvency position of a business firm. (Interest coverage ratio/Debt service coverage ratio).

(ix) ROR on shareholders' equity is computed dividing EAT by _____ (share capital/ shareholders' funds).

(x) Issue of 12% preference shares will _____ debt-equity ratio of a corporate enterprise. (decrease/increase)

[Answers: (i) 23.1%, (ii) 3, (iii) 4.0%, (iv) decrease, (v) not affect, (vi) decrease, (vii) 6 times, (viii) debt service coverage ratio, (ix) shareholders' funds, (x) decrease]

RQ.4.2 There are four groups of financial ratios; liquidity, leverage, activity, and profitability. Financial analysis is conducted by four types of analysts: management, equity investors, long-term creditors and short-term creditors. You are required to (a) explain each type of ratio, (b) explain the emphasis of each type of analyst, (c) state if the same basic approach to financial analysis should be taken by each group of analysts.

RQ.4.3 What is the importance of ratio analysis? Briefly discuss the importance of the following accounting ratios:
(a) Liquidity ratio, (b) Debt-equity ratio, (c) Stock-turnover rate, and (d) Ratio of debtors to turnover.

RQ.4.4 What procedure would you adopt to study the liquidity of a business firm?

RQ.4.5 How would you analyse the financial position of a company from the point of view of (a) an investor, (b) a creditor, and (c) a financial executive of the company?

RQ.4.6 Discuss the importance of ratio analysis for interfirm and intrafirm comparisons, including circumstances responsible for its limitations. If any.

RQ.4.7 Distinguish between percentage analysis and ratio analysis relating to the interpretation of financial statements. What is the value of these two types of analysis?

RQ.4.8 How does the acid-test ratio differ from the current ratio? How are they similar? What is the usefulness of the defensive interval ratio?

RQ.4.9 What is the relationship of the assets turnover rate to the rate of return on total assets?

RQ.4.10 Two companies have the same amount of working capital. The current debt paying ability of one company is much weaker than that of the other. Explain how this could occur.

RQ.4.11 (a) Discuss some inherent limitations of single-year financial statements for purposes of analysis and interpretation.
(b) To what extent are these limitations overcome by the use of comparative statements?

RQ.4.12 What is indicated when the average age of accounts receivable for a firm is 45 days, but credit terms require customers to pay accounts within 30 days?

RQ.4.13 What are the limitations of financial ratios as a technique for appraising the financial position of a company?

RQ.4.14 'A uniform system of accounts, including identical forms for balance sheets and income statements is a prerequisite of inter firm comparisons.' Elucidate.

Examination Questions

Theory Questions

4.1 Explain 'trading on equity' with illustration.
(*Calcutta University, 2010, 2007, 2006 and Bangalore University, 2010*)

4.2 Write short note on limitations of ratio analysis. (*Pune University, 2010*)

4.3 Differentiate between debt-equity ratio and return on investment. (*Pune University, 2010*)

4.4 (a) Explain various elements of current assets and current liabilities.
(b) Explain the uses of comparative statement of analysis (*Mumbai University, 2009*)

4.5 Write short note on trend analysis. (*Mumbai University, 2009*)

4.6 Explain in detail the importance of ratio analysis. (*Mumbai University, 2009*)

4.7 Explain in detail the merits and limitations of the following: (a) Trading on equity and (b) Ratio analysis. (*Pune University, 2009*)

4.8 Explain the significance of net profit ratio and debt equity ratio. (*Pune University, 2007*)

4.9 Write short note on debt equity ratio. (*Pune University, 2007*)

4.10 Write a short note on trading on equity. (*Punjab University, 2007*)

4.11 Ratio analysis is only a technique for making judgements and not a substitute for it. Comment.
(Mumbai University, November 2003)

4.12 Explain the methods of financial statement analysis. (Bharatiyar University, April 2003)

4.13 (a) What are liquidity ratios and what is their significance?
(b) What are common-size statements? *(Mumbai University, November 2002)*

4.14 What is common-size balance sheet and income-statement? Explain the procedure of preparing common size balance sheet. *(Bharatiyar University, April 2001)*

4.15 (a) What is a common size statement? Give an example.
(b) What is meant by financial statement analysis? Who are the users of financial statement analysis?
(Bharatiyar University, November 2001)

4.16 Choose the best answer:

1. High level of current assets
(a) Increase profitability and liquidity.
(b) Decrease profitability and liquidity.
(c) Increase liquidity but decreases profitability.
(d) Decrease liquidity but increase profitability.

2. Sales is Rs 90,000 and gross profit ratio is 33.33% what is the cost of goods sold?
(a) Rs 70,000 (b) Rs 60,000 (c) Rs 80,000 (d) Rs 30,000

3. Bills payable is a
(a) Long-term liability (b) Current liability
(c) Contingent liability (d) None of the above.
(Bharatiyar University, April 2001)

4. A high debt-equity ratio
(a) Increases only risk (b) Increases only return
(c) Increases risk as well as return (d) None of the above.

5. Return on investment depends upon
(a) Profit margin on sales only (b) Turnover of capital employed only
(c) Turnover of capital employed only (d) Both (a) and (b) given above
(e) None of the above
(Bharatiyar University, November 2001)

6. Identify one which is not a fixed asset.
(a) Furniture (b) Building (c) Debtors (d) Plant

7. Gross working capital represents
(a) Total current assets (b) Total current liabilities
(c) Net current assets (d) None of the above.

8. Debt-equity ratio is
(a) Liquidity ratio (b) Profitability ratio
(c) Solvency ratio (d) None of the above.

9. "A higher account receivable turnover ratio" means
(a) Lower debt collection period (b) Higher debt collection period
(c) Lower sales (d) None of the above.

(Bharatiyar University, April 2003)

Numerical Questions

4.1 From the following details, prepare balance sheet with as much details as possible:

(a) Stock velocity = 6
(b) Capital turnover ratio = 2
(c) Fixed assets turnover ratio = 3
(d) Gross profit turnover ratio = 20 per cent
(e) Debtors velocity = 3 months
(f) Creditors velocity = 73 days

The gross profit was Rs 5,00,000; reserves and surplus Rs 2,00,000; closing stock was Rs 20,000 in excess of opening stock. (*Adapted Pune University, 2010*)

Solution

Balance Sheet

Liabilities	*Amount*	*Assets*	*Amount*
Capital	Rs 8,50,000	Closing stock	Rs 3,60,000
Reserves and surplus	2,00,000	Debtors	6,25,000
Creditors	4,24,000	Fixed assets	7,00,000
Other current liabilities including bank overdraft (balancing figure)	2,11,000		
	16,85,000		16,85,000

Working Notes

1. Gross profit ratio = (Gross profit/Sales) × 100
20 = (Rs 5 lakh/sales) × 100
20 sales = Rs 5,00,00,000 or Sales = Rs 5 crore/20 = Rs 25 lakh
Cost of goods sold = Sales – Gross profit = Rs 25 lakh – Rs 4,00,000 = Rs 21 lakh

2. Stock turnover = Cost of goods sold/Average stock
6 = Rs 21,00,000/Average stock
Average stock = Rs 21,00,000/6 = Rs 3,50,000
(Opening stock + closing stock)/2 = Rs 3,50,000
Or Closing stock + Opening stock = Rs 7,00,000 (i)
Closing stock – Opening stock = Rs 20,000 (ii)
Subtracting equation (ii) and (i)
2 Opening stock = Rs 6,80,000

Or Opening stock = Rs 6,80,000/2 = Rs 3,40,000
Therefore, closing stock = Rs 3,40,000 + Rs 20,000 = Rs 3,60,000

3. Capital turnover ratio = Cost of sales/Capital fund

2 = Rs 21 lakh/capital fund or capital fund = Rs 21 lakh/2 = Rs 10.5 lakh
Capital = Rs 10.5 lakh – Rs 2,00,000 Reserves and surplus = Rs 8.5 lakh

4. Fixed assets turnover ratio = Cost of sales/Fixed assets

3 = Rs 21 lakh/Fixed assets
3 Fixed assets = Rs 21 lakh
Fixed assets = Rs 21 lakh/3 = Rs 7 lakh

5. Debtors collection period = 3 months or Debtors turnover ratio is 12 months/3 months = 4

Debtors turnover = Credit sales/Average debtors (It is assumed that all sales are credit sales and debtors turnover/velocity is based on year-end figure)

4 = Rs 25 lakh/Debtors
Debtors = Rs 25 lakh/4 = Rs 6,25,000

6. Credit velocity/payment period = 73 days or

Creditors turnover ratio is 365 days/73 = 5
Creditors turnover = Credit purchases/Average creditors
Assuming all purchases to be credit purchases, the amount of purchases is determined as follows:

Cost of goods sold = Opening stock + Purchases – Closing stock
Rs 21 lakh – Rs 3.4 lakh + Rs 3.6 lakh = Purchases
Rs 21.2 lakh = Purchases

Assuming creditors turnover ratio is based on the year-end figure, the amount of creditors is as follows:

5 = Rs 21.2 lakh/closing creditors
Closing creditors = Rs 21.2 lakh/5 = Rs 4,24,000

4.2 Given below are balance sheets of India Trading Co. Limited as at 31.12.06 and 13.12.07

	31.12.06	*31.12.07*
Assets:		
Cash	Rs 20,000	Rs 30,000
Debtors	45,000	35,000
Inventory	75,000	70,000
Net fixed assets	2,00,000	2,25,000
	3,40,000	3,60,000
Liabilities:		
Paid-up capital	1,30,000	1,30,000
Reserves and surplus	70,000	80,000
10% Debentures	1,00,000	1,00,000
Creditors	30,000	35,000
Bills payable	10,000	15,000
	3,40,000	3,60,000

You are required to rearrange the above statement in a form suitable for financial analysis and compute the following ratios: **(i)** Current ratio, **(ii)** Proprietary ratio, **(iii)** Liquid ratio, **(iv)** Debt-equity ratio, **(v)** Fixed asset to net worth ratio and **(vi)** Stock to net working capital ratio. (*Mumbai University, 2009*)

Solution

Balance sheet (Report form) of India Trading Co. Limited as at 31.12.206 and 31.12.2007

Particulars	*31.12.06*	*31.12.07*
Assets, liabilities and owner's equity:		
Fixed assets:		
Net fixed assets	Rs 2,00,000	Rs 2,25,000
Current assets:		
Cash	20,000	30,000
Debtors	45,000	35,000
Inventory	75,000	70,000
Total current assets	1,40,000	1,35,000
Less current liabilities:		
Creditors	30,000	35,000
Bills payable	10,000	15,000
Net current assets/Net working capital	1,00,000	85,000
Total net assets	3,00,000	3,10,000
Financed by		
Shareholders' equity:		
Paid-up capital	1,30,000	1,30,000
Reserves and surplus	70,000	80,000
	2,00,000	2,10,000
Long-term/Non-current liabilities:		
10% Debentures	1,00,000	1,00,000
Total obligations	3,00,000	3,10,000

Computation of ratios:

(i) Current ratio = (CA/CL)

2006: (Rs 1,40,000/Rs 1,00,000) = 1.40:1
2007: (Rs 1,35,000/Rs 85,000 = 1.59:1

(ii) Proprietary ratio = [Proprietor/owner's funds/Total assets] × 100

2006: (Rs 2,00,000/Rs 3,40,000) × 100 = 58.82%
2007: (Rs 2,10,000/Rs 3,60,000) × 100 = 58.33%

(iii) Liquid ratio = (Liquid assets/current liabilities)

2006: (Rs 65,000/Rs 1,00,000) = 0.65:1
2007: (Rs 65,000/Rs 85,000) = 0.76:1

(iv) (a) Debt-equity ratio (Based on long-term debt)

2006: (Rs 1,00,000/Rs 3,40,000) = 0.29:1
2007: (Rs 1,00,000/Rs 3,60,000) = 0.28:1

(b) Based on total external obligations

2006: (Rs 1,40,000/Rs 3,40,000) = 0.41:1
2007: (Rs 1,50,000/Rs 3,60,000) = 0.42:1

(v) Fixed assets to net worth ratio = (Net fixed assets/Net worth) × 100

2006: (Rs 2,00,000/Rs 3,40,000) × 100 = 58.82%
2007: (Rs 2,25,000/Rs 3,60,000) × 100 = 62.50%

(vi) Stock to net working capital ratio = (Stock/Net working capital0 × 100

2006: (Rs 75,000/Rs 1,00,000) × 100 = 75%
2007: (Rs 70,000/Rs 85,000) × 100 = 82.35%

4.3 From the given information calculate: (a) Debtors turnover and (b) Average collection period

Particulars	*31st March 2007*	*31st March 2008*
Debtors opening balance	Rs 70,000	Rs 80,000
Debtors closing balance	90,000	1,00,000
Credit sales	6,00,000	7,00,000

Consider 360 days a year. (*Pune University, 2008*)

Solution

(i) Debtors turnover = Credit sales/Average debtors

2007: (Rs 6,00,000)/(Rs 70,000 + Rs 90,000) ÷ 2 = Rs 80,000 = 7.5
2008: (Rs 7,00,000)/(Rs 80,000 + Rs 1,00,000) ÷ 2 = Rs 90,000 = 70/9

(ii) Average collection period = 360 days/Debtors turnover

2007: 360 days/7.5 = 48 days
2008: (360 days × 9)/70 = 46.29 days

4.4 Following is the balance sheet of a limited company as on 31st March, 2008:

Liabilities		*Assets*	
Share capital	Rs 2,00,000	Land and building	Rs 1,40,000
Reserves & surplus	70,000	Plant & machinery	3,50,000
12% Debentures	4,20,000	Stock in trade	2,00,000
Creditors	1,00,000	Debtors	1,00,000
Bills payable	50,000	Bills receivables	10,000
		Bank balance	40,000
Total	8,40,000	Total	8,40,000

The sales of the company were Rs 4,00,000. The gross profit was Rs 25,000 and net profit was Rs 20,000.
Calculate: Current ratio, Quick ratio, Debt equity ratio, Gross profit ratio and Net profit ratio.
(*Pune University, 2008*)

Solution

(i) Current ratio: Current assets/current liabilities
Current assets: Rs 2,00,000 stock + Rs 1,00,000 Debtors + Rs 10,000 B/R and Rs 40,000 Bank balance = Rs 3,50,000
Current liabilities: Rs 1,00,000 creditors + Rs 50,000 B/P = Rs 1,50,000
CR = Rs 3,50,000/Rs 1,50,000 = 2.33:1

(ii) Quick ratio: (Current assets – stocks)/Current liabilities
(Rs 3,50,000 – Rs 2,00,000 = Rs 1,50,000)/ Rs 1,50,000 = 1:1

(iii) Debt-equity ratio:
(a) (Based on total external obligation including CL): (Rs 1,50,000 CL + Debentures Rs 4,20,000 = Rs 5,70,000)/Equity funds (Rs 2,00,000 + 70,000 = Rs 2,70,000) = 2.11:1
(b) Based on long-term debt only: (Rs 4,20,000/Rs 2,70,000) = 1.56:1

(iv) Gross profit ratio: (Gross profit/Sales) × 100 = (Rs 25,000/Rs 4,00,000) × 100 = 6.25 per cent

(v) Net profit ratio: (Net profit/Sales) × 100 = (Rs 20,000/Rs 4,00,000) × 100 = 5 per cent

4.5 Following information is given for two companies A Ltd. and B Limited

Current ratio	1.25	1.01
Acid-test ratio	0.96	0.69
Gross profit ratio (%)	26.7	33.3
Debt equity ratio	0	0.33
Net profit ratio (%)	15	10

Analyse the financial position of the two companies. (*Pune University, 2007*)

Solution

Financial analysis:

1. **Liquidity:** Both companies, in general, have unsatisfactory liquidity position. Between the two, A's is better than B's as its liquid (acid-ratio) ratio is close to 1 (0.96). The current ratio of just 1.01 of company A is indicative of the fact that it is likely to face problems in paying current liabilities on due dates.
2. **Solvency:** As far as solvency ratios are concerned, Firm A does not use debt at all (and therefore deprives its owners of trading on equity). Firm B has satisfactory D/E ratio; the fact that its profitability ratios are positive, it is not likely to default on payment of interest.
3. **Profit margin:** Firm B has higher gross profit margin than Firm A, implying lower costs of production/purchases of Firm B. In contrast, low net profit ratio of Firm B compared to Firm A may primarily be due to interest component.

4.6 Debtors are 5 times of inventory of finished goods. The W.I.P. is Rs 1,00,000. Stock of raw materials is Rs 30,000 which is half of inventory of finished goods. Current liabilities are Rs 1,00,000. Compute: **(i)** Amount of working capital and **(ii)** Current ratio. (*Pune University, 2006*)

Solution

Statement showing computation of working capital and current ratio

(A) Current assets:		
Stock of raw materials	Rs 30,000	
Work-in process	1,00,000	
Finished goods (3 times of stock of raw material)	60,000	
Debtors (5 times of finished goods)	3,00,000	
Gross working capital (Total current assets)	4,90,000	
(B) Current liabilities	1,00,000	
(C) Net working capital (A – B)	3,90,000	
(D) Current ratio (CA/CL)		4.9:1

PART 3

LONG-TERM INVESTMENT DECISION

It has been argued in Chapter 1 that financial management focuses not only on the procurement of funds but also on their efficient use with the objective of maximising the owner's wealth. The allocation of funds is, therefore, an important function of financial management. The allocation of funds involves the commitment of funds to assets and activities. It is also referred to as the investment decision, that is, making a choice regarding the assets in which funds will be invested. These assets fall into two broad categories: (i) short-term or current assets, and (ii) long-term or fixed assets. Accordingly, there are two types of investment decisions. The first is the short-term investment decision. It is also known as management of current assets or working capital management. The second type of decision is the long-term investment decision. This is widely known as capital budgeting or the capital expenditure decision. The various dimensions of working capital management are covered in detail in Part IV of this volume. This part is devoted to an in-depth and comprehensive discussion of capital budgeting/capital expenditure management decisions. Chapter 5 is concerned with the general principles of capital budgeting and evaluation techniques. Additional aspects of capital budgeting, namely, comparison of NPV and IRR, projects with unequal lives and capital rationing are described in Chapter 6. Cost of capital and the analysis of risk and uncertainty are examined respectively in Chapters 7 and 8.

Chapter

5

Capital Budgeting I: Principles and Techniques

Learning Objectives

1. Understand the basic nature of capital budgeting, the importance of, and the difficulties associated with, capital budgeting decisions and the various types of such decisions
2. Discuss the major components of relevant cash flows, effect of taxes, depreciation, working capital on cash flow patterns/estimates
3. Calculate the relevant cash flows in single proposals, replacement situations and mutually exclusive projects
4. Compute, interpret and evaluate the accounting rate of return (ARR) and the widely-used traditional capital budgeting technique—the pay back period
5. Apply the sophisticated capital budgeting techniques—net present value (NPV) and internal rate of return (IRR)—to relevant cashflows to choose acceptable as well as preferred capital projects
6. Compute and illustrate terminal value (TV) method and profitability index (PI) as capital budgeting evaluation techniques

INTRODUCTION

This Chapter is devoted to a discussion of the principles and techniques of capital budgeting. Section 1 discusses the nature of capital budgeting in terms of meaning, importance, difficulties, rationale and types. The identification of relevant data for capital budgeting decisions is explained in Section 2. Section 3 of the chapter examines the evaluation techniques. It also outlines the capital budgeting practices in India. The last Section summarises the main points.

SECTION I NATURE OF CAPITAL BUDGETING

Meaning

Capital budgeting decisions pertain to fixed/long-term assets which by definition refer to assets which are in operation, and yield a return, over a period of time, usually, exceeding

Capital budgeting is the process of evaluating and selecting long-term investments that are consistent with the goal of shareholders (owners) wealth maximisation.

Capital expenditure is an outlay of funds that is expected to produce benefits over a period of time exceeding one year.

one year. They, therefore, involve a current outlay or series of outlays of cash resources in return for an anticipated flow of future benefits.[1] In other words, the system of capital budgeting is employed to evaluate expenditure decisions which involve current outlays but are likely to produce benefits over a period of time longer than one year. These benefits may be either in the form of increased revenues or reduced costs. **Capital expenditure** management, therefore, includes addition, disposition, modification and replacement of fixed assets. From the preceding discussion may be deduced the following basic features of capital budgeting[2]: **(i)** potentially large anticipated benefits; **(ii)** a relatively high degree of risk; and **(iii)** a relatively long time period between the initial outlay and the anticipated returns. The term capital budgeting is used interchangeably with capital expenditure decision, capital expenditure management, long-term investment decision, management of fixed assets and so on.

Importance

Capital budgeting decisions are of paramount importance in financial decision making. In the first place, such decisions affect the profitability of a firm. They also have a bearing on the competitive position of the enterprise mainly because of the fact that they relate to fixed assets. The fixed assets represent, in a sense, the true earning assets of the firm. They enable the firm to generate finished goods that can ultimately be sold for profit. The current assets are not generally earning assets. Rather, they provide a buffer that allows the firms to make sales and extend credit. True, current assets are important to operations, but without fixed assets to generate finished products that can be converted into current assets, the firm would not be able to operate. Further, they are 'strategic' investment decisions as against 'tactical'—which involve a relatively small amount of funds. Therefore, such capital investment decisions may result in a major departure from what the company has been doing in the past. Acceptance of a strategic investment will involve a significant change in the company's expected profits and in the risks to which these profits will be subject. These changes are likely to lead stockholders and creditors to revise their evaluation of the company.[3] Thus, capital budgeting decisions determine the future destiny of the company. An opportune investment decision can yield spectacular returns. On the other hand, an ill-advised and incorrect decision can endanger the very survival even of the large firms. A few wrong decisions and the firm may be forced into bankruptcy.

Secondly, a capital expenditure decision has its effect over a long time span and inevitably affects the company's future cost structure. To illustrate, if a particular plant has been purchased by a company to start a new product, the company commits itself to a sizable amount of fixed costs, in terms of labour, supervisors' salary, insurance, rent of building, and so on. If the investment turns out to be unsuccessful in future or yields less profit than anticipated, the firm will have to bear the burden of fixed costs unless it writes off the investment completely. In short, future costs, break-even point, sales and profits will all be determined by the selection of assets.

Thirdly, capital investment decisions, once made, are not easily reversible without much financial loss to the firm because there may be no market for second-hand plant and equipment and their conversion to other uses may not be financially viable.

Finally, capital investment involves costs and the majority of the firms have scarce capital resources. This underlines the need for thoughtful, wise and correct investment decisions, as an incorrect decision would not only result in losses but also prevent the firm from earning profits from other investments which could not be undertaken for want of funds.

Difficulties

Capital expenditure decisions are of considerable significance as the future success and growth of the firm depends heavily on them. But, they are beset with a number of difficulties.

Firstly, the benefits from investments are received in some future period. The future is uncertain. Therefore, an element of risk is involved. For instance, a decision to acquire an asset that is going to last for 15 years requires a 15-year forecast. A failure to forecast correctly will lead to serious errors which can be corrected only at a considerable expense. Future revenue involves estimating the size of the market for a product and the expected share of the firm in that. These estimates depend on a variety of factors, including price, advertising and promotion, and sales effort and so on. Adding to the uncertainties are the possibilities of shifts in consumer preferences, the actions of competitors, technological developments and changes in the economic or political environment.

Secondly, costs incurred and benefits received from the capital budgeting decisions occur in different time periods. They are not logically comparable because of the time value of money.

Thirdly, it is not often possible to calculate in strict quantitative terms all the benefits or the costs relating to a particular investment decision.

Rationale

The rationale underlying the capital budgeting decision is efficiency. Thus, a firm must replace worn and obsolete plants and machinery, acquire fixed assets for current and new products and make strategic investment decisions. This will enable the firm to achieve its objective of maximising profits either by way of increased revenues or cost reductions. The quality of these decisions is improved by capital budgeting. Capital budgeting decision can be of two types: **(i)** those which expand revenues, and **(ii)** those which reduce costs.

Investment Decisions Affecting Revenues Such investment decisions are expected to bring in additional revenue, thereby raising the size of the firm's total revenue. They can be the result of either expansion of present operations or the development of new product lines. Both types of investment decisions involve acquisition of new fixed assets and are income-expansionary in nature in the case of manufacturing firms.

Investment Decisions Reducing Costs Such decisions, by reducing costs, add to the total earnings of the firm. A classic example of such investment decisions are the replacement proposals when an asset wears out or becomes outdated. The firm must decide whether to continue with the existing assets or replace them. The firm evaluates the benefits from the new machine in terms of lower operating cost and the outlay that would be needed to replace the machine. An expenditure on a new machine may be quite justifiable in the light of the total cost savings that result.

A fundamental difference between the above two categories of investment decision lies in the fact that cost-reduction investment decisions are subject to less uncertainty in comparison to the revenue-affecting investment decisions. This is so because the firm has a better 'feel' for potential cost savings as it can examine past production and cost data. However, it is difficult to precisely estimate the revenues and costs resulting from a new product line, particularly when the firm knows relatively little about the same.

Capital budgeting process includes four distinct but interrelated steps used to evaluate and select long-term proposals: proposal generation, evaluation, selection and follow up.

Accept reject decision is the evaluation of capital expenditure proposal to determine whether they meet the minimum acceptance criterion.

Mutually exclusive projects (decisions) are projects that compete with one another; the acceptance of one eliminates the others from further consideration.

Kinds

Capital budgeting process refers to the total process of generating, evaluating, selecting and following up on capital expenditure alternatives.[4] The firm allocates or budgets financial resources to new investment proposals. Basically, the firm may be confronted with three types of capital budgeting decisions: **(i)** the accept-reject decision; **(ii)** the mutually exclusive choice decision; and **(iii)** the capital rationing decision.

Accept-reject Decision This is a fundamental decision in capital budgeting. If the project is accepted, the firm would invest in it; if the proposal is rejected, the firm does not invest in it. In general, all those proposals which yield a rate of return greater than a certain required rate of return or cost of capital are accepted and the rest are rejected. By applying this criterion, all **independent projects** are accepted. Independent projects are projects that do not compete with one another in such a way that the acceptance of one precludes the possibility of acceptance of another. Under the accept-reject decision, all independent projects that satisfy the minimum investment criterion should be implemented.

Independent projects are projects whose cash flows are unrelated/ independent of one another; the acceptance of one does not eliminate the others from further consideration.

Mutually Exclusive Project Decisions **Mutually exclusive projects** are those which compete with other projects in such a way that the acceptance of one will exclude the acceptance of the other projects. The alternatives are mutually exclusive and only one may be chosen. Suppose, a company is intending to buy a new folding machine. There are three competing brands, each with a different initial investment and operating costs. The three machines represent mutually exclusive alternatives, as only one of these can be selected. It may be noted here that the mutually exclusive project decisions are not independent of the accept-reject decisions. The project(s) should also be acceptable under the latter decision. In brief, in our example, if all the machines are rejected under the accept-reject decision, the firm should not buy a new machine. Mutually exclusive investment decisions acquire significance when more than one proposal is acceptable under the accept-reject decision. Then, some technique has to be used to determine the 'best' one. The acceptance of this 'best' alternative automatically eliminates the other alternatives.

Capital Rationing Decision In a situation where the firm has **unlimited funds**, all independent investment proposals yielding return greater than some predetermined level are accepted. However, this situation does not prevail in most of the business firms in actual practice. They have a fixed capital budget. A large number of investment proposals compete for these limited funds. The firm must, therefore, ration them. The firm allocates funds to projects in a manner that it maximises long-run returns. Thus, **capital rationing** refers to a situation in which a firm has more acceptable investments than it can finance. It is concerned with the selection of a group of investment proposals out of many investment proposals acceptable under the accept-reject decision. Capital rationing employs ranking of the acceptable investment projects. The projects can be ranked on the basis of a predetermined criterion such as the rate of return. The projects are ranked in the descending order of the rate of return. This aspect has been developed further in Chapter 10.

Capital rationing is the financial situation in which a firm has only fixed amount to allocate among competing capital expenditures.

Unlimited funds is the financial situation in which a firm is able to accept all independent projects that provide an acceptable return.

SECTION 2 DATA REQUIREMENT: IDENTIFYING RELEVANT CASH FLOWS

Cash Flows Vs Accounting Profit

Capital budgeting is concerned with investment decisions which yield return over a period of time in future. The foremost requirement for evaluation of any capital investment proposal is to estimate the future benefits accruing from the investment proposal. Theoretically, two alternative criteria are available to quantify the benefits: **(i)** accounting profit, and **(ii)** cash flows. The basic difference between them is primarily due to the inclusion of certain non-cash expenses in the profit and loss account, for instance, depreciation. Therefore, the accounting profit is to be adjusted for non-cash expenditures to determine the actual cash inflow. The cash flow approach of measuring future benefits of a project is superior to the accounting approach as cash flows are theoretically better measures of the net economic benefits of costs associated with a proposed project.

In the first place, while considering an investment proposal, a firm is interested in estimating its economic value. This economic value is determined by the economic outflows (costs) and inflows (benefits) related with the investment project. Only cash flows represent the cash transactions. The firm must pay for the purchase of an asset with cash. This cash outlay represents a foregone opportunity to use cash in some other productive alternatives. Consequently, the firm should measure the future net benefits in cash terms. On the other hand, under the accounting practices, the cost of the investment is allocated over its economic useful life in the nature of depreciation rather than at the time when costs are actually incurred. The accounting treatment clearly does not reflect the original need for cash at the time of inflows and outflows in later years. Only cash flows reflect the actual cash transactions associated with the project. Since investment analysis is concerned with finding out whether future economic inflows are sufficiently large to warrant the initial investment, only the cash flow method is appropriate for investment decision analysis.[5]

Secondly, the use of cash flows avoids accounting ambiguities. There are various ways to value inventory, allocate costs, calculate depreciation and amortise various other expenses. Obviously, different net incomes will be arrived at under different accounting procedures. But

there is only one set of cash flows associated with the project. Clearly, the cash flow approach to project evaluation is better than the net income flow approach (accounting approach).

Thirdly, the cash flow approach takes cognisance of the time value of money whereas the accounting approach ignores it. Under the usual accounting practice, revenue is recognised as being generated when the product is sold, not when the cash is collected from the sale; revenue may remain a paper figure for months or years before payment of the invoice is received. Expenditure, too, is recognised as being made when incurred and not when the actual payment is made. Depreciation is deducted from the gross revenues to determine the before-tax earnings. Such a procedure ignores the increased flow of funds potentially available for other uses. In other words, accounting profits which are quite useful as performance measures often are less useful as decision criteria. Therefore, from the viewpoint of capital expenditure management, the cash flow approach can be said to be the basis of estimating future benefits from investment proposals. The data required for the purpose would be cash revenues and cash expenses. The difference between the cash flow approach and the accounting profit approach is depicted in Table 5.1.

TABLE 5.1 A Comparison of Cash Flow and Accounting Profit Approaches

Accounting Approach Towards 'Benefits'			*Cash Flow Approach Towards 'Benefits'*	
Revenues		Rs 1,000		Rs 1,000
Less: Expenses:				
Cash expenses	Rs 500		Rs 500	
Depreciation	300	800		
Earnings before tax		200		
Taxes (0.35)		70	70	570
Net earnings after taxes/Cash flow		130		430

Table 5.1 shows that the accounting profits amounting to Rs 130 are less than the cash flow (Rs 430). This difference can be attributed to the depreciation charge of Rs 300. The cash available with the firm is Rs 430. This can be utilised for further investment. The accounting approach indicates that only Rs 130 is available and hence gives only a partial picture of the tangible benefits available. Clearly, such an approach does not bring out the total benefits of the project available for reinvesting. Therefore, in place of earnings, the cash flow information is employed in evaluating capital expenditure alternatives.

Incremental Cash Flow

Relevant cash flow is the incremental after-tax cash outflow (investment) and resulting subsequent inflows associated with a proposed capital expenditure.

The second aspect of the data required for capital budgeting relates to the basis on which the **relevant cash outflows** and inflows associated with proposed capital expenditure are to be esti-mated. The widely prevalent practice is to adopt incremental analysis. According to incremental analysis, only differences due to the decision need be considered. Other factors may be important but not to the decision at hand.[6] For purposes of estimating cash flows in the analysis of investments, **incremental cash flows**, that is, those cash flows (and only those cash flows) which are directly attributable to the investment project are taken into account. It is for this reason

that fixed overhead costs, which remain the same whether the proposal is accepted or rejected, are not considered. However, if there is an increase in them due to the new proposal, they must be considered.

Project may be referred to as a kind of **"mini firm"** with its own future revenues and costs, its own assets, it own earnings and its own cash flows[7].

Incremental cash flows are the additional cash flows (outflows as well as inflows) expected to result from a proposed capital expenditure.

Effect of Taxes

Finally, the incremental cash flows are adjusted for tax liability. In other words, taxes paid are deducted from the cash flows to estimate the benefits arising out of the investment decision.

To conclude the above discussion relating to the data required for the capital budgeting deci-sion, the expenses/costs to be considered are 'incremental after-tax cash flows'. Table 5.2 summarises the relevant and irrelevant information in relation to asset selection decisions.

TABLE 5.2 Relevant and Irrelevant Outflows

Relevant Cash Outflows	*Irrelevant Cash Outflows*
1. Variable labour expenses	1. Fixed overhead expense (existing)
2. Variable material expenses	2. **Sunk costs**
3. Additional fixed overhead expenses	
4. Cost of the investment	
5. Marginal taxes	

Sunk costs are cash outflows that have already been made (i.e., past outlays) and therefore have no effect on the cash flows relevant to a current decision.

Cash flow Pattern

Cash flow pattern associated with capital investment projects can be classified as conventional or non-conventional.

Conventional cash flow pattern is an initial outflow followed by only a series of inflows.

Conventional Cash Flows They consist of an initial cash outlay followed by a series of cash inflows. Most of the capital expenditure decisions display this pattern of cash flow. To illustrate, the firm may spend Rs 1,500 in time period zero and as a result may expect to receive a Rs 300 cash inflow at the end of each year for the next 8 years. The conventional cash flow pattern is diagrammed in Fig. 5.1.

Non-conventional cash flow pattern is a pattern in which an initial outflow is not followed by only a series of inflows.

Non-Conventional Cash Flows They refer to the cash flow pattern in which an initial cash outlay is not followed by a series of inflows. Alternating inflows and outflows and an inflow followed by outflows are examples of non-conventional cash flow patterns. A classic example of such cash flow patterns is that of the purchase of an asset that generates cash inflows for a period of years, is overhauled, and again generates a stream of cash inflows for a number of years. To illustrate, a machine purchased for Rs 1,000 generates cash inflows of Rs 250 each for five years. In the sixth year, an outlay of Rs 400 is required to overhaul the machine, after which it generates cash inflows of Rs 250 for four years. Such a non-conventional pattern of cash flows is shown in Fig. 5.2.

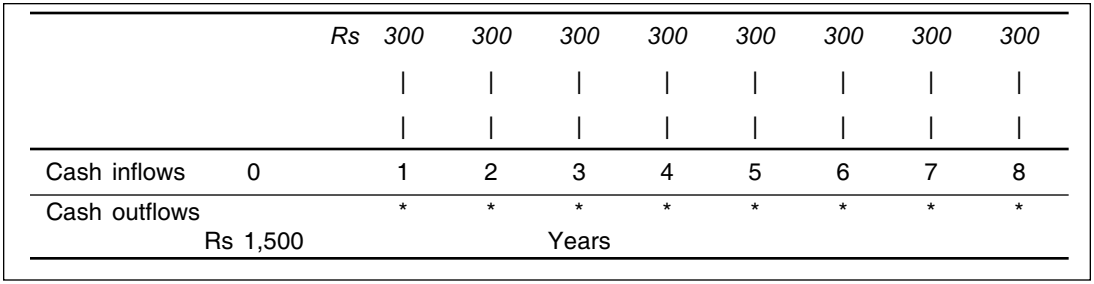

FIGURE 5.1 Conventional Cash Flow Pattern

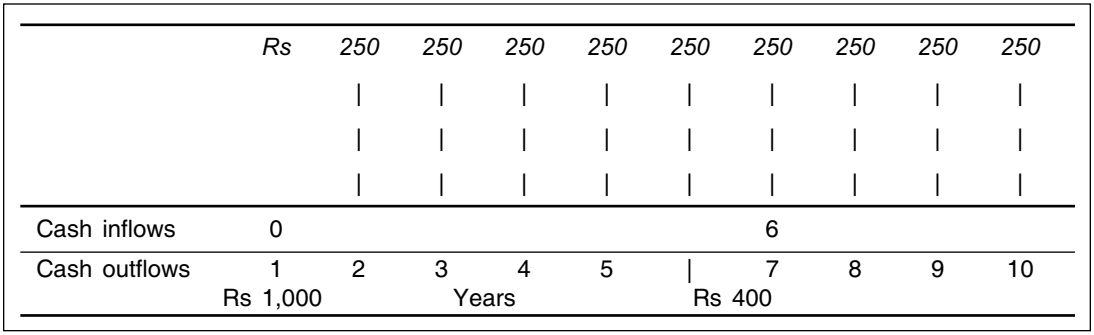

FIGURE 5.2 Non-conventional Cash Flow Pattern

Cash Flow Estimates

For capital budgeting cash flows have to be estimated. There are certain ingredients of cash flow streams.

Tax Effect It has been already observed that cash flows to be considered for purposes of capital budgeting are net of taxes. Special consideration needs to be given to tax effects on cash flows if the firm is incurring losses and, therefore, paying no taxes. The tax laws permit carrying losses forward to be set off against future income. In such cases, therefore, the benefits of tax savings would accrue in future years.

Effect on Other Projects Cash flow effects of the project under consideration, if it is not econo-mically independent, on other existing projects of the firm must be taken into consideration. For instance, if a company is considering the production of a new product which competes with the existing products in the product line, it is likely that as a result of the new proposal, the cash flows related to the old product will be affected. Assume that there is a decline of Rs 5,000 in the actual flow from the existing product. This should be taken into consideration while estimating the cash streams from the new proposal. In operational terms, the cash flow from the new product should be reduced by Rs 5,000. This is in conformity with the general rule of the incremental cash flows which involves identifying changes in cash flows as a result of undertaking the project being evaluated. Clearly, the cash flow effects of the project should not be evaluated in isolation, if it affects other project(s) in any way.

Effect of Indirect Expenses Another factor which merits special consideration in estimating cash flows is the effect of overheads. The indirect expenses/overheads are allocated to the different products on the basis of wages paid, materials used, floor space occupied or some other similar common factor. The question that arises is: should such allocation of overheads be taken into account in the cash flows? The answer hinges upon whether the amount of overheads will change as a result of the investment decision. If yes, it should be taken into account. If, however, overheads will not change as a result of the investment decision, they are not relevant.

A company allocates overheads on the basis of the floor space used. Assume it intends to replace an old machine by a new one. Further assume that the new machine would occupy less space so that there would be a reduction in the overhead charged to it. Since there is no effect on cash flows, a change in the overhead is not relevant to the cash flow streams of the machine being acquired. But if the surplus space is used for an alternative use, and if any cash flow is generated, it will be relevant to the calculations. Thus, the deciding factor is whether there is any alternative use. The alternative use rule is a corollary of the incremental cash flow rule.[8]

Depreciation is a non-cash expense that affects the taxes paid in cash.

Effect of Depreciation **Depreciation**, although a non-cash item of cost, is deductible expenditure in determining taxable income. Depreciation provisions are prescribed by the Companies Act for accounting purposes and by the Income Tax Act for taxation purposes.

The purpose of the provisions of depreciation contained in the Compa- nies Act is the computation of managerial remuneration, dividend payment and disclosure in financial statements. Since companies in India are regulated by the Companies Act, they should provide depreciation in the books of accounts in accordance with Schedule XIV of the Act which prescribes the rate of depreciation for various types of depreciable assets on written down value (WDV) basis as well as straight line basis. It also permits companies to charge depreciation on any other basis provided it has the effect of writing off 95 per cent of the original cost of the asset on the expiry of the specified period and has the approval of the government. In actual practice, however, companies follow the provisions of the Income Tax Act with the basic objectives of its tax deductibility.

The provisions of Income Tax Act relating to depreciation are contained in Section 32. The sec-tion envisages three important conditions for following depreciation, namely, **(i)** the asset is owned by the assessee, **(ii)** the asset is used by the assessee for the purpose of business and **(iii)** the asset is in the form of buildings, furniture, machinery and plants including ships, vehicles, books, scientific apparatus, surgical equipments and so on.

The amount of annual depreciation on an asset is determined by **(a)** the actual cost of the asset and **(b)** its classification in the relevant block of assets. The actual cost means the cost of acquisition of the asset and the expenses incidental thereto which are necessary to put the asset in a usable state, for instance, freight and carriage inwards, installation charges and expenses incurred to facilitate the use of the asset like expenses on the training of the operator or on essential construction work.

Block of assets are assets which fall in the same class and in respect of which the same depreciation rate is applicable irrespective of their nature.

Depreciation is charged, with a view to simplify computation, not on an individual asset but on a block of assets. A **block of assets** defined as a group of assets falling within a class of assets, being building, machinery, plant or furniture in respect of which the same rate of depreciation is prescribed. Thus, assets which fall within the same class of assets and in respect of which the same percentage/rate of depreciation has been prescribed irrespective of their nature form one block of assets. For example, all assets under the category of plant and machinery which qualify for depreciation at 15 per cent will form one block and depreciation is computed with reference to the actual cost of the block. Similarly, assets depreciable at 40 per cent will constitute another block; a third block consists of assets depreciable at 50 per cent, and the fourth block comprises assets subject to a 100 per cent write-off.

Depreciation is computed at block-wise rates on the basis of written down value (WDV) method only. Presently, the block-wise rates for plant and machinery are at 15 per cent, 20 per cent, 30 per cent, 40 per cent, 50 per cent, 60 per cent, 80 per cent and 100 per cent. The depreciation allowance on office buildings and furniture and fittings is 10 per cent. If an asset acquired during a year has been used for a period of less than 180 days during the year, depreciation on such assets is allowed only at 50 per cent of the computed depreciation according to the relevant rate.

Apart from the simplification of the computation of the amount of depreciation, a significant implication of categorising assets into blocks is that if an asset falling in a block is sold out, there is no capital gain or terminal depreciation or balancing charge. The sale proceeds of the asset are reduced from the WDV of the block. Capital gain/loss can arise in these situations:

(i) When the sale proceeds exceeds the WDV of the whole block;

(ii) When the entire block is sold out; and

(iii) In case of 100 per cent depreciable assets.

The terminal loss is not allowed in the relevant assessment year but is spread over a number of years to be allowed by way of depreciation.

In case of insufficiency/absence of profit, unabsorbed depreciation can be set off against income under any head against business income as in the case of unabsorbed loss. Effective 1996-97, it can be carried forward for a maximum period of eight years.

The mechanics of computation of depreciation is illustrated in Example 5.1.

Example 5.1

Assume the following facts relating to Avon Ltd (AL):

Block of Assets	*Depreciation Rate (percentage)*	*WDV as on 1.4.20X7 (Rs lakh)*	*Addition During 20X7–8 (Rs lakh)*
A	25	500	250
B	40	300	150

Assets sold during 20X7–8 amounted to Rs 35 lakh (Block A) and Rs 50 lakh (Block B). It is expected that fresh investments in assets during 20X8–9 will be: Block A (Rs 160 lakh) and Block B (Rs 80 lakh). It is also projected by the AL that disinvestment proceeds from the assets will amount to Rs 45 lakh in

case of Block A and Rs 25 lakh in case of Block B. Assume that about 50 per cent of additional investment during 20X8–9 will be made after September 20X8.

Compute the relevant depreciation charge for 20X7–8 and the projected depreciation charge for 20X8–9.

Solution

The relevant depreciation charge for 20X7–8 and the projected depreciation charge for 20X8–9 is calculated in Tables 5.3 and 5.4 respectively.

TABLE 5.3 Computation of Depreciation Charge During 20X7–8

(Rs Lakh)

Particulars	*Blocks*	
	A	*B*
1. WDV as on 1.4.20 X7	500	300
2. *Add:* Cost of assets acquired during 20 X7 – 8	250	150
	750	450
3. *Less:* Sales during 20 X7 – 8	35	50
4. WDV (for depreciation)	715	400
5. Depreciation allowance	179	160
6. WDV as on 1.4. 20 X8	536	240

TABLE 5.4 Computation of Depreciation Charge During 20X8–9

(Rs Lakh)

Particulars	*Blocks*	
	A	*B*
1. WDV as on 1.4.20X8	536	240
2. *Add:* Cost of assets acquired during 20X8–9	160	80
	696	320
3. *Less:* Expected proceeds of sales during 20X8–9	45	25
4. WDV (for depreciation)	651	295
5. Depreciation allowance[@]	153	110
6. WDV as on 1.4. 20X9	498	185
[@]Normal depreciation allowance	163	118
Less: Depreciation allowance inadmissible in respect of assets acquired after 30.9.20X8	10	8
	(80 × 0.25 × 0.5)	(40 × 0.4 × 0.5)
	153	110

Note: If the entire block of assets is sold during a year for an amount exceeding (1 + 2) or the sale proceeds of the block sold is higher than (1 + 2), the difference represents short-term capital gains subject to tax. Where the sale proceeds are lower than (1 + 2), the difference is short-term capital loss and the AL is entitled to tax shield.

In case block consists of a single asset (e.g. plant and machinery), **no depreciation is to be charged in the terminal year in which it is sold**. The difference between the written down value (WDV) of the machine at the beginning of the year and its sale proceeds repre-

sents short-term capital gain (when sale proceeds exceeds written down value/book vale of the machine) and short-term capital loss (in case the book value exceeds sale proceeds/salvage value). Such short-term capital gains and losses have been accorded **special tax treatment**, that is, they are subject to the same rate of tax as the business firm/corporate is.

To illustrate the implication of the tax provisions for capital budgeting, let us assume, a company buys a new machine for Rs 10 lakh (forming a separate block). The machine is subject to 20 per cent depreciation on WDV basis. It is expected to have economic useful life of 5 years at the end of which its expected salvage value is Rs 1 lakh.

The depreciation in the first four years would be Rs 2 lakh, Rs 1.6 lakh, Rs 1.28 lakh and Rs 1.024 lakh respectively. The accumulated depreciation would be Rs 5.90 lakh. As a result, the WDV/book value of the machine at the beginning of year-5 would be Rs 4.10 lakh. With no depreciation charged in year-5 and sale proceeds of Rs 1 lakh, there would be short-term capital loss of Rs 3.10 lakh. This loss, in turn, would yield tax shield. Assuming 30 per cent tax rate, the tax shield is (Rs 3.10 lakh × 0.30) Rs 92,880. This amount would be reckoned as **cash inflow in year 5**.

The tax shield would be Rs 92,880 in financial accounting also. It would consist of two components: (i) depreciation in year 5, Rs 81,920 (0.20 × Rs 4,09,600) and (ii) loss on sale of machine Rs 2,27,680 (Rs 4,09,600 – Rs 1,00,000 – Rs 81,920). The tax advantage on depreciation would be Rs 24,576 (0.30 × Rs 81,920) and on loss Rs 68,304 (0.30 × Rs 2,27,680). The total (Rs 24,576 + Rs 68,304) is Rs 92,880. Thus, the firm does not suffer any lsos by not charging depreciation in the terminal year (as per income-tax requirement).

In case block consists of several assets (plants/machinery/equipments), depreciation is charged in the terminal year in which the machine is sold on its **closing balance** (written down value at the beginning of year of sales – sale value). The terminal loss is allowed to be carried forward to be charged as depreciation in subsequent years (though the asset does not exist). This tax provision implies that the terminal loss would provide tax shield in the subsequent years.

To illustrate, continuing with the present example, assuming the machine purchased for Rs 10 lakh is one of several machines, depreciation charged in year 5 would be on Rs 3,09,600 (Rs 4,09,600 - Rs 1,00,000, sale value) at 20 per cent, that is, Rs 61,920. The terminal loss due to sale of machine is (Rs 3,09,600 – Rs 61,920) Rs 2,47,680. This loss in terms of unabsorbed depreciation would provide tax advantage in future years.

Net working capital change is the difference between change in current assets and change in current liabilities.

In practice, as the block is likely to consist of several machines for manufacturing firms, the tax provision puts business firms at disadvantage as the tax advantage on terminal loss is available in a number of years and not in single year.

Working Capital Effect Working capital constitutes another important ingredient of the cash flow stream which is directly related to an investment proposal. The term **working capital** is used here in net sense, that is, current assets minus current liabilities (**net working capital**). If an investment is expected to increase sales, it is likely that there will be an increase in current assets in the form of accounts

receivable, inventory and cash. But part of this increase in current assets will be offset by an increase in current liabilities in the form of increased accounts and notes payable. Obviously, the sum equivalent to the difference between these additional current assets and current liabilities will be needed to carry out the investment proposal. Sometimes, it may constitute a significant part of the total investment in a project. The increased working capital forms part of the initial cash outlay. The additional net working capital will, however, be returned to the firm at the end of the project's life. Therefore, the recovery of working capital becomes part of the cash inflow stream in the terminal year. The initial investment in, and the subsequent recovery of, working capital do not balance out each other due to the time value of money.

The increase in the working capital may not only be in the zero time period, that is, at the time of initial investment. There can be continuous increase in the working capital as sales increase in later years. This increase in working capital should be considered as cash outflow of the year in which additional working capital is required.

Suppose,there is a project that requires an initial investment of Rs 20,000 and has a useful life of 5 years. The requirements of working capital are detailed in Table 5.5.

TABLE 5.5 Working Capital Requirements

Particulars	*Year*					
	0	*1*	*2*	*3*	*4*	*5*
(a) Initial investment	Rs 20,000					
Sales		Rs 5,000	Rs 10,000	Rs 20,000	Rs 15,000	Rs 0
Expenses		1,000	2,000	5,000	4,000	500
(b) Changes in inventory (decrease)		1,000	2,000	6,000	(4,000)	(5,000)
(c) Changes in receivables		1,000	2,000	4,000	(2,000)	(5,000)
(d) Changes in payables		1,500	2,000	5,000	(3,500)	(5,500)
(e) Change in net working capital ($b + c - d$)		500	2,000	5,000	(2,500)	(4,500)

The changes in the net working capital are given in the last row of Table 5.5. The net working capital has increased in years 1, 2 and 3 representing cash outflows, while it has decreased in years 4 and 5 showing cash inflows as working capital is recovered.

Almost all revenue-expansion capital investment proposals require additional working capital. Likewise, almost all cost-reduction capital investment projects release the existing amount of working capital. Such projects enhance the firm's efficiency in such a way that the amount of inventory on hand or accounts receivable can be reduced. Improved inventory control systems or improved billing and collection systems are some classic examples. From the point of view of evaluating an investment project, the amount of working capital so released should be seen as a cash inflow in the zero time period (when the investment proposal is being considered), reducing the net cash investment required for the project. In the terminating year of the project, it should be treated as a cash outflow and adjusted against the cash inflow of that year.

Conventionally, the amount invested in net working capital at the time of starting the project as well as in subsequent years is assumed to have been recovered fully by the terminal year. In reality, the firm would most probably recover less than 100 per cent primarily because of bad debts and inventory loss. Therefore, the working capital recovered would be less than

100 per cent (say, 95 per cent). Accordingly, the cash inflow due to recovery of working capital in terminal year should be taken at less than 100 per cent amount.[9] Moreover, **for convenience**, it is assumed that net working capital is recovered instantaneously on termination of the project. In practice, however, it may take several months of the following year to recover it.[10]

Finally, tax considerations would not be involved when the net working capital recovered is less than 100 per cent[11] because bad debt loss due to some uncollectible debtors and loss due to obsolete inventory are already reckoned in operating costs.

Determination of Relevant Cashflows

The data requirement for capital budgeting are cash flows, that is, outflows and inflows. Their computation depends on the nature of the proposal. Capital projects can be categorised into: **(i)** single proposal, **(ii)** replacement situations and **(iii)** mutually exclusive.

Single Proposal The cash outflows, comprising cash outlays required to carry out the proposed capital expenditure are depicted in Format 5.1, while the computation of the cash inflows after taxes (CFAT) is shown in Format 5.2. The computation is illustrated in Example 5.2 and Example 5.3.

FORMAT 5.1 Cash Outflows of New Project [Beginning of the Period at Zero Time ($t = 0$)]

(1) Cost of new project
(2) + Installation cost of plant and equipments
(3) ± Working capital requirements

FORMAT 5.2 Determination of Cash Inflows: Single Investment Proposal ($t = 1 - N$)

Particulars	*Years*					
	1	*2*	*3*	*4*	....	*N*
Cash sales revenues						
Less: Cash operating cost						
Cash inflows before taxes (CFBT)						
Less: Depreciation						
Taxable income						
Less: Tax						
Earning after taxes						
Plus: Depreciation						
Cash inflows after tax (CFAT)						
Plus: Salvage value (in *n*th year)						
Plus: Recovery of working capital (in *n*th year)						

Example 5.2

An iron ore compay is considering investing in a new processing facility. The company extracts ore from an open pit mine. During a year, 1,00,000 tonnes of ore is extracted. If the output from the extraction process is sold immediately upon removal of dirt, rocks and other impurities, a price of Rs 1,000 per ton of ore can be obtained. The company has estimated that its extraction costs amount to 70 per cent of the net realisable value of the ore.

As an alternative to selling all the ore at Rs 1,000 per tonne, it is possible to process further 25 per cent of the output. The additional cash cost of further processing would be Rs 100 per ton. The proposed ore would yield 80 per cent final output, and can be sold at Rs 1,600 per ton.

For additional processing, the company would have to instal equipment costing Rs.100 lakh. The equipment is subject to 20 per cent depreciation per annum on reducing balance (WDV) basis/method. It is expected to have useful life of 5 years. Additional working capital requirement is estimated at Rs.10 lakh. The company's cut-off rate for such investments is 15 per cent. Corporate tax rate is 35 per cent.

Assuming there is no other plant and machinery subject to 20 per cent depreciation, should the company instal the equipment if **(a)** the expected salvage is Rs 10 lakh and **(b)** there would be no salvage value at the end of year 5.

Solution

Financial Evaluation Whether to Instal Equipment for Further Processing of Iron Ore

(A) Cash Outflows

Cost of equipment	Rs 1,00,00,000
Plus: Additional working capital	10,00,000
	1,10,00,000

(B) Cash Inflows (CFAT)

Particulars	*Year*				
	1	*2*	*3*	*4*	*5*
Revenue from processing [(Rs 1,600 × 20,000) – Rs 1,000 × 25,000)]	Rs 70,00,000	Rs 70,00,000	Rs 70,00,000	Rs 70,00,000	Rs 70,00,000
Less: Processing costs: Cash costs (Rs 100 × 25,000 tons)	25,00,000	25,00,000	25,00,000	25,00,000	25,00,000
Depreciation (*working note* 1)	20,00,000	16,00,000	12,80,000	10,24,000	—
Earnings before taxes	25,00,000	29,00,000	32,20,000	34,76,000	45,00,000
Less: Taxes (0.35)	8,75,000	10,15,000	11,27,000	12,16,600	15,75,000
Earnings after taxes (EAT)	16,25,000	18,85,000	20,93,000	22,59,400	29,25,000
Add: Depreciation	20,00,000	16,00,000	12,80,000	10,24,000	
CFAT	36,25,000	34,85,000	33,73,000	32,83,400	29,25,000

Working Notes

1 Depreciation Schedule

Year	*Depreciation base of equipment*	*Depreciation @ 20% on WDV*
1	Rs 1,00,00,000	Rs 20,00,000
2	80,00,000	16,00,000
3	64,00,000	12,80,000
4	51,20,000	10,24,000
5	40,96,000	Nil[@]

[@]As the block consists of a single asset, no depreciation is to be charged in the terminal year of the project.

(C) (a) Determination of NPV (Salvage Value = Rs 10 lakh)

Year	*CFAT*	*PV factor (0.15)*	*Total PV*
1	Rs 36,25,000	0.870	Rs 31,53,750
2	34,85,000	0.756	26,34,660
3	33,73,000	0.658	22,19,434
4	32,83,400	0.572	18,78,105
5	29,25,000	0.497	14,53,725
Salvage value	10,00,000	0.497	4,97,000
Tax benefit on short-term capital loss	10,83,600 b	0.497	5,38,549
Recovery of working capital	10,00,000	0.497	4,97,000
Gross present value			1,28,72,223
Less: Cash outflows			1,10,00,000
Net present value (NPV)			18,72,223

(b) 0.35 × (Rs 40,96,000 – Rs 10,00,000) = Rs 10,83,600.

Recommendation The company is advised to instal the equipment as it promises a positive NPV.

(D) Determination of NPV (Salvage Value = Zero)

PV of operating CFAT (1 – 5 years)	Rs 1,13,39,674
Add: PV of tax benefit on short term capital loss (Rs 40,96,000 × 0.35 = Rs 14,33,600 × 0.497, PV factor)	7,12,499
Add: PV of recovery of working capital	4,97,000
Total present value	1,25,49,173
Less: Cash outflows	1,10,00,000
NPV	15,49,173

Since the NPV is still positive, the company is advised to instal the equipment.

SPREADSHEET SOLUTION 5.1

Evaluation Whether to Install Equipment for Further Processing of Iron Ore (When salvage value is Rs 10 lakh)

Microsoft Excel - Book1

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P43 =

	A	B	C	D	E	F	G	H
1	Year	0	1	2	3	4	5	
2	Cost of Equipment (Rs)	10,000,000						
3	Working Capital (Rs)	1,000,000						
4	Expected output without further processing (tons)	25,000						
5	Expected realization per ton without futher processing (Rs)	1,000						
6	Expected output with further processing (%)	0.8						
7	Expected realisation per ton with further processing (Rs)	1,600						
8	Processing cost per ton (Rs)	100						
9	Corporate tax rate (%)	0.35						
10	Depreciation rate (%)	0.2						
11	Salvage Value (Rs)	1,000,000						
12	Discount rate (%)	0.15						
13								
14	Cost of Equipment	–10,000,000						
15	Working Capital	–1,000,000						
16	Total initial cost	–11,000,000						
17	Revenue from processing		7,000,000	7,000,000	7,000,000	7,000,000	7,000,000	
18	Processing cost		2,500,000	2,500,000	2,500,000	2,500,000	2,500,000	
19	Depreciation		2,000,000	1,600,000	1,280,000	1,024,000	0	
20	Earning before taxes		2,500,000	2,900,000	3,220,000	3,476,000	4,500,000	
21	Taxes		8,75,000	1,015,000	1,127,000	1,216,600	1,575,000	
22	Earning after taxes		1,625,000	1,885,000	2,093,000	2,259,400	2,925,000	
23	Operating CFAT		3,625,000	3,485,000	3,373,000	3,283,400	2,925,000	
24	Salvage value						1,000,000	
25	Tax benefit on short-term capital loss						1,083,600	
26	Release of Working Capital						1,000,000	
27	CFAT		3,625,000	3,485,000	3,373,000	3,283,400	6,008,600	
28	NPV	1,869,767.58						
29								
30								
31	Workings							
32	Depreciation Schedule							
33	Depreciation base of equipment		10,000,000	8,000,000	6,400,000	5,120,000	4,096,000	
34	Depreciation		2,000,000	1,600,000	1,280,000	1,024,000		
35								
36	Tax Benefit on Short-term capital loss							
37	Book Value of equipment						4,096,000	
38	Salvage Value						1,000,000	
39	Short-term capital loss						3,096,000	
42	Tax Benefit on short-term capital loss						1,083,600	
43								

Sheet1 / Sheet2 / Sheet3 /

Ready

Enter the years in cells B1 to G1 starting with year 0. Enter the input in cells B2 to B12.

Enter =–B2 in cell B14, =–B3 in cell B15 for investment in equipment and working capital respectively. Enter =SUM(B14:B15) in cell B16 to calculate the total initial investment.

Enter the formula =($B4*$B6*$B7)–($B4*$B5) in cell C17 and copy the formula in cells D17 to G17 to calculate revenue for all years. Enter the formula =$B4*$B8 in cell C18 and copy the formula to cells D18 to G18 to calculate the processing cost.

Depreciation is worked out in cells C33 to G34. For calculating depreciation enter =B2 in cell C33. Enter the formula =C33*$B10 in cell C34. Enter =C33–C34 in cell D33 and copy it to cells E33 to G33. Also copy the formula in cell C34 to cells D34 to G34. The Depreciation figures are carried to cells C19 to G19. This is done by entering =C34 in cell C19 and it is copied in cells D19 to G19.

To calculate earnings before taxes, enter =C17-C18-C19 in cell C20 and copy the formula to cells D20 to G20.

To calculate taxes, enter = C20*B9 in cell C21 and copy to cells D21 to G21.

To calculate earnings after taxes, enter =C20-C21 in cell C22 and copy to cells D22 to G22.

To calculate operating CFAT, enter =C22+C19 in cell C23 and copy to cells D23 to G23.

Salvage value is entered in cells G24 by entering =B11

Tax benefit on short-term capital loss is worked out in cells G37 to G40. Enter =G33 in cell G37 and =B11 in cell G38. Short-term capital loss is calculated in cell G39 by entering =G37-G38. Tax benefit on short-term capital loss is calculated in cell G40 by entering =G39*B9. This benefit is carried to cell G25 by entering =G40 in cell G25.

Working capital released is entered in cell G26 by providing reference to cell B15 by entering =B15 in cell G26.

Year-wise CFAT are calculated in row 27 by entering =sum(C23:C26) in cell C27 and copying it to cells D27 to G27.

NPV is calculated in cell B28 by entering =NPV(B12, C27:G27)+B16. **(The difference in NPV is due to approximation)**.

When Salvage Value is Zero

In case, the salvage value of the equipment is zero, only one change is required in spreadsheet. Enter 0 in cell B11 instead of 1,000,000. The spreadsheet will calculate the new NPV.

Example 5.3

For the company in Example 5.2, assume there are other plants and machinery subject to 20 per cent depreciation (i.e. in the same block of assets). What course of action should the company choose?

Solution

(a) Cash outflows would remain unchanged.

(b) The annual depreciation will also remain the same for the first 4 yeas: In year 5, the depreciation = Rs 30,96,000 (opening WDV of equipment, Rs 40,96,000 – Rs 10,00,000, salvage value) × 0.20 = Rs 6,19,200.

(c) The CFAT (operating) for years, 1-4 will not change. In year 5, it will be shown as below:

Particulars	*CFAT (t = 5)*
Revenue from processing	Rs 70,00,000
Less: Processing costs:	
Cash costs	25,00,000
Depreciation	6,19,200
Earning before taxes	38,80,800
Less: Taxes (0.35)	13,58,280
EAT	25,22,520
CFAT	31,41,720

Determination of NPV (Salvage Value = Rs 10 lakh)

Year	*CFAT*	*PV factor*	*Total PV*
1	Rs 36,25,000	0.870	Rs 31,53,750
2	34,85,000	0.756	26,34,660
3	33,73,000	0.658	22,19,434
4	32,83,400	0.572	18,78,105
5	31,41,720	0.497	15,61,435

(*Contd.*)

(*Contd.*)

Salvage value	10,00,000	0.497	4,97,000
Recovery of working capital	10,00,000	0.497	4,97,000
Gross present value			1,24,41,384
Less: Cash outflows			1,10,00,000
Net present value (NPV)			14,41,384 @

@In fact, the NPV of the equipment is likely to be higher as tax advantage will accrue on the eligible depreciation of Rs 24,76,800, i.e. (Rs 30,96,000 – Rs 6,19,200) in future years.

Recommendation The company should instal the equipment.

Determination of NPV (Salvage Value = 0)

(i) For the first 4 years, depreciation amount will remain unchanged. In the fifth year, depreciation = Rs 40,96,000 (Rs 40,96,000, opening WDV less zero salvage value) × 0.20 = Rs 8,19,200.

(ii) Operating CFAT for years 1 – 4 will remain unchanged. The CFAT for 5th year would be Rs 32,11,720 as shown below:

	Revenues from processing	Rs 70,00,000
	Less: Processing costs (Rs 25,00,000 + Rs 8,19,200)	33,19,200
	EBIT	36,80,800
	Less: Taxes (0.35)	12,88,280
	EAT	23,92,520
	Add: Depreciation	8,19,200
	CFAT	32,11,720
(iii)	PV of operating CFAT (1 – 4 years)	98,85,949
	Add: PV of operating CFAT (5th year) (Rs 32,11,720 × 0.497)	15,96,225
	Add: PV of recovery of working capital	4,97,000
	Total PV	1,19,79,174
	Less: Cash outflows	1,10,00,000@
	NPV	9,79,174

@In effect, NPV would be higher as tax advantage will accrue on depreciation of Rs 32,76,800 in future years.

Recommendation The decision does not change, as NPV is positive.

Replacement Situation In the case of replacement of an existing machine (asset) by a new one, the relevant cash outflows are after-tax incremental cash flows. If a new machine is intended to replace an existing machine, the proceeds so obtained from its sale reduce cash outflows required to purchase the new machine and, hence, part of relevant cash flows. The calculation of after-tax incremental cash outflows is illustrated in Format 5.3 and Format 5.4 which provide depreciation base in the case of replacement situations.

FORMAT 5.3 Cash Outflows in a Replacement Situation

1. Cost of the new machine
2. + Installation Cost
3. ± Working Capital
4. – Sale proceeds of existing machine

FORMAT 5.4 Depreciation Base of New Machine in a Replacement Situation

1. WDV of the existing machine
2. + Cost of the acquisition of new machine (including installation costs)
3. – Sale proceeds of existing machine

The computation is illustrated in Example 5.4.

Example 5.4

Royal Industries Ltd is considering the replacement of one of its moulding machines. The existing machine is in good operating condition, but is smaller than required if the firm is to expand its operations. It is 4 years old, has a current salvage value of Rs 2,00,000 and a remaining life of 6 years. The machine was initially purchased for Rs 10 lakh and is being depreciated at 20 per cent on the basis of written down value method.

The new machine will cost Rs 15 lakh and will be subject to the same method as well as the same rate of depreciation. It is expected to have a useful life of 6 years, salvage value of Rs 1,50,000 at the sixth year end. The management anticipates that with the expanded operations, there will be a need of an additional net working capital of Rs 1 lakh. The new machine will allow the firm to expand current operations and thereby increase annual revenues by Rs 5,00,000; variable cost to volume ratio is 30 per cent. Fixed costs (excluding depreciation) are likely to remain unchanged.

The corporte tax rate is 35 per cent. Its cost of capital is 10 per cent. The company has several machines in the block of 20 per cent depreciation.

Should the company replace its existing machine? What course of action would you suggest, if there is no salvage value?

Solution

Financial Evaluation Whether to Replace Existing Machine

(A) Cash Outflows (Incremental)

Cost of the new machine	Rs 15,00,000
Add: Additional working captial	1,00,000
Less: Sale value of existing machine	2,00,000
	14,00,000

(B) Determination of Incremental CFAT (Operating)

Year	*Incremental contribution*[a]	*Incremental depreciation*[b]	*Taxable income*	*Taxes (0.35)*	*EAT [Col.4 – Col.5]*	*CFAT [Col.6 + Col.3]*
1	*2*	*3*	*4*	*5*	*6*	*7*
1	Rs 3,50,000	Rs 2,60,000	Rs 90,000	Rs 31,500	Rs 58,500	Rs 3,18,500
2	3,50,000	2,08,000	1,42,000	49,700	92,300	3,00,300
3	3,50,000	1,66,400	1,83,600	64,260	1,19,340	2,85,740
4	3,50,000	1,33,120	2,16,880	75,908	1,40,972	2,74,092
5	3,50,000	1,06,496	2,43,504	85,226	1,58,278	2,64,774
6	3,50,000	55,197	2,94,803	1,03,181	1,91,622	2,46,819

[a]Rs 5,00,000 – [Rs 5,00,000 × 0.30, variable cost to value (V/V) ratio] = Rs 3,50,000

[b](Working note)

Working Notes

1. Incremental Depreciation (t = 1 – 6)

Year	*Incremental asset cost base*	*Depreciation (20% on WDV)*
1	Rs 13,00,000	Rs 2,60,000
2	10,40,000	2,08,000
3	8,32,000	1,66,400
4	6,65,600	1,33,120
5	5,32,480	1,06,496
6	4,25,984	55,197[c]

[c]0.20 × (Rs 4,25,984 – Rs 1,50,000, salvage value) = Rs 55,197

2. (i)

Written Down Value (WDV) of Existng Machine at the Beginning of the Year 5

Initial cost of machine	Rs 10,00,000
Less: Depreciation @ 20% in year 1	2,00,000
WDV at beginning of year 2	8,00,000
Less: Depreicaiton @ 20% on WDV	1,60,000
WDV at beginning of year 3	6,40,000
Less: Depreciation @ 20% on WDV	1,28,000
WDV at beginning of year 4	5,12,000
Less: Depreciation @ 20% on WDV	1,02,400
WDV at beginning of year 5	4,09,600

(ii) Depreciation Base of New Machine

WDV of existing machine	4,09,600
Add: Cost of the new machine	15,00,000
Less: Sale proceeds of existing machine	2,00,000
	17,09,600

(iii) Base for Incremental Depreciation

Depreciation base of a new machine	17,09,600
Less: Depreciation base of an exsiting machine	4,09,600
	13,00,000

(C) Determination of NPV (Salvage Value = Rs 1.50 lakh)

Year	*CFAT*	*PV factor (0.10)*	*Total PV*
1	Rs 3,18,500	0.909	Rs 2,89,517
2	3,00,300	0.826	2,48,048
3	2,85,740	0.751	2,14,591
4	2,74,092	0.683	1,87,205
5	2,64,774	0.621	1,64,424
6	2,46,819	0.564	1,39,206
6 Salvage value	1,50,000	0.564	84,600
6 Recovery of working capital	1,00,000	0.564	56,400
Gross present value			13,83,991
Less: Cash outflows			14,00,000
Net present value			(16,009)

Recommendation Since the NPV is negative, the company should not replace the existing machine. However, in effect, the NPV is likely to be positive as tax advantage will accrue on the eligible depreciation of Rs 2,19,803 (Rs 4,25,984 – Rs 1,50,000 – Rs 55,197) in the future years.

Determination of NPV (Salvage Value = Zero)

(i)	**For the first 5 years, depreciation will remain unchanged. In the sixth year, it will be = Rs 4,25,984 × 0.20 = Rs 85,197.**	
(ii)	**Operating CFAT for years 1–5 will remain unchanged.**	
	CFAT for year 6 would be:	
	Incremental contribution	Rs 3,50,000
	Less: Incremental depreciation	85,197
	Taxable income	2,64,803
	Less: Taxes (0.35)	92,681
	EAT	1,72,122
	Add: Depreciation	85,197
	CFAT	2,57,319
(iii)	**PV of operating CFAT (1 – 5 years)**	11,03,785
	Add: PV of operating CFAT (6th year) (Rs 2,57,319 × 0.564)	1,45,128
	Add: PV of working capital	56,400
	Total present value	13,05,313
	Less: Cash outflows	14,00,000
	NPV	(94,687)

Recommendation Since the NPV is negative, the existing machine should not be replaced.

SPREADSHEET SOLUTION

(See the excel sheet screen shot on next page)
Enter the inputs in cells B1 to B11
Enter the years in row 16, starting with year 0.

Enter =–B1 in cell B17, =–B6 in cell B18 and =B3 in cell B19 for investment in equipment, working capital and salvage value of existing equipment respectively. Enter =SUM(B17:B19) in cell B20 to calculate the total initial investment.

Enter the formula =$B7 in cell C21 and copy the formula in cells D21 to H21 to calculate incremental revenue for all years. Enter the formula =C21*$B8 in cell C22 and copy the formula to cells D22 to H22 to calculate the incremental variable cost.

Depreciation is worked out in cells B38 to H42. For calculating depreciation, enter =B2*(1–B9)^B4 in cell B38. Enter the formula =B18+B1–B3 in cell B39. Enter =B39–B38 in cell B40 and copy it to cell C40. Enter =C40*$B9 in cell C41 and copy the formula in cells D41 to H41. Enter =C40–C41 in cell C42 and copy the formula in cell D42 to H42. The depreciation figures are carried to cells C23 to H23. This is done by entering =C41 in cell C23 and it is copied in cell D23 to H23.

To calculate taxable income, enter =C21–C22–C23 in cell C24 and copy the formula to cells D24 to H24.

To calculate taxes, enter =C24*$B11 in cell C25 and copy to cells D25 to H25.

To calculate earnings after taxes, enter =C24–C25 in cell C26 and copy to cells D26 to H26.

To calculate operating CFAT, enter =C26+C23 in cell C28 and copy to cells D28 to H28.

Salvage value is entered in cell H29 by entering =B5

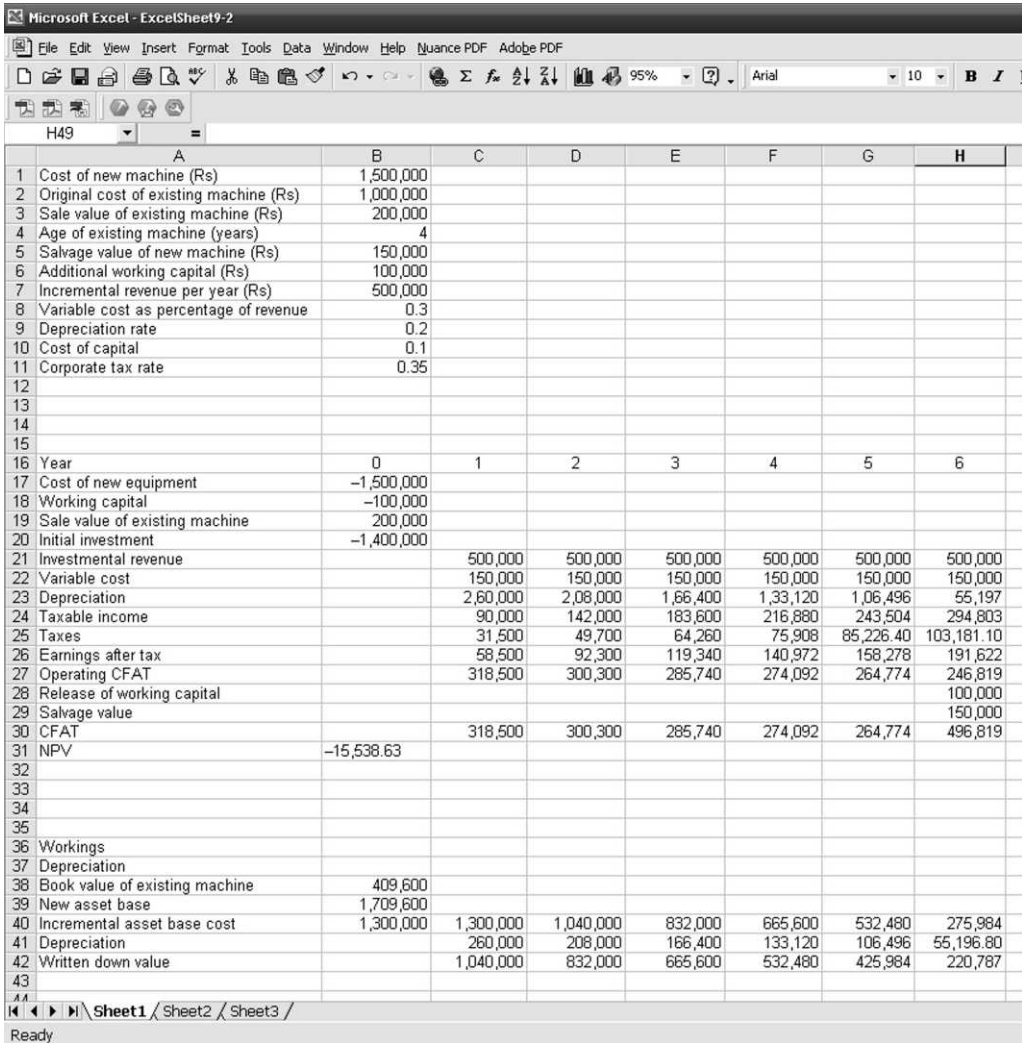
Working capital released is entered in cell H28 by providing reference to cell B6 by entering =B6 in cell H28

Year-wise CFAT are calculated in row 30 by entering =SUM(C27:C29) in cell C30 and copying it to cells D30 to H30.

NPV is calculated in cell B31 by entering =NPV(B10, C30:H30)+B20. **(The difference in NPV is due to approximations)**.

SPREADSHEET SOLUTION 5.2

Financial Evaluation Whether to Repalce Existing Machine (when salvage value is Rs 1,50,000)



Microsoft Excel - ExcelSheet9-2

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H49 =

	A	B	C	D	E	F	G	H
1	Cost of new machine (Rs)	1,500,000						
2	Original cost of existing machine (Rs)	1,000,000						
3	Sale value of existing machine (Rs)	200,000						
4	Age of existing machine (years)	4						
5	Salvage value of new machine (Rs)	150,000						
6	Additional working capital (Rs)	100,000						
7	Incremental revenue per year (Rs)	500,000						
8	Variable cost as percentage of revenue	0.3						
9	Depreciation rate	0.2						
10	Cost of capital	0.1						
11	Corporate tax rate	0.35						
12								
13								
14								
15								
16	Year	0	1	2	3	4	5	6
17	Cost of new equipment	–1,500,000						
18	Working capital	–100,000						
19	Sale value of existing machine	200,000						
20	Initial investment	–1,400,000						
21	Investmental revenue		500,000	500,000	500,000	500,000	500,000	500,000
22	Variable cost		150,000	150,000	150,000	150,000	150,000	150,000
23	Depreciation		2,60,000	2,08,000	1,66,400	1,33,120	1,06,496	55,197
24	Taxable income		90,000	142,000	183,600	216,880	243,504	294,803
25	Taxes		31,500	49,700	64,260	75,908	85,226.40	103,181.10
26	Earnings after tax		58,500	92,300	119,340	140,972	158,278	191,622
27	Operating CFAT		318,500	300,300	285,740	274,092	264,774	246,819
28	Release of working capital							100,000
29	Salvage value							150,000
30	CFAT		318,500	300,300	285,740	274,092	264,774	496,819
31	NPV	–15,538.63						
32								
33								
34								
35								
36	Workings							
37	Depreciation							
38	Book value of existing machine	409,600						
39	New asset base	1,709,600						
40	Incremental asset base cost	1,300,000	1,300,000	1,040,000	832,000	665,600	532,480	275,984
41	Depreciation		260,000	208,000	166,400	133,120	106,496	55,196.80
42	Written down value		1,040,000	832,000	665,600	532,480	425,984	220,787
43								

Sheet1 / Sheet2 / Sheet3 /

Ready

When Salvage Value is Zero

In case, the salvage value of the equipment is zero, only one change is required in the spreadsheet. Enter 0 in cell B5 instead of Rs 150,000. The spreadsheet will calculate the new NPV.

Mutually Exclusive Situations In the case of mutually exclusive proposals, the selection of one proposal precludes the choice of other(s). The calculation of the cash outflows and inflows are on lines similar to the replacement situations. This is illustrated in Example 5.5.

Example 5.5

A company is considering two mutually exclusive proposals, X and Y. Proposal X will require the purchase of machine X, for Rs 1,50,000 with no salvage value but an increase in the level of working capital to the tune of Rs 50,000 over its life. The project will generate additional sales of Rs 1,30,000 and require cash expenses of Rs 30,000 in each of the 5 years of its life. Proposal Y will require the purchase of machine Y for Rs 2,50,000 with no salvage value and additional working capital of Rs 70,000. The project is expected to generate additional sales of Rs 2,00,000 with cash expenses aggregating Rs 50,000.

Both the machines are subject to written down value method of depreciation at the rate of 20 per cent. Assuming the company does not have any other asset in the block of 20 per cent; has 12 per cent cost of capital and is subject to 35 per cent tax, advise which machine it should purchase? What course of action would you suggest if Machine X and Machine Y have salvage values of Rs 10,000 and Rs 25,000 respectively?

Solution

Financial Evaluation of Proposals, X and Y

Proposal X

Cash outflows		
Cost price of machine	Rs 1,50,000	
Additional working capital	50,000	
Initial investment	2,00,000	
CFAT and NPV		
(i) Incremental sales revenue	1,30,000	
Less: Cash expenses	30,000	
Incremental cash profit before taxes	1,00,000	
Less: Taxes (0.35)	35,000	
CFAT (t = 1 – 5)	65,000	
(×) PV factor of annuity for 5 years (0.12)	× 3.605	
Present value	2,34,325	

(ii) **PV of Tax Savings Due to Depreciation**

Year	*Depreciation*	*Tax savings*	*PVF*	*Present value*	
1	Rs 30,000	Rs 10,500	0.893	Rs 9,377	
2	24,000	8,400	0.797	6,695	
3	19,200	6,720	0.712	4,785	
4	15,360	5,376	0.636	3,419	24,276

(iii) PV of tax savings on short-term capital loss (STCL):
(Rs 61,440 STCL × 0.35 × 0.567)
12,193

(iv) Release of working capital (Rs 50,000 × 0.567)	28,350	
Total present value	2,99,144	
Less: Cash outflows	2,00,000	
NPV	99,144	

Proposal Y

Cash outflows		
Cost price of machine	2,50,000	
Additional working capital	70,000	
Initial investment	3,20,000	

(*Contd*)

(*Contd*)

CFAT and NPV	
(i) Incremental sales revenue	2,00,000
Less: Cash expenses	50,000
Incremental cash profits before taxes	1,50,000
Less: Taxes (0.35)	52,500
CFAT (t = 1 – 5)	97,500
(×) PV factor of annuity for 5 years (0.12)	× 3.605
Present value	3,51,488

(ii) PV of Tax Savings Due to Depreciation

Year	*Depreciation*	*Tax savings*	*PVF*	*Present value*	
1	Rs 50,000	Rs 17,500	0.893	Rs 15,628	
2	40,000	14,000	0.797	11,158	
3	32,000	11,200	0.712	7,974	
4	25,600	8,960	0.636	5,699	40,459

(iii) PV of tax savings on short-term capital loss (Rs 1,02,400 × 0.35 × 0.567)	20,321
(iv) Release of working capital (Rs 70,000 × 0.567)	39,690
Total present value	4,51,958
Less: Cash outflows	3,20,000
NPV	1,31,958

Advice: Proposal Y is recommended in view of its higher NPV.

Alternatively (Incremental Cashflow Approach)

Incremental Cash Outflows	
Investment required in Proposal **Y**	Rs 3,20,000
Less: Investment required in Proposal **X**	2,00,000
	1,20,000
Incremental CFAT and NPV	
(i) Incremental sales revenue (**Y** – **X**)	70,000
Less: Incremental cash expenses (**Y** – **X**)	20,000
Incremental cash profit before taxes	50,000
Less: Taxes (0.35)	17,500
Incremental CFAT (*t* = 1 – 5)	32,500
(×) PV of annuity for 5 years (0.12)	×3.605
Incremental present value	1,17,162

(ii) PV of Tax Savings Due to Incremental Depreciation

Year	*Incremental depreciation*	*Tax savings*	*PVF*	*Present value*	
1	Rs 20,000	Rs 7,000	0.893	Rs 6,251	
2	16,000	5,600	0.797	4,463	
3	12,800	4,480	0.712	3,190	
4	10,240	3,584	0.636	2,279	16,183

(iii) PV of tax savings on incremental (**Y** – **X**) short term capital loss (STCL):	
(Rs 1,02,400 – Rs 61,440) × 0.35 × 0.567	8,129
(iv) Incremental (**Y** – **X**) *working capital* (Rs 70,000 – Rs 50,000) × 0.567	11,340
Incremental present value	1,52,814
Less: Incremental cash outflows	1,20,000
Incremental NPV	32,814

Recommendation Proposal Y is better.

Financial Evaluation of Proposals, Assuming Salvage Value of Machines X and Y (Incremental Approach)

(a) Sum of PV of items (i), (ii) and (iv) (Rs 1,17,162 + Rs 16,183 + Rs 11,340)@	Rs 1,44,685
(b) PV of incremental salvage value (Rs 15,000 × 0.567)	8,505
(c) PV of tax savings on incremental STCL@@ (Rs 74,400 – Rs 51,140) × 0.35 × 0.567	4,616
Incremental present value	1,57,806
Less: Incremental cash outflows	1,20,000
Incremental NPV	37,806

Decision: Decision (superiority of proposal Y) remains unchanged.
@Items **(i)**, **(ii)** and **(iv)** when there is no salvage will not change due to salvage value.
@@As a result of salvage value, the amount of short-term capital loss (STCL) will change.

SECTION 3 EVALUATION TECHNIQUES

This section discusses the important evaluation techniques for capital budgeting. Included in the methods of appraising an investment proposal are those which are objective, quantified and based on economic costs and benefits.

The methods of appraising capital expenditure proposals can be classified into two broad categories: **(i)** traditional, and **(ii)** time-adjusted. The latter are more popularly known as discounted cash flow (DCF) techniques as they take the time factor into account. The first category includes **(i)** average rate of return method and **(ii)** pay back period method. The second category includes **(i)** net present value method, **(ii)** internal rate of return method, **(iii)** net terminal value method, and **(iv)** profitability index.

Traditional Techniques

Average Rate of Return

Computation The average rate of return (ARR) method of evaluating proposed capital expenditure is also known as the accounting rate of return method. It is based upon accounting information rather than cash flows. There is no unanimity regarding the definition of the rate of return. There are a number of alternative methods for calculating the ARR. The most common usage of the average rate of return (ARR) expresses it as follows:

$$\text{ARR} = \frac{\text{Average annual profits after taxes}}{\text{Average investment over the life of the project}} \times 100 \qquad \textbf{(5.1)}$$

The average profits after taxes are determined by adding up the after-tax profits expected for each year of the project's life and dividing the result by the number of years. In the case of annuity, the average after-tax profits are equal to any year's profits.

The average investment is determined by dividing the net investment by two. This averaging process assumes that the firm is using straight line depreciation, in which case the book value of the asset declines at a constant rate from its purchase price to zero at the end of its depreciable life. This means that, on the average, firms will have one-half of their initial purchase price in the books.[12] Consequently, if the machine has salvage value, then only the depreciable cost (cost-salvage value) of the machine should be divided by two in order to ascertain the average net investment, as the salvage money will be recovered only at the end

of the life of the project. Therefore, an amount equivalent to the salvage value remains tied up in the project throughout its life time. Hence, no adjustment is required to the sum of salvage value to determine the average investment.[13] Likewise, if any additional net working capital is required in the initial year which is likely to be released only at the end of the project's life, the full amount of working capital should be taken in determining relevant investment for the purpose of calculating ARR. Thus,

$$\text{Average investment} = \text{Net working capital} + \text{Salvage value} + 1/2\ (\text{Initial cost of machine} - \text{Salvage value}) \quad \textbf{(5.2)}$$

For instance, given the information: initial investment (purchase of machine), Rs 11,000, salvage value, Rs 1,000, working capital, Rs 2,000, service life (years) 5 and that the straight line method of depreciation is adopted, the average investment is: Rs 1,000 + Rs 2,000 + 1/2 (Rs 11,000 – Rs.1,000) = Rs 8,000.

Example 5.6

Determine the average rate of return from the following data of two machines, A and B.

Particulars		*Machine A*	*Machine B*
Cost		Rs 56,125	Rs 56,125
Annual estimated income after depreciation and income tax:			
Year	1	3,375	11,375
	2	5,375	9,375
	3	7,375	7,375
	4	9,375	5,375
	5	11,375	3,375
		36,875	36,875
Estimated life (years)		5	5
Estimated salvage value		3,000	3,000

Depreciation has been charged on straight line basis.

Solution ARR = (Average income/Average investment) × 100

Average income of Machines A and B = (Rs 36,875/5) = Rs 7,375

Average investment = Salvage value + 1/2 (Cost of machine – Salvage value)

= Rs 3,000 + 1/2 (Rs 56,125 – Rs 3,000) = Rs 29,562.50

ARR (for machines A and B) = (Rs 7,375/Rs 29563.50) = 24.9 per cent

In addition to the above, there are other approaches to calculate the average rate of return (ARR). One approach, which is a variation of the above, involves using original rather than the average cost of the project. In the case of this alternative approach, the ARR for both the machines would be 13.1 per cent (Rs 7,375 ÷ Rs 56,125).

Accept-reject Rule With the help of the ARR, the financial decision maker can decide whether to accept or reject the investment proposal. As an accept-reject criterion, the actual ARR would be compared with a predetermined or a minimum required rate of return or cut-off rate. A project would qualify to be accepted if the actual ARR is higher than the minimum desired ARR. Otherwise, it is liable to be rejected. Alternatively, the ranking method can be used to select or reject proposals. Thus, the alternative proposals under consideration may be arranged in the descending order of magnitude, starting with the proposal with the highest ARR and ending with the proposal having the lowest ARR. Obviously, projects having higher ARR would be preferred to projects with lower ARR.

Evaluation of ARR In evaluating the ARR, as a criterion to select/reject investment projects, its merits and drawbacks need to be considered. The most favourable attribute of the ARR method is its easy calculation. What is required is only the figure of accounting profits after taxes which should be easily obtainable. Moreover, it is simple to understand and use. In contrast to this, the discounted flow techniques involve tedious calculations and are difficult to understand. Finally, the total benefits associated with the project are taken into account while calculating the ARR. Some methods, pay back for instance, do not use the entire stream of incomes.

However, this method of evaluating investment proposals suffers from serious deficiencies. The principal shortcoming of the ARR approach aries from the use of accounting income instead of cash flows. The cash flow approach is markedly superior to accounting earnings for project evaluation. The earnings calculations ignore the reinvestment potential of a project's benefits while the cash flow takes into account this potential and, hence, the total benefits of the project.

The second principal shortcoming of ARR is that it does not take into account the time value of money. The timing of cash inflows and outflows is a major decision variable in financial decision making. Accordingly, benefits in the earlier years and later years cannot be valued at par. To the extent the ARR method treats these benefits at par and fails to take account of the differences in the time value of money, it suffers from a serious deficiency. Thus, in Example 5.6, the ARR in case of both machines, A and B is the same, although machine B should be preferred since its returns in the early years of its life are greater. Clearly, the ARR method of evaluating investment proposals fails to consider this.

Thirdly, the ARR criterion of measuring the worth of investment does not differentiate between the size of the investment required for each project. Competing investment proposals may have the same ARR, but may require different average investments, as shown in Table 5.6. The ARR method, in such a situation, will leave the firm in an indeterminate position.

TABLE 5.6

Machines	*Average Annual Earnings*	*Average Investment*	*ARR (per cent)*
1	*2*	*3*	*4*
A	Rs 6,000	Rs 30,000	20
B	2,000	10,000	20
C	4,000	20,000	20

Finally, this method does not take into consideration any benefits which can accrue to the firm from the sale or abandonment of equipment which is replaced by the new investment. The 'new' investment, from the point of view of correct financial decision making, should be measured in terms of incremental cash outflows due to new investments, that is, new investment minus sale proceeds of the existing equipment ± tax adjustment. But the ARR method does not make any adjustment in this regard to determine the level of average investments. Investments in fixed assets are determined at their acquisition cost.

For these reason, the ARR leaves much to be desired as a method for project selection.

Pay Back Method

Payback (period) method is the exact amount of time required for a firm to recover its initial investment in a project as calculated from cash inflows.

Computation The **pay back method** (PB) is the second traditional method of capital budgeting. It is the simplest and, perhaps, the most widely employed, quantitative method for appraising capital expenditure decisions. This method answers the question: How many years will it take for the cash benefits to pay the original cost of an investment, normally disregarding salvage value? Cash benefits here represent CFAT ignoring interest payment. Thus, the pay back method (PB) measures the number of years required for the CFAT to pay back the **original outlay** required in an investment proposal.

Original/initial investment (outlay) is the relevant cash outflow for a proposed project at time zero (t = 0).

There are two ways of calculating the PB period. The first method can be applied when the cash flow stream is in the nature of **annuity** for each year of the project's life, that is, CFAT are uniform. In such a situation, the initial cost of the investment is divided by the constant annual cash flow:

Annuity is a stream of equal cash inflows.

$$\text{PB} = \frac{\text{Investment}}{\text{Constant annual cash flow}} \qquad \textbf{(5.3)}$$

For example, an investment of Rs 40,000 in a machine is expected to produce CFAT of Rs 8,000 for 10 years,

$$\text{PB} = \text{Rs } 40{,}000/\text{Rs } 8{,}000 = 5 \text{ years}$$

The second method is used when a project's cash flows are not uniform **(mixed stream)** but vary from year to year. In such a situation, PB is calculated by the process of cumulating cash flows till the time when cumulative cash flows become equal to the original investment outlay. Table 5.7 presents the calculations of pay back period for Example 5.6.

Mixed stream is a series of cash inflows exhibiting any pattern other than that of an annuity.

TABLE 5.7

Year	*Annual CFAT*		*Cumulative CFAT*	
	A	*B*	*A*	*B*
1	Rs 14,000	Rs 22,000	Rs 14,000	Rs 22,000
2	16,000	20,000	30,000	42,000
3	18,000	18,000	48,000	60,000
4	20,000	16,000	68,000	76,000
5	25,000 *	17,000 *	93,000	93,000

* CFAT in the fifth year includes Rs.3,000 salvage value also.

The initial investment of Rs 56,125 on machine A will be recovered between years 3 and 4.

The pay back period would be a fraction more than 3 years. The sum of Rs 48,000 is recovered by the end of the third year. The balance Rs 8,125 is needed to be recovered in the fourth year. In the fourth year CFAT is Rs 20,000. The pay back fraction is, therefore, 0.406 (Rs 8,125/Rs 20,000). The pay back period for machine A is 3.406 years. Similarly, for machine B the pay back period

would be 2 years and a fraction of a year. As Rs 42,000 is recovered by the end of the second year, the balance of Rs 14,125 needs to be recovered in the third year. In the third year CFAT is Rs 18,000. The pay back fraction is 0.785 (Rs 14,125/Rs 18,000). Thus, the PB period for machine B is 2.785 years.

Accept-Reject Criterion The pay back period can be used as a decision criterion to accept or reject investment proposals. One application of this technique is to compare the actual pay back with a predetermined pay back, that is, the pay back set up by the management in terms of the maximum period during which the initial investment must be recovered. If the actual pay back period is less than the predetermined pay back, the project would be accepted; if not, it would be rejected. Alternatively, the pay back can be used as a ranking method. When mutually exclusive projects are under consideration, they may be ranked according to the length of the pay back period. Thus, the project having the shortest pay back may be assigned rank one, followed in that order so that the project with the longest pay back would be ranked last. Obviously, projects with shorter pay back period will be selected.

Evaluation The pay back method has certain merits. It is easy to calculate and simple to understand. Moreover, the pay back method is an improvement over the ARR approach. Its superiority arises due to the fact that it is based on cash flow analysis. The results of Example 5.6 illustrated in Table 5.10 can be cited in support of this. Thus, though the average cash flows for both the machines under the ARR method were the same, the pay back method shows that the pay back period for machine B is shorter than for machine A. The pay back period approach shows that machine B should be preferred as it refunds the capital outlay earlier than machine A.

The pay back approach, however, suffers from serious limitations. Its major shortcomings are as follows:

The first major shortcoming of the pay back method is that it completely ignores all cash inflows after the pay back period. This can be very misleading in capital budgeting evaluations. Table 5.8 reveals alternative projects with the same pay back period (3 years).

TABLE 5.8

Particulars	*Project X*	*Project Y*
Total cost of the project	Rs 15,000	Rs 15,000
Cash inflows (CFAT)		
Year 1	5,000	4,000
2	6,000	5,000
3	4,000	6,000
4	0	6,000
5	0	3,000
6	0	3,000
Pay back period (years)	3	3

In fact, the projects differs widely in respect of cash inflows generated after the pay back period. The cash flow for project X stops at the end of the third year, while that of Y continues up to the sixth year. Obviously, the firm would prefer project Y because it makes available to the firm cash inflows of Rs 12,000, in years 4 through 6, whereas project X does not yield any cash inflow after the third year. Under the pay back method, however, both the projects would be given equal ranking, which is apparently incorrect. Therefore, it cannot be

regarded as a measure of profitability. Its failure lies in the fact that it does not consider the total benefits accruing from the project.

Another deficiency of the pay back method is that it does not measure correctly even the cash flows expected to be received within the pay back period as it does not differentiate between projects in terms of the timing or the magnitude of cash flows. It considers only the recovery period as a whole. This happens because it does not discount the future cash inflows but rather treats a rupee received in the second or third year as valuable as a rupee received in the first year. In other words, to the extent the pay back method fails to consider the pattern of cash inflows, it ignores the time value of money.

Table 5.9 shows that both the projects A and B have **(i)** the same cash outlays in the zero time period; **(ii)** the same total cash inflows of Rs 15,000; and **(iii)** the same pay back period of 3 years. But project A would be acceptable to the firm because it returns cash earlier than project B, enabling A to repay a loan or reinvest it and earn a return. A possible solution to this problem is provided by determining the pay back period of discounted cash flows. This is illustrated in the subsequent section of this chapter.

The discounted payback method still has significant drawbacks. The major one is that the cut-off period is still arbitrarily set. As a result, there is a possibility that a project with positive NPV may be rejected because the cutoff is too short. Also, it does not ensure that a project accepted under shorter discounted payback period has necessarily the maximum NPV.[14]

TABLE 5.9 Cashflows of Projects

Particulars	*Project A*	*Project B*
Total cost of the project	Rs 15,000	Rs 15,000
Cash inflows (CFAT)		
Year 1	10,000	1,000
2	4,000	4,000
3	1,000	10,000

Another flaw of the pay back method is that it does not take into consideration the entire life of the project during which cash flows are generated. As a result, projects with large cash inflows in the latter part of their lives may be rejected in favour of less profitable projects which happen to generate a larger proportion of their cash inflows in the earlier part of their lives. Table 5.10 presents the comparison of two such projects. On the basis of the pay back criterion, project A will be adjudged superior to project B.

TABLE 5.10

Particulars	*Project A*	*Project B*
Total cost of the project	Rs 40,000	Rs 40,000
Cash inflows (CFAT)		
Year 1	14,000	10,000
2	16,000	10,000
3	10,000	10,000
4	4,000	10,000
5	2,000	12,000
6	1,000	16,000
7	Nil	17,000
Pay back period (years)	3	4

It is quite evident just from a casual inspection that project B is more profitable than project A, since the cash inflows of the former amount to Rs 45,000 after the expiry of the pay back period and the cash flows of the latter beyond the pay back period are only Rs 7,000.

The above weaknesses notwithstanding, the pay back method can be gainfully employed under certain circumstances.[15] In the first place, where the long-term outlook, say in excess of three years, is extremely hazy, the pay back method may be useful. In a politically unstable country, for instance, a quick return to recover the investment is the primary goal, and subsequent profits are almost unexpected surprises. Likewise, this method may be very appropriate for firms suffering from liquidity crisis. A firm with limited liquid assets and no ability to raise additional funds, which nevertheless wishes to undertake capital projects in the hope of easing the crisis, might use pay back as a selection criterion because it emphasises quick recovery of the firm's original outlay and little impairment of the already critical liquidity situation. Thirdly, the pay back method may also be beneficial in taking capital budgeting decisions for firms which lay more emphasis on short-run earning performance rather than its long-term growth. The pay back period is a measure of liquidity of investments rather than their profitability. Thus, the pay back period should more appropriately be treated as a constraint to be satisfied than as a profitability measure to be maximised.[16] In spite of the weakness of the payback period method, the method can be used in conjunction with other more sophisticated methods. It can be used to screen potential projects to the few that merit more careful scrutiny with more sophisticated methods such as DCFs.[17] Finally, the pay back period is useful, apart from measuring liquidity, in making calculations in certain situations. For instance, the internal rate of return can be computed easily from the pay back period. The pay back method is a good approximation of the internal rate of return which otherwise requires a trial and error approach.

To conclude the discussion of the traditional methods of appraising capital investment decisions, there are two major drawbacks of these techniques. They do not consider the total benefits in terms of **(i)** the magnitude and **(ii)** the timing of cash flows. For these reasons,the traditional methods are unsatisfactory as capital budgeting decision criteria. The two essential ingredients of a theoretically sound appraisal method, therefore, are that **(i)** it should be based on a consideration of the total cash stream, and **(ii)** it should consider the time value of money as reflected in both the magnitude and the timing of expected cash flows in each period of a project's life. The time-adjusted (also known as discounted cash flow) techniques satisfy these requirements and, to that extent, provide a more objective basis for selecting and evaluating investment projects.

Discounted Cashflow (DCF)/Time-Adjusted (TA) Techniques

The distinguishing characteristics of the DCF capital budgeting techniques is that they take into consideration the time value of money while evaluating the costs and benefits of a project. In one form or another, all these methods require cash flows to be discounted at a certain rate, that is, the cost of capital. The cost of capital (K) is the minimum discount rate earned on a project that leaves the market value unchanged.

The second commendable feature of these techniques is that they take into account all benefits and costs occurring during the entire life of the project.

In the discussions that follow, we have attempted to discuss the DCF evaluation methods. First, we have explained the general procedure behind DCF. This is followed by a discussion of the first DCF technique, namely, net present value (NPV). We have then covered the internal rate of return (IRR) method. The two variations of the NPV method, that is, terminal

value and profitability index (PI) or benefit-cost ratio are also discussed. An attempt has also been made to compare the NPV method with IRR and the PI.

Present Value (PV)/Discounted Cash Flow (DCF)

General Procedure The present value or the discounted cash flow procedure recognises that cash flow streams at different time periods differ in value and can be compared only when they are expressed in terms of a common denominator, that is, present values. It, thus, takes into account the time value of money. In this method, all cash flows are expressed in terms of their present values. The procedure to determine present value is comprehensively covered in Chapter 2.

The present value of the cash flows in Example 5.6 are illustrated in Table 5.11.

TABLE 5.11 Calculations of Present Value of CFAT

	Machine A			Machine B		
Year	CFAT	PV factor (0.10)	Present value	CFAT	PV factor (0.10)	Present value
1	2	3	4	5	6	7
1	Rs 14,000	0.909	Rs 12,726	Rs 22,000	0.909	Rs 19,998
2	16,000	0.826	13,216	20,000	0.826	16,520
3	18,000	0.751	13,518	18,000	0.751	13,518
4	20,000	0.683	14,660	16,000	0.683	10,928
5	25,000*	0.621	15,525	17,000*	0.621	10,557
			69,645			71,521

*includes salvage value.

The PV so determined is compared with the PV of cash outflows. The present values of cash inflows of both the machines are higher than cash outflows, and, therefore both are acceptable.

The PV of CFAT (Col. 4 and Col. 7 of Table 5.11) now can be used to determine the 'discounted' pay back period. It is determined on the basis of discounted present value of CFAT vis-a-vis unadjusted cash flows (Col .2 and Col .5 of Table 5.11) used in the 'simple' pay back method. The relevant values of the 'discounted' pay back period are 4.2 and 3.66 years for Machines A and B respectively in Example 5.6.

Net Present Value (NPV) Method The first DCF/PV technique is the NPV. **NPV** may be described as the summation of the present values of cash proceeds (CFAT) in each year minus the summation of present values of the net cash outflows in each year. Symbolically, the NPV for projects having conventional cash flows would be:

$$\text{NPV} = \sum_{t=1}^{n} \frac{CF_t}{(1+K)^t} + \frac{S_n + W_n}{(1+K)^n} - CO_0 \qquad \textbf{(5.4)}$$

If cash outflow is also expected to occur at some time other than at initial investment (non-conventional cash flows) the formula would be:

$$\text{NPV} = \sum_{t=1}^{n} \frac{CF_t}{(1+K)^t} + \frac{S_n + W_n}{(1+K)^n} - \sum_{t=0}^{n} \frac{CO_t}{(1+K)^t} \qquad \textbf{(5.5)}$$

Net present value (NPV is found by subtracting a projects initial investment from the present value of its cash inflows discounted at the firm's cost of capital.

The decision rule for a project under NPV is to accept the project if the NPV is positive and reject if it is negative. Symbolically,

(i) NPV > zero, accept, **(ii)** NPV < zero, reject **(5.6)**

Zero NPV implies that the firm is indifferent to accepting or rejecting the project. However, in practice it is rare if ever such a project will be accepted, as such a situation simply implies that only the original investment has been recovered[18].

In Example 5.6 we would accept the proposals of purchasing machines A and B as their net present values are positive. The positive NPV of machine A is Rs 13,520 (R 69,645 – Rs 56,125) and that of B is Rs 15,396 (Rs 71,521 – Rs 56,125).

In Example 5.6, if we incorporate cash outflows of Rs 25,000 at the end of the third year in respect of overhauling of the machine, we shall find the proposals to purchase either of the machines are unacceptable as their net present values are negative. The negative NPV of machine A is Rs 6,255 (Rs 68,645 – Rs 74,900) and of machine B is Rs 3,379 (Rs 71,521 – Rs 74,900).

As a decision criterion, this method can also be used to make a choice between mutually exclusive projects. On the basis of the NPV method, the various proposals would be ranked in order of the net present values. The project with the highest NPV would be assigned the first rank, followed by others in the descending order. If, in our example, a choice is to be made between machine A and machine B on the basis of the NPV method, machine B having larger NPV (Rs 15,396) would be preferred to machine A (NPV being Rs 12,520).

Evaluation The present value method including the NPV variation possesses several merits. The first, and probably the most significant, advantage is that it explicitly recognises the time value of money. In Example 5.6, for instance (Table 5.11), the total cash inflows (CFAT) pertaining to the two machines (A and B) are equal. But the present value as well as the NPV is different. As can be seen from Table 5.11, this is primarily because of the differences in the pattern of the cash streams. The magnitude of CFAT in the case of machine A is lower in the earlier years as compared to the machine B while it is greater in the latter years. Because of larger inflows in the first two years, the NPV of machine B is larger than that of machine A. The need for recognising the time value of money is, thus, satisfied by this method.

Secondly, it also fulfills the second attribute of a sound method of appraisal in that it considers the total benefits arising out of the proposal over its lifetime.

Thirdly, a changing discount rate can be built into the NPV calculations by altering the denominator. This feature becomes important as this rate normally changes because the longer the time span, the lower is the value of money and the higher is the discount rate.

Fourthly, this method is particularly useful for the selection of mutually exclusive projects. This aspect will be discussed in detail in the latter part of the chapter, where it is shown that for mutually exclusive choice problems, the NPV method is the best decision-criterion.

Finally, this method of asset selection is instrumental in achieving the objective of financial management which is the maximisation of the shareholders' wealth. The rationale behind this contention is the effect on the market price of shares as a result of the acceptance of a proposal having present value exceeding the initial outlay or, as a variation having NPV greater than zero. The market price of the shares will be affected by the relative force of what the investors expect and what actual return is earned on the funds. The discount rate that is used to convert benefits into present values is the minimum rate or the rate of interest is that when

the present values of cash inflows is equal to the initial outlay or when the NPV = 0, the return on investment just equals the expected or required rate by investors. There would, therefore, be no change in the market price of shares. When the present value exceeds the outlay or the NPV > 0, the return would be higher than expected by the investors. It would, therefore, lead to an increase in share prices. The present value method is, thus, logically consistent with the goal of maximising shareholders' wealth in terms of maximising the market price of the shares.

In brief, the present value method is a theoretically correct technique for the selection of investment projects. Nevertheless, it has certain limitations also.

In the first place, it is difficult to calculate as well as understand and use in comparison with the pay back method or even the ARR method. This, of course, is a minor flaw.

The second, and a more serious problem associated with the present value method, involves the calculation of the required rate of return to discount the cash flows. The discount rate is the most important element used in the calculation of the present values because different discount rates will give different present values. The relative desirability of a proposal will change with a change in the discount rate. For instance, for a proposal involving an initial outlay of Rs 9,000, having annuity of Rs 2,800 for 5 years, the net present values for different required rates of return are given in Table 5.12.

TABLE 5.12 Net Present Value With Different Discount Rates

Discount rate (per cent)	*Net present value*
Zero	Rs 5,000.00
4	3,465.00
8	2,179.50
10	1,614.00
12	1,093.50
16	168.00
20	(626.50)

The importance of the discount rate is, thus, obvious. But the calculation of the required rate of return presents serious problems. The cost of capital is generally the basis of the discount rate. The calculation of the cost of capital is very complicated. In fact, there is a difference of opinion even regarding the exact method of calculating it.

Another shortcoming of the present value method is that it is an absolute measure. Prima facie between two projects, this method will favour the project which has higher present value (or NPV). But it is likely that this project may also involve a larger initial outlay. Thus, in case of projects involving different outlays, the present value method may not give dependable results.

Finally, the present value method may also not give satisfactory results in the case of two projects having different effective lives. In general, the project with a shorter economic life would be preferable, other things being equal. A project which has a higher present value may also have a larger economic life so that the funds will remain invested for a longer period, while the alternative proposal may have shorter life but smaller present value. In such situations, the present value method may not reflect the true worth of the alternative proposals.

Internal Rate of Return (IRR) Method The second discounted cash flow (DCF) or time-adjusted method for appraising capital investment decisions is the internal rate of return (IRR) method. This technique is also known as yield on investment, marginal efficiency of capital, marginal productivity of capital, rate of return, time-adjusted rate of return and so on. Like the present value method, the IRR method also considers the time value of money by discounting the cash streams. The basis of the discount factor, however, is different in both cases. In the case of the net present value method, the discount rate is the required rate of return and being a predetermined rate, usually the cost of capital, its determinants are external to the proposal under consideration. The IRR, on the other hand, is based on facts which are internal to the proposal. In other words, while arriving at the required rate of return for finding out present values the cash flows—inflows as well as outflows—are not considered. But the IRR depends entirely on the initial outlay and the cash proceeds of the project which is being evaluated for acceptance or rejection. It is, therefore, appropriately referred to as internal rate of return.

Internal rate of return (IRR) is the discount rate that equates the present values of cash inflows with the initial investment associated with a project, thereby causing NPV = 0.

The **internal rate of return** is usually the rate of return that a project earns. It is defined as the discount rate (r) which equates the aggregate present value of the net cash inflows (CFAT) with the aggregate present value of cash outflows of a project. In other words, it is that rate which gives the project NPV of zero.

Assuming conventional cash flows, mathematically, the IRR is represented by the rate, r, such that

$$CO_0 = \sum_{t=1}^{n} \frac{CF_t}{(1+r)^t} + \frac{S_n + W_n}{(1+r)^n} \qquad \textbf{(5.7)}$$

$$\text{Zero} = \sum_{t=1}^{n} \frac{CF_t}{(1+r)^t} + \frac{S_n + W_n}{(1+r)^n} - CO_0 \qquad \textbf{(5.8)}$$

For unconventional cash flows, the equation would be:

$$= \sum_{t=0}^{n} \frac{CF_t}{(1+r)^t} + \frac{S_n + W_n}{(1+r)^n} - \sum_{t=1}^{n} \frac{CO_0}{(1+r)^t} \qquad \textbf{(5.9)}$$

$$= \sum_{t=1}^{n} \frac{CF_t}{(1+r)^t} + \frac{S_n + W_n}{(1+r)^n} - \sum_{t=0}^{n} \frac{CO_t}{(1+r)^t} = \text{Zero} \qquad \textbf{(5.10)}$$

where r = The internal rate of return,
CF_t = Cash inflows at different time periods,
S_n = Salvage value,
W_n = Working capital adjustments and
CO_t = Cash outlay at different time periods

Accept-Reject Decision The use of the IRR, as a criterion to accept capital investment decisions, involves a comparison of the actual IRR with the required rate of return also known as the cut-off rate or hurdle rate. The project would qualify to be accepted if the IRR (r) exceeds the cut-off rate (k). If the IRR and the required rate of return are equal, the firm is indifferent as to whether to accept or reject the project.

Computation Unlike the NPV method, calculating the value of IRR is more difficult. The procedure will depend on whether the cash flows are annuity or mixed stream.

Annuities The following steps are taken in determining IRR for an annuity:

- Determine the pay back period of the proposed investment.
- In Table A-4 (present value of an annuity) look for the pay back period that is equal to or closest to the life of the project.
- In the year row, find two PV values or discount factor (DFr) closest to PB period but one bigger and other smaller than it.
- From the top row of the table, note interest rate (r) corresponding to these PV values (DFr).
- Determine actual IRR by interpolation. This can be done either directly using Equation 5.11 or indirectly by finding present values of annuity (Equation 5.12).

$$\text{IRR} = r - \left(\frac{\text{PB} - \text{DF}_r}{\text{DF}_{rL} - \text{DF}_{rH}} \right) \qquad \textbf{(5.11)}$$

where PB = Pay back period,

DF_r = Discount factor for interest rate r,

DF_{rL} = Discount factor for lower interest rate,

DF_{rH} = Discount factor for higher interest rate and

r = Either of the two interest rates used in the formula

Alternatively,

$$\text{IRR} = r - \left(\frac{\text{PV}_{CO} - \text{PV}_{CFAT}}{\Delta \text{PV}} \right) \times \Delta r \qquad \textbf{(5.12)}$$

where PV_{CO} = Present value of cash outlay,

PV_{CFAT} = Present value of cash inflows (DF_r x annuity),

r = Either of the two interest rates used in the formula,

Δr = Difference in interest rates and

ΔPV = Difference in calculated present values of inflows

The computations are shown in Example 5.7.

Example 5.7

A project costs Rs 36,000 and is expected to generate cash inflows of Rs 11,200 annually for 5 years. Calculate the IRR of the project.

Solution

(1) The pay back period is 3.214 (Rs 36,000/Rs 11,200)

(2) According to Table A-4, discount factors closest to 3.214 for 5 years are 3.274 (16 per cent rate of interest) and 3.199 (17 per cent rate of interest). The actual value of IRR which lies between 16 per cent and 17 per cent can, now, be determined using Equations 5.11 and 5.12.

Substituting the values in Equation 5.11 we get: $\text{IRR} = 16 + \left(\frac{3.274 - 3.214}{3.274 - 3.199} \right) = 16.8$ per cent

Alternatively (starting with the higher rate), $\text{IRR} = 17 - \left(\frac{3.214 - 3.199}{3.274 - 3.199} \right) = 16.8$ per cent

Instead of using the direct method, we may find the actual IRR by applying the interpolation formula to the present values of cash inflows and outflows (Equation 5.12). Here, again, it is immaterial whether we start with the lower or the higher rate.

$$PV_{CFAT}\ (0.16) = \text{Rs } 11{,}200 \times 3.274 = \text{Rs } 36{,}668.8$$

$$PV_{CFAT}\ (0.17) = \text{Rs } 11{,}200 \times 3.199 = \text{Rs } 35{,}828.8$$

$$\text{IRR} = 16 + \left(\frac{36{,}668.8 - 36{,}000}{36{,}668.8 - 35{,}828.8}\right) \times 1 = 16.8 \text{ per cent}$$

Alternatively (starting with the higher rate), $\text{IRR} = r - \dfrac{(PV_{CO} - PV_{CFAT})}{\Delta PV} \times \Delta r$

$$\text{IRR} = 17 - \left(\frac{36{,}000 - 35{,}828.8}{840}\right) \times 1 = 16.8 \text{ per cent}$$

For a Mixed Stream of Cash Flows Calculating the IRR for a mixed stream of cash flows is more tedious. In a mixed stream of cash flows, the inflows in various years are uneven or unequal. One way to simplify the process is to use 'fake annuity' as a starting point.[19] The following procedure is a useful guide to calculating IRR:

1. Calculate the average annual cash inflow to get a 'fake annuity'.
2. Determine 'fake pay back period' dividing the initial outlay by the average annual CFAT determined in step 1.
3. Look for the factor, in Table A-4, closest to the fake pay back value in the same manner as in the case of annuity. The result will be a rough approximation of the IRR, based on the assumption that the mixed stream is an annuity (fake annuity).
4. Adjust subjectively the IRR obtained in step 3 by comparing the pattern of average annual cash inflows (as per step 1) to the actual mixed stream of cash flows. If the actual cash flows stream happens to be higher in the initial years of the project's life than the average stream, adjust the IRR a few percentage points upward. The reason is obvious as the greater recovery of funds in the earlier years is likely to give a higher yield rate (IRR). Conversely, if in the early years the actual cash inflows are below the average, adjust the IRR a few percentage points downward. If the average cash flows pattern seems fairly close to the actual pattern, no adjustment is to be made.
5. Find out the present value (using Table A-3) of the mixed cash flows, taking the IRR as the discount rate as estimated in step 4.
6. Calculate the PV, using the discount rate. If the PV of CFAT equals the initial outlay, that is, NPV is zero, it is the IRR. Otherwise, repeat step 5. Stop, once two consecutive discount rates that cause the NPV to be positive and negative, respectively have been calculated. Whichever of these two rates causes the NPV to be closest to zero is the IRR to the nearest 1 per cent.
7. The actual value can be ascertained by the method of interpolation as in the case of an annuity.

Example 5.8

Let us apply this procedure for determining the IRR of Example 5.6 of a mixed stream of CFAT for machines A and B. The cash flows associated with the machines are given in Table 5.7.

Solution

1. The sum of cash inflows of both the machines is Rs 93,000 which when divided by the economic life of the machine (5 years), results in a 'fake annuity' of Rs 18,600.
2. Dividing the initial outlay of Rs 56,125 by Rs 18,600, we have 'fake average pay back period' of 3.017 years.
3. In Table A-4, the factor closest to 3.017 for 5 years is 2.991 for a rate of 20 per cent.
4. Since the actual cash flows in the earlier years are greater than the average cash flows of Rs 18,600 in machine B, a subjective increase of, say, 1 per cent is made. This makes an estimated rate of IRR 21 per cent for machine B. In the case of machine A, since cash inflows in the initial years are smaller than the average cash flows, a subjective decrease of, say, 2 per cent is made. This makes the estimated IRR rate 18 per cent for machine A.
5. Using the PV factors for 21 per cent (Machine B) and 18 per cent (Machine A) from Table A-3 for years 1-5, the PVs are calculated in Table 5.13.

TABLE 5.13

	Machine A			*Machine B*		
Year	*CFAT*	*PV factor (0.18)*	*Total PV*	*CFAT*	*PV factor (0.21)*	*Total PV*
1	Rs 14,000	0.847	Rs 11,858	Rs 22,000	0.826	Rs 18,172
2	16,000	0.718	11,488	20,000	0.683	13,660
3	18,000	0.609	10,962	18,000	0.564	10,152
4	20,000	0.516	10,320	16,000	0.467	7,472
5	25,000	0.437	10,925	17,000	0.386	6,562
Total present value			55,553			56,018
Less: Initial investment		56,125			56,125	
NPV			(572)			(107)

6. Since the NPV is negative for both the machines, the discount rate should be subsequently lowered. In the case of machine A the difference is of Rs 572 whereas in machine B the difference is Rs 107. Therefore, in the former case the discount rate is lowered by 1 per cent in both the cases. As a result, the new discount rate would be 17 per cent for A and 20 per cent for B.

The calculations given in Table 5.14 shows that the NPV at discount rate of 17 per cent is Rs 853 (machine A) and Rs 1,049 for machine B at 20 per cent dicount.

TABLE 5.14

	Machine A			*Machine B*		
Year	*CFAT*	*PV factor (0.17)*	*Total PV*	*CFAT*	*PV factor (0.20)*	*Total PV*
1	Rs 14,000	0.855	Rs 11,970	Rs 22,000	0.833	Rs 18,326
2	16,000	0.731	11,696	20,000	0.694	13,880
3	18,000	0.624	10,232	18,000	0.579	10,422
4	20,000	0.534	10,680	16,000	0.484	7,712
5	25,000	0.456	11,400	17,000	0.442	6,834
PV of cash inflows			56,978			57,174
Less: Initial outlay			56,125			56,125
Net present value			853			1,049

(a) For machine A: Since 17 per cent and 18 per cent are consecutive discount rates that give positive and negative net present values, interpolation method can be applied to find the actual IRR which will be between 17 and 18 per cent.

$$\text{IRR} = 17 + \left[\frac{\text{Rs } 56,978 - \text{Rs } 56,125}{\text{Rs } 56,978 - \text{Rs } 55,553}\right] \times 1 = 17.6 \text{ per cent}$$

(b) For machine B: $\text{IRR} = 20 + \left[\frac{\text{Rs } 57,174 - \text{Rs } 56\ 125}{\text{Rs } 57,174 - \text{Rs } 56,018}\right] \times 1 = 20.9$ per cent

Evaluation of IRR The IRR method is a theoretically correct technique to evaluate capital expenditure decisions. It has the advantages which are offered by the NPV criterion such as: **(i)** it considers the time value of money, and **(ii)** it takes into account the total cash inflows and outflows.

In addition, the IRR is easier to understand. Business executives and non-technical people understand the concept of IRR much more readily than they understand the concept of NPV. They may not be following the definition of IRR in terms of the equation but they are well aware of its usual meaning in terms of the rate of return on investment. For instance, business executives will understand the investment proposal in a better way if told that IRR of machine B is 21 per cent and k is 10 per cent instead of saying that the NPV of machine B is Rs 15,396.

Another merit of IRR is that it does not use the concept of the required rate of return/the cost of capital. It itself provides a rate of return which is indicative of the profitability of the proposal. The cost of capital, of course, enters the calculations later on.

Finally, it is consistent with the overall objective of maximising shareholders' wealth. According to IRR, as a decision-criterion, the acceptance or otherwise of a project is based on a comparison of the IRR with the required rate of return. The required rate of return is, by definition, the minimum rate which investors expect on their investment. In other words, if the actual IRR of an investment proposal is equal to the rate expected by the investors, the share prices will remain unchanged. Since, with IRR, only such projects are accepted as have IRR > required rate, the share prices will tend to rise. This will naturally lead to the maximisation of shareholders' wealth.

Its theoretical soundness notwithstanding, the IRR suffers from serious limitations.

First, it involves tedious calculations. As shown above, it generally involves complicated computational problems. Secondly, it produces multiple rates which can be confusing. This aspect is further developed later in this chapter. Thirdly, in evaluating mutually exclusive proposals, the project with the highest IRR would be picked up to the exclusion of all others. However, in practice, it may not turn out to be the one which is the most profitable and consistent with the objectives of the firm, that is, maximisation of the shareholders' wealth. This aspect also has been discussed in detail later in this chapter. Finally, under the IRR method, it is assumed that all intermediate cash flows are reinvested at the IRR. In our example, the IRR rates for machines A and B are 17.6 per cent and 20.9 per cent respectively. In operational terms, 17.6 per cent IRR signifies that all cash inflows of machine A can be reinvested at 17.6 per cent whereas that of B at 20.9 per cent. It is rather ridiculous to think that the same firm has the ability to reinvest the cash flows at different rates.

There is no difference in the 'quality of cash' received either from project A or B. The reinvestment rate assumption under the IRR method is, therefore, very unrealistic. Moreover, it is not safe to assume always that intermediate cash flows from the project will be reinvested at all. A portion of cash inflows may be paid out as dividends. Likewise, a portion of it may

be tied up in current assets such as stocks, debtors or cash. Clearly, the firm will get a wrong picture of the capital project if it assumes that it invests the entire intermediate cash proceeds. Further, it is not safe to assume, as is often done, that they will be reinvested at the same rate of return as the company is currently earning on its capital (IRR) or at the current cost of capital, k. In order to have correct and reliable results it is obvious, therefore, that they should be based on realistic estimates of the interest rate (if any) at which income will be reinvested. Terminal value takes care of this aspect.

Terminal Value Method The terminal value approach (TV) even more distinctly separates the timing of the cash inflows and outflows. The assumption behind the TV approach is that each cash inflow is reinvested in another asset at a certain rate of return from the moment it is received until the termination of the project. Consider Example 5.9.

Example 5.9

Original outlay, Rs 10,000; Life of the project, 5 years; Cash inflows, Rs 4,000 each for 5 years; and Cost of capital (*k*), 10 per cent.

Expected interest rates at which cash inflows will be reinvested:

Year-end	*Per cent*
1	6
2	6
3	8
4	8
5	8

Solution

We would reinvest Rs 4,000 received at the end of the year 1 for 4 years at the rate of 6 per cent. The cash inflows in year 2 will be re-invested for 3 years at 6 per cent, the cash inflows of year 3 for 2 years and so on.

There will be no reinvestment of cash inflows received at the end of the fifth year. The total sum of these compounded cash inflows is then discounted back for 5 years at 10 per cent and compared with the present value of the cash outlays, that is, Rs 10,000 (in this case).

The PV of the terminal sum is given in Table 5.15.

TABLE 5.15

Year	*Cash inflows*	*Rate of interest*	*Years for investment*	*Compounding factor*	*Total compounded sum*
1	*2*	*3*	*4*	*5*	*6*
1	Rs 4,000	6	4	1.262	Rs 5,048
2	4,000	6	3	1.191	4,764
3	4,000	8	2	1.166	4,664
4	4,000	8	1	1.080	4,320
5	4,000	8	0	1.000	4,000
					22,796

Now, we have to find out the present value of Rs 22,796. The discount rate would be the cost of capital, k (0.10). The sum of Rs.22,796 would be received at the end of year 5. Its present value = Rs 22,796 × 0.621 = Rs 14,156.3.

Accept-reject Rule The decision rule is that if the present value of the sum total of the compounded reinvested cash inflows (PVTS) is greater than the present value of the outflows (PVO), the proposed project is accepted otherwise not. Symbolically,

$$\text{PVTS} > \text{PVO accept} \qquad \textbf{(5.13)}$$
$$\text{PVTS} < \text{PVO reject}$$

The firm would be indifferent if both the values are equal. Thus, since the PVTS of Rs 14,156.31 exceeds the original outlay of Rs 10,000, we would accept the assumed project under the TV criterion.

A variation of the terminal value method (TV) is the net terminal value (NTV). Symbolically it can be represented as NTV = (PVTS – PVO). If the NTV is positive, accept the project, if the NTV is negative, reject the project. In the above example, the NTV is positive. Its value is Rs 4,156.31. Therefore, the project is acceptable.

The NTV method is similar to NPV method, with the difference that while in the former, values are compounded, in the latter, they are discounted. Both the methods will give the same results provided of course the same figures have been discounted as have been compounded and the same interest rate (rates) is used for both discounting and compounding.

Evaluation The NTV (or TV) method has a number of advantages.

Firstly, these methods explicitly incorporate the assumption about how the cash inflows are reinvested once they are received and avoid any influence of the cost of capital on the cash inflow stream itself. Secondly, it is mathematically easier, making simple the process of evaluating the investment worth of alternative capital projects. Thirdly, this method would be easier to understand for business executives who are not trained in accountancy or economics than NPV for IRR, as the 'compounding technique', appeals more than 'discounting'. Fourthly, it is better suited to cash budgeting requirements. The NPV computation in spite of being a cash flow approach does not explicitly show all the cash inflows. It does not take into account cash inflows in respect of interest earnings.

The major practical problem of this method lies in projecting the future rates of interest at which the intermediate cash inflows received will be reinvested.

Profitability index measures the present value of returns per rupee invested.

Profitability Index (PI) or Benefit-Cost Ratio (B/C Ratio) Yet another time-adjusted capital budgeting technique is profitability index (PI) or benefit-cost ratio (B/C). It is similar to the NPV approach. The **profitability index** approach measures the present value of returns per rupee invested, while the NPV is based on the difference between the present value of future cash inflows and the present value of cash outlays. A major shortcoming of the NPV method is that, being an absolute measure, it is not a reliable method to evaluate projects requiring different initial investments. The PI method provides a solution to this kind of problem. It is, in other words, a relative measure. It may be defined as the ratio which is obtained dividing the present value of future cash inflows by the present value of cash outlays. Symbolically,

$$\text{PI} = \frac{\text{Present value cash inflows}}{\text{Present value of cash outflows}} \qquad \textbf{(5.14)}$$

This method is also known as the B/C ratio because the numerator measures benefits and the denominator costs. A more appropriate description would be present value index.

Accept-Reject Rule Using the B/C ratio or the PI, a project will qualify for acceptance if its PI exceeds one. When PI equals 1, the firm is indifferent to the project.

When PI is greater than, equal to or less than 1, the net present value is greater than, equal to or less than zero respectively. In other words, the NPV will be positive when the PI is greater than 1; will be negative when the PI is less than one. Thus, the NPV and PI approaches give the same results regarding the investment proposals.

The selection of projects with the PI method can also be done on the basis of ranking. The highest rank will be given to the project with the highest PI, followed by others in the same order.

In Example 5.6 (Table 5.15) of machine A and B, the PI would be 1.22 for machine A and 1.27 for machine B:

PI (Machine A) = Rs 68,645/Rs 56,125) = 1.22

PI (Machine B) = (Rs 71,521/Rs56125) = 1.27

Since the PI for both the machines is greater than 1, both the machines are acceptable.

Though it is common to define PI as the ratio of the PV of the cash inflows divided by the PV of cash outflows, the PI may also be measured on the basis of the net benefits of a project against its current cash outlay rather than measure its gross benefits against its total cost over the life of the project. This aspect becomes very important in situations of capital rationing.[19] In such a situation, the decision rule would be to accept the project if the PI is positive and reject the project it it is negative.

Evaluation Like the other discounted cash flow techniques, the PI satisfies almost all the requirements of a sound investment criterion. It considers all the elements of capital budgeting, such as the time value of money, totality of benefits and so on. Conceptually, it is a sound method of capital budgeting. Although based on the NPV, it is a better evaluation technique than NPV in a situation of capital rationing. For instance, two projects may have the same NPV of Rs 10,000 but project A requires an initial investment of Rs 50,000 whereas B only of Rs 25,000. Project B should be preferred as will be suggested by the PI method. The NPV method, however, will give identical rankings of both the projects. Thus, the PI method is superior to the NPV method as the former evaluates the worth of projects in terms of their relative rather than absolute magnitudes. However, in some problems of a mutually exclusive nature, the NPV method would be superior to the PI method. The comparison of PI and NPV is further explored in Chapter 6.

This method is, however, more difficult to understand. Also, it involves more computation than the traditional methods but less than IRR.

Summary

- Capital budgeting decisions relate to long-term assets which are in operation and yield a return over a period of time. They, therefore. involve current outlays in return for series of anticipated flow of future benefits.
- Such decisions are of paramount importance as they affect the profitability of a firm, and are the major determinants of its efficiency and competing power. While an opportune investment decision can yield spectacular returns, an ill-advised/incorrect decision can endanger the very survival of a firm. A few wrong decisions and the firm may be forced into bankruptcy.
- Capital expenditure decisions are beset with a number of difficulties. The two major difficulties are: **(i)** The benefits from long-term investments are received in some future period which is uncertain. Therefore, an element of risk is involved in forecasting future sales revenues as well

as the associated costs of production and sales; **(ii)** It is not often possible to calculate in strict quantitative terms all the benefits or the costs relating to a specific investment decision.

- Such decisions are of two types, namely, revenue expanding investment decisions and cost reducing investment decisions. The latter types of decisions are subject to less risk as the potential cash saving can be estimated better from the past production and cost data. It is more difficult to estimate revenues and costs of a new product line.
- The capital outlays and revenue benefits associated with such decisions are measured in terms of cash flows after taxes. The cash flow approach for measuring benefits is theoretically superior to the accounting profit approach as it **(i)** avoids the ambiguities of the accounting profits concept, **(ii)** measures the total benefits and **(iii)** takes into account the time value of money.
- The major difference between the cash flow and the accounting profit approaches relates to the treatment of depreciation. While the accounting approach considers depreciation in cost computation, it is recognised, on the contrary, as a source of cash to the extent of tax advantage in the cash flow approach.
- For taxation purposes, depreciation is charged (on the basis of written down value method) on a block of assets and not on an individual asset. A block of assets is a group of assets (say, of plant and machinery) in respect of which the same rate of depreciation is prescribed by the Income-Tax Act.

  Depreciation is charged on the year-end balance of the block which is equal to the opening balance plus purchases made during the year (in the block considered) minus sale proceeds of the assets during the year.

  In case the entire block of assets is sold during the year (the block ceases to exist at year-end), no depreciation is charged at the year-end. If the sale proceeds of the block sold is higher than the opening balance, the difference represents short-term capital gain which is subject to tax. Where the sale proceeds are less than the opening balance, the firm is entitled to tax shield on short-term capital loss. The adjustment related to the payment of taxes/tax shield is made in terminal cash inflows of the project.
- The data requirement for capital budgeting are after tax cash outflows and cash inflows. Besides, they should be incremental in that they are directly attributable to the proposed investment project. The existing fixed costs, therefore, are ignored. In brief, incremental after-tax cash flows are the only relevant cash flows in the analysis of new investment projects.
- The investment in new capital projects can be categorised into **(i)** a single proposal, **(ii)** a replacement proposal and **(iii)** mutually exclusive proposals.
- In the case of single/independent investment proposal, cash outflows primarily consist of **(i)** purchase cost of the new plant and machinery, **(ii)** its installation costs and **(iii)** working capital requirement to support production and sales (in the case of revenue expanding proposals/release of working capital in cost reduction proposals.

  The cash inflows after taxes (CFAT) are computed by adding depreciation (D) to the projected earnings after taxes (EAT) from the proposal. In the terminal year of the project, apart from operating CFAT, the cash inflows include salvage value (if any, net of removal costs), recovery of working capital and tax advantage\taxes paid on short-term capital loss\gain on sale of machine (if the block ceases to exist).
- In the case of replacement situation, the sale proceeds from the existing machine reduce the cash outflows required to purchase the new machine. The relevant CFAT are *incremental* after-tax cash inflows.

- In the case of mutually exclusive proposals, the selection of one proposal precludes the selection of the other(s). The computation of the cash outflows and cash inflows are on lines similar to the replacement situation.
- The capital budgeting evaluation techniques are: **(i)** traditional, comprising (a) average/accounting rate of return (ARR) and (b) pay back (PB) period; **(ii)** discounted cash flow (DCF), primarily consisting of (a) net present value (NPV), (b) internal rate of return (IRR) and **(iii)** profitability/present value index (PI).
- The ARR is obtained dividing annual average profits after taxes by average investments. Average investment = 1/2 (Initial cost of machine – Salvage value) + Salvage value + net working capital. Annual average profits after taxes = Total expected after tax profits/Number of years

  The ARR is unsatisfactory method as it is based on accounting profits and ignores time value of money.
- The pay back method measures the number of years required for the CFAT to pay back the initial capital investment outlay, ignoring interest payment. It is determined as follows:
  (i) In the case of annuity CFAT: Initial investment/Annual CFAT.
  (ii) In the case of mixed CFAT: It is obtained by cumulating CFAT till the cumulative CFAT equal the initial investment.

  Although the pay back method is superior to the ARR method in that it is based on cash flows, it also ignores time value of money and disregards the total benefits associated with the investment proposal.
- The DCF methods satisfy all the attributes of a good measure of appraisal as they consider the total benefits (CFAT) as well as the timing of benefits.
- The NPV may be described as the summation of the present values of **(i)** operating CFAT (CF) in each year and **(ii)** salvages value(S) and working capital(W) in the terminal year(n) minus the summation of present values of the cash outflows(CO) in each year. The present value is computed using cost of capital (k) as a discount rate. Symbolically,

$$\text{NPV} = \sum_{t=1}^{n} \frac{CF_t}{(1+k)^t} + \frac{S_n + W_n}{(1+k)^n} - \sum_{t=0}^{n} \frac{CO_t}{(1+k)^t}$$

  The project will be accepted in case the NPV is positive.
- The IRR is defined as the discount rate (r) which equates the aggregate present value of the operating CFTA received each year and terminal cash flows (working capital recovery and salvage value) with aggregate present value of cash outflows of an investment proposal. Symbolically,

$$\text{IRR} = \sum_{t=1}^{n} \frac{CF_t}{(1+r)^t} + \frac{S_n + W_n}{(1+r)^n} - \sum_{t=1}^{n} \frac{CO_t}{(1+r)^t}$$

  The project will be accepted when IRR exceeds the required rate of return.
- The profitability index/present value index measures the present value of returns per rupee invested. It is obtained dividing the present value of future cash inflows (bot operating CFAT and terminal) by the present value of capital cash outflows. The proposal will be worth accepting if the PI exceeds one.

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18. It may be noted that (i) NPV value is based on the assumption that cash inflows (CFAT) accrue at year-end. However, in practice, CFAT accrue through out the period. Therefore, the actual NPV is likely to be higher than the estimated value. It also implies that determination of NPV is conservative in nature. (ii) As a corollary of (i), it implies that the project may be worth accepting even at zero NPV.
19. Gitman, L J, *op cit*., 1997, pp 295-96.
20. Osteryoung, J S, *op cit*., p 114.

Practical Problems

P.5.1 A company is considering an investment proposal to instal new milling controls at a cost of Rs.50,000. The facility has a life expectancy of 5 years and no salvage value. The tax rate is 35 per cent. Assume the firm uses straight line depreciation and the same is allowed for tax purposes. The estimated cash flows before depreciation and tax (CFBT) from the investment proposal are as follows:

Year	*CFBT*
1	Rs 10,000
2	10,692
3	12,769
4	13,462
5	20,385

Compute the following:

(i) Pay back period,
(ii) Average rate of return,
(iii) Internal rate of return,
(iv) Net present value at 10 per cent discount rate,
(v) Profitability index at 10 per cent discount rate.

Solution

Determination of cashflows after taxes (CFAT)

Year	*CFBT*	*Depreciation (Rs 50,000/5)*	*Profits before tax (Col.2 – Col.3)*	*Taxes (0.35)*	*EAT (Col.4 – Col.5)*	*CFAT (Col.6+Col.3)*
1	*2*	*3*	*4*	*5*	*6*	*7*
1	Rs 10,000	Rs 10,000	Nil	Nil	Nil	Rs 10,000
2	10,692	10,000	Rs 692	Rs 242	Rs 450	10,450
3	12,769	10,000	2,769	969	1,800	11,800
4	13,462	10,000	3,462	1,212	2,250	12,250
5	20,385	10,000	10,385	3,635	6,750	16,750
					11,250	61,250

(i) **Pay back (PB) period**

Year	*CFAT*	*Cumulative CFAT*
1	Rs 10,000	Rs 10,000
2	10,450	20,450
3	11,800	32,250
4	12,250	44,500
5	16,750	61,250

The recovery of the investment falls between the fourth and fifth years. Therefore, the PB is 4 years plus a fraction of the fifth year. The fractional value = Rs 5,500 ÷ Rs 16,750 = 0.328. Thus, the PB is 4.328 years.

(ii) Average rate of return (ARR) $\dfrac{\text{Average income}}{\text{Average investment}} \times 100$

$$= \frac{\text{Rs } 2,250 \text{ (Rs } 11,250 \div 5)}{\text{Rs } 25,000 \text{ (Rs } 50,000 \div 2)} \times 100 = 9 \text{ per cent}$$

(iii) Internal rate of return (IRR) $\text{Rs } 50,000 = \dfrac{\text{Rs } 10,000}{(1+r)^1} + \dfrac{\text{Rs } 10,450}{(1+r)^2} + \dfrac{\text{Rs } 11,800}{(1+r)^3} + \dfrac{\text{Rs } 12,250}{(1+r)^4} + \dfrac{\text{Rs } 16,750}{(1+r)^5}$

The fake pay back period = 4.0816 (Rs 50,000/Rs 12,250). From Table A-4, the value closest to the fake pay back period of 4.0816 against 5 years is 4.100 against 7 per cent. Since the actual cash flow stream is the initial years is slightly below the average cash flow stream, the IRR is likely to be lower than 7 per cent. Let us try with 6 per cent.

		PV factor		*Total PV*	
Year	*CFAT*	*(0.06)*	*(0.07)*	*(0.06)*	*(0.07)*
1	Rs 10,000	0.943	0.935	Rs 9,430	Rs 9,350
2	10,450	0.890	0.873	9,300	9,123
3	11,800	0.840	0.816	9,912	9,629
4	12,250	0.792	0.763	9,702	9,347
5	16,750	0.747	0.713	12,512	11,942
Total PV				50,856	49,391
Less: Initial outlay				50,000	50,000
NPV				856	(609)

The IRR is between 6 and 7 per cent. By interpolation, IRR = 6.6 per cent.

(iv) **Net present value (NPV)**

Year	*CFAT*	*PV factor (0.10)*	*Total PV*
1	Rs 10,000	0.909	Rs 9,090
2	10,450	0.826	8,632
3	11,800	0.751	8,862
4	12,250	0.683	8,367
5	16,750	0.621	10,401
Total PV			45,352
Less: Initial outlay			50,000
NPV			(4,648)

(v) Profitability index (PI) $PI = \frac{\text{PV of cash inflows}}{\text{PV of cash outflows}} = \frac{\text{Rs } 45{,}352}{\text{Rs } 50{,}000} = 0.907$

P.5.2 A project costing Rs 5,60,000 is expected to produce annual net cash benefits (CFAT) of Rs 80,000 over a period of 15 years. Estimate the internal rate of return (IRR). Also, find the pay back period and obtain the IRR from it. How do you compare this IRR with the one directly estimated?

Solution $\text{PB value} = \frac{\text{Rs } 5{,}60{,}000}{\text{Rs } 80{,}000} = 7.000$

The factors closet to 7.000 are 7.191 at 11 per cent rate of discount and 6.811 at 12 per cent rate of discount against 15 years (Table A-4). The actual IRR would be between 11 and 12 per cent.

Using interpolation, the IRR would be 0.11 + 0.005 (0.19 ÷ 0.38) = 11.5 per cent.

IRR determination through PB period The reciprocal of the PB period is a good approximation of the IRR if, (i) the life of the project is at least twice the PB period, and (ii) the project generates annuity cash inflows. Accordingly, IRR would be the reciprocal of the PB period, i.e. 1/7 = 0.1428 = 14.28 per cent.

Comparison The two IRRs are different. But the IRR which is directly estimated is correct as at this rate of discount, NPV of cash flow stream of the project would be zero. The NPV cannot be zero at 14.28 per cent. The IRR through the PB period is only an approximate measure.

P.5.3 Band-Box is considering the purchase of a new wash and dry equipment in order to expand its operations. Two types of options are available: a low-speed system (LSS) with a Rs 20,000 initial cost and a high speed system (HSS) with an initial cost of Rs 30,000. Each system has a fifteen year life and no salvage value. The net cash flows after taxes (CFAT) associated with each investment proposal are:

	Low speed system (LSS)	*High speed system (HSS)*
CFAT for years 1 through 15	Rs 4,000	Rs 6,000

Which speed system should be chosen by Band-Box, assuming 14 per cent cost of capital?

Solution

Determination of NPV

Years	*CFAT*		*PV factor (0.14)*	*Total PV*	
	LSS	*HSS*		*LSS*	*HSS*
1-15	Rs 4,000	Rs 6,000	6.142	Rs 24,568	Rs 36,852
Less: Initial cost				20,000	30,000
NPV				4,568	6,852

The high speed system should be chosen by Band-Box as its NPV is greater.

P.5.4 Modern Enterprises Ltd is considering the purchase of a new computer system for its research and development division, which would cost Rs 35 lakh. The operation and maintenance costs (excluding depreciation) are expected to be Rs 7 lakh per annum. It is estimated that the useful life of the system would be 6 years, at the end of which the disposal value is expected to be Rs 1 lakh.

The tangible benefits expected from the system in the form of reduction in design and draftmanship costs would be Rs 12 lakh per annum. The disposal of used drawing office equipment and furniture initially is anticipated to net Rs 9 lakh.

As capital expenditure in research and development, the proposal would attract a 100 per cent write-off for tax purposes. The gains arising from disposal of used assets may be considered tax free. The effective tax rate is 35 per cent. The average cost of capital of the company is 12 per cent.

After appropriate analysis of cash flows, advise the company of the financial viability of the proposal. Ignore tax on salvage value.

Solution

Assessment of financial viability of proposal

(Amount in lakh of rupees)

Incremental cash outflows	
Cost of new computer system	35
Less: Sale proceeds from drawing office equipment and furniture	9
	26
Incremental CFAT and NPV:	
(a) Cost savings (years 1–6)	
Reduction in design and draftmanship costs	12
Less: Operation and maintenance costs	7
Cost savings (earnings) before taxes	5
Less: Taxes (0.35)	1.75
Earnings after taxes (CFAT)	3.25
(×) PV factor of annuity for 6 years (0.12)	× 4.111
Total PV of cost savings	13.36
(b) Tax savings on account of depreciation	
Cost of new computer system (Rs 35 lakhs × 0.35)	12.25
(×) PV factor for year 1	× 0.892
Total PV	10.93
(c) Terminal salvage value at the end of year, 6 (Rs 1 lakh × 0.507)	0.507
(d) Gross PV of CFAT [(a) + (b) + (c)]	24.797
Less: Cash outflows	26.000
NPV	(1.203)

Recommendation Since NPV is negative, the proposal is not financially viable.

P.5.5 A plastic manufacturer has under consideration the proposal of production of high quality plastic glasses. The necessary equipment to manufacture the glasses would cost Rs 1 lakh and would last 5 years. The tax relevant rate of depreciation is 25 per cent on written down value. There is no other asset in this block. The expected salvage value is Rs 10,000. The glasses can be sold at Rs 4 each. Regardless of the level of production, the manufacturer will incur cash cost of Rs 25,000 each year if the project is undertaken. The overhead costs allocated to this new line would be Rs 5,000. The variable costs are estimated at Rs 2 per glass. The manufacturer estimates it will sell about 75,000 glasses per year; the tax rate is 35 per cent. Should the proposed equipment be purchased? Assume 20 per cent cost of capital and additional working requirement, Rs 50,000.

Solution Cash outflows

Cost of production equipment	Rs 1,00,000
Additional working capital requirement	50,000
	1,50,000

Determination of CFAT and NPV

Particulars	*Years*				
	1	*2*	*3*	*4*	*5*
Sales revenue (75,000 × 4)	Rs 3,00,000	Rs 3,00,000	Rs 3,00,000	Rs 3,00,000	Rs 3,00,000
Less: Costs:					
Variable costs (75,000 × 2)	1,50,000	1,50,000	1,50,000	1,50,000	1,50,000
Additional fixed costs	25,000	25,000	25,000	25,000	25,000
Depreciation (D)	25,000	18,750	14,062	10,547	Nil[@]
Earnings before taxes	1,00,000	1,06,250	1,10,938	1,14,453	1,25,000
Less: Taxes	35,000	37,187	38,828	40,059	43,750
Earnings after taxes (EAT)	65,000	69,063	72,110	74,394	81,250
CFAT (EAT + D)	90,000	87,813	86,172	84,941	81,250
Add: Recovery of WC					50,000
Add: Salvage value (SV)					10,000
Add: Tax benefit on short term capital loss[@@]					7,574
					1,48,824
Multiplied by PV factor 0.20	0.833	0.694	0.579	0.482	0.402
PV (CFAT × PV factor)	74,970	60,942	49,894	40,942	59,827
Total PV (t = 1 – 5)					2,86,575
Less: Cash outflows					1,50,000
NPV					1,36,575

[@]As the block consists of single asset, no depreciation is to be charged in the terminating year as the asset has been sold in the year.

[@@](Rs 1,00,000 – Rs 68,359 accumulated depreciation – Rs 10,000, SV) × 0.35 = Rs 7,574.

Recommendation The company is advised to buy the proposed equipment.

P.5.6 A plastic manufacturing company is considering replacing an older machine which was fully depreciated for tax purposes with a new machine costing Rs 40,000. The new machine will be depreciated over its eight-year life. It is estimated that the new machine will reduce labour costs by Rs 8,000 per year. The management believes that there will be no change in other expenses and revenues of the firm due to the machine. The company requires an after-tax return on investment of 10 per cent. Its rate of tax is 35 per cent. The company's income statement for the current year is given for other informations.

Income statement for the current year

Sales		Rs 5,00,000
Costs:		
Materials	Rs 1,50,000	
Labour	2,00,000	
Factory and administrative	40,000	
Depreciation	40,000	4,30,000
Net income before taxes		70,000
Taxes (0.35)		24,500
Earnings after taxes		45,500

Should the company buy the new machine? You may assume the company follows straight line method of depreciation and the same is allowed for tax purposes.

Solution

Cash inflows:			
(i)	Present: Earnings after taxes		Rs 45,500
	Add: Depreciation		40,000
	CFAT (present)		85,500
(ii)	Estimated CFAT, if the new machine is purchased:		
	Sales		5,00,000
Costs:			
	Material	Rs 1,50,000	
	Labour	1,92,000	
	Factory and administrative	40,000	
	Depreciation (including Rs 5,000 on new machine)	45,000	4,27,000
	Net income before taxes		73,000
	Taxes		25,550
	Earnings after taxes		47,450
	Add: Depreciation		45,000
	CFAT (expected)		92,450
(iii)	Differential cash flow: Rs 92,450 – Rs 85,500		6,950

(iv) **Determination of NPV**

Years	*CFAT*	*PV factor (0.10)*	*Total PV*
1-8	Rs 6,950	5.335	Rs 37,078
Less: Cost of new machine			40,000
NPV			(2,922)

Recommendation Since the NPV is negative, the new machine should not be purchased.

P.5.7 A company is currently considering modernisation of a machine originally costing Rs 50,000 (current book value zero). However, it is in a good working condition and can be sold for Rs 25,000. Two choices are available. One is to rehabilitate the existing machine at a total cost of Rs 1,80,000; and the other is to replace the existing machine with a new machine costing Rs 2,10,000 and requiring Rs 30,000 to install. The rehabilitated machine as well as the new machine would have a six year life and no salvage value. The projected after-tax profits under the various alternatives are:

	Expected after-tax profits		
Year	*Existing machine*	*Rehabilitated machine*	*New machine*
1	Rs 2,00,000	Rs 2,20,000	Rs 2,40,000
2	2,50,000	2,90,000	3,10,000
3	3,10,000	3,50,000	3,50,000
4	3,60,000	4,00,000	4,10,000
5	4,10,000	4,50,000	4,30,000
6	5,00,000	5,40,000	5,10,000

The firm is taxed at 35 per cent. The company uses the straight line depreciation method and the same is allowed for tax purposes. Ignore block assets concept. The cost of capital is 12 per cent.

Advise the company whether it should rehabilitate the existing machine or should replace it with the new machine. Also, state the situation in which the company would like to continue with the existing machine.

Solution

Cash outflows

(i)	If machine is rehabilitated:	
	Rehabilitation costs	Rs 1,80,000
(ii)	If machine is purchased:	
	Cost of new machine	2,10,000
	Add: Installation cost	30,000
	Less: Effective sale value of old machine (Rs 25,000 – Rs 8,750, tax)	(16,250)
	Incremental cash outflows	2,23,750

Cash inflows after taxes

	Existing machine	*Rehabilitated machine*			*New machine*		
Year	*EAT/ CFAT*[a]	*EAT*	*D*	*CFAT*	*EAT*	*D*	*CFAT*
1	Rs 2,00,000	Rs 2,20,000	Rs 30,000	Rs 2,50,000	Rs 2,40,000	Rs 40,000	Rs 2,80,000
2	2,50,000	2,90,000	30,000	3,20,000	3,10,000	40,000	3,50,000
3	3,10,000	3,50,000	30,000	3,80,000	3,50,000	40,000	3,90,000
4	3,60,000	4,00,000	30,000	4,30,000	4,10,000	40,000	4,50,000
5	4,10,000	4,50,000	30,000	4,80,000	4,30,000	40,000	4,70,000
6	5,00,000	5,40,000	30,000	5,70,000	5,10,000	40,000	5,50,000

[a]Since the existing machine has been fully depreciated (book value being zero), no depreciation would be added to determine CFAT.

Determination of NPV

Year	*Incremental CFAT*			*Total PV*	
	Rehabilitated machine	*New machine*	*PV factor (0.12)*	*Rehabilitated machine*	*New machine*
1	Rs 50,000	Rs 80,000	0.893	Rs 44,650	Rs 71,440
2	70,000	1,00,000	0.797	55,790	79,700
3	70,000	80,000	0.712	49,840	56,960
4	70,000	90,000	0.636	44,520	57,240
5	70,000	60,000	0.567	39,690	34,020
6	70,000	50,000	0.507	35,490	25,350
Total present value				2,69,980	3,24,710
Less: Initial cash outflows				1,80,000	2,23,750
NPV				89,980	1,00,960

Recommendation Since NPV of the new machine is more, the company should buy it. If the NPV of incremental CFAT of both the alternatives were negative, the company would have continued with the existing machine.

P.5.8 BS Electronics is considering a proposal to replace one of its machines. In this connection, the following information is available.

The existing machine was bought 3 years ago for Rs 10 lakh. It was depreciated at 25 per cent per annum on reducing balance basis. It has remaining useful life of 5 years, but its annual maintenance cost is expected to increase by Rs 50,000 from the sixth year of its installation. Its present realisable value is Rs 6 lakh. The company has several machines, having 25 per cent depreciation.

The new machine costs Rs 15 lakhs and is subject to the same rate of depreciation. On sale after 5 years, it is expected to net Rs 9 lakh. With the new machine, the annual operating costs (excluding depreciation) are expected to decrease by Rs 1 lakh. In addition, the new machine would increase productivity on account of which net revenues would increase by Rs 1.5 lakh annually.

The tax rate applicable to the firm is 35 per cent and the cost of capital is 10 per cent.

Is the proposal financially viable? Advise the firm on the basis of NPV of the proposal.

Solution

Financial evaluation whether to replace an existing machine (using NPV method)

(A) Incremental cash outflows	
Cost of new machine	Rs 15,00,000
Less: Sale value of existing machine	6,00,000
	9,00,000

(B) Determination of CFAT (operating)

Year	*Incremental cash profits before taxes*	*Incremental depreciation*	*Taxable income (col. 2 – col. 3)*	*Taxes (0.35)*	*EAT (col. 4 – col. 5)*	*CFAT (col. 6 + col. 3)*
1	*2*	*3*	*4*	*5*	*6*	*7*
1	Rs 2,50,000	Rs 2,25,000	Rs 25,000	Rs 8,750	Rs 16,250	Rs 2,41,250
2	2,50,000	1,68,750	81,250	28,438	52,812	2,21,562
3	3,00,000	1,26,563	1,73,437	60,703	1,12,734	2,39,297
4	3,00,000	94,922	2,05,078	71,777	1,33,301	2,28,223
5	3,00,000	71,191	2,28,809	8,0083	1,48,726	2,19,917

(C) Determination of net present value

Year	*CFAT*	*PV factor (0.10)*	*Total present value*
1	Rs 2,41,250	0.909	Rs 2,19,296
2	2,21,562	0.826	1,83,010
3	2,39,297	0.751	1,79,712
4	2,28,223	0.683	1,55,876
5	2,19,917	0.620	1,36,349
5	9,00,000 (Net salvage value)*	0.620	5,58,000
Total present value			14,32,243
Less: Incremental cash outflows			9,00,000
Net present value			5,32,243

*at the beginning of year 6.

It is important to note that machine is sold after 5 years and not at the end of year 5.

Recommendation Since NPV is positive, the company is advised to replace the existing machine.

Working Notes

(i) WDV of existing machine in the beginning of year 4

Initial cost of machine	Rs 10,00,000
Less: Depreciation @ 25% in year 1	2,50,000
WDV at beginning of year 2	7,50,000
Less: Depreciation @ 25% on WDV	1,87,500
WDV at beginning of year 3	5,62,500
Less: Depreciation @ 25% on WDV	1,40,625
WDV at beginning of year 4	4,21,875

(ii) Depreciation base of new machine

WDV of existing machine	4,21,875
Plus: Cost of the new machine	15,00,000
Less: Sale proceeds of existing machine	(6,00,000)
	13,21,875

(iii) Base for incremental depreciation

Depreciation base of new machine	13,21,875
Less: Depreciation base of existing machine	(4,21,875)
	9,00,000

(iv) **Incremental depreciation (T = 1 – 5)**

Year	*Incremental asset cost base*	*Depreciation @ 25% on WDV*
1	Rs 9,00,000	Rs 2,25,000
2	6,75,000	1,68,750
3	5,06,250	1,26,563
4	3,79,687	94,922
5	2,84,765	71,191

(v) Incremental cash profits before taxes (in terms of decrease in operating costs and increase in revenues) owing to the new machine

Year	*Savings in operating costs*	*Increase in revenue*	*Incremental cash profit before taxes*
1	Rs 1,00,000	Rs 1,50,000	Rs 2,50,000
2	1,00,000	1,50,000	2,50,000
3	1,50,000 [@]	1,50,000	3,00,000
4	1,50,000	1,50,000	3,00,000
5	1,50,000	1,50,000	3,00,000

[@] Maintenance expenses of existing machine are expected to increase by Rs 50,000 from sixth year of installation.

P.5.9 Seshasayee Industries Ltd is considering replacing a hand-operated weaving machine with a new fully automated machine. Given the following information, advise the management whether the machine should be replaced or not. Assume the company has only this machine in 25 per cent block of assets and the block will cease to exist after the useful life of the automated machine.

Existing situation:
- One full-time operator's salary, Rs 36,000
- Variable overtime, Rs 3,000
- Fringe benefits, Rs 3,000
- Cost of defects, Rs 3,000
- Original price of hand-operated machine, Rs 60,000
- Expected life, (years), 10
- Age, (years) 5
- Depreciation method, written down value
- Current salvage value of old machine, Rs 36,000
- Marginal tax rate, 35
- Required rate of return, 15

Proposed situation:
- Fully-automated operation, No operator is necessary
- Cost of machine, Rs 1,80,000
- Transportation charges, Rs, 3,000
- Installation costs, Rs 15,000
- Expected economic life (years), 5
- Depreciation method, written down value
- Annual maintenance, Rs 3,000
- Cost of defects, Rs 3,000
- Salvage after 5 years, Rs 20,000.

Solution

Incremental cash outflows

Cost of machine	Rs 1,80,000
Add: Transportation charges	3,000
Add: Installation costs	15,000
Less: Cash inflow from the sale of old machine	36,000
	1,62,000

Determination of CFAT and NPV

Particulars	*Years*				
	1	*2*	*3*	*4*	*5*
Cost savings	Rs 39,000	Rs 39,000	Rs 39,000	Rs 39,000	Rs 39,000
Less: Incremental depreciation	40,500	30,375	22,781	17,086	—
Earnings before taxes	(1,500)	8,625	16,219	21914	39,000
Less: Taxes (0.35)	(525)	3,019	5,677	7,670	13,650
Earnings after taxes	(975)	5,606	10,542	14,244	25,350
CFAT (EAT + D)	39,525	35,981	33,323	31,330	25,350
Add: Salvage value					20,000
Add: Tax advantage[@]					10,940
(×) PV factor (0.15)	0.870	0.756	0.656	0.572	0.497
Present value	34,387	27,202	21,860	17,921	27,976
Total PV (t = 1 – 5)					1,29,346
Less: Cash outflows					1,62,000
Net present value					(32,654)

[@] on short-term capital loss (Rs 51,258 – Rs 20,000) × 0.35 = Rs 10,940.

Recommendation Since the NPV is negative, the machine is not recommended for purchase.

Working Notes

(i) Incremental depreciation (if machine is purchased)

(a) WDV of existing machine in the beginning of year 6:

Initial cost of machine		Rs 60,000
Less: Depreciation charges (year 1 to 5)		
Year 1 (Rs 60,000 × 0.25)	Rs 15,000	
2 (45,000 × 0.25)	11,250	
3 (33,750 × 0.25)	8,438	
4 (25,312 × 0.25)	6, 328	
5 (18,984 × 0.25)	4, 746	45,762
		14,238

(b) Depreciation base of new machine:

WDV of existing machine	14,238
Add: Cost of new machine (Rs 1,80,000 + Rs 3,000 + Rs 15,000)	1,98,000
Less: Sale of existing machine	(36,000)
	1,76,238

(c) Base of incremental depreciation (Rs 1,76,238 – Rs 14,238) 1,62,000

(d) **Incremental depreciation (t = 1 – 5)**

Year	*Incremental WDV base*	*Depreciation*
1	Rs 1,62,000	Rs 40,500
2	1,21,500	30,375
3	91,125	22,781
4	68,344	17,086
5	51,258	Nil (as machine is sold)

(ii) **Cost savings (if machine is purchased)**

	Existing situation	*Proposed situation*	*Differential cost savings*
Salary	Rs 36,000	—	Rs 36,000
Variable overtime	3,000	—	3,000
Fringe benefits	3,000	—	3,000
Cost of defects	3,000	Rs 3,000	Nil
Annual maintenance	—	3,000	(3,000)
	45,000	6,000	39,000

P.5.10 XYZ Company manufactures several different products. One of the principal products sells for Rs 20 per unit. The sales manager of XYZ has stated repeated that he could sell more units of this product if they were available. To substantiate his claim, he counducted a market research study last year at a cost of Rs 35,000. The study indicated that XYZ could sell 18,000 units of this product annually for the next five years.

The equipment currently in use has the capacity to produce 11,000 units annually. The variable production costs are Rs 9 per unit. The equipment has a value of Rs 60,000 for tax purposes and a remaining useful life of five years. The salvage value of the equipment is negligible now and will be zero in five years.

A maximum of 20,000 units could be produced annually on the new machinery which can be purchased. The new equipment costs Rs 2,50,000 and has an estimated useful life of five years with no salvage value. The production manager estimates that the new equipment would provide increased production efficiencies that would reduce the variable production costs to Rs 7 per unit.

XYZ Company uses straight line depreciation on all of its equipments. The firm is subject to a 35 per cent tax and its after-tax cost of capital is 15 per cent.

The sales manager felt so strongly about the need for additional capacity that he attempted to prepare an economic justification for the equipment although this was not one of his responsibilities. His analysis, presented below, disappointed him because it did not justify acquiring the equipment.

Purchase price of new equipment		Rs 2,50,000
Disposal of existing equipment:		
Loss on disposal	Rs 60,000	
Less: Tax benefit (0.35)	(21,000)	39,000
Cost of market research study		35,000
Total investment		3,24,000
Contribution margin from product:		
Using the new equipment [18,000 × (Rs 20-7)]		2,34,000
Using the existing equipment [11,000 × (Rs 20-9)]		1,21,000
Increase in contribution		1,13,000
Less: Depreciation		50,000
Increase in before-tax income		63,000

(*Contd.*)

(*Contd.*)

Income tax (0.35)	22,050
Increase in income	40,950
Less: Cost of capital on the additional investment required (0.15 × Rs 3,24,000)	48,600
Net annual return of proposed investment in new equipment	(7,650)

The controller of XYZ Company plans to prepare a discounted cash flow analysis for this investment proposal. He has asked you to prepare corrected calculations of: (a) the required investment in new equipment, and (b) the recurring annual cash flows. Give your recommendation on the basis of above information and assuming 25 per cent depreciation on the block of assets to which the machine belongs.

Solution

Financial evaluation whether to replace existing equipment

(a)	Required investment in new equipment:	
	Purchase price of new equipment	Rs 2,50,000
(b)	Recurring annual cash flows:	
	(i) Depreciation base of new machine:	
	Book value of existing machine	60,000
	Add: Cost of new machine	2,50,000
		3,10,000
	(ii) Base for incremental depreciation:	
	Depreciation base of new machine	3,10,000
	Less: Book value of existing machine	60,000
		2,50,000

(iii) Incremental depreciation (t = 1 – 5):

Year	*Incremental WDV base*	*Depreciation*
1	Rs 2,50,000	Rs 62,500
2	1,87,500	46,875
3	1,40,625	35,156
4	1,05,469	26,367
5	79,102	19,775

Note: Unabsorbed depreciation is Rs 59,327 (Rs 79,102 – 19,775); tax advantage on this will be available in future years.

(c) **Determination of CFAT and NPV**

Particulars	*Years*				
	1	*2*	*3*	*4*	*5*
Incremental contribution	Rs 1,13,000	Rs 1,13,000	Rs 1,13,000	Rs 1,13,000	Rs 1,13,000
Less: Incremental depreciation	62,500	46,875	35,156	26,367	19,775
Incremental taxable income	50,500	66,125	77,844	86,633	93,225
Less: Taxes	17,675	23,144	27,245	30,322	32,629
Earnings after taxes	32,825	42,981	50,599	56,311	60,596
CFAT (EAT + Depreciation)	95,325	89,856	85,755	82,678	80,371
(x) PV factor (0.15)	0.870	0.756	0.658	0.572	0.497

(*Contd.*)

(*Contd.*)

Present value	82,933	67,931	56,427	47,292	39,944
Total present value (t = 1 – 5)					2,94,527
Less: Purchase price of new equipment					2,50,000
Net present value					44,527

Recommendation The company is advised to replace the existing equipment.

Mini Case

5.C.1 (Net Present Value) The Hotel Seawind is one of the premier four-star hotels in Goa. Since its inception in 1990, it has been the favourite choice of the visitors to the city. It boasts of facilities such as swimming pools, a gymnasium, boutiques, a discotheque, 24 × 7 coffee shop and multi-cuisine restaurant. It has rooms which are classified into three types, as shown below:

Class	*Number of rooms*	*Daily tariff*
Economy	200	Rs 2,500
Executive	100	4,000
Deluxe	25	6,000

The current financial details of Seawind are summaried below:

(i) Staff salaries

Grade	*Number*	*Amount per annum per person*	*Total*
(1)	*(2)*	*(3)*	*(4)*
A	1	Rs 20,00,000	Rs 20,00,000
B	25	8,00,000	2,00,00,000
C	70	3,00,000	2,10,00,000
D	200	1,50,000	3,00,00,000
Total			7,30,00,000

(ii) Profit from restaurant: Rs 1,00,00,000

(iii) Profits from the coffee shop: Rs 30,00,000

(iv) Profit from the boutique and discotheque: Rs 25,00,000

(v) Room tariffs:

• Economy class: 200 × Rs 2,500 × 350 days × 0.40 (occupancy)	Rs 7,00,00,000
• Executive class: 100 × Rs 4,000 × 350 × 0.40	5,60,00,000
• Deluxe class: 25 × Rs 6,000 × 350 × 0.40	2,10,00,000
	14,70,00,000

(vi) Annual maintenance cost (electricity charges, land tax, water tax, office stationery and other miscellaneous expenses): Rs 5,00,00,000

(vii) Profits before tax (PAT/EBT): Total revenues – Total cost

Total revenues		
• Room tariffs	Rs 14,70,00,000	
• Profit from restaurant	1,00,00,000	
• Profit from coffee shop	30,00,000	
• Profit from boutique/discotheque	25,00,000	Rs 16,25,00,000
Total costs		
• Salary	7,30,00,000	

• Maintenance cost	5,00,00,000	12,30,00,000
		3,95,00,000
(viii) Profit after tax (PAT)		
• Tax		1,38,25,000
		2,56,75,000

In the past few years, the occupancy in Seawind has declined from 55 per cent to 40 per cent which has dented its profits attributed to **(i)** stiff competition from new four-star hotels that have come up recently and **(ii)** its inability to offer value-added services to its customers.

In order to check the decline in profits and to plan out the future strategy to maximise its revenues, Rahul Singh, the CEO of Seawind, has hired the Trump Consultants.

The Trump Consultants have suggested two proposals for the consideration of the CEO of Hotel Seawind as detailed below:

Proposal I: The first proposal is to increase its rating from four-star to five-star. Due to this, the occupancy rate would increase from 40 per cent to 50 per cent. The upgradation would involve the following:

- Increase in the number of rooms: economy class, 100; executive class, 80; and deluxe class, 25.
- Build a casino and a ball room.
- Increase in staff: B grade, 40; C grade, 100; and D grade, 300.

The upgradation plan would require additional expenses detailed below:

1. Cost of building of casino and ball room: Rs 4,00,00,000
2. Cost of building extra rooms in the hotel;
   - Economy class, Rs 8,00,000 per room
   - Executive class, Rs 12,00,000 per room
   - Deluxe class, Rs 20,00,000 per room

The additional maintenance cost would amount to Rs 1,40,00,000.

Proposal II: The details of the second proposal of the consultants are given below:

(i) Creation of casino and entertainment centre at a cost of Rs 4,00,00,000.
(ii) Creation of an *ayurveda* spa at a cost of Rs 50,00,000
(iii) Creation of a helipad at a cost of Rs 20,00,000
(iv) Increase in staff: B grade, 2; C grade, 10; and D grade, 30.

The revenue generated from the proposal would be as shown below:

- From casino, spa helipad and the entertainment centre, Rs 2,50,00,000
- Incremental revenue from restaurant, coffee shop and discotheque, Rs 50,00,000
- Increase in occupancy rate to 45 per cent

The additional maintenance cost would be Rs 1,00,00,000.

Required Which proposal of Trump Consultant should Rahul Singh accept? Why? Ignore depreciation for tax purposes.

Solution

Evaluation of Proposal I (Upgradation to 5-star Level)

(A)	Incremental Cash Outflows (t-0)	
(1)	Expenditure on building extra rooms1	Rs 22,60,00,000
(2)	Expenditure on building casino and ball room	4,00,00,000
(3)	Additional staff and maintenance cost	5,00,00,000
		31,60,00,000
(B)	Incremental Cash Inflows After Taxes (t = 1 – 4)	
(1)	Incremental revenue from hotel rooms3	12,60,00,000
(2)	Incremental revenue from casino	50,00,000
(3)	Incremental revenue from coffee shop and discotheque	24,00,000
	Total incremental earnings before taxes	13,34,00,000
(4)	Less taxes (0.35)	4,66,90,000
	Total incremental earnings after taxes (t = 1 – 4) [CFAT]	8,67,10,000

© Determination of NPV:

Year	*CFAT*	*PVIF (0.13)*	*Total PV*
1–3	Rs 8,67,10,000	2.992	Rs 25,94,36,000
Less incremental cash outflows			31,60,00,000
NPV			(–5,65,64,000)

1	Economy class: 100 rooms × Rs 8,00,000	=	Rs 8,00,00,000
	Executive class: 80 rooms × Rs 12,00,000	=	9,60,00,000
	Deluxe class: 25 rooms × Rs 20,00,000	=	5,00,00,000
			22,60,00,000
2	Grade B staff: 15 × Rs 8,00,000	=	1,20,00,000
	C : 30 × 3,00,000	=	90,00,000
	D : 100 × 1,50,000	=	1,50,00,000
			3,60,00,000
	Plus additional maintenance cost		1,40,00,000
			5,00,00,000
3	Economy class: 100 rooms × Rs 2,500 × 350 × 0.050		Rs 4,37,50,000
	Executive class: 80 rooms × 4,000 × 350 × 0.50		5,60,00,000
	Deluxe class: 25 rooms × 6,000 × 350 × 0.050		2,62,50,000
			12,60,00,000

Evaluation of Proposal II (Creation of Casino, Entertainment Centre and Helipad)

Incremental Cash outflows: (t = 0)	
Expenditure on casino and entertainment centre	Rs 4,00,00,000
Expenditure on *ayurveda* spa	50,00,000
Expenditure on helipad	20,00,000
Additional staff and maintenance cost[1]	1,91,00,000
	6,61,00,000
Increment Cash Inflows: (t = 1 – 4)	
Revenue from rooms (increase in occupancy)[2]	1,83,75,000
Revenue from casino, spa and helipad	2,50,00,000
Revenue from restaurant, coffee shop and discotheque	50,00,000
Total incremental before tax	4,83,75,000
Less taxes (0.35)	1,69,31,250
Incremental CFAT (t = 1 – 4)	3,14,43,750

Determination of NPV

Year	*CFAT*	*PVIF (0.13)*	*Total PV*
1–4	Rs 3,14,43,750	2.992	Rs 9,40,79,700
Total PV			
Less incremental cash outflows			6,61,00,000
NPV			2,79,79,700

1	B Grade : 2 × Rs 80,000	=	Rs 16,00,000
	C Grade: 10 × Rs 3,00,000	=	30,00,000
	D Grade: 30 × Rs 1,50,000		45,00,000
	Additional maintenance cost		1,00,00,000
	Total		1,91,00,000

2 Room tariffs: (at 45% occupancy)	
Economy class: 200 × Rs 2,500 × 350 × 0.45	Rs 7,87,50,000
Executive class: 100 × Rs 4,000 × 350 × 0.45	6,30,00,000
Deluxe class: 25 × Rs 6,000 × 350 × 0.45	2,36,25,000
	16,53,75,000
Less existing (at 40% occupancy)	14,70,00,000
	1,83,75,000

Decision: Proposal II, that is creation of casino and entertainment centre, an *ayurvedic* spa and a helipad should be accepted as it has a positive NPV.

Review Questions

RQ. 5.1(a) Indicate whether the following statements are true or false.

(i) Two mutually exclusive projects (A and B) have been evaluated. Project A has an NPV of Rs 8 lakh and an IRR of 16 per cent; Project B has NPV of Rs 7 lakh but has IRR or 18 per cent. Since Project B has higher IRR, it should be selected.

(ii) The cost of capital for new projects is 15 per cent. Two competing projects (X and Y) respectively have IRRs of 14 per cent and 12 per cent respectively; since IRR of project X is higher, it should be selected.

(iii) Two competing projects have the following NPVs: Project X, + Rs 5 lakh (with initial outlay of Rs 25 lakh) and Project Y, + Rs 4,20,000 (with initial outlay of Rs 20,00,000). The company should opt for project X as it has higher NPV.

(iv) A project requires an initial investment of Rs 10,00,000. The estimated cash inflows from the project are as follows: Rs 3 lakh (year 1), Rs 1 lakh (year 2), Rs 3 lakh (year 3), Rs 6 lakh (Year 4) and Rs 4 lakh (year 5). The pay back of the project is 4 years.

(v) A project requires an investment of Rs 20 lakh. The estimated profit after tax for years 1-5 are: Rs 3 lakh, Rs 3 lakh, Rs 3 lakh, Rs 6 lakh and Rs 8 lakh. The accounting rate of return is 21 per cent

(vi) In the case of independent investment projects, if the NPV of the project is zero, IRR is equal to cost of capital.

(vii) A company has evaluated 3 investment proposals under IRR method, yielding different rates of return. Though the IRR values are varying, reinvestment rate of intermediate cash inflows is assumed to be the same for all these 3 proposals.

(viii) Since IRR is expressed in percentage figure, it is the best method for evaluating capital budgeting projects.

(ix) The more distant the CFAT, the higher is the present value of such cash flows.

(x) NPV is the best method of evaluating long-term investment proposals.

(b) Fill in the following blanks:

(xi) _____ present value tables can be used only when cashflows are uniform to determine NPV.

(xii) In the case of mixed stream of cash flows, _____ present value tables are used to determine NPV.

(xiii) _____ determines the number of years required to recover initial investment outlay.

(xiv) In the case of _____ investment proposals, IRR and NPV method provides the same result.

(xv) In the case of conflict in ranking. _____ method provides better result than _____ method.

[Answers: (i) False (ii) False (iii) True (iv) False (v) False (vi) True (vii) False (viii) False (ix) False (x) True (xi) Annuity (xii) simple (xiii) Payback method (xiv) independent (xv) NPV, IRR

RQ. 5.2 Why is it important to evaluate capital budgeting projects on the basis of after-tax cash incremental flows? Why not use accounting data instead of cash flow?

RQ. 5.3 What are the components of net cash outlay in the capital budgeting decision? At what time is such an outlay incurred in the case of conventional cash flows?

RQ. 5.4 How should working capital and sunk costs be treated in analysing investment opportunities? Explain with suitable examples.

RQ. 5.5 Explain clearly the concept of block of assets *vis-a-vis* depreciation in the context of replacement situations of capital budgeting.

RQ. 5.6 Suppose a firm is considering replacing an old machine with a new one. The firm does not anticipate that any new revenues will be created by the replacement since demand for the product generation by both the machines is the same. However, in the CFAT work sheet used in evaluating the proposal, the analyst shows positive CFBT in the operating cash flow section. What creates operating CFBT in this situation?

RQ. 5.7 It is said that only cash costs are relevant for capital budgeting decision. However, depreciation which is a non-cash cost is a prominent part of cash flow analysis for such an investment decision. How do you explain this paradox?

RQ. 5.8 What is pay back period? Also, discuss the utility of the pay back period in determining the internal rate of return.

RQ. 5.9 What are the critical factors to be observed while making replacement investment decision?

RQ. 5.10 What does the profitability index signify? What is the criterion for judging the worth of investments in the capital budgeting technique based on the profitability index?

RQ. 5.11 Do the profitability index and the NPV criterion of evaluating investment proposals lead to the same acceptance-rejection and ranking decisions?

Examination Questions

Theory Questions

5.1 Explain briefly profitability index. How does it differ from net present value method? (*Delhi University, 2011*)

5.2 Evaluate the accounting rate of return method of assessing capital budgeting proposals. (*Delhi University, 2009, 2011*)

5.3 Evaluate payback period method of capital budgeting. (*Delhi University, 2006, 2010*)

54 Write short note on internal rate of return. (*University of Pune, 2009, 2010*)

5.5 What is the rationale behind use of weighted average cost of capital over specific cost of capital in evaluating project? (*Calcutta University, 2010*)

5.6 What is profitability index? Is it a better criterion than net present value. (*Delhi University, 2009*)

5.7 What do you mean by capital budgeting'? Explain process of capital budgeting (*University of Pune, 2009*)

5.9 Narrate the situations when a company needs to have capital budgeting decisions (*Calcutta University, 2009*)

5.10 Write short note on internal rate of return. (*Calcutta University, 2009*)

5.8 Define capital budgeting. (*Punjab University, 2008*)

5.11 Despite being conceptually unsound, payback period is very popular in business as a criteria for assigning priorities to investment projects. Explain. (*Delhi University, 2008*)

5.12 Explain the nature of capital investment decisions. Why are such decisions important for a business enterprise? (*Punjab University, 2008*)

5.13 Discuss the methods of project evaluation under cash flow and examine the role of cost of capital in each case. (*Calcutta University, 2008*)

5.14 Define capital budgeting. Explain the following techniques of capital budgeting with their respective merits and demerits: **(a)** Payback method, **(b)** Net present value and **(c)** Average rate of return (*Pune University, 2008*)

5.15 Explain payback method of capital budgeting. How does it differ from profitability index method? (*Delhi University, 2007*)

5.16 What is profitability index? Cost of project is Rs 20 lakh. The NPV is Rs 3 lakh. Find the profitability index. Will the profitability index of project change if the cost of capital changes? (PI = 1.15; it would change. (*Delhi University, 2007*)

5.17 What is profitability index method in the context of capital expenditure decision? (*Calcutta University, 2007*)

5.18 "Payback period does not measure profitability." Comment. (*Delhi University, 2006*)

5.19 How do you evaluate capital expenditure project? (*Punjab University, 2006*)

5.20 Why do we focus on cash flows rather than on profits while evaluating capital budgeting decisions. (*Delhi University, 2005*)

5.21 State the salient features of the present value method of project evaluation. In case of conflict situation when net present value and internal rate of return methods are applied in project evaluation, which of these two methods would you prefer and why. *(Calcutta University, 2004)*

5.22 Compare the NPV method with IRR method. What are the steps involved in the calculation of IRR in the case of uneven cash inflows? *(Delhi University, 2003)*

5.23 Explain how, in case of single project, the decision under both net present value and internal rate of return will be the same. *(Calcutta University, 2003)*

5.24 Define capital budgeting. Explain various types of capital budgeting proposals. *(Gujarat University, March-April 2003)*

5.25 (a) How would you deal 'sunk costs' and 'allocated overheads' in analysing investment decisions?

(b) Explain the distinctive features of capital budgeting decisions. *(Delhi University, 2002)*

5.26 Define 'internal rate of return' of a project and state the information that it conveys to an investor. *(Calcutta University, 2002)*

5.27 State and explain the fundamental conditions that a rational method for project evaluation should satisfy. *(Calcutta University, 2001)*

5.28 Explain briefly the internal rate of return. *(Delhi University, 2001)*

5.29 What is profitability index? Which is a superior ranking criteria-profitability index or the net present value? *(Delhi University, 2000)*

5.30 State whether the following statements are true or false: Discounted cash flow techniques take into account the time value of money. *(Delhi University, 2000)*

5.31 Which of the following statements are correct and which are false? Give briefly reasons for your answers:

(a) Pay-back technique takes into consideration cash after the pay-back period. *(Delhi University, 1997)*

(b) 'Net Present Value' technique is inferior to 'Pay-back' technique. *(Delhi University, 1998)*

(c) Capital investment decisions are irreversible in character. *(Delhi University, 1999)*

5.32 What is capital budgeting decision? Why is it significant for a firm? *(Delhi University, 1997)*

5.33 Explain the various methods of evaluating capital expenditure proposals. (*Bangalore University*)

5.34 Mention the steps involved in the capital budgeting process. (*Bangalore University*)

5.35 What is net present value method? (*Bangalore University*)

5.36 What is capital budgeting? How is it significant for a firm? (*Bangalore University*)

5.37. While evaluating capital investment proposals, the time value of money is considered in the case of: **(a)** Payback method, **(b)** Discounted cash flow method, **(c)** Accounting rate of return method, **(d)** None of these. [(Answer **(b)**] (*Bangalore University*)

5.38 The return after the pay-off period is not considered in the case of: **(a)** Payback method, **(b)** IRR method), **(c)** Present value index method, **(d)** None of these, [Answer **(a)**] (*Bangalore University*)

Numerical Questions

5.1 A company is considering which of two mutually exclusive projects it should undertake. The finance director thinks that the project with higher NPV should be chosen as both projects have the same initial outlay and length of life. The company anticipates a cost of capital of 10% and the net after tax cash flows of the project are as follows:

(Rs '000)

Year	*0*	*1*	*2*	*3*	*4*	*5*
Project X	210	40	80	90	75	25
Project Y	210	222	10	10	6	6

Compute: (i) The NPV and PI of each project. (ii) State with reasons which project you would recommend? (*Delhi University, 2011*)

Solution

Determination of NPV and PI of projects X and Y

Year	*CFAT*		*PV factor at 10%*	*Total PV*	
	X	*Y*		*X*	*Y*
1	Rs 40,000	Rs 2,22,000	0.909	Rs 36,360	Rs 2,01,798
2	80,000	10,000	0.826	66,080	8,260
3	90,000	10,000	0.751	67,590	7,510
4	75,000	6,000	0.683	51,223	4,098
5	25,000	6,000	0.621	15,525	3,726
Gross present value (GPV)				2,36,778	2,25,392
Less cash outflows (CO)				2,10,000	2,10,000
Net present value				26,778	15,392
PI (GPV/CO)				1.128	1.073

Recommendation: Project X is recommended as it has higher NPV as well as higher PI.

5.2 Scorpio Ltd. has a machine with an additional life of 5 year which costs Rs 12,00,000, has a book value of Rs 4,00,000. A new machine costing Rs 20,00,000 is available. Though its capacity is the same as that of the old machine, it will mean a saving in variable costs to the extent of Rs 8,00,000 per annum. The life of the machine will be 5 years at the end of which it will have a scrap value of Rs 2,00,000. The rate of income tax is 40% and as a policy firm does not make an investment if the yield is less than 12% per annum. The old machine, if sold today, will realise Rs 1,00,000, it will have no salvage value if sold at the end of 5 years. Advise Scorpio Ltrd. Whether or not the old machine should be replaced? Capital gain on sale of old machine is also subject to the same rate of tax i.e. 40%. (*Delhi University, 2011*)

Solution

Determination of incremental cash outflows

Cost of new machine		Rs 20,00,000
Less effective sale proceeds of existing machine:		
Sale value	Rs 1,00,000	
Add tax advantage on loss of sale of machine (Rs 3,00,000 × 40%)	1,20,000	2,20,000
		17,80,000

Determination of CFAT and NPV

Particulars		*Years (1 – 5)*
Increase in cash earnings/Savings in variable cots		Rs 8,00,000
Less increase in depreciation:		
New machine (Rs 20,00,000 – Rs 2,00,000)/5 years =	Rs 3,60,000	
Existing machine (Rs 4,00,000 – zero)/5 years	80,000	2,80,000
Earnings before taxes		5,20,000
Less taxes (40%)		2,08,000
Earnings after taxes (EAT)		3,12,000
CFAT (EAT + Incremental depreciation]		5,92,000
(x) PV of annuity for 5 years at 12%		× 3.605
PV of operating CFAT (1 – 5)		Rs 21,34,160
Add PV of salvage value (Rs 2,00,000 × 0.567)		1,13,400
Total present value		22,47,560
Less incremental cash outflows		17,80,000
Net present value		4,67,560

Recommendation: Since NPV is positive, the company is advised to replace the existing machine.

5.3 Tata Co. is considering replacement of its existing machine which is obsolete and unable to meet rapidly rising demand for its product. The company is faced with two alternatives: (1) To buy machine – M-1 which is similar to the existing machine or (2) To go for machine M-2 which is more expensive and has much greater capacity. The cashflows at the present level of operations under the two alternatives are as follows:

Cashflows (in lakh of Rupees) at the end of year:

Year	*0*	*1*	*2*	*3*	*4*	*5*
Machine – M1	(—) 25	—	5	20	14	14
Machine – M2	(—) 40	10	14	16	17	15

The Company's cost of capital is 10%. The Finance Manager tries to evaluate machines by calculating the following: (a) Net present value, (b) Profitability index and (c) Payback period. At the end of his calculations, however, the Finance Manager is unable to make up his mind as to which machine to recommend. You are required to make these calculations and in the light of thereof to advise Finance Manager about the proposed investment. (*Pune University, 2010*)

Solution

Determination of NPV, profitability index and payback period of Machines (M1 and M2)

(Amount in Rs lakh)

Year	CFAT		PV factor at 10%	Total PV		Cumulative CFAT	
	M1	M2		M1	M2	M1	M2
1	—	Rs 10	0.909	—	Rs 9.09	—	Rs 10
2	Rs 5	14	0.826	Rs 4.13	11.56	Rs 5	24
3	20	16	0.751	15.02	12.02	25	40
4	14	17	0.683	9.56	11.61	39	57
5	14	15	0.621	8.69	9.31	53	72
Gross present value (GPV)				37.40	53.59		
Less cash outflows (CO)				25.00	40.00		
(i) Net present value (NPV)				12.40	13.59		
(ii) Profitability index (GPV/CO)				1.50	1.34		
(iii) Payback period		(M1)		3 years			
		(M2)		3 years			

Recommendation: Since NPV is higher for M2 than M1, the finance manager is advised to opt for M2. In the case of conflict of rankings, NPV provides superior results. For this reason, though profitability index is higher for M1, the recommendation is for M2.

5.4 Silicon Public Ltd. Pune which has a 50% tax rate and 10% after tax cost of capital is evaluating a project which will cost Rs 1,00,000 and also will require an increase in the level of inventories of Rs 50,000 initially which will be receivable in the 5th year of project's effective life.

The project will generate sales of Rs 1,00,000 and will require cash expenses of Rs 30,000 in each year of its 5 year life. It will depreciate on straight line basis. As a Finance Manager of the Company, advise management whether to accept project on the basis of NPV.

(*Pune University, 2010*)

Solution

Determination of NPV of project

Sales revenue		Rs 1,00,000
Less cash expenses		30,000
Less depreciation (Rs 1,00,000/5 years), assumed no salvage value		20,000
Earnings before taxes		50,000
Less taxes (50%)		25,000
Earnings after taxes (EAT)		25,000
Operating CFAT (1-5 years), EAT + Depreciation		45,000
(x) Present value factor for 5 years at 10%		(x) 3.791
Present value		Rs 1,70,595
Add PV of recovery of Rs 50,000 in year 5(Rs 50,000 × PVIF at 10% 0.621)		31,050
Gross present value		2,01,645
Less cash outflows:		
Investment outlay	Rs 1,00,000	
Add investment inventories	50,000	1,50,000
Net present value (NPV)		51,645

Recommendation: Since NPV is positive, the management is advised to accept the project.

5.5 From the information given below compute the pay back period:

Initial outlay	Rs 80,000
Estimated life	5 years
Profit after tax:	
End of year 1	Rs 6,000
2	14,000
3	4,000
4	6,000
5	10,000

Depreciation has been calculated under straight line method (*Calcutta University, 2010*)

Solution

Determination of payback period

Year	*PAT*	*Depreciation (Rs 80,000/5)*	*CFAT (PAT + D)*	*Cumulative CFAT*
1	Rs 6,000	Rs 16,000	Rs 22,000	Rs 22,000
2	14,000	16,000	30,000	52,000
3	4,000	16,000	20,000	72,000
4	6,000	16,000	22,000	94,000
5	10,000	16,000	26,000	1,20,000

The recovery of investment (Rs 80,000) falls between year 3 and 4. The PB period is 3 years plus a fraction of year 4. The fractional value = Rs 8,000 (i.e., Rs 80,000 – Rs 72,000)/ Rs 22,000 (CFAT of year 4) = 0.3636. PB period is 3.36 years.

5.6 There are two projects A and B. Each project requires an investment of Rs 20,000. You are required to rank these projects according to payback period method from the following information:

	Net profit before depreciation and after tax	
Years	*Project A*	*Project B*
1	Rs 1,000	Rs 2,000
2	2,000	4,000
3	4,000	6,000
4	5,000	8,000
5	8,000	—

(*Punjab University, 2010*)

Solution

Computation showing determination of payback period of projects A and B

Year	*Net profit before depreciation and after taxes, i.e., CFAT*		*Cumulative CFAT*	
	Project A	*B*	*A*	*B*
1	Rs 1,000	Rs 2,000	Rs 1,000	Rs 2,000
2	2,000	4,000	3,000	6,000
3	4,000	6,000	7,000	12,000
4	5,000	8,000	12,000	20,000
5	8,000	—	20,000	—

PB period: Project A = 4 years

Project B = 4 years

5.7 A project costing Rs 5,60,000 is expected to purchase annual net profits of Rs 80,000 over a period of 15 years. Estimate the IRR. Also find the payback period and obtain the IRR from it. How do you compare this IRR with the one directly estimated? The present value of annuity 1-15 years @ 11% rate of discount 7.19 and 6.811 (at 12% rate of discount). (*Pune University, 2010*)

Solution

(i) Determination of IRR:
PB value = Rs 5,60,000/Rs 80,000 = 7.00
Given the PV factor of annuity for 1-15 years @ 11% rate of discount 7.19 and 6.811 and 12%, the actual IRR would be between 11 and 12 per cent. Using interpolation, the IRR = 11% + 0.19/(7.19 – 6.81 = 0.38) = 11% + 0.5 = 11.5%

(ii) IRR based on payback period: The reciprocal of the PB period is a good approximation of IRR if (a) the life of the project is at least twice of the PB period and (b) the project generates annuity cash inflows. Accordingly, IRR would be reciprocal of the PB period, i.e., 1/7 = 0.1428 = 14.28 per cent.

Comparison: The two IRRs are different. But the IRR which is directly estimated is **correct** as at this rate of discount NPV of costs and benefits (i.e., cash flow stream) of the project would be zero. The NPV cannot be zero at 14.28%. The IRR based on the PB period is only an approximate measure.

5.8 M/s Rohini Ltd. wants to enter into the field of production and sale of household appliances. Following details are available:

(a) Capital outlay Rs 26 lacs

(b) Salvage value at the end of 4th year Rs 2 lacs

(c) Tax rate 40%

(d) Projected sale as per market survey for total sale of 1.20 Lacs unit in 4 year life – 1st year 20%, 30% each in next 2 years and balance in terminal year.

(e) Cost and revenue details (per unit)

Year	*Selling price*	*P.V. ratio (%)*	*Fixed cost*	*Discounting factors*
1	Rs 500	30	Rs 75	0.90
2	600	20	80	0.81
3	650	20	80	0.73
4	750	12	60	0.66

(f) Initial investment is arranged from NBFC at 11% p.a.
Suggest the management based on NPV and Discounted pay back, whether investment is justifiable or not. (*Pune University, 2010*)

Solution

Determination of CFAT, NPV and discounted PB period

Particulars	*Years*			
	1	*2*	*3*	*4*
Sales (in units)	24,000	36,000	36,000	24,000
Selling price per unit (Rs)	500	600	650	750
Variable cost per unit (Rs)	150	120	130	90
Fixed cost per unit (Rs)	75	80	80	60
Total cost per unit (Rs)	225	200	210	150
Sales revenue (in lakh of rupees)	120	216	234	180
Less total costs	54	72	75.6	36

(*Contd.*)

(*Contd.*)

Less depreciation (Rs 26 lakh – Rs 2 lakh salvage value)/4 years	6	6	6	6
Earnings before taxes	60	138	152.4	138
Less taxes (40%)	24	55.2	60.96	55.2
Earnings after taxes (EAT)	36	82.8	91.44	82.8
CFAT (EAT + Depreciation)	42	88.8	97.44	88.8
Add salvage value (in 4th year)				2.0
Multiplied by PV factor (0.11)	0.90	0.81	0.73	0.66
PV (CFAT × PV factor)	37.80	71.93	71.13	59.93
Total PV				240.79
Less capital/cash outflows				26.00
NPV				214.79
Discounted PB period (Rs 26 lakh/Rs 37.80) (years)				0.69

Recommendation: Since NPV is positive (and discounted PB period is less than one year), the project is financially sound and investment is justifiable.

5.9 Calculate simple pay back and discounted pay back period from the information given below:

Initial investment in the project:	Rs 4,00,000
Cash inflows:	
Year 1	3,00,000
Year 2	1,00,000
Year 3	1,00,000
Year 4	1,00,000

The discount rate may be taken at 10%. (*Punjab University, 2010).*

Solution

Computation showing determination of payback period and discounted payback period.

Year	*CFAT*	*PV factor at 10%*	*Total PV*	*Cumulative CFAT*	
				Normal	*Discounted*
1	Rs 3,00,000	0.909	Rs 2,72,700	Rs 3,00,000	Rs 2,72,700
2	1,00,000	0.826	82,600	4,00,000	3,55,300
3	1,00,000	0.751	75,100	5,00,000	4,30,400
4	1,00,000	0.683	68,300	6,00,000	4,98,700

(i) PB period = 2 years

(ii) Discounted payback period = 2 years = (Rs 44,700/Rs 75,100) = 2 years + 0.595 = 2.595 years

5.10 The Eastern Corporation Ltd., a firm in the 40% tax bracket with a 15% required rate of return, is considering a new project. This project involves the introduction of a new product. This project is expected to last five years and then to be terminated. Given the following information, determine the after-tax cash flows associated with the project and then find the project's net present value and advise the company whether it should invest in the project or not.

Cost of new plant and equipment: Rs 20,90,000

Shipping and installation cost; Rs 30,000

Unit sales:

Year:	*1*	*2*	*3*	*4*	*5*
Units:	10,000	13,000	16,000	10,000	6,000

Sales price per unit: Rs 500/unit in years 1- 4 and Rs 380/unit in year 5
Variable cost per unit: Rs 260/unit
Annual fixed cost : Rs 30,000
There will be an initial working, capital requirement of Rs 80,000 just to get production started. For each year, the total investment in net working capital will be equal to 10% of the rupee value of sales for that year. Thus, the investment in working capital will increase during years 1 through 3, then decrease in year 4. Finally, all working capital is liquidated at the termination of the project at end of year 5.
The depreciation method: Use straight-line method for providing depreciation over five years assuming that the plant and equipment will have no salvage value after five years.

(*Delhi University, 2010*)

Solution

Present value of cash outflows

Particulars		*Amount*
Cost of new plant and equipment		Rs 20,90,000
Add shipping and installation costs		30,000
Add working capital:		
In zero year	Rs 80,000	
In year 1 Rs 5,00,000* – Rs 80,000 = Rs 4,20,000 × 0.870 =	3,65,400	
In year 2 Rs 6,50,000* – 5,00,000 = Rs 1,50,000 × 0.7560 =	1,13,400	
In year 3 Rs 8,00,000* – 6,50,000 = Rs 1,50,000 × 0.658 =	98,700	6,57,500
Total		27,77,500

*10% of sales

Determination of CFAT and NPV

Particulars	*Years*				
	1	*2*	*3*	*4*	*5*
Sales revenue	Rs 50,00,000	Rs 65,00,000	Rs 80,00,000	Rs 50,00,00	Rs 22,80,000
Less costs:					
Variable costs	26,00,000	33,80,000	41,60,000	26,00,000	15,60,000
Fixed costs	30,000	30,000	30,000	30,000	30,000
Depreciation (Rs 21,20,000/ 5 years)	4,24,000	4,24,000	4,24,000	4,24,000	4,24,000
Earnings before taxes	19,46,000	26,66,000	33,86,000	19,46,000	2,66,000
Less taxes (0.40)	7,78,400	10,66,400	13,54,400	7,78,400	1,06,400
Earnings after taxes	11,67,600	15,99,600	20,31,600	11,67,600	1,59,600
CFAT (EAT + Dep.)	15,91,600	20,23,600	24,55,600	15,91,600	5,83,600
Add recovery of working capital				3,00,000	5,00,000
PV factor of 15% (X)	0.870	0.756	0.658	0.572	0.497
Present value	13,84,692	15,29,842	16,15,785	10,81,995	5,38,549
Total present value					Rs 61,50,863
Less cash outflows					27,77,500
Net present value					33,73,363

Recommendation: Since NPV is positive, the company is advised to buy new plant and equipment.

5.11 Company is considering an investment proposal to purchase a machine costing Rs 2,50,000. The machine has a life expectancy of 5 years and no salvage value. The company's tax rate is 40%. The firm uses straight line method for providing depreciation. The estimated cash flows before tax (CFBT) from the machine are as follows:

Year	*CFBT*
1	60,000
2	70,000
3	90,000
4	1,00,000
5	1,50,000

Calculate: (a) Pay Back period, (b) Average rate of return, (c) Net present value and profitability index at 10% discount rate, and (d) Internal rate of return (*Punjab University 2010*)

Determination of CFAT (operating)

Year	*CFBT*	*Depreciation (Rs 2,50,000/5)*	*Taxable income (Col.2 – Col 3)*	*EAT (Col.4 × 0.60)*	*CFAT (Col. 5 + Col.3)*
1	*2*	*3*	*4*	*5*	*6*
1	Rs 60,000	Rs 50,000	Rs 10,000	Rs 6,000	Rs 56,000
2	70,000	50,000	20,000	12,000	62,000
3	90,000	50,000	40,000	24,000	74,000
4	1,00,000	50,000	50,000	30,000	80,000
5	1,50,000	50,000	1,00,000	60,000	1,10,000

Determination of NPV, profitability index and PB period

Year	*CFAT*	*PVf at 10%*	*Total PV*	*Cum. CFAT*
1	Rs 56,000	0.909	Rs 50,904	Rs 56,000
2	62,000	0.826	51,212	1,18,000
3	74,000	0.751	55,574	1,92,000
4	80,000	0.683	54,640	2,72,000
5	1,10,000	0.621	68,310	3,82,000
Gross present value (GPV)			2,80,640	
Less cash outflows (CO)			2,50,000	
Net present value			30,640	
Profitability index (GPV/CO)			1.12	
Payback period 3 years + (Rs 22,000/Rs 80,000 = 0.275) = 3.275 years)				

Average rate of return = (Average EAT/Average investment) × 100 = (Rs 1,32,000/5 years = Rs 26,400)/ Rs 1,25,000 = 21.12 per cent

Determination of IRR:

Fake payback period = Rs 2,50,000/Rs 76,400, Average CFAT) = 3.272

According to Table A-4 discount factors closest to 3.272 for 5 years are 3.199 at 17% and 3.274 (at 16%). Since actual CFAT are lower in initial years compared to average CFAT (of Rs 76,400), IRR is likely to be lower than 16%. L et us compute it at 14% and 15%.

Year	*CFAT*	*PV factor at*		*Total PV at*	
		14%	*15%*	*14%*	*15%*
1	Rs 56,000	0.877	0.877	Rs 49,112	Rs 48,720
2	62,000	0.769	0.756	47,678	46,872
3	74,000	0.675	0.658	49,950	48,692
4	80,000	0.592	0.572	47,360	45,760
5	1,10,000	0.519	0.497	57,090	54,670
Total				2,51,190	2,44,714

IRR = 14% + (Rs 1,190/Rs 2,51,190 – Rs 2,44,714 = Rs 6,476) = 14% + 0.18 = 14.18 per cent.

5.12 ABC Engineering Co. is considering two investments. Each requires an initial investment of Rs 1,80,000. The cost of capital is 8%. The total cash inflow after tax and depreciation for each project is as follows:

Year	*Project A (Rs)*	*Project B (Rs)*	*PV of Rs 1 @ 8%*
1	30,000	60,000	0.926
2	50,000	1,00,000	0.857
3	60,000	65,000	0.794
4	65,000	45,000	0.735
5	40,000	—	0.681
6	30,000	—	0.630
7	16,000	—	0.583

Calculate: Payback period, Discounted payback period, Profitability index and Net present value of both the projects. (*Pune University, 2009*)

Solution

Evaluation of projects A and B (based on various methods)

Year	*CFAT (Rs)*		*Cum. CFAT (Rs)*		*PV factor at 8%*	*Total PV (Rs)*	
	A	*B*	*A*	*B*		*A*	*B*
1	30,000	60,000	30,000	60,000	0.926	27,780	55,560
2	50,000	1,00,000	80,000	1,60,000	0.857	42,850	85,700
3	60,000	65,000	1,40,000	2,25,000	0.794	47,640	51,610
4	65,000	45,000	2,05,000	2,70,000	0.735	47,775	30,075
5	40,000	—	2,45,000	—	0.681	27,240	—
6	30,000	—	2,75,000	—	0.630	18,900	—
7	16,000	—	2,91,000	—	0.583	9,328	—
Gross present value (GPV)						2,21,513	2,25,945
Less initial investment (CO)						1,80,000	1,80,000
Net present value						41,513	45,945
Profitability index (GPV/CO)						1.23	1.26

Payback period (A): 3 years + (Rs 40,000/Rs 65,000) = 3.615 years
(B): 2 years + (Rs 20,000/Rs 65,000) = 2.308 years

Determination of discounted payback period of Projects A and B

Year	*PV (Rs)*		*Cumulative PV (Rs)*	
	A	*B*	*A*	*B*
1	27,780	55,560	27,780	55,560
2	42,850	85,700	70,630	1,41,260
3	47,640	51,610	1,18,270	1,92,870
4	47,775	33,075	1,66,045	2,25,945
5	27,240	—	1,93,285	—
6	18,900	—	2,12,185	—
7	9,328	—	2,21,513	—

Discounted PB period (A): 4 years + (Rs 13,955/Rs 27,240) = 4.512 years
(B): 2 years + (Rs 38,740/Rs 51,610) = 2.751 years

5.13 Shree Vithal Limited needs an initial investment of Rs 50,00,000. Tax rate is 40%. The company follows straight line method of depreciation @ 20% per annum and proposed inflows (before tax and depreciation) over its expected economic useful life (of next 5 years) are as follows:

Year 1	Rs 25,00,000
2	25,00,000
3	30,00,000
4	30,00,000
5	40,00,000

Assume no salvage value at year-end 5. Determine (i) Pay back (PB) period (ii) Payback profitability and (iii) Average rate of return (ARR).

(*Adapted Mumbai University, 2009*)

Solution

Determination of EAT and CFAT (amount in Rs lakh)

Year	*CFBT*	*Depreciation (Rs 50 lakh × 0.2)*	*EBT*	*Taxes (0.40)*	*EAT*	*CFAT (EAT+Dep.)*
1	Rs 25	Rs 10	Rs 15	Rs 6	Rs 9	Rs 19
2	25	10	15	6	9	19
3	30	10	20	8	12	22
4	30	10	20	8	12	22
5	40	10	30	12	18	28

Determination of cumulative CFAT (amount in Rs lakh)

Year	*1*	*2*	*3*	*4*	*5*
Cumulative CFAT	Rs 19	Rs 38	Rs 60	Rs 82	Rs 110

(i) The recovery of investment falls between years 2 and 3. Therefore, the PB period is 2 years plus a fraction of year 3. The fractional value is Rs 12 lakh/Rs 22 lakh = 0.545. Thus, the PB period is 2.545 years.

(ii) After recovering Rs 60 lakh initial investment in 2.5 years approximately, the project yields additional CFAT of Rs 50 lakh in the remaining 2.5 years of its economic useful life.

(iii) ARR = (Average EAT/Average Investment) × 100 = (Rs 60 lakh/5 years = Rs 12 lakh/Rs 25 lakh) × 100 = 48%.

5.14 The Rodex company is considering investment in machine that produces product X. The machine will cost Rs 5,00,000. In the first year, 10,000 units of X will be produced and the price will be Rs 20 per unit. The volume is expected to increase by 20% and price of the product by 10%. The material used to manufacture the product is becoming more expensive. The cost of production is, therefore, expected to increase by 15%. The production cost in the first year will be Rs 10 per unit.

The Company uses straight-line depreciation on the machine for tax purposes. There will be no salvage value after the 5-year life of the machine. The tax rate is 50% and the discount rate is 20%. Should the machine be bought?

(*Delhi University, 2009*)

Solution

Cash outflows:

Cost of new machine	Rs 5,00,000

Determination of CFAT and NPV

Particulars	*Years .*	
	1	*2-5*
Sales	Rs 2,00,000[1]	Rs 2,64,000[2]
Less cost of production	1,00,000[3]	1,38,000[4]
Less depreciation (Rs 5,00,000/5 years)	1,00,000	1,00,000
Earnings before taxes	Zero	26,000
Less taxes (50%)	—	13,000
Earnings after taxes (EAT)	—	13,000
CFAT (EAT + Depreciation)	1,00,000	1,13,000
(x) PV factor at 20%	0.833	2.158[5]
Present value	83,300	2,43,854
Total present value		Rs 3,27,154
Less cost of new machine		5,00,000
Net present value		(1,72,846)

(1) 10,000 units x Rs 20; **(2)** 12,000 units x Rs 22; **(3)** 10,000 units x Rs 10; **(4)** 12,000 units x Rs 11.50 and **(5)** PVf at 20% for 5 years annuity 2.991 – PVf for year 1, 0.833 = 2.158 (PVf, 20%, 4 years)

Recommendation: Since NPV is negative, the company is advised not to buy the new machine.

5.15 Aryan Enterprises is considering the possibility of manufacturing a particular component which at present is being bought from outside. The manufacture of the component would call for an investment of Rs 7,50,000 in a new machine besides an additional investment of Rs 50,000 in working capital. The life of the machine would be 10 years with a salvage value of Rs 50,000. The estimated savings (before tax) would be Rs 1,80,000 per annum. The income tax rate is 50%. The company's required rate of return is 10%. Depreciation is provided on straight line basis. Suggest to the firm whether this investment should be made or not. (*Delhi University, 2009*)

Solution

Cash outflows:

Cost of new machine	Rs 7,50,000
Additional working capital	50,000
	8,00,000

Determination of CFAT and NPV

Particulars		*Amount*
Cost savings (cash)		Rs 1,80,000
Less depreciation (Rs 7,50,000 – Rs 50,000)/10 years		70,000
Net cost savings/Earnings before taxes		1,10,000
Less taxes (50%)		55,000
Earnings after taxes (EAT)		55,000
CFAT (EAT + Depreciation)		1,25,000
(X) PV factor at 10% for 10 years annuity		(x) 6.145)
Total present value of operating CFAT		(i) 7,68,125
Add PV of terminal cash flows (t = 10):		
Salvage value	Rs 50,000	
Recovery of working capital	50,000	1,00,000
(X) PV factor of 10%		0.386
Present value of terminal cash flows		(ii) 38,600
Total present value (i + ii)		8,06,725
Less cash outflows		8,00,000
Net present value		6,725

Recommendation: Since NPV is positive, the company is advised to buy new machine to manufacture component (hitherto purchased from outside).

5.16 From the following cash flow streams, which cash flow streams would you recommend and why?

End of Year	*Stream A*	*Stream B*	*Stream C*
1	Rs 200	Rs 500	Rs 350
2	300	400	350
3	400	300	350
4	500	200	350

(*Calcutta University, 2009*)

Solution

Statement showing computation of present value of 3 cash flow streams;

Year	*Cash flow streams*			*PV factor at 10%*	*PV of cash flows*		
	A	*B*	*C*		*A*	*B*	*C*
1	Rs 200	Rs 500	Rs 350	0.91	Rs 182	Rs 455	Rs 318.50
2	300	400	350	0.83	249	332	290.50
3	400	300	350	0.75	300	225	262.50
4	500	200	350	0.68	340	136	238.00
					1,071	1,148	1,109.50

Recommendation: Cash flow stream B is recommended as it provides maximum present value.

5.17 The cost of a plant is Rs 30,000. The expected life of the plant is 3 years. It is expected to generate EBDIT (Earnings before depreciation, interest and taxes): Rs 13,000, Rs 15,000, and Rs 17,000 respectively. Compute accounting rate of return assuming 50% tax, and straight line method of depreciation. (*Calcutta University, 2009*)

Solution

Determination of EAT and ARR

Year	*EBDIT*	*Depreciation (Rs 30,000/3)*	*EBIT*	*Taxes @ 50%*	*EAT*
1	Rs 13,000	Rs 10,000	Rs 3,000	Rs 1,500	Rs 1,500
2	15,000	10,000	5,000	2,500	2,500
3	17,000	10,000	7,000	3,500	3,500
Total EAT					7,500
Average EAT					2,500

ARR = (Average EAT/Average Investment) × 100 = [Rs 2,500/Rs 15,000 (i.e. Rs 30,000/2)] × 100 = 16.67%

5.18 A company is considering an investment project which requires an initial cash outlay of Rs 5,00,000 on equipment and Rs 20,000 as working capital. The project's economic life is 6 years. An additional investment of Rs 50,000 each would also be necessary at the end of second and fourth years to restore the efficiency of the equipment. The annual cash inflows expected from the project are:

Year	*Cash inflow (Rs)*
1	Rs 80,000
2	1,20,000
3	1,80,000
4	2,00,000
5	2,60,000
6	3,00,000

If the realisable scrap value of the equipment is Rs 20,000 after 6 years and cost of capital is 20%, justify whether the project should be accepted or not by determining the net present value. Assume that working capital will be recovered in full at the end of the project life.

(*Calcutta University, 2009*)

Solution

Determination of cash inflows

Cost of equipment		Rs 5,00,000
Add working capital		20,000
Add PV of additional investment:		
Year-2 end (Rs 50,000 × 0.694)	Rs 34,700	
Year-4 end (Rs 50,000 × 0.482)	24,100	58,800
		5,78,800

Determination of net present value

Year	*CFAT*	*PV factor of 20%*	*Total PV*
1	Rs 80,000	0.833	Rs 66,640
2	1,20,000	0.694	83,280
3	1,80,000	0.579	1,04,220
4	2,00,000	0.482	96,400
5	2,60,000	0.402	1,04,520
6	3,00,000	0.335	1,00,500
6 Salvage value	20,000	0.335	6,700
6 Working capital	20,000	0.335	6,700
Gross present value			5,68,960
Less present value of cash outflows			5,78,800
Net present value			(9,840)

Recommendation: Since NPV is negative, the company is advised not to accept investment project

5.19 From the following data, comment upon the project you will prefer and why? Both projects involve equal cash outflows.

Year	*Project X (cash inflows)*	*Project Y (cash inflows)*
1	Rs 1,000	Rs 5,000
2	2,000	4,000
3	3,000	3,000
4	4,000	2,000
5	5,000	1,000

(*Punjab University, 2009*)

Solution

Cash inflows are received more in earlier years in Project Y compared to Project X. Therefore, total present value of Project Y (assuming it to have positive NPV) would be higher *vis-à-vis* Project X; Project Y is to be preferred due to time value of money.

5.20 A company is considering investment in a project which cost Rs 6,00,000. The expected cash inflows are Rs 1,20,000, Rs 1,40,000, Rs 1,80,000, Rs 2,00,000 and Rs 2,50,000 in respective years 1 to 5. Calculate payback period. (*Bangalore University, 2008*)

Solution

Determination of payback period

Year	*CFAT*	*Cumulative CFAT*
1	Rs 1,20,000	Rs 1,20,000
2	1,40,000	2,60,000
3	1,80,000	4,40,000
4	2,00,000	6,40,000
5	2,50,000	—

The recovery of investment falls between the third and the fourth year. The PB is 3 years plus a fraction of 4th year. The fractional value = Rs 1,60,000/Rs 2,00,000 = 0.8. Thus, the payback period is 3.8 years.

5.21 A firm's cost of capital is 10%. It is considering two mutually exclusive projects, X and Y. The details are given below:

	Project X	*Project Y*
Investment	Rs 1,40,000	Rs 1,40,000
Net cash inflows after taxes:		
Year 1	Rs 20,000	Rs 20,000
2	40,000	80,000
3	60,000	40,000
4	90,000	20,000
5	1,20,000	70,000

Compute NPV of projects and advise the firm. (*Adapted Bangalore University, 2008*)

Solution

Determination of NPV of projects X and Y

Year	*CFAT*		*PV at 10%*	*Total PV*	
	X	*Y*		*X*	*Y*
1	Rs 20,000	Rs 20,000	0.909	Rs 18,180	Rs 18,180
2	40,000	80,000	0.826	33,040	66,080
3	60,000	40,000	0.751	45,060	30,040
4	90,000	20,000	0.683	61,470	13,660
5	1,20,000	70,000	0.621	74,520	43,470
Gross present value				2,32,270	1,71,430
Less cash inflows/Investments				1,40,000	1,40,000
Net present value				92,270	31,430

Recommendation: Company should select Project X as it gives higher NPV.

5.22 Using the information given below compute the pay back period under discounted pay back period and comment.

Initial outlay	Rs 80,000
Estimated life (years)	5
Profit after tax:	
End of year 1	6,000
2	14,000
3	24,000
4	16,000
5	Nil

Depreciation has been calculated under straight line method. The cost of capital may be taken at 20% p.a. (*Calcutta University, 2008*)

Solution

Determination of discounted payback

Year	*Profit after tax (PAT)*	*Depreciation (Rs 80,000/5)*	*CFAT (PAT + D)*	*PV factor at 20% PV*	*Total*	*Cumulative PV*
1	Rs 6,000	Rs 16,000	Rs 22,000	0.83	Rs 18,260	Rs 18,260
2	14,000	16,000	30,000	0.69	20,700	38,960
3	24,000	16,000	40,000	0.58	23,200	62,160
4	16,000	16,000	32,000	0.48	15,360	77,520
5	Nil	16,000	16,000	0.40	6,400	83,920

The recovery of investment (Rs 80,000) falls between fourth and fifth years. The PB period is 4 years plus a fraction of fifth year. The fractional value is Rs 2,480 (i.e., Rs 80,000 – Rs 77,520)/ Rs 6,400 (i.e., Rs 83,920 – Rs 77,520) = 0.3875.

The discounted pay back period is 4.3875 years.

Comment: Since the discounted PB period is less than economic useful life of 5 years, the project is commercially profitable (NPV is positive at Rs 3,920) and is worth accepting.

5.23 A project costs Rs 1 lakh and yields an annual cash inflows (after tax) of Rs 20,000 for 8 years. Calculate pay-back period.

(*Punjabi University, 2008*)

Solution

PB Period = Total cost of project/Annual CFAT = Rs 1,00,000/Rs 20,000 = 5 years.

5.24 A firm is considering two mutually exclusive projects, Project X and Project Y. The details are as follows:

Year	*Project X (cash flows)*	*Project Y (cash flows)*
0	Rs (15,00,000)	Rs (15,00,000)
1	1,00,000	6,50,000
2	2,50,000	6,00,000
3	3,50,000	6,00,000
4	5,50,000	5,75,000
5	7,50,000	5,25,000

Calculate: (1) NPV @ 15%, (2) Pay back period, and (3) Profitability index. Give your opinion as to which is to be selected.

(*Pune University, 2008 and 2007*)

Solution

Determination of NPV and profitability index of project X

Year	*CFAT*		*PV factor*	*Total PV*	
	Project X	*Project Y*	*at 10%*	*X*	*Y*
1	Rs 1,00,000	Rs 6,50,000	0.870	Rs 87,000	Rs 5,65,500
2	2,50,000	6,00,000	0.756	1,89,000	4,53,600
3	3,50,000	6,00,000	0.658	2,30,300	3,94,800
4	5,50,000	5,75,000	0.572	3,14,600	3,28,900
5	7,50,000	5,25,000	0.497	3,72,750	2,60,925
Gross present value (GPV)				11,93,650	20,03,725
Less cash outflows (CO)				15,00,000	15,00,000
Net present value (NPV)				(3,06,350)	5,03,725
Profitability index (GPV/CO)				0.796	1.336

Determination of pay back period of projects X and Y

Year	*CFAT*		*Cumulative CFAT*	
	X	*Y*	*X*	*Y*
1	Rs 1,00,000	Rs 6,50,000	Rs 1,00,000	Rs 6,50,000
2	2,50,000	6,00,000	3,50,000	12,50,000
3	3,50,000	6,00,000	7,00,000	18,50,000
4	5,50,000	5,75,000	12,50,000	24,25,000
5	7,50,000	5,25,000	20,00,000	29,50,000

PB period (X) = 4 years + (Rs 2.5 lakh/Rs 7.5 lakh) = 4.333 years.
(Y) = 2 years + (Rs 2.5 lakh/Rs 6.0 lakh) = 2.42 years.

Recommendation: Project Y should be selected.

5.25 Moongapa Ltd. has a machine with an additional life of 5 years which costs Rs 10,00,000 and has a book value of Rs 4,00,000. A new machine costing Rs 20,00,000 is available. Though its capacity is the same as that of old machine, it will mean a saving in variable costs to the extent of Rs 7,00,000 per annum. The life of the machine will be 5 years at the end of which it will have a scrap value of Rs 2,00,000. The income tax is 40% and as policy the firm does not make an investment if the yield is less than 12% per annum. The old machine if sold today, will realise Rs 1,00,000, it will have no salvage value if sold at the end of 5 years. Advise Moongapa Ltd. whether or not the old machine should be replaced? Capital gain on sale of old machine is also subject to the same tax at the rate of 40%.

(*Delhi University, 2008*)

Solution

Determination of incremental cash inflows:

Cost of new machine	Rs 20,00,000
Less sale proceeds of existing machine	1,00,000
Less tax advantage due to loss on sale of existing machine (Rs 4,00,000 – Rs 1,00,000 = Rs 3,00,000 loss) × 0.40	1,20,000
	17,80,000

Determination of CFAT and NPV

Particulars	*Amount*
Savings in variable costs (Earnings before depreciation)	Rs 7,00,000
Less incremental depreciation:	
New machine (Rs 20,00,000 – Rs 2,00,000)/5 years = Rs 3,60,000	
Less depreciation on existing machine (Rs 4,00,000/5) = 80,000	2,80,000
Net savings (Earning before taxes)	4,20,000
Less taxes (40%)	1,68,000
Earnings after taxes (EAT)	2,52,000
CFAT (EAT + Depreciation, incremental)	5,32,000
(x) PV factor at 12% for annuity of 5 years	(x) 3.605
Present value (of operating CFAT)	19,17,860
Add PV of salvage value at year-end 5 (Rs 2,00,000 × 0.567)	1,13,400
Total present value	20,31,260
Less cash outflows	17,80,000
Net present value	2,51,260

Recommendation: Since NPV is positive, the company is advised to replace the old machine.

5.26 R. Ltd. presenting considering two machines for possible purchase. Other information related to machines are as follows:

	Machine 1	*Machine 2*
Purchase price	Rs 50,000	Rs 60,000
Estimated life	4 years	4 years
Method of depreciation	St. line	St. line
Estimated Scrap value	Nil	Nil
Cash flow before depreciation and tax:		
Y_1	Rs 25,000	Rs 45,000
Y_2	25,000	19,000
Y_3	25,000	25,000
Y_4	25,000	27,000
Rate of tax is 40%		

Compute net present value of each machine assuming cost of capital is 8%. Which machine the company should buy? (*Calcutta University, 2007*)

Solution

Determination of CFAT of Machines (M) 1 and 2

Year	*CFBDT*		*Depreciation@*		*EBT*		*EAT (EBT × 0.6)*	
	Machine 1	*Machine 2*	*M-1*	*M-2*	*M-1*	*M-2*	*M-1*	*M-2*
1	Rs 25,000	Rs 45,000	Rs 12,500	Rs 15,000	Rs 12,500	Rs 30,000	Rs 7,500	Rs 18,000
2	25,000	19,000	12,500	15,000	12,500	4,000	7,500	2,400
3	25,000	25,000	12,500	15,000	12,500	10,000	7,500	6,000
4	25,000	27,000	12,500	15,000	12,500	12,000	7,500	7,200

@M-1: Rs 50,000/4 years = Rs 12,500; M-2: Rs 60,000/4 years = Rs 15,000

Determination of CFAT and NPV of Machines 1 and 2

Year	*CFAT (EAT+D)*		*PV factor at 8%*	*Total present value*	
	M-1	*M-2*		*M-1*	*M-2*
1	Rs 20,000	Rs 33,000	0.926	Rs 18,520	Rs 30,558
2	20,000	17,400	0.857	17,140	14,912
3	20,000	21,000	0.794	15,880	16,674
4	20,200	22,200	0.735	14,700	16,317
Total present value				66,240	78,461
Less cost of machine				50,000	60,000
Net present value				16,240	18,461

Recommendation: The company should buy machine M-2 as it has higher NPV.

5.27 Calculate internal rate of return for the Project Rs A'. The details of the project are as follows: Initial cost = Rs 10,500

Year	*1*	*2*	*3*	*4*
Cash inflows	Rs 2,000	Rs 3,000	Rs 4,000	Rs 5,000
Present value factor at 10%	.909	.826	.751	.683
Present value factor at 12%	.893	.797	.712	.636

(*Punjab University, 2007*)

Solution

Determination of IRR at 10% and 12%

Year	*CFAT*	*PV factor at*		*Total NPV at.*	
		10%	*12%*	*10%*	*12% .*
1	Rs 2,000	0.909	0.893	Rs 1,818	Rs 1,786
2	3,000	0.826	0.797	2,478	2,391
3	4,000	0.751	0.712	3,004	2,848
4	5,000	0.683	0.636	3,415	3,180
Total present value				10,715	10,205

By interpolation IRR = 10% + (Rs 10,715 – Rs 10,500)/(Rs 10,715 – Rs 10,205) (x)2% = 10% + (Rs 215/Rs 510) × 2% = 10% + (0.42 × 2%) = 10.84%.

5.28 A project costs Rs 2,00,000 and yields annually a profit of Rs 30,000 after depreciation @ 12.5% (for 8 years, with no salvage value) but before tax at 50%. Calculate pay-back period.

(*Punjab University, 2007*)

Solution

Determination of annual CFAT (t = 1 – 8):

Earnings before taxes	Rs 30,000
Less taxes (0.50)	15,000
Earnings after taxes	15,000
Add depreciation (0.125 × Rs 2 lakh)	25,000
CFAT	40,000

Payback period = Total cost of project/Annual CFAT = Rs 2,00,000/Rs 40,000 = 5 years

5.29 Raj and Co. intends to invest Rs 10 lakh in a project having a life of 4 years. The cash inflows from the project at the end of year one to the fourth year are expected as Rs 3,00,000, Rs 4,20,000, Rs 4,00,000 and Rs 3,30,000 before charging depreciation and tax. You are required to calculate the Accounting Rate of Return on the project. (*Calcutta University, 2007*)

Solution

Determination of EAT and ARR

Year	*CFBDT*	*Depreciation*[@]	*EBT*	*Taxes*[@@]	*EAT*
1	Rs 3,00,000	Rs 2,50,000	Rs 50,000	Rs 17,500	Rs 32,500
2	4,20,000	2,50,000	1,70,000	59,500	1,10,500
3	4,00,000	2,50,000	1,50,000	52,500	97,500
4	3,30,000	2,50,000	80,000	28,000	52,000
Total earnings after taxes					2,92,500
Average EAT (Rs 2,92,500/4)					73,125

[@]Assumed at straight line basis with no salvage value (Rs 10,00,000/4 years) = Rs 2,50,000

[@@]Taxes are assumed at 35%

ARR = (Average income/Average investment) × 100 = Rs 73,125/Rs 5,00,000 (i.e., Rs 10 lakh/2) = 14.625%

5.30 A company is currently considering the replacement of a machine originally costing Rs 50,000. The current book value of the machine is NIL and it can continue for another 6 years after which it will have NIL salvage value. The cost of new machine is Rs 2,10,000 but it will require another Rs 30,000 to install it. new machine is also likely to last 6 years with no salvage value.

The projected profits from the existing and new machine are as under:

Year	*Expected after tax profits*	
	Existing machine	*New machine*
1	Rs 2,00,000	Rs 2,40,000
2	2,50,000	3,10,000
3	3,10,000	3,50,000
4	3,60,000	4,10,000
5	4,10,000	4,30,000
6	5,00,000	5,10,000

The tax rate is 40%. The company uses straight line method of depreciation and the same is allowed for tax purposes. Cost of capital is 12%. If the new machine is purchased, the existing machine can be sold for Rs 25,000.

Advise the company about the feasibility of new proposal. (*Delhi University, 2007*)

Solution

Determination of incremental cash outflows

Cost of new machine		Rs 2,10,000
Add installation cost		30,000
Less effective sale proceeds of existing machine:		
Sale value	Rs 25,000	
Less tax on gain (Rs 25,000 – zero) × 0.4	10,000[@]	15,000
		2,25,000

[@]Since no capital gain tax rate is given, it is assumed that tax on capital gain of Rs 25,000 would be subject to ordinary tax rate of 40%.

Determination of incremental CFAT and NPV

Particulars	*Years.*					
	1	*2*	*3*	*4*	*5*	*6*
(i) CFAT with new machine:						
EAT	Rs 2,40,000	Rs 3,10,000	Rs 3,50,000	Rs 4,10,000	Rs 4,30,000	Rs 5,10,000
Add depreciation[@]	40,000	40,000	40,000	40,000	40,000	40,000
	2,80,000	3,50,000	3,90,000	4,50,000	4,70,000	5,50,000
(ii) CFAT with existing machine: EAT = CFAT (no depreciation, as current book value of machine is zero)	2,00,000	2,50,000	3,10,000	3,60,000	4,10,000	5,00,000
(iii) Incremental CFAT (i-ii)	80,000	1,00,000	80,000	90,000	60,000	50,000
(x) PV factor at 12%	0.893	0.797	0.712	0.636	0.567	0.507
Present value	71,440	79,700	56,960	57,240	34,020	25,350
Total present value		Rs 3,24,710				
Less incremental cash outflows		2,25,000				
Net present value		99,710				

[@](Rs 2,40,000/6 years)

Recommendation: Since NPV is positive, the proposal to replace the existing machine is financially profitable.

5.31 A company is considering the replacement of an existing machine. It is faced with two alternatives: **(i)** To buy machine A which is similar to the existing machine, **(ii)** To buy machine B which is more expensive and has higher capacity. The cash flows after tax at the present level of operations for the two alternatives are as follows;

After tax, cash flows (in lakhs of Rs) at the end of year:

Year	A	B
0	(–25)	(–40)
1	—	10
2	5	14
3	20	16
4	14	17
5	14	15

Cost of capital is 10%. Calculate: (i) Net present value, and (ii) Profitability index. Advise the company about the better alternative. (*Delhi University, 2006*)

Solution

Determination of NPV and profitability index of machines A and B

Year	*CFAT*		*PV factor at 10%*	*Total PV .*	
	A	*B*		*A*	*B*
1	—	Rs 10,00,000	0.909	—	Rs 9,09,000
2	Rs 5,00,000	14,00,000	0.826	Rs 4,13,000	11,56,400
3	20,00,000	16,00,000	0.751	15,02,000	12,01,600
4	14,00,000	17,00,000	0.683	9,56,200	11,61,100
5	14,00,000	15,00,000	0.621	8,69,400	9,31,500
Gross present value (GPV)				37,40,600	53,59,600
Less cost of machine (CO)				25,00,000	40,00,000
(i) Net present value				12,40,600	13,59,600
(ii) Profitable index (GPV/CO)				1.496	1.34

Recommendation: Buying machine B is better alternative as it has higher NPV.

5.32 No project is acceptable unless the yield is 10%. Cash inflow after tax of a certain project along with cash outflow are given below:

Year	*Outflows*	*Inflows*
0	Rs 1,50,000	—
1	30,000	Rs 20,000
2		30,000
3		60,000
4		80,000
5		30,000

The salvage value at the end of the 5th year is Rs 40,000. Calculate net present value.
(*Punjab University, 2006*)

Solution

Statement showing net present value of project

Year	*Cash flows*	*PV factor at 10%*	*Total PV*
0	(Rs 1,50,000)	1.000	(Rs 1,50,000)
1	(30,000)	0.909	(27,270)
1	20,000	0.909	18,180
2	30,000	0.826	24,780
3	60,000	0.751	45,060
4	80,000	0.683	54,640
5	30,000	0.621	18,630

(*Contd.*)

(*Contd.*)

5 (Salvage value)	40,000	0.621	24,840
Gross present value of CFAT			1,86,130
Less present value of CO			(1,77,270)
Net present value			8,860

5.33 Calculate discounted pay back period from the information given below:

Cost of project	Rs 6,00,000
Life of the project	5 years
Annual ash inflow	Rs 2,00,000
Cut-off rate 10%	

(*Punjab University, 2006*)

Solution

Computation of discounted CFAT and cumulative CFAT

Year	*CFAT*	*PV factor at 10%*	*Discounted CFAT*	*Cumulative CFAT*
1	Rs 2,00,000	0.909	Rs 1,81,800	Rs 1,81,800
2	2,00,000	0.826	1,65,200	3,47,000
3	2,00,000	0.751	1,50,200	4,97,200
4	2,00,000	0.683	1,36,600	6,33,800
5	2,00,000	0.621	1,24,200	7,58,000

Discounted PB period = 3 years + (Rs 6,00,000 – Rs 4,97,200)/ Rs 1,36,600 = 3 years + (Rs 1,02,800/ Rs 1,36,600) = 3.75 years

5.34 Compute the pay back period for the project:

End of year	*1*	*2*	*3*	*4*	*5*
Book value of Fixed Assets	Rs 90	Rs 80	Rs 70	Rs 60	Rs 50
Profit after tax	20	22	24	26	28

(*Calcutta University, 2006*)

Solution

Determination of CFAT and payback period

Year	*Profit after Tax (PAT)*	*Depreciation@ (D)*	*CFAT (PAT+D)*	*Cumulative CFAT*
1	Rs 20	Rs 10	Rs 30	Rs 30
2	22	10	32	62
3	24	10	34	96
4	26	10	36	132
5	28	10	38	170

@**(i)** There has been a decrease of Rs 10 each year in book value of fixed assets; based on this uniform decrease of Rs 10, it is safe to assume that depreciation changed is Rs 10 (and firm follows straight line method of depreciation).

(ii) Since book value at year-end 1 is Rs 90, based on depreciation of Rs 10, the value of initial investment in project at beginning of year 1 would be Rs 100 (Rs 90 + Rs 10).

(iii) The recovery of Rs 10 falls between year 3 and year 4. The payback (PB) period is 3 years plus a fraction of fourth year. The fractional value = Rs 4/Rs 36 = 0.11. Thus, PB period is 3.11 years.

5.35 Calculate the average rate of return for projects A and B form the following:

	Project A	*Project B*
Investments	Rs 20,000	Rs 30,000
Expected life	4 years	5 years
Projected net income (after depreciation, interest and taxes):		
Year 1	Rs 2,000	Rs 3,000
2	1,500	3,000
3	1,500	2,000
4	1,000	1,000
5	—	1,000

If the required rate of return is 12%, which project should be undertaken.

(*Bangalore University, 2006*)

Solution

Statement showing computation of average rate of return

Particulars	*Project A*	*Project B*
Year 1	Rs 2,000	Rs 3,000
2	1,500	3,000
3	1,500	2,000
4	1,000	1,000
5	—	1,000
Total	6,000	10,000
Average EAT	1,500	2,000
Average investment	10,000	15,000
Average rate of return (ARR):		
(Average EAT/Average investment) (%)	15	13.33

Recommendation: Project A should be undertaken as it yields higher average rate of return.

5.36 Given profitability index 1.182 and present value of cash outflows Rs 20 lakh, determine gross present value (GPV) and net present value of the project.

(*Adapted Bangalore University, 2006*)

Solution

PI = GPV of CFAT/PV of CO

GPV of CFAT = Rs 20 lakh × 1.182 = Rs 23.64 lakh

Net present value (NPV) = Rs 23.64 lakh – Rs 20 lakh = Rs 3.64 lakh.

5.37 SIP Corporation wishes to replace its existing machine. The following information is available:

Existing machine
- Purchased 2 years ago
- Remaining life = 6 years
- Salvage value = Rs 500
- Current book value = Rs 2,600
- Realisable market value = Rs 3,000
- Depreciation: straight line method

New machine:
- Capital cost = Rs 8,000
- Estimated useful life = 6 years
- Estimated salvage value = Rs 800

The replaced machine would permit an output expansion. As a result sales is expected to rise by Rs 1,000 per year. Operating expenses would decline by Rs 1,500 per year. It would require an additional inventory of Rs 2,000 and would cause an increase in accounts payable by Rs 500. Assuming a corporate tax of 40% and cost of capital of 18%, should the machine be replaced? Use differential approach for calculations. (*Delhi University, 2006*)

Solution

Determination of incremental cash outflows

Cost of new machine		Rs 8,000
Add increase in working capital (Rs 2,000 – Rs 500)		1,500
Less effective sale proceeds from existing machine:		
Sale value	Rs 3,000	
Less taxes payable on gain (Rs 3,000 – Rs 2,600) × 0.4	160	2,840
		6,660

Determination of CFAT and NPV

Particulars	*Years (1 – 6)*
Increase in cash earnings (Rs 1,000 + Rs 1,500)	Rs 2,500
Less increase in depreciation:	
New machine (Rs 8,000 – Rs 800)/6 years = Rs 1,200	
Old machine (Rs 2,600 – Rs 500)/6 years = 350	850
Earnings before taxes	1,650
Less taxes (40%)	660
Earnings after taxes	990
CFAT (EAT + Increase in depreciation)	1,840
(x) PV factor at 18% for 6 years	× 3.498
PV of operating CFAT (1 – 6)	Rs 6,436
Add PV of terminal cash flows in 6th year (Differential salvage value Rs 300 + working capital Rs 1,500) × 0.370	666
Total present value	7,102
Less incremental cash outflows	6,660
Net present value	442

Recommendation: Since NPV is positive, it would be profitable for the company to replace the existing machine.

5.38 Ankit Manufacturing Co. Ltd. owns a machine which is six years old and has an estimated remaining life of two years. The following cash flow estimates have been made for the machine:

End of year	*Net cash flow*	*Salvage value*
6	—	Rs 1,20,000
7	Rs 80,000	60,000
8	50,000	Nil

Management wants to determine whether the machine should be retained for one more year or two more years. The company's required rate of return is 10%. Use NPV method.

(*Delhi University, 2005*)

Solution

Determination of NPV when machine is retained (i) for one year and (ii) for two years

Particulars	*Amount*	
Alternative (i):		
Net cash flow from operations	Rs 80,000	
Plus salvage value at year-end 1	60,000	
Total cash inflow	1,40,000	
(x) PV factor at 10%	0.909	Rs 1,27,260
Less current salvage value (in zero year)		1,20,000
Net present value		7,260
Alternative (ii):		
PV of CFAT (year-end 1) (Rs 80,000 × Rs 0.909)		Rs 72,720
Add PV of CFAT (year-end 2) (Rs 50,000 × 0.826)		41,300
Total present value		1,14,020
Less current salvage value (in zero year)		1,20,000
Net present value		(5,980)

Recommendation: Machine should be retained for one year only.

5.39 XYZ company is considering replacement of its existing machine by a new machine which is expected to cost Rs 1,60,000. The new machine will have a life of 5 years and will yield cash revenues of Rs 2,50,000 and incur annual cash expenses of Rs 1,30,000. The estimated salvage value of the new machine is nil. The existing machine has a book value of Rs 40,000 and can be sold for Rs 20,000 today. It is good for next 5 years and is estimated to generate annual cash revenue of Rs 2,00,000 and to involve annual cash expenses of Rs 1,40,000. Its salvage value after 5 years is zero. Corporate tax rate is 40%. Depreciation rate is 25% on W.D.V. method. The company's opportunity cost of capital is 20%.

Ignore taxes on profit or loss on sale of machine. Advise whether the company should replace the machine or not. (*Delhi University, 2005*)

Solution

Determination of incremental cash outflows:

Cost of new machine	Rs 1,60,000
Less sale value of existing machine	20,000
	1,40,000

Determination of Incremental CFAT and NPV of new machine

Particulars	*Years*				
	1	*2*	*3*	*4*	*5*
Incremental earnings before depreciation[1]	Rs 60,000	Rs 60,000	Rs 60,000	Rs 60,000	Rs 60,000
less incremental depreciation[2]	30,000	22,500	16,875	12,657	9,942
Earnings before taxes	30,000	37,500	43,125	47,343	50,508
Less taxes (0.4)	12,000	15,000	17,250	18,937	20,203
Earnings after taxes	18,000	22,500	25,875	28,406	30,305
CFAT (EAT + Depreciation)	48,000	45,000	42,750	41,063	39,797
(x) PV factor at 20%	0.833	0.694	0.579	0.482	0.402
Present value	39,984	31,230	24,752	19,792	15,998
Total present value					1,31,756
Less cash outflows					1,40,000
Net present value					(8,244)

Recommendation: Since NPV is negative, the company is advised not to replace the existing machine.

Working Notes

1. Earnings with new machine(Rs 2,50,000 – Rs 1,30,000)	Rs 1,20,000
Less earnings with existing machine (Rs 2,00,000 – Rs 1,40,000)	60,000
Incremental earnings (from new machine)	60,000

2. Schedule showing incremental depreciation

Year	Depreciation with		Incremental depreciation
	New machine	Existing machine	
1	Rs 40,000	Rs 10,000	Rs 30,000
2	30,000	7,500	22,500
3	22,500	5,626	16,875
4	16,875	4,218	12,657
5	12,656	3,164	9,492

5.40 On the basis of data given below calculate:

(i) ARR on projects A and B;

(ii) Payback period for A and B.

(Depreciation has been charged on straight line basis and estimated life span of both projects is 5 years):

Item	Project A	Project B
Cost	Rs 56,125	Rs 56,125

Net Income after depreciation and taxes:

Year		
1	Rs 3,375	Rs 11,375
2	5,375	9,375
3	7,375	7,375
4	9,375	5,375
5	11,375	3,375

(Delhi University, 2003)

Solution

Determination of ARR and PB Period for Projects *A* and *B*

Year	EAT		Depreciation	CFAT (EAT + D)		Cumulative CFAT	
	Project A	Project B	(Rs 56,125/5)	A	B	A	B
1	Rs 3,375	Rs 11,375	Rs 11,225	Rs 14,600	Rs 22,600	Rs 14,600	Rs 22,600
2	5,375	9,375	11,225	16,600	20,600	31,200	43,200
3	7,375	7,375	11,225	18,600	18,600	49,800	61,800
4	9,375	5,375	11,225	20,600	16,600	70,400	Not
5	11,375	3,375	11,225	22,600	14,600	Not required	required
	36,875	36,875					—

(i) ARR = (Average EAT/Average investment) × 100

$$\text{(Project A)}\ \frac{\text{Rs } 7,373 (\text{Rs } 36,875/5)}{\text{Rs } 28,062.50} \times 100 = 26.28 \text{ per cent}$$

$$\text{(Project B)}\ \frac{\text{Rs } 7,375}{\text{Rs } 28,062.50} \times 100 = 26.28 \text{ per cent}$$

(ii) PB period (Project A) = 3 years + (Rs 56,125 – Rs 49,800)/Rs 20,600 = 3.307 years
(Project B) = 2 years + (Rs 56,125 – Rs 43,200)/Rs 18,600 = 2.695 years

Chapter

6

Capital Budgeting II: Additional Aspects

Learning Objectives

1. Use present value profiles to compare and contrast and evaluate NPV and IRR techniques in light of conficiting rankings
2. Compare and contrast NPV and PI evaluation techniques
3. Describe two capital budgeting refinements—comparing projects with unequal lives and capital rationing—that frequently require special form of analysis

INTRODUCTION

The simple accept-reject investment decisions with primarily conventional cash flows were discussed in the preceding Chapter. A firm generally faces complex investment situations and has to choose among alternatives. The evaluation techniques discussed earlier can be extended to handle such decisions. The focus of this Chapter is on extension of these techniques to complex investment situations. Section 1 is devoted to a comparison of the DCF methods, namely, NPV, IRR and PI. This Section also outlines the conceptual framework of evaluating projects with unequal lives. Project selection under capital rationing is explained in Section 2. The major points are summarised in Section 3.

SECTION 1 NPV, IRR, PROFITABILITY INDEX METHODS – A COMPARISON

NPV Vs. IRR Methods

The NPV and IRR methods would in certain situations give the same accept-reject decision. But they may also differ in the sense that the choice of an asset under certain circumstances may be mutually contradictory. The comparison of these methods, therefore, involves a discussion of **(i)** the similarities between them, and **(ii)** their differences, as also the factors which are likely to cause such differences.

NPV and IRR: Similarities The two methods-IRR and NPV- would give consistent results in terms of acceptance or rejection of investment proposals in certain situations. That is, if a project is sound, it will be indicated by both the methods. If, however, it does not qualify for acceptance, both the methods will indicate that it should be rejected.

Conventional investment projects are projects which cash outflows are confined to the initial period.

Independent projects are all profitable projects that can be accepted.

The situations in which the two methods will give a concurrent accept-reject decision will be in respect of conventional and independent projects. A **conventional investment** is one in which the cash flow pattern is such that an initial investment (outlay or cash outflow) is followed by a series of cash inflows. Thus, in the case of such investments, cash outflows are confined to the initial period. The **independent proposals** refer to investments the acceptance of which does not preclude the acceptance of others so that all profitable proposals can be accepted and there are no constraints in accepting all profitable projects. The reason why both the methods are equivalent and support or reject a proposal is simple. The decision-criterion with these methods may be recalled here. According to the NPV method, the decision rule is that a project will be accepted if it has a positive NPV, that is, NPV exceeds zero. The IRR method would support projects in whose case the IRR is more than the required rate of return (r exceeds k). When the NPV = zero or the IRR = k, the project may be accepted or rejected. The projects which have positive net present values will also have an IRR higher than the required rate of return.

Thus, Fig. 6.1 portrays NPV as **(i)** positive; **(ii)** zero; and **(iii)** negative corresponding to three situations **(a)** IRR > K; **(b)** IRR = K; **(c)** IRR < K.

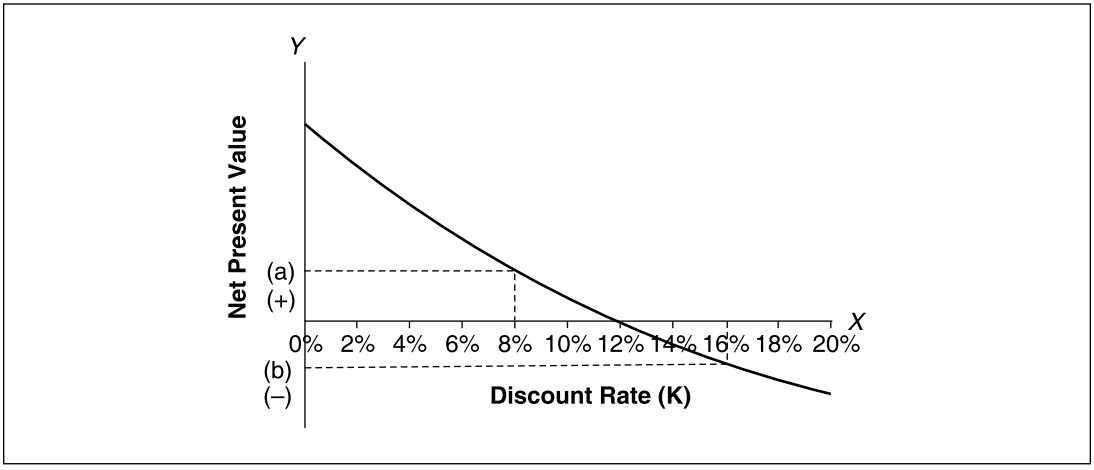

FIGURE 6.1 NPV and Discount Rate

Figure 6.1 shows the relationship between the NPV of a project and the discount rate. If there is no K, or discount rate is zero (a very unreal situation), NPV is maximum. As the value of K increases, the NPV starts declining. At 12 per cent rate of discount, the NPV is zero. This is the IRR also because by definition it is that rate of discount which reduces the NPV to zero. Assuming cost of capital to be 8 per cent, we find that NPV is positive by amount (a) and the project is acceptable and so is it under IRR as its value is > K (0.12 >

0.08). If we assume K to be 16 per cent, the project is unacceptable as the NPV is negative by amount (b) and so is it under IRR as IRR < K (0.12 < 0.16). The two approaches lead to identical results with regard to the accept-reject decision.

NPV and IRR Methods: Differences Thus, in the case of independent conventional investments, the NPV and IRR methods will give concurrent results. However, in certain situations they will give contradictory results such that if the NPV method finds one proposal acceptable, IRR favours another. This is so in the case of mutually exclusive investment projects. If there are alternative courses of action, only one can be accepted. Such alternatives are mutually exclusive. The mutual exclusiveness of the investment projects may be of two types: **(i)** technical, and **(ii)** financial. The term **technical exclusiveness** refers to alternatives having different profitabilities and the selection of that alternative which is the most profitable. Thus, in the case of a purchase or lease decision the more profitable out of the two will be selected. The mutual exclusiveness may also be financial. If there are resource constraints, a firm will be forced to select that project which is the most profitable rather than accept all projects which exceed a minimum acceptable level (say, k). The exclusiveness due to limited funds is popularly known as **capital rationing**.

Conflicting ranking is conflict in the ranking of a given project by NPV or IRR resulting from differences in magnitude or timing of cashflows.

The **different ranking** given by the NPV and IRR methods can be illustrated under the following heads:

1. Size-disparity problem;
2. Time-disparity problem; and
3. Unequal expected lives.

Size-disparity arises when the initial investment in mutually exclusive projects is different

Size-disparity Problem This arises when the initial investment in projects under consideration, that is, mutually exclusive projects, is different. The cash outlay of some projects is larger than that of others. In such a situation, the NPV and IRR will give a different ranking. Consider Example 6.1.

Example 6.1

A and *B* are two mutually exclusive investments involving different outlays. The details are:

Particulars	*Project A*	*Project B*	*Project B-A*
Cash outlays	(Rs 5,000)	(Rs 7,500)	(Rs 2,500)
Cash inflows at the end of year, 1	6,250	9,150	2,900
IRR (%)	25	22	16
k (%)		10	
NPV	681.25	817.35	

Thus, the two methods rank the projects differently. Project A has a higher IRR (0.25) than project B (0.22) but the NPV of project B (Rs 817.35) is more than that of A (Rs 681.25). The important question is which method, in such a situation, gives better results? The answer should be related to the effect of the decision on the maximisation of the shareholders' wealth. The IRR method is not compatible with the goal of wealth maximisation. It is concerned with the rate of return on investment or yield rather than the total yield on the investment. In the above example, assuming 10 per cent to be the required rate of return, the firm would be left with Rs 750 [Rs 6,250 – (Rs 5,000 + 0.10 × Rs 5,000)] after one year in case project A is

accepted and Rs 900 [Rs 9,150 – (Rs 7,500) + 0.10 × Rs 7,500] in case project B is accepted. The NPV method suggests that project B is better. This recommendation is consistent with the goal of the firm of maximising shareholders' wealth. When faced with mutually exclusive projects, each having a positive NPV, the one with the largest NPV will have the most beneficial effect on shareholders wealth. Since the selection criterion under the NPV method is to pick up the project with the largest NPV, the NPV is the best operational criterion. As long as the firm accepts the mutually exclusive investment proposal with the largest NPV, it will be acting consistently with the goal of maximising shareholders' wealth. This is because the project with the largest NPV will cause the share price and shareholders' wealth to increase more than will be possible with any of the other projects.[1]

Incremental analysis involves computation of IRR of the incremental outlay of the project requiring bigger initial investment

Incremental Approach The conflict between the NPV and IRR in the above situation can be resolved by modifying the IRR so that it is based on incremental analysis. According to the incremental approach, when the IRR of two mutually exclusive projects whose initial outlays are different exceeds the required rate of return, the IRR of the incremental outlay of the project requiring a bigger initial investment should be calculated. This involves the following steps:

1. Find out the differential cash flows between the two proposals.
2. Calculate the IRR of the incremental cash flows.
3. If the IRR of the differential cash flows exceeds the required rate of return, the project having greater investment outlays should be selected, otherwise it should be rejected.

The logic behind the incremental approach is that the firm would get the profits promised by the project involving smaller outlay plus a profit on the incremental outlay. In general, projects requiring larger outlay would be more profitable if IRR on differential cash outlays exceeds the required rate or return. The modified IRR for mutually exclusive proposals involving size-disparity problem would provide an accept-reject decision identical to that given by the NPV method.

In Example 6.1, the IRR of the differential cash outlay of Project B is 16 per cent. The required rate of return is 10 per cent. Thus, project B is better than project A in spite of the fact that IRR in the latter is lower because it offers the benefits offered by project A plus a return in excess of the required return on Rs 2,500, that is, differential cash outlays.

To summarise the above discussion, the NPV method is superior to the IRR because the former supports projects which are compatible with the goal of maximisation of shareholders' wealth while the latter does not. On modifying the IRR method by adopting the incremental approach, IRR would give results identical to the NPV method. The modified IRR method has other merits also. It is easier to interpret and apply than the NPV measure. However, it requires additional computation, whereas the NPV method provides the correct answer in the first instance itself.

Time-disparity arises when the cash flow pattern of mutually exclusive projects is different

Time-disparity Problem The mutually-exclusive proposals may differ on the basis of the pattern of cash flows generated, although their initial investments may be the same. This may be called the time-disparity problem. The time-disparity problem may be defined as the conflict in ranking of proposals by the NPV and IRR methods which have different patterns of

cash inflows. In such a situation, like the size-disparity problem, the NPV method would give results superior to the IRR method. This is illustrated in Example 6.2.

Example 6.2

Year	*Cashflows*	
	Project A	*Project B*
0	Rs 1,05,000	Rs 1,05,000
1	60,000	15,000
2	45,000	30,000
3	30,000	45,000
4	15,000	75,000
IRR (%)	20	16
NPV (0.08)	23,970	25,455

We find on the basis of a comparison of the internal rate of returns that project A is better, but the NPV method suggests that project B is better. Since the cost of capital is 8 per cent, given the objective of the firm to maximise wealth, project B is definitely better.

Under the time-disparity problem it is the cost of capital which will determine the ranking of projects. If we take $k = 0.10$, we shall find project A is better as its net present value would be Rs 19,185 compared to Rs 18,435 of B. Its IRR is also more than that of B. Both the methods give identical prescription. But it does not imply that the IRR is superior to the NPV method, as the NPV is giving the same ranking as the IRR. In the event of conflicting rankings, the firm should rely on the rankings given by the NPV method.

Projects With Unequal Lives Another situation in which the IRR and NPV methods would give a conflicting ranking to mutually exclusive projects is when the projects have different expected lives. This is shown in Example 6.3.

Example 6.3

There are two projects A and B. A has a service life of one year, while B's useful life is five years. The initial cash outlay for both the projects may be assumed to be Rs 20,000 each. The cash proceeds from project A (at the end of the first year) amount to Rs 24,000. The cash generated by project B at the end of the fifth year is likely to be Rs 40,200. Assume that the required rate of return is 10 per cent. Compute the NPV and the IRR of the two projects.

Solution

IRR and NPV of Projects A and B

Project	*IRR (per cent)*	*NPV*
A	20	Rs 1,816
B	15	4,900

Obviously, the ranking given by the IRR and NPV methods is different. According to the IRR method, the recommendation would favour project A while the NPV method would support project B. The conflict in the ranking by the two methods in such cases may be resolved by adopting a modified procedure. There are two approaches to do this: **(i) common time horizon approach** and **(ii) equivalent annual value/cost approach.**

Common time horizon approach makes a comparison between projects that extends over multiples of the lives of each.

According to the first appraoch, in order to have valid comparisons between the projects, they must be compared over the same period of time. The comparison may, thus, extend over multiples of the lives of each. Thus,

if the service life of one project is 3 years and of another 4 years, the comparison must be over a 12 year period with replacements occurring for each.[2] Consider Example 6.4.

Example 6.4

Particulars	*Project A*	*Project B*
Initial outlay	Rs 10,000	Rs 20,000
Cash inflows after taxes		
Year-end 1	8,000	8,000
2	7,000	9,000
3	Nil	7,000
4	Nil	6,000
Service life (years)	2	4
Required rate of return	0.10	

Solution

Project A

Year	*Cash flows*	*PV factor*	*Total present value*
0	Rs 10,000	1.000	(Rs 10,000)
1	8,000	0.909	7,272
2	7,000	0.826	5,782
3	(10,000) [a]	0.826	(8,260)
3	8,000	0.751	6,008
4	7,000	0.683	4,781
NPV			5,583

[a] Machine replaced at the end of year 2.

Project B

Year	*Cash flows*	*PV factor*	*Total present value*
0	(Rs 20,000)	1.000	(Rs 20,000)
1	8,000	0.909	7,272
2	9,000	0.826	7,434
3	7,000	0.751	5,257
4	6,000 0.683		4,098
Net present value			4,061

Decision Project A should be preferred to project B because of its larger NPV. If we had compared the two projects without incorporating the consequences of replacing the machine at the end of year 2, the decision would have been the reverse, because the net present value of project A then would be Rs 3,054 [Rs 7,272 + Rs 5,782 – Rs 10,000].

The implicit assumption of this approach is that the investment which is being replaced will produce cash flows of a similar pattern in future as it has done in the past.

We have taken a very simple situation where the project's life was only 2 years. But in actual practice, the competing alternatives may have much longer lives, say 15 years and 20 years. In such circumstances, it would probably not be possible to apply strictly the criterion mentioned above, that is, replacing the investment of the shorter-period project 4 times and longer-period project 3 times, in all having a 60 year life. It will obviously not be possible to make correct estimates for these projects for such a distant future.

The application of the *common time horizon approach* encounters operational difficulty in terms of assumptions of the same technology, price of the capital asset, and operating costs and revenues.

The *equivalent annual value/cost* method obviates these difficulties. According to this method, equivalent annual value/cost of all mutually exclusive investment projects under consideration is determined. The **equivalent annual net present value** (EANPV) is determined dividing the NPV of cash flows of the project by the annuity factor corresponding to the life of the project at the given cost of capital. The decision-criterion, in the case of revenue-expanding proposals, is the maximisation of EANPV and minimisation of **equivalent annual cost** (EAC) in the case of cost-reduction proposals. For analysis purposes, it is assumed that the firm would need the equipment more or less indefinitely. Therefore, it would be replaced when it wears out.[3] The assumption is consistent with the going concern accounting principle. This is illustrated in Examples 6.5 and 6.6.

Equal annual net present value (EANPV) approach evaluates unequal-lived projects that converts the net present value of unequal-lived mutually exclusive projects into an equivalent (in NPV terms) annual amount.

Equal annual cost (EAC) converts the present value of costs of unequal-lived mutually exclusive projects into an equivalent annual amount/cost.

Example 6.5 (Revenue-expanding Investment Proposal)

A firm is considering to buy one of the following two mutually exclusive investment projects:

Project A: Buy a machine that requires an initial investment outlay of Rs 1,00,000 and will generate the CFAT of Rs 30,000 per year for 5 years.

Project B: Buy a machine that requires an initial investment outlay of Rs 1,25,000 and will generate the CFAT of Rs 27,000 per year for 8 years.

Which project should be undertaken by the firm? Assume 10 per cent as cost of capital.

Solution

(i) Determination of NPV of Projects A and B

Project	*Years*	*CFAT*	*PV factor (0.10)*	*Total PV*	*NPV*
A	1-5	Rs 30,000	3.791	Rs 1,13,730	Rs 13,730
B	1-8	27,000	5.335	1,44,045	19,045

(ii) Determination of EANPV:

$$\text{EANPV} = \frac{\text{Net present value of the project}}{\text{PV of annuity corresponding to life of the project at given cost of capital}} \quad \textbf{(6.1)}$$

EANPV (A) = Rs 13,730/3.791 = Rs 3,621.74

EANPV (B) = Rs 19,045/5.335 = Rs 3,569.82

On the basis of NPV criterion, Project B is preferred. However, on the basis of EANPV, project A becomes more desirable, with higher EANPV. In fact, acceptance of project A would be a right decision.

Example 6.6

(Cost-reduction Investment Proposal) A firm is considering to instal a large stamping machine. Two machines currently being marketed will do the job satisfactorily. Machine A costs Rs 50,000 and will require cash running expenses of Rs 15,000 per year. It has a useful life of 6 years and is expected to yield Rs 2,000 salvage value at the end of its useful life. Machine B costs Rs 65,000 but cash running expenses are expected to be Rs 12,000. This machine is expected to have a useful life of 10 years with salvage value of Rs 5,000. Assume both the machines would be depreciated on straight line basis for tax purposes.

If the corporate tax rate is 35 per cent and cost of capital is 10 per cent, which machine should be bought by the company?

Solution

Equivalent Annual Costs of Machines A and B

Particulars	*Costs*		*PV factor (0.10)*	*Adjusted PV*	
	Machine A	*Machine B*		*Machine A*	*Machine B*
0 (Initial cost)	Rs 50,000	Rs 65,000	1.000	Rs 50,000	Rs 65,000
(Operating cost):					
1-6 years (A)	6,950		4.355	30,267.25	
1-10 years (B)	—	5,700	6.145		35,026.50
				80,267.25	1,00,026.50
Less: Salvage value:					
6th year (A)	2,000		0.564	1,128.00	—
10th year (B)		5,000	0.386	—	1,930
Present value of total costs				79,139.25	98,096.50
Divided by annuity PV factor for 10 per cent corresponding to the life of the project (capital recovery factor)				4.355	6.145
Equivalent annual cost (EAC)				18,172	15,963.63

Recommendation Since Machine B has a lower equivalent annual cost, it is preferred investment.

Working Notes

Determination of Operating Costs

Particulars	*Machine A*	*Machine B*
Cash running cost	Rs 15,000	Rs 12,000
Less: Tax shield @35 per cent (assuming profitable operations)	5,250	4,200
Less: Tax advantage on depreciation charged every year:		
Machine A (Rs 8000 × 0.35)	2,800	—
Machine B (Rs 6,000 × 0.35)	—	2,100
Effective operating cash outflows	6,950	5,700

Reinvestment Rate Assumption The preceding discussions have revealed that in the case of mutually exclusive projects, the NPV and IRR methods would rank projects differently where **(a)** the projects have different cash outlays initially, **(b)** the pattern of cash inflows is different, and **(c)** the service lives of the projects are unequal. It has also been found that the ranking given by the NPV method in such cases is theoretically more correct. The conflict between these two methods is mainly due to different assumptions with regard to the reinvestment rate on funds released from the proposal. The assumption underlying the IRR method seems to be incorrect and deficient. The IRR criterion implicitly assumes that the cash flow generated by the projects will be reinvested at the internal rate of return, that is, the same rate as the proposal itself offers. With the NPV method, the assumption is that the funds released can be reinvested at a rate equal to the cost of capital, that is, the required rate of return. The crucial factor is which assumption is correct? The assumption of the NPV method is considered to be superior theoretically because it has the virtue of having a rate which can consistently be applied to all investment proposals. Moreover, the rate of return (k) represents an opportunity

rate of investment. In contrast to the NPV method, the IRR method assumes a high reinvestment rate for investment proposals having a high IRR and a low investment rate for investment proposals having a low IRR. The **implicit reinvestment rate** will differ depending upon the cash flow stream for each investment proposal. Obviously, under the IRR method, there can be as many rates of reinvestment as there are investment proposals to be evaluated unless some investment proposals turn out to have an IRR which is equal to that of some other project(s).

Implicit investment rate is the rate at which interim cash flows can be invested.

The superficiality of the reinvestment rate under the IRR method can be demonstrated by comparing the following two investment projects.[4]

Project	*Initial investment*	*Cash inflows*	
		Year 1	*Year 2*
A	Rs 100	Rs 200	0
B	100	0	Rs 400

Under the IRR method, both projects have a rate of return of 100 per cent. If Rs 100 were invested for one year at 100 per cent, it would grow to Rs 200, and if invested for two years, to Rs 400. Since both the projects have the same IRR, the firm should be indifferent regarding their acceptability, if only one of two projects is to be picked up as both the projects are equally profitable. For this to be true, it is necessary that Rs 200 received at the end of year 1 in case of project A should be equal to Rs 400 at the end of year 2. In order to achieve this, it necessarily follows that the firm must be able to reinvest the first year's earnings at 100 per cent. If not, it would be unable to transform Rs 200 at the end of the first year into Rs 400 at the end of the second. And if it cannot transform Rs 200 into Rs 400 in a year's time, the two projects *A* and *B* cannot be ranked equal. There is no reason to believe that a firm can find other investment opportunities at precisely the required rate.

In contrast, the present value method does not pose any problem. Let us calculate the present value of Example 6.7, assuming cost of capital (k) as 10 per cent.

Example 6.7

Year	*Project A*			*Project B*		
	Cashflows	*PV factor*	*Total PV*	*Cashflows*	*PV factor*	*Total PV*
1	Rs 200	0.909	Rs 181.80	0	—	—
2	0	—		Rs 400	0.826	Rs 330.40
			181.80			330.40
Less: Initial outlay			100.00			100.00
Net present value			81.80			230.40

The PV method indicates that project B is preferable to project A as its net present value is greater. The reinvestment rate in the PV method seems more realistic and reasonable. It assumes that earnings are reinvested at the same rate as the market cost of capital.

However, the IRR can be modified assuming the cost of capital to be the reinvestment rate. The **intermediate cash inflows** will be compounded by using the cost of capital. The compounded sum so arrived at and the initial cost outflows can be used as the basis of determining the IRR. The limitation of IRR arising out of the inconsistency in the reinvestment rate assumption can be obviated through the modified approach.

Intermediate cash flows are cash inflows received prior to the termination of the project.

Modified IRR Method Since investment at the cost of capital is generally more realistic, the modified IRR (MIRR) is a better indicator of a project's true profitability. The MIRR also solves the problem of multiple IRRs.[5]

The MIRR can be computed by using Equation 6.2

$$CO_0 = \frac{\text{Compounded sum}_n}{(1 + \text{MIRR})^n} \qquad \textbf{(6.2)}$$

For facts contained in Example 5.6, the MIRR of Machine A is 14.57 per cent as shown below:

Year	*CFAT*	*Compounded factor at 10% for n – 1years*	*Compounded sum*
1	Rs 14,000	1.464 (for 4 years)	Rs 20,496
2	16,000	1.331 (for 3 years)	21,296
3	18,000	1.210 (for 2 years)	21,780
4	20,000	1.110 (for 1 year)	22,200
5	25,000	No compounding	25,000
Total compounded sum at year-end 5			1,10,772

Note: Cost of capital is 10 per cent (Compounded factors are as per Table A-1.)

$$\text{Rs } 56{,}125 = \frac{\text{Rs } 1{,}10{,}772}{(1 + \text{MIRR})^5}$$

1. Dividing the compound sum/terminal value (Rs 1,10,772) by the initial outlay (Rs 56,125), we have growth factor (1.9737).
2. In Table A-1, the factors closet to 1.9737 for 5 years are 1.925 (at 14%) and 2.011 (at 15%).
3. The MIRR would be between 14% and 15% as shown below.
   Rs 56,125 compounds at 15% for 5 years = Rs 1,12,867
   Rs 56,125 compounds at 14% for 5 years = 1,08,041
   Difference of 1 per cent 4,826
   Based on interpolation:

$$\text{MIRR} = 14\% + \left(\frac{\text{Rs } 1{,}10{,}772 - \text{Rs } 1{,}08{,}041 = \text{Rs } 2{,}731}{\text{Rs } 4{,}826}\right) \times 1 = 14.57 \text{ per cent.}$$

(It may be noted that IRR for Machine A was 17.6 per cent).

The MIRR method, *prima-facie*, appears to be better than the standard IRR. But its superiority is open to question.[6] In the first place, the MIRR may look like a rate of return, but it is not a rate of return on the project's annual cash flows; instead, it is a rate of return on a modified set of cash flows. Secondly, therefore, in view of observation 1, it cannot be reckoned as a true `internal' rate of return which depends only on cash flows generated from the investment project and, finally, the value of a project does not depend on what the firm does with the cash flows accruing from the project.

Thus, the assumption regarding the reinvestment rate of the cash inflows generated at the intermediate stage is theoretically more correct in the case of NPV as compared to the IRR. This is mainly because the rate is a consistent figure for the NPV but it can widely vary for the IRR according to the cash flow patterns.

Computational Problems Apart from inconsistency in the application of the reinvestment rate, the IRR method also suffers from computational problems. These may be discussed with reference to two aspects.

Computation in Conventional Cash Flows It has been shown while computing the IRR that the calculation of the IRR involves a trial-and-error procedure as a result of which complicated computation has to be done. In conventional proposals having a constant cash inflow stream (i.e. annuity) the computation, is not so tedious. But when the cash inflows are unequal over the years, laborious calculations are involved. The calculations of the NPV, on the other hand, is relatively simple and presents no special problems.

Computation in Non-conventional Flows The problem of computation of IRR gets accentuated when cash flow patterns are non-conventional. The complications in such cases are (a) that the IRR is indeterminate, and (b) there may be multiple IRRs.

Indeterminate IRR For the following pattern of cash flows of an investment proposal, the IRR cannot be determined.[7]

Example 6.8

CO_0 = Rs 1
$CFAT_1$ 2
CO_2 2

Where subscripts 0, 1, 2 refer to respective time periods, CFAT = cash inflows, CO = cash outflows
The required equation to solve the IRR is:

$$1 + \frac{2}{(1+r)^2} = \frac{2}{(1+r)}, \qquad \text{which leads to } r^2 = -1$$

Clearly, the value of IRR is intermediate. On the other hand, the NPV of this project, given k as 10 per cent, can be easily ascertained. This would be negative (Rs –0.834), as shown below:

Year	*Cash flows*	*PV factor*	*Total present value*
0	Rs (1)	1.000	Rs 1.000
1	+2	0.909	1.818
2	(2)	0.826	(1.652)
			(0.834)

Multiple Rates of IRR Another serious computational deficiency of IRR method is that it can yield multiple internal rates of return. This is illustrated in Example 6.9.[8]

Example 6.9

Initial cost	Year 0	(Rs 20,000)
Net cash flow	1	90,000
Net cash flow	2	(80,000)

The required equation is: Rs 20,000 $= \dfrac{\text{Rs } 90{,}000}{(1+r)} - \left(\dfrac{\text{Rs } 80{,}000}{(1+r)^2}\right)$

Let $(1 + r)$ be $= X$ and divide both sides of equation by Rs 10,000, $2 = \dfrac{9}{X} - \dfrac{8}{X^2} = 0$

Multiplying by X^2, we can transform the equation into the quadratic form,

$$2X^2 - 9X + 8 = 0$$

Such an equation with a variable to the second power has 2 roots which can be identified as:

$$X = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \qquad \textbf{(6.2)}$$

where a = coefficient of the variable raised to the second power
b = coefficient of the variable raised to the first power
c = constant or coefficient of the variable raised to the zero power

Substituting the values for *a, b,* and *c* into the quadratic formula produces value for X of 1.21. Since $X = (1 + r)$, the internal rates for this project are 21.9 and 228 per cent.

Thus, the project yields a dual IRR. This kind of problem does not arise when the NPV method is used. The problem with the IRR is that if two rates of return make the present value of the project zero, (21.9 and 228 per cent respectively in our example), which rate should be used for decision-making purposes?

To conclude the discussion relating to the comparison of NPV and IRR methods, the two methods would give similar accept-reject decisions in the case of independent conventional investments. They would, however, rank mutually exclusive projects differently in the case of the **(i)** size-disparity problem, **(ii)** time-disparity problem, and **(iii)** unequal service life of projects. The ranking by the NPV decision criterion would be theoretically correct as it is consistent with the goal of maximisation of shareholders' wealth. Further, the reinvestment rate of funds released by the project is based on assumptions which can be consistently applied. The IRR can, of course, be modified by adopting the incremental approach to resolve the conflict in ranking. But it involves additional computation. Another deficiency of the IRR is that it may be indeterminate and give multiple rates in the case of a non-conventional cash flow pattern. In sum, therefore, the NPV emerges as a superior evaluation technique.

Net Present Value Vs. Profitability Index

In most situations, the NPV and PI, as investment criteria, provide the same accept and reject decision, because both the methods are closely related to each other. Under the PI method, the investment proposal will be acceptable if the PI is greater than one; it will be greater than one only when the proposal has a positive net present value. Likewise, PI will be less than one when the investment proposal has negative net present value under the NPV method. However, while evaluating mutually exclusive investment proposals, these methods may give different rankings. Example 6.10 presents such a case.

Example 6.10

Year	*Project A*	*Project B*
0	(Rs 50,000)	(Rs 35,000)
1	40,000	30,000
2	40,000	30,000
Present value of cash inflow (0.10)	69,440	52,080
NPV	19,440	17,080
PI	69,440/50,000 = 1.39	52,080/ 35,000 = 1.49

Thus, project A is acceptable under the NPV method, while project B under the PI method. Which project should the firm accept? The NPV technique is superior and so project A should be accepted. The reasons for the superiority of NPV method are the same as given in comparing NPV and IRR techniques. The best project is the one which adds the most, among available alternatives, to the shareholders' wealth. The NPV method, by its very definition, will always select such projects. Therefore, the NPV method gives a better mutually exclusive choice than PI. The NPV method guarantees the choice of the best alternative.

SECTION 2 PROJECT SELECTION UNDER CAPITAL RATIONING

The **capital rationing situation** refers to the choice of investment proposals under financial constraints in terms of a given size of capital expenditure budget. The objective to select the combination of projects would be the maximisation of the total NPV. The project selection under capital rationing involves two stages: **(i)** identification of the acceptable projects. **(ii)** selection of the combination of projects. The acceptability of projects can be based either on profitability index or IRR.

Capital rationing implies the choice of investment proposals under financial constraints of capital expenditure budget.

Capital rationing can be of two types, namely, **soft rationing** and **hard rationing**. While hard rationing refers to the situation when a business firm cannot raise required finances to execute all potential available profitable investment projects, the soft rationing is internal to the firms in that different divisions/units of a firm are allocated a fixed amount of capital budget each year.[9]

Soft rationing is primarily used, as a means of control on the capital spending of divisional managers. It does not imply that the firm, as a whole, has paucity of funds. In other words, the firm can raise required funds, if it so desires.

The fallout of soft rationing is that the firm eventually is deprived of the profitable investment projects (in case divisions happen to have such projects). As a result, the imposition of soft rationing is in conflict with the basic goal of the firm of maximisation of the wealth/value.

Indivisible project is a project which can be accepted/rejected in its entirety.

The method of selecting investment projects under capital rationing situation will depend upon whether the projects are **indivisible** or **divisible**. In case the project is to be accepted/rejected in its entirety, it is called an indivisible project; a divisible project, on the other hand, can be accepted/rejected in part. These are illustrated in Examples 6.11 and 6.12 respectively.

Divisible project is a project which can be accepted in parts.

Example 6.11 (Divisible Project)

A company has Rs 7 crore available for investment. It has evaluated its options and has found that only 4 investment projects given below have positive NPV. All these investments are divisible. Advise the management which investment(s)/projects it should select.

Project	*Initial investment (Rs crore)*	*NPV (Rs crore)*	*PI*
X	3.00	0.60	1.20
Y	2.00	0.50	1.25
Z	2.50	1.50	1.60
W	6.00	1.80	1.30

Solution

Ranking of the Projects in Descending Order of Profitability Index

Project and (rank)	*Investment outlay (Rs crore)*	*Profitability index*	*NPV (Rs crore)*
Z (1)	2.50	1.60	1.50
W (2)	6.00	1.30	1.80
Y (3)	2.00	1.25	0.50
X (4)	3.00	1.20	0.60

Accept Project Z in *full* and W in part (Rs 4,50,000) as it will maximise the NPV.

Example 6.12 (Indivisible Project)

A company working against a self-imposed capital budgeting constraint of Rs 70 crore is trying to decide which of the following investment proposals should be undertaken by it. All these investment proposals are indivisible as well as independent. The list of investments along with the investment required and the NPV of the projected cash flows are given as below:

Project	*Initial investment (Rs crore)*	*NPV (Rs crore)*
A	10	6
B	24	18
C	32	20
D	22	30
E	18	20

Which investment should be acquired by the company?

Solution

NPV from investments D, E and B is Rs 68 crore with Rs 64 crore utilised leaving Rs 6 crore to be invested in some other investment outlet. No other investment package would yield an NPV higher than this amount. The company is advised to invest in D, E and B projects.

Trial and error process is an integral part of selecting optimal investment packages/set in capital ratinoning situation. Consider Example 6.13.

Example 6.13

Sound Limited has a financial resource constraint of a maximum of Rs 65 lakh in the current year. It has evaluated a large number of investment projects but has discarded all except those listed below. All the listed investment proposals are independent. The selected list of investments provide investment outlays, gross present value, NPV and present value index.

Project	*Investment outlay*	*NPV*	*Gross present value*	*Present value index*
A	Rs 21,85,000	Rs 15,07,500	Rs 36,92,500	1.69
B	19,10,000	10,70,000	29,80,000	1.56
C	15,50,000	2,15,000	17,65,000	1.14
D	13,00,000	2,75,000	15,75,000	1.21
E	11,45,000	15,80,000	27,25,000	2.38
F	9,40,000	4,25,000	13,65,000	1.45
G	6,75,000	6,20,000	12,95,000	1.92
H	5,35,000	3,90,000	9,25,000	1.73
I	4,65,000	6,10,000	10,75,000	2.31
J	4,30,000	4,77,500	9,07,500	2.11
K	4,10,000	2,95,000	7,05,000	1.72
L	3,50,000	3,05,000	6,55,000	1.87
M	2,75,000	1,07,500	3,82,500	1.39
N	2,45,000	2,05,000	4,50,000	1.84
O	1,90,000	3,00,000	4,90,000	2.58
	1,26,05,000	83,82,500	2,09,87,500	

Which investments should be acquired by Sound Limited?

Solution First, we should arrange the investment projects in descending order of present value (PI) index. The optimal investment portfolio/set will be one which yields the maximum NPV. The investment projects are accordingly listed below.

Project	*PI*	*Investment outlays of*		*NPV of*	
		Project	*Cumulative*	*Project*	*Cumulative*
O	2.58	Rs 1,90,000	Rs 1,90,000	Rs 3,00,000	Rs 3,00,000
E	2.38	11,45,000	13,35,000	15,80,000	18,80,000
I	2.31	4,65,000	18,00,000	6,10,000	24,90,000
J	2.11	4,30,000	22,30,000	4,77,500	29,67,500
G	1.92	6,75,000	29,05,000	6,20,000	35,87,500
L	1.87	3,50,000	32,55,000	3,05,000	38,92,500
N	1.84	2,45,000	35,00,000	2,05,000	40,97,500
H	1.73	5,35,000	40,35,000	3,90,000	44,87,500
K	1.72	4,10,000	44,45,000	2,95,000	47,82,500
A	1.69	21,85,000	66,30,000[1]	15,07,500	—
B	1.56	19,10,000	63,55,000	10,70,000	58,52,500[2]
F	1.45	9,40,000		4,25,000	
M	1.39	2,75,000		1,07,500	
D	1.21	13,00,000		2,75,000	
C	1.14	15,50,000		2,15,000	

[1]Not feasible at this stage; cumulative investment outlays exceed Rs 65 lakh.
[2]Investment outlay as well as NPV consist of projects (from O to H) plus project B.

In case the company is guided simply by the PI index, then it selects the first nine projects (numbered from O through K) plus project B. This investment package yields an NPV of Rs 58,52,500.

However, this is not the optimal investment package as it does not provide the highest possible NPV. By dropping Project K (Rs 4,10,000) and B (Rs 19,10,000) from the proposed investment package and substituting projects A (Rs 21,85,000) and M (Rs 2,75,000), the firm generates a higher NPV of Rs 61,02,500, as shown below.

Project	*Investment outlays of*		*NPV of*	
	Project (s)	*Cumulative*	*Project (s)*	*Cumulative*
O to H	—	Rs 40,35,000	—	Rs 44,87,500
A	Rs 21,85,000	62,20,000	Rs 15,07,500	59,95,000
M	2,75,000	64,95,000	1,07,500	61,02,500

Such a substitution exercise involves a trial and error approach. Thus, the optimal investment package consists of 10 projects (O, E, I, J, G, L, N, H, A and M) requiring a total investment outlay of Rs 64.95 lakh, yielding a total NPV of Rs 61,02,500.

Fallout of Capital Rationing

Capital rationing limits the amount to be spent on capital expenditure decisions. The firm may impose such a limit primarily for two reasons: **(i)** there may be a paucity of funds and **(ii)** corporate managers/owners may be conservative and may not like to invest more than a specified/stated sum in capital projects at one point of time; they may like to accept projects with a greater margin of safety, measured by NPV.

Whatever might be the reasons for capital rationing, it usually results in an investment policy that is *less than optimal*. The reason is that capital rationing does not allow the business firm to accept all profitable investment projects which could add to net present value and, thus, add to the wealth of shareholders. In other words, capital rationing inflicts opportunity cost to the extent of NPV foregone on account of non-acceptance of otherwise acceptable (profitable) investment projects.

Another notable consequence is that capital rationing may lead to the acceptance of several small investment projects (promising higher return per rupee of investment) rather than a few large investment projects. Acceptance of such a package of investment projects is likely to have a bearing on the risk complexion of the business firm (perhaps it may decrease).

Finally, selection criterion of investment projects under capital rationing (based on one-period analysis) does not reckon intermediate cash inflows expected to be provided by an investment project. However, some investment projects may yield relatively higher CFAT in the initial/early years compared to other projects. Obviously, availability of such funds in the early years tends to reduce capital budgeting constraints of the early/future years as they can be used to finance profitable investment projects. For this reason, the management should consider more than one period in the allocation of limited capital for investment projects[10].

Summary

- In case of independent investment proposals, all the discounted cash flow (DCF) methods provide consistent results in terms of acceptance or rejection of capital budgeting proposal(s). The independent proposals refer to investment projects, the acceptance of which does not preclude the acceptance of other profitable proposal (s).

  The reason is that all the DCF methods are based on cash flows and take into account total benefits as well as time value of money. The data inputs in terms of cash outflows, CFAT, cost of capital and so on is the same for all these methods. As a result, the investment projects which have positive NPV will also have **(i)** an IRR> required rate of return, (k) and **(ii)** a present value index >one
- In the case of mutually exclusive proposals, the DCF methods may provide conflicting rankings. The reason is while the NPV method is based on the *total* yield/earnings/NPV, the other two methods (IRR and PI) are concerned with the *rate* of return/earnings on investment.
- While IRR and PI methods are not compatible with the objective of financial decision making of the firm, that is, maximising shareholders' wealth, the recommendation of NPV method is consistent with the goal of the firm of maximising shareholders' wealth.
- The IRR and PI methods can be modified (by adopting the incremental approach) to give results identical to the NPV method. The logic behind the incremental approach is that the firm would get the profits promised by the smaller outlay investment project plus the profit on the incremental investments required in the project involving larger outlay.
- The conflict between the NPV and IRR methods is mainly ascribed to the different reinvestment rate assumptions of intermediate cash inflows accruing from projects. The IRR method implicitly assumes that the cash flows generated from the projects are subject to reinvestment at IRR. In contrast, the reinvestment rate assumption under the NPV method is the cost of capital. The assumption of the NPV method is conceptually superior to that of the IRR as the former has the virtue of having a uniform rate which can consistently be applied to all investment proposals.
- The IRR can be modified (to overcome the deficiency of the reinvestment rate assumption) assuming the cost of capital to be the reinvestment rate.
- The IRR method is beset with computational and other operational difficulties. In the case of mixed-stream of cash flows, it involves a trial-and-error procedure. When cash flows are non-conventional, its value is either indeterminate or it has multiple values. In contrast, the NPV calculations do not present any such problems.
- The NPV method continues to be the best alternative under capital rationing situations. For these reasons, therefore, the NPV emerges as a theoretically correct and better technique for evaluation of capital projects.

- There are two approaches to deal with investment projects of unequal/varying lives: **(i)** common time horizon approach and **(ii)** equivalent annual value, (EANPV)/cost approach (EAC). The first approach requires that the projects must be compared over the same period of time (by taking the LCM of the lives of the capital projects). The implicit assumption of this approach is that the investment which is being replaced will produce cash flows of a similar pattern in future as it has done in the past. Therefore, the approach lacks realism and presents operational difficulties to be used in the real business world.
- The EANPV/EAC is a better approach. The EANPV is determined dividing the NPV of cash flows of the project by the annuity factor corresponding to the life of the project at the given cost of capital. The EAC is obtained dividing the total PV of cash outflows by the relevant annuity factor. While the maximisation of EANPV is the decision-criterion in the case of revenue-expanding proposals, the minimisation of EAC is the guiding criterion for cost reduction proposals.
- Capital rationing involves the choice of combination of available projects maximise the total NPV, given the capital budget constraints. The ranking of investment projects can be done either on the basis of present value index or the IRR. The procedure to select the package of investment projects will relate to whether the project is divisible or indivisible, the objective being the maximisation of total NPV by exhausting the capital budget as far as possible.

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Practical Problems

P.6.1 Northern Chemicals Ltd owns a machine with the following characteristics:

Book value	Rs 1,10,000
Current market value	80,000
Expected salvage value at the end of 5 years remaining useful life	Nil
Annual cash operating costs	36,000

The firm's cost of capital is 15 per cent; its tax rate is 35 per cent. The company follows the straight line method of depreciation and the same is accepted for tax purposes.

The management of the company is considering selling the machine. If it does so, the total cash operating costs to perform the work now done by the machine will increase by Rs 40,000 per year to Rs 76,000 per year. Advise whether the machine should be sold.

Solution

Cash inflows (if machine is sold)

Selling price of the old machine	Rs 80,000
Add tax savings (0.35 × Rs 30,000, short-term capital loss)	10,500
	90,600

Present value of cash outflows saved if machine is not sold (PV of keeping machine)

Particulars	*Amount before tax*	*Amount after tax*
Annual cash operating costs saved (Rs 76,000 – Rs 36,000)	Rs 40,000	Rs 26,000
Plus: Tax savings on depreciation (Rs 1,10,000 ÷ 5)	22,000	14,300
Net annual cash flows		40,300
(x) $PVIFA_{15,5}$		(×) 3.352
PV of keeping machine		1,35,086
PV of selling machine		90,500
Difference favouring keeping the machine		44,586

Recommendation The machine should not be sold.

P.6.2 Avon Chemical Company Ltd is presently paying an outside firm Re 1 per gallon to dispose of the waste material resulting from its manufacturing operations. At normal operating capacity the waste is about 40,000 gallons per year.

After spending Rs 40,000 on research, the company discovered that the waste could be sold for Rs 15 per gallon if it was processed further. Additional processing would, however, require an investment of Rs 6,00,000 in new equipment, which would have an estimated life of 5 years and no salvage value. Depreciation would be computed by the reducing balance method @ 25 per cent. There are no other assets in the 25 per cent block.

Except for the costs incurred in advertising Rs 20,000 per year, no change in the present selling and administrative expenses is expected if the new product is sold. The details of additional processing costs are as follows: variable—Rs 5 per gallon of waste put into process; fixed (excluding depreciation)—Rs 30,000 per year.

In costing the new product, general factory overheads will be allocated at the rate of Re 1 per gallon.

There will be no losses in processing, and it is assumed that all of the waste processed in a given year will be sold in that very year. Waste that is not processed further will have to be disposed off at the present rate of Re 1 per gallon. Estimates indicate that 30,000 gallons of the new product could be sold each year.

The management, confronted with the choice of disposing off the waste, or processing it further and selling it, seeks your advice. Which alternative would you recommend? Assume that the firm's cost of capital is 15 per cent and it pays, on an average, 35 per cent tax on its income.

Solution

Cash outflows:

Cost of additional investment	Rs 6,00,000

(i) Present value of cash inflows (excluding depreciation), t = 1 – 5

Particulars		*Amount*
Increase in sales revenue (30,000 × Rs 15)		Rs 4,50,000
Cost saving: reduction in disposal costs (30,000 × Re 1)		30,000
Less: Incremental costs:		4,80,000
Variable (30,000 × Rs 5)	Rs 1,50,000	
Fixed, manufacturing or processing	30,000	
Advertising	20,000	2,00,000

(*Contd*)

(*Contd*)

Earnings before taxes	2,80,000
Less: Taxes	98,000
CFAT	1,82,000
× PVIFA	(×)3.352
Total present value	6,10,064

(ii) PV of tax shield due to depreciation

Year	*Depreciation*	*Tax advantage*	*PV factor*	*Total PV*
1	Rs 1,50,000	Rs 52,500	0.870	Rs 45,675
2	1,12,500	39,375	0.756	29,767
3	84,375	29,531	0.658	19,431
4	63,281	22,148	0.572	12,669
				1,07,542

(iii) PV of tax advantage due to short-term capital loss: [0.35 × (Rs 1,89,844) × 0.497] = Rs 33,023.

(iv)

Determination of NPV

Gross present value [(i) + (ii) + (iii)]	Rs 7,50,629
Less: Cost of additional investment	6,00,000
NPV	1,50,629

Note: Rs 40,000 spent on research is irrelevant cost and so is the allocated share of factory overheads.

Recommendation Since the NPV is positive, the company is advised to purchase new equipment.

P.6.3 An educational institute is planning to install airconditioners for its new computer centre. It has received proposals from 2 manufacturers. The first proposal is for the installation of 6 window airconditioners @ Rs 25,000 each. The other is for the installation of split airconditioners of an equal capacity costing Rs 2,00,000. The useful life of window airconditioners is 6 years and that of split airconditioners is 10 years. The cash operating costs associated with each proposal are given below:

Year	*Proposal 1*	*Proposal 2*
1	Rs 20,000	Rs 18,000
2	20,000	18,000
3	20,000	18,000
4	25,000	22,000
5	25,000	22,000
6	25,000	22,000
7		26,000
8		26,000
9		26,000
10		26,000

The salvage value of the window airconditioners at the end of 6 years is expected to be Rs 10,000 and that of the split airconditioners Rs 15,000. Advise the educational institute which proposal should be selected by it if its opportunity cost of funds is 10 per cent.

Solution

Equivalent Annual Cost

Proposal 1

Particulars	*Year*	*Cost*	*PV factor (at 10%)*	*PV*
Purchase cost	0	Rs 1,50,000	1.000	Rs 1,50,000
Operating costs	1	20,000	0.909	18,180
	2	20,000	0.826	16,520
	3	20,000	0.751	15,020
	4	25,000	0.683	17,075
	5	25,000	0.621	15,525
	6	25,000	0.564	14,100
Salvage value	6	(10,000)	0.564	(5,640)
Total PV				Rs 2,40,780

$$\text{Equivalent Annual Cost (EAC)} = \frac{\text{Total present value of the project}}{\text{PV of annuity corresponding to the life of the project at the given cost of capital}}$$

Rs 2,40,780/4.355 = Rs 55,288.17

Proposal 2

Particulars	*Year*	*Cost*	*PV factor (at 10%)*	*PV*
Purchase cost	0	Rs 2,00,000	1.000	Rs 2,00,000
Operating costs	1	18,000	0.909	16,362
	2	18,000	0.826	14,868
	3	18,000	0.751	13,518
	4	22,000	0.683	15,026
	5	22,000	0.621	13,662
	6	22,000	0.564	12,408
	7	26,000	0.513	13,338
	8	26,000	0.467	12,142
	9	26,000	0.424	11,024
	10	26,000	0.386	10,036
Salvage Value	10	(15,000)	0.386	(5,790)
Total PV				Rs 3,38,174

Equivalent Annual Cost (EAC) = Rs 3,32,384/6.145 = Rs 55,032.38

Recommendation The educational institution should go for split airconditioners as their equivalent annual cost is lower.

P.6.4 Company Y is operating an elderly machine that is expected to produce a net cash inflow of Rs 40,000 in the coming year and Rs 40,000 next year. Current salvage value is Rs 80,000 and next year's value is Rs 70,000. The machine can be replaced now with a new machine, which costs Rs 1,50,000 but is much more efficient and will provide a cash inflow of Rs 80,000 a year for 3 years. Company Y wants to know whether it should replace the equipment now or wait a year with the clear understanding that the new machine is the best of the available alternatives and that it in turn be replaced at the optimal point. Ignore tax. Take opportunity cost of capital as 10 per cent. Advise with reasons.

Solution

(i) Determination of Equivalent Annual NPV if an elderly (Existing) Machine is Replaced Now (at time = 0 period)

(a) Cash outflows (incremental)

Cost of new machine	Rs 1,50,000
Less: Salvage value of an elderly machine	80,000
	70,000

(b) NPV of cash inflows

Year	*Incremental cash inflows*	*PV factor at 10%*	*Total PV*
1	Rs 40,000	0.909	Rs 36,360
2	40,000	0.826	33,040
3	80,000	0.751	60,080
Total PV of incremental cash inflows			1,29,480
Less: Incremental cash outflows			70,000
Net present value			59,480

(c) Equivalent annual net present value *(Rs 59,480 ÷ 2.487 PVF for 3 years at 10 per cent)*
23,916.37

(ii) Determination of Equivalent Annual NPV if an Elderly Machine is replaced next year (at time = 0 period)

(a) Incremental cash outflows	
Cost of new machine (Rs 1,50,000 × 0.909)	Rs 1,36,350
Less: Salvage value of an elderly machine (Rs 70,000 × 0.909)	63,630
	72,720

(b) NPV of cash inflows

Year	*Incremental cash inflows*	*PV factor at 10%*	*Total PV*
2	Rs 40,000	0.826	Rs 33,040
3	80,000	0.751	60,080
4	80,000	0.683	54,640
			1,47,760
Less: PV of cash outflows at $t = 0$			72,720
NPV at $t = 0$			75,040

(c) Equivalent annual NPV (Rs. 75,040 ÷ 2.487)	*Rs 30,172.90*

Recommendation Company Y is advised to replace the machine one year from now as it promises a higher equivalent annual NPV.

P.6.5 A software company is considering installing an air conditioning plant, for the entire company. It has two options, X and Y.

Plant X costs Rs 5,00,000 to purchase and install. It has 5 years of useful life and will be depreciated over this period on a straight-line basis to a book value of Rs 25,000. However, the management hopes to sell it for Rs 40,000. Maintenance and other operating costs of running the plant are Rs 2,50,000 per year.

Plant Y has a 10 year life but costs Rs 7,00,000 to purchase and install. It will be depreciated over 8 years on a straight-line basis to zero book value. However, at the beginning of year 7 and is expected to cost Rs 1,00,000; it is not to be capitalized but to be expended. At year-end 10, the plant is expected to have a salvage value of Rs 30,000, which is likely to be equivalent to the removal cost of the plant. Plant Y is less expensive to run than Plant X as it requires Rs 2,20,000 per year to operate.

Corporate tax rate is 35 per cent; cost of capital is 12 per cent. Assuming straight-line method of depreciation as well as the time period of depreciation are acceptable for tax purposes, advise which plant should be purchased by the company.

Solution

Determination of equivalent annual cost of plants *X* and *Y*

Particulars	*Year*	*COBT*	*COAT*	*PV factor at 0.12*	*Total PV*
Plant X					
Purchase cost	0	Rs 5,00,000	Rs 5,00,000	1.000	Rs 5,00,000
Operating costs	1–5	2,50,000	1,62,500[1]	3.605	5,85,812
Tax advantage on depreciation	1–5	—	(33,250[2])	3.605	(1,19,866)
Salvage value	5	40,000	(34,750[3])	0.567	(19,703)
Total cost					9,46,243
Divided by annuity PV factor at 12% corresponding to life of plant, 5 years					3.605
Equivalent annual cost					2,62,481
Plant Y					
Purchase costs	0	7,00,000	7,00,000	1.000	7,00,000
Operating costs	1–10	2,20,000	1,43,000[4]	5.650	8,07,950
Tax advantage on depreciation	1–8	—	(30,6255)	4.968	(1,52,145)
Overhaul cost	7	1,00,000	65,000[6]	0.507[7]	32,955
Total cost					13,88,760
Divided by annuity PV factor at 12% for 10 years					5.650
Equivalent annual cost					2,45,798

1. Rs 2,50,000 (1-tax rate 0.35) = Rs 1,62,500
2. [(Rs 5,00,000 – Rs 25,000)/5 years] × tax rate, 0.35 = Rs 33,250
3. Rs 40,000 – Tax payment on gain i.e., Rs 15,000 × 0.35 = Rs 34,750
4. Rs 2,20,000 (1 – 0.35) = Rs 1,43,000
5. (Rs 70,000/8 years) × 0.35 = Rs 30,625
6. Rs 1,00,000 × 0.65 = Rs 65,000
7. PV factor at year-end 6 at 12% (as per Table A-3).

Recommendation Buy plant Y as its EAC is lower.

P.6.6 The capital budgeting department of a company has suggested 3 investment proposals. The after-tax cash flows for each are tabulated below. If the cost of capital is 12 per cent, rank them on the basis of the profitability index.

	After-tax cash flows		
Year	*Project A*	*Project B*	*Project C*
0	Rs 20,000	Rs 60,000	Rs 36,000
1	5,600	12,000	13,000
2	6,000	20,000	13,000
3	8,000	24,000	13,000
4	8,000	32,000	13,000

Solution

Determination of present value

Year	CFAT			PV factor	Total PV		
	A	B	C		A	B	C
1	Rs 5,600	Rs 12,000	Rs 13,000	0.893	Rs 5,001	Rs 10,716	Rs 11,609
2	6,000	20,000	13,000	0.797	4,782	15,940	10,361
3	8,000	24,000	13,000	0.712	5,696	17,088	9,256
4	8,000	32,000	13,000	0.636	5,088	20,352	8,268
					20,567	64,096	39,494

Profitability index = PV of cash inflows/PV of cash outflows

$PI_{(A)}$ = Rs 20,567/Rs 20,000 = 1.028

$PI_{(B)}$ = Rs 64,096/Rs 60,000 = 1.068

$PI_{(C)}$ = Rs 39,494/Rs 36,000 = 1.097

The projects in descending order of profitability are: C, B and A.

P.6.7 A textile company has Rs 20 lakh available for investment. It has evaluated its options and found that only four investments (W, X, Y and Z) have positive net present values. All these investments are entirely independent of one other. However, they have an equal life period of 5 years. The risk-free interest rate is 5 per cent per annum. The cost of capital to the company is 10 per cent. The relevant data for the selected investments are:

Investment	Initial outlay	Present value of future cash inflows from the investment
W	Rs 8,00,000	Rs 10,00,000
X	6,00,000	10,00,000
Y	7,00,000	11,40,000
Z	6,00,000	12,00,000

Which investment(s) should the firm adopt? Would your answer be different if the present value of future cash flows of project W were Rs 12,50,000 instead of Rs 10,00,000?

Solution

(a) NPVs of investment projects

Investment	Initial outlay	PV of future cash flows	NPV
W	Rs 8,00,000	Rs 10,00,000	Rs 2,00,000
X	6,00,000	10,00,000	4,00,000
Y	7,00,000	11,40,000	4,40,000
Z	6,00,000	12,00,000	6,00,000

(i) NPV from investments Z, X and W = Rs 12,00,000 (with full capital budget amount utilised).

(ii) NPV from investments X, Y and Z = Rs 14,40,000 (with Rs 19,00,000 utilised, leaving Rs 1,00,000 to be invested elsewhere). Rs 1,00,000 can be invested for a period of 5 years at 5 per cent. The compound sum of Rs 1,00,000 would be Rs 1,27,600 [Rs 1,00,000 × 1.276 (the sum of rupee one at 5 per cent in 5 years as per Table A-1)].

The NPV of Rs 1,27,600 received at the end of the fifth year would be Rs 62,100 [(Rs 1,00,000 × 0.621, that is, the present value of rupee one at 10 per cent rate of discount to be received in 5 years from now as per Table A-3)]. Thus, the total NPV is Rs 14,40,000 + Rs 62,100 = Rs 15,02,100.

Therefore, the firm should adopt X, Y, and Z investment proposals.

(b) No. It is because the NPV from investments Z, X and W would still be lower than the package of investments as outlined in (a) (ii). The new NPV from investments Z, X and W would be Rs 14,50,000, while from X, Y and Z, it is Rs 15,02,100.

P.6.8 A company (profile summarised below) with a 12 per cent cost of funds and limited investment funds of Rs 4,00,000 is evaluating the desirability of several investment proposals.

Project	*Initial investment*	*Life (in years)*	*Year-end cash inflow*
A	Rs 3,00,000	2	Rs 1,87,600
B	2,00,000	5	66,000
C	2,00,000	3	1,00,000
D	1,00,000	9	20,000
E	3,00,000	10	66,000

(i) Rank the projects according to the profitability index, and NPV methods.
(ii) Determine the optimal investment package.
(iii) Which projects should be selected, if the company has Rs 5,00,000 as the size of its capital budget?
(iv) Determine the optimal investment package in the above situations, assuming that the projects are divisible.

Solution

(i) Determination of NPV and PI for all projects

Project	*Life in years*	*Year-end CFAT*	*PV factor at 0.12 corresponding to life of the project*	*Total PV of CFAT*	*Initial investment*	*NPV*	*PI*	*Ranking 1 to 5 in order of preference*	
								NPV	*PI*
A	2	Rs 1,87,600	1.690	Rs 3,17,044	Rs 3,00,000	Rs 17,044	1.057	4	5
B	5	66,000	3.605	2,37,930	2,00,000	37,930	1.189	3	3
C	3	1,00,000	2.402	2,40,200	2,00,000	40,200	1.200	2	2
D	9	20,000	5.328	1,06,560	1,00,000	6,560	1.066	5	4
E	10	66,000	5.650	3,72,900	3,00,000	72,900	1.243	1	1

(ii) Optimal investment package when capital budget is Rs 4,00,000

Project	*Investment*	*NPV*
E	Rs 3,00,000	Rs 72,900
D	1,00,000	6,560
		79,460

(iii) Capital budget is Rs 5,00,000

E	3,00,000	72,900
C	2,00,000	40,200
		1,13,100

(iv) (a) Capital budget is Rs 4,00,000

Project	*Investment*		*PI*	*NPV*
E	Rs 3,00,000		1.243	72,900
C (0.50)	1,00,000	(0.50 × Rs 2,00,000)	1.200	20,100
				93,000

(*Contd.*)

(*Contd.*)

(b) Capital budget is Rs 5,00,000			
E	3,00,000	1.243	72,900
C	2,00,000	1.200	40,200
			1,13,100

P.6.9 Anurag Ltd, working against a self-imposed capital budgeting constraint of Rs 3,50,000, is trying to decide which of the following investment proposals should be undertaken by it? All the investments are mutually independent (do not affect one another's cashflows). The list of investments, along with the investment required and the NPV of the projected cashflows, is as follows:

Investments	*Outlays*	*NPV*
A	Rs 50,000	Rs 30,000
B	1,20,000	90,000
C	1,60,000	1,00,000
D	1,10,000	1,50,000
E	90,000	1,00,000

Which investments should be acquired by the company?

Solution NPV from investments D, E and B is Rs 3,40,000, with Rs 3,20,000 utilized, leaving Rs 30,000 to be invested elsewhere. No other package of investments would yield NPV of Rs 3,40,000. It is true that the entire amount of capital is not utilised, but no firm would like to invest money only for the sake of it. Therefore, the company would be well advised to acquire D, E and B investments.

P.6.10 S Ltd has Rs 10,00,000 allocated for capital budgeting purposes. The following proposals and associated profitability indexes have been determined:

Project	*Amount*	*Profitability Index*
1	Rs 3,00,000	1.22
2	1,50,000	0.95
3	3,50,000	1.20
4	4,50,000	1.18
5	2,00,000	1.20
6	4,00,000	1.05

Which of the above investments should be undertaken? Assume that the projects are indivisible and there is no alternative use of the money allocated for capital budgeting.

Solution

Statement showing ranking of projects (in descending order of profitability index) and their NPV

Projects	*Initial investment*	*Profitability index*	*Gross present value (Col. 2 × Col. 3)*	*Net present value (Col. 4 – Col. 2)*
1	*2*	*3*	*4*	*5*
1	Rs 3,00,000	1.22	Rs 3,66,000	Rs 66,000
3	3,50,000	1.20	4,20,000	70,000
5	2,00,000	1.20	2,40,000	40,000
4	4,50,000	1.18	5,31,000	81,000
6	4,00,000	1.05	4,20,000	20,000

Notes: (i) Project 2 has been excluded in view of its profitability index being less than one, implying negative NPV. (ii) Since project 3 has a higher profitability index, it has been assigned a higher rank than project 5.

S Ltd. is advised to undertake projects 4, 3 and 5 as this package holds potentials of yielding the maximum NPV of Rs 1,91,000 (Rs 81,000 + Rs 70,000 + Rs 40,000).

Mini Case

6.C.1 (Net Present Value) Choolah Chimney Ltd (CCL) is a leading manufacturer of items used in kitchens such as gas stoves, electric chimneys, ovens and so on. It has grown significantly under the CEO Vivek Razdan's dynamic leadership. In line with his belief to enhance competitiveness by using research and development for launching innovative products in the market, the CCL has recently developed a zero Maintenance Electric Chimney (known as Zimney) which is ideally suited for Indian cooking. The research and development cost of Zimney amounts to Rs 20,00,000.

To gauge the market prospects for Zimney, a market survey was conducted by Bazar Gyani, the V.P., Marketing, at an estimated cost of Rs 5,00,000. The results of the survey were very positive showing a significant demand for Zimney. The survey report also indicated that Zimney could capture 8 per cent of the current market size of 1,00,000 units of gas electric chimney. Considering the growth of satellite towns/cities and residential colonies, the market is expected to grow at 2 per cent annually. The VP, Marketing suggested to the CEO that a market penetration pricing strategy would be most suitable and Zimney should be priced at Rs 5,000 per unit in the initial year of the launch. The price could be raised in subsequent years by 5 per cent annually. The marketing and administrative costs are expected to be Rs 4,00,000 per year.

The CCL is presently using 6 machines acquired 3 years ago at a cost of Rs 10,00,000 each, having a useful life of 7 years, with no salvage value. These machines are currently being used for manufacturing other types of chimneys. They could be sold for Rs 2,00,000 per machine with a removal cost of Rs 30,000 for each.

The machine to manufacture Zimney is available in that market for Rs 1,00,00,000 with a useful life of 4 years and salvage value of Rs 10,00,000. It can produce other types of chimneys also.

The new machine, being state of the art technology would improve the productivity of the workers as well reduce the unit variable cost of manufacture to Rs 600, which would increase by 5 per cent annually. Exhibit 1 summarises the labour cost with the existing machine and the new equipment.

Category	*Existing*		*New Machine/Equipment*	
	Number	*Monthly salary*	*Number*	*Monthly salary*
Skilled labour	20	Rs 4,000	15	Rs 4,000
Maintenance men	2	6,000	1	6,000
Floor managers	3	8,000	2	8,000

The maintenance costs currently amount to 1,00,000 per year (existing machine). They would total Rs 70,000 with the new equipment. The net working capital required to start production of Zimney would be Rs 60,00,000.

The policy of CCL is to pay five months salary as compensation in case of lay-off of employees.

Required

Should the CCL launch the Zimney. Assume the following: (i) Tax, 35 per cent (ii) Required rate of return, 14 per cent and (iii) Straight line depreciation for the tax purposes.

Solution

Financial Evaluation of Proposal to launch Zimney

(A) Incremental Cash Outflow (t = 0):	
1. Cost of new machine	Rs 1,00,00,000
2. Less sale proceeds of existing machines[a]	(10,20,000)
3. Less tax benefits on loss of sale of existing machines[b]	(8,42,999)
4. Cost of laying-off workers[c]	1,70,000

5. Additional working capital	60,00,000
	1,43,07,001

[a]Sale proceeds of existing machines [(6 × Rs 2,00,000, sale price – (6 × Rs 30,000, removal cost)] = Rs 10,20,000

[b]Tax benefits on loss of existing machine

1. Book value of existing machine [(6 × Rs 10,00,000) – (3 × Rs 8,57142, annual depreciation i.e. Rs 60,00,000 ÷ 7)] = Rs 60,00,000 – Rs 25,71,428 = Rs 34,28,571.
2. Loss on sale of existing machine [book value, Rs 34,28,571 – Rs 10,20,000, sale proceeds] = Rs 24,08,571.
3. Tax benefit (Rs 24,08,571 (A) 0.35) = Rs 8,42,999.

[c]Cost of lay-off:

1. Skilled labour 5 × Rs 4,000 × 5 (months)	=	Rs 1,00,000
2. Floor manager = 1 × Rs 8,000 × 5	=	40,000
3. Maintenance person = 1 × Rs 6,000 × 5	=	30,000
		1,70,000

(B) Incremental Cash Inflows: (t = 1 – 4):

Particulars	*Year*			
	1	*2*	*3*	*4*
1. Sales revenue[a]	Rs 4,00,00,000	Rs 4,28,40,000	Rs 4,58,81,640	Rs 4,91,34,408
2. Add savings in maintenance cost[b]	30,000	30,000	30,000	30,000
3. Add savings in labour cost[c]	4,08,000	4,08,000	4,08,000	4,08,000
4. Less variable cost[d]	(52,00,000)	(55,40,800)	(59,05,796)	(62,96,663)
5. Less incremental depreciation[e]	(13,92,858)	(13,92,858)	(13,92,858)	(13,92,858)
6. EBT	3,38,45142	3,63,44,342	3,90,20,986	4,18,82,887
7. Less tax (0.35)	(1,18,45,799)	(1,27,20,519)	(1,36,57,346)	(1,46,59,010)
8. EAT	2,19,99,342	2,36,23,822	2,53,63,640	2,72,23,876
9. Add incremental depreciation	13,92,858	13,92,858	13,92,858	13,92,858
10. CFAT	2,33,92,200	2,50,16,680	2,67,56,498	2,86,16,734
11. Release of working capital	—	—	—	60,00,000
12. Total	2,33,92,200	2,50,16,680	2,67,56,498	3,46,16,734

[a]Sales revenue : Year 1 (0.08 × 1,00,000 × Rs 5,000) = Rs 4,00,00,000
2 (0.08 × 1,02,000 × Rs 5,250) = 4,28,40,000
3 (0.08 × 1,04,040 × Rs 5,512) = 4,58,81,640
4 (0.08 × 1,06,120 × Rs 5,787) = 4,91,34,408

[b]Savings in maintenance cost (Rs 1,00,000, existing – Rs 70,000 proposed) = Rs 30,000

[c]Savings in labour cost:

1 Existing:	Skilled labour (20 × Rs 4,000 × 12 months)	Rs 9,60,000	
	Floor manager (3 × Rs 8,000 × 12)	2,88,000	
	Maintenance (2 × Rs 6,000 × 12)	1,44,000	Rs 13,92,000
2 New:	Skilled labour (15 × Rs 4,000 × 12)	7,20,000	
	Floor manager (2 × Rs 8,000 × 12)	1,92,000	
	Maintenance (1 × Rs 6,000 × 12)	72,000	9,84,000
			4,08,000

[d]Variable cost and general administrative costs:

Year 1	[(0.08 × 1,00,000 × Rs 600) + Rs 4,00,000]	= Rs 52,00,000
2	[(0.08 × 1,02,000 × Rs 630) + Rs 4,00,000]	= 55,40,000
3	[(0.08 × 1,04,040 × Rs 661) + Rs 4,00,000]	= 59,05,796
4	[(0.08 × 1,06,120 × Rs 694) + Rs 4,00,000]	= 62,96,663

[e]Incremental depreciation:

1. New equipment (Rs 1,00,00,000 – Rs 10,00,000) ÷ 4	Rs 22,50,000
2. Existing (Book value, Rs 34,28,571 – 0) ÷ 4	8,57,142
	13,92,858

(C) Computation of NPV

Year	*Incremental cash inflows*	*PV factor (0.14)*	*Total PV*
1	Rs 2,33,92,200	0.877	Rs 2,05,14,959
2	2,50,16,680	0.769	1,92,37,826
3	2,67,56,498	0.675	1,80,60,636
4	3,46,16,734	0.592	2,04,93,106
Total			7,83,06,527
Less Incremental cash outflow			1,43,07,001
NPV			6,39,99,526

Decision: The Chola Chimney should launch the Zimney
Note: The research and development cost of Zimney (Rs 20,00,000) and expenses incurred on market survey (Rs 5,00,000) are sunk cost and, therefore, irrelevant for analysis.

Review Questions

RQ. 6.1 Fill in the following blanks:

(i) _____ method is the most appropriate measure for cost reduction investment projects with unequal lives.

(ii) _____ is an appropriate method for revenue-expanding investment proposals with unequal lives.

(iii) Intermediate cash inflows are assumed to have been reinvested at the rate of _____ under IRR method.

(iv) Intermediate cash inflows are assumed to be reinvested at _____under NPV method.

(v) _____ method is an appropriate measure in projects selection (when they are divisible) under capital rationing.

(vi) _____ cash flows are substantially lower than _____ cashflows, when adjusted for inflation factor.

(vii) _____ should be used to discount real cashflows in selecting investment projects requiring adjustment for inflation.

(viii) Capital budgeting decisions should either reckon the inflation factor in _____ as well as in cost of capital or exclude it completely.

(ix) Real cost of capital is obtained dividing nominal cost of capital by _____.

(x) CFAT will be deflated by _____ to determine real CFAT.

Answers: (i) Equvalent annual cost (ii) Equivalent annual NPV (iii) IRR (iv) Cost of capital (v) Present value index (vi) Real, nominal (vii) Real cost of capital (viii) cash inflows after taxes (ix) (1 + Inflation rate) (x) inflation rate.

RQ. 6.2 Contrast the IRR and the NPV methods. Under what circumstance may they lead to (a) comparable recommendations, and (b) give conflicting recommendations? In circumstances

in which they give contradictory results, which criteria should be used to select the project and why?

RQ. 6.3 What are the critical factors to be observed while making capital budgeting decisions under capital rationing?

RQ. 6.4 What is the criterion for judging the worth of investments in the capital budgeting technique based on the profitability index? What is its value, when its NPV is (a) zero, (b) negative and (c) positive? Also indicate the relationship between IRR and cost of capital in these situations.

RQ. 6.5 'For most investment decisions that the firm faces, net present value is either a superior decision criterion, or is at least as good as the competing techniques.' In what investment situation is the profitability index better than the net present value?

RQ. 6.6 Discuss the problems of ranking projects with varying economic lives, sizes and patterns of cash outflows and inflows.

Examination Questions

Theory Questions

6.1 Why is it possible for the IRR and NPV methods to result in different ranking of investment proposals? Which will you prefer in that situation and why?

(Delhi University, 2006, 2008, 2009)

6.2 Explain briefly profitability index. How does it differ from net present value method?

(Delhi University, 2007)

6.3 "While evaluating single project with conventional cash flows, both NPV and IRR provide identical decisions." Explain. *(Delhi University, 2005)*

6.4 What do you understand by capital rationing in the context of capital budgeting? How would you select project in such a situation? *(Calcutta University, 2004)*

6.5 Explain the merits and demerits of average rate of return of evaluating capital projects.

(Gujarat University, March-April 2003)

6.6 State the circumstances under which conflicting ranking would be given by the internal rate of return (IRR) and the net present value (NPV) method. *(Calcutta University, 2000)*

Numerical Questions

6.1 Z Ltd. has to select one of the two alternatives projects whose particulars are given below:
Project 1: Initial outlay – Rs 2,40,000. The expected cash inflow from it at the end of first year and second year are Rs 50,000 and Rs 2,50,000 respectively.
Project 2: Initial outlay – Rs 2,35,930. The expected cash inflow from this project at the end of the first year and second year are Rs 1,90,000 and Rs 90,000 respectively.
Rank the two projects in order of preference by the NPV method and IRR method. Which of the alternatives would you select and why? Assume cost of capital is 10%.

(Calcutta University, 2010)

Solution

Determination of NPV of projects (P) 1 and 2

Year	CFAT		PV factor at 10%	Total PV .	
	P-1	P-2		P-1	P-2
1	Rs 50,000	Rs 1,90,000	0.909	Rs 45,450	Rs 1,72,710
2	2,50,000	90,000	0.826	2,06,500	74,340
Gross present value				2,51,950	2,47,050
Less initial outlay				2,40,000	2,35,930
Net present value (Rank)				11,950(1)	11,120(2)

Determination of IRR: Project 1: Fake payback period = Rs 2,40,000/Rs 1,50,000 average CFAT = 1.6.

According to Table A-4, discount factor closest to 1.6 is 1.605 for 2 years at 16%. Since the initial CFAT of year 1 is substantially lower (at Rs 50,000) than average CFAT (of Rs 1,50,000), IRR is likely to be much lower than 16%. Given the fact that NPV is positive at 10%, IRR is evidently to be higher than 10% . Let us attempt at 12% and 13%.

Year	CFAT	PV factor at		Total PV at.	
		12%	13%	12%	13%
1	Rs 50,000	0.892	0.885	Rs 44,600	Rs 44,250
2	2,50,000	0.797	0.783	1,99,250	1,95,750
				2,43,850	2,40,000

IRR is 13 per cent.

Project 2: Fake payback period = Rs 2,35,930/Rs 1,40,000 average CFAT = 1.685 According to Table A-4, discount factor closest to 1.685 for 2 years is 12%. Since the actual CFAT are substantial in year 1 itself (Rs 1,90,000/out of Rs 2,80,000), IRR is likely to be higher than 12%. Let us attempt at 14% and 15%.

Year	CFAT	PV factor at		Total PV at.	
		12%	13%	12%	13%
1	Rs 1,90,000	0.877	0.867	Rs 1,66,630	Rs 1,64,730
2	90,000	0.770	0.756	69,300	68,040
				2,35,930	2,32,770

IRR is 14 per cent.

Recommendation: Project-1 should be preferred as it has higher NPV than Project-2. In the case of conflict of rankings, NPV method provides better results.

6.2 XYZ Ltd. is considering two additional mutually exclusive projects. The after-tax cash flows associated with these projects are as follows:

Year	Project A	Project B
0	Rs 1,00,000	Rs 1,00,000
1	32,000	0
2	32,000	0
3	32,000	0
4	32,000	0
5	32,000	Rs 2,00,000

The required rate of return on these projects is 11%. **(i)** What is each project's net present value? **(ii)** What is each project's internal rate of return? **(iii)** What has caused the ranking conflict? **(iv)** Which project should be accepted? Why? (*Delhi University, 2010*)

Solution

(i) Determination of NPV of projects A and B

Year	CFAT		PV factor at 11%	Present Value	
	Project A	Project B		Project A	Project B
1	Rs 32,000	—	0.901	Rs 28,832	—
2	32,000	—	0.812	25,984	—
3	32,000	—	0.731	23,392	—
4	32,000	—	0.659	21,088	—
5	32,000	Rs 2,00,000	0.593	18,976	Rs 1,18,600
Total present value				1,18,272	1,18,600
Less cash outflows				1,00,000	1,00,000
Net present value				18,272	18,600

(ii) Determination of IRR

Project A: Payback period = Rs 1,00,000/Rs 32,000 = 3.125

According to Table A-4, discount factor closet to 3.125 for 5 years is 3.127 at 18%. Therefore, IRR is 18 per cent.

Project B: Fake payback period = Rs 1,00,000/Rs 40,000 (fake annuity) = 2.5.

According to Table A-4, discount factor closet to 2.5 for 5 years is 2.532 at 28%. Since CFAT for 4 years are zero (very extreme case), the actual IRR is likely to be **substantially lower** than 28%. Since NPV computation shows positive NPV of Rs 18,600 at 11% discount rate (at CO = Rs 1,00,000), IRR is likely to be higher by some percentage points. Let us attempt to compute it at 13 to 15% range (as per Table A-3)

Rs 2,00,000 × 0.543 (at 13%) = Rs 1,08,600
2,00,000 × 0.519 (at 14%) = 1,03,800
2,00,000 × 0.497 (at 15%) = 99,400

IRR lies between 14 and 15 per cent. Based on interpolation its value is 14.86% as shown below:

$$\text{IRR} = 14\% + \frac{\text{Rs } 3,800}{\text{Rs } 4,400} = 14\% + 0.86\% = 14.86\%$$

(iii) Besides time-disparity of cash flows, reinvestment rate assumption of IRR (i.e., CFAT are reinvested at IRR) causes ranking conflict between NPV and IRR methods.

(iv) Project B should be accepted. In the case of conflict of rankings, NPV method provides superior results.

6.3 A company is considering which of the two mutual exclusive projects it should undertake. The finance director thinks that the project with the higher NPV should be chosen whereas the managing director thinks that the one with the higher IRR should be undertaken especially as both projects have the same initial outlay and length of life. The company anticipates a cost of capital of 10% and the net after tax cash flows of the projects are as follows:

Year	Project X	Project Y
0	(200)	(200)
1	35	218
2	80	10
3	90	10
4	75	4
5	20	3

Calculate NPV and IRR of each project. State, with reason, which project you would recommend. *(Delhi University, 2008 and 2007)*

Solution

(i) Determination of NPV of Project X and Y

Year	CFAT		PV factor at 10%	Total PV	
	X	Y		X	Y
1	Rs 35,000	Rs 2,18,000	0.909	Rs 31,815	Rs 1,98,162
2	80,000	10,000	0.826	66,080	8,260
3	90,000	10,000	0.751	67,590	7,510
4	75,000	4,000	0.683	51,225	2,732
5	20,000	3,000	0.621	12,420	1,863
Total present value				2,29,130	2,18,527
Less cash outflows				2,00,000	2,00,000
Net present value				29,130	18,527

(ii) Determination of IRR

Project X: Fake payback period = Rs 2,00,000/Rs 60,000 (average CFAT) = 3.333

According to Table A-4, discount factors closest to 3.333 for 5 years are 3.352 (at 15%) and 3.274 (at 16%). Let us compute IRR at 15% and 16%.

Year	CFAT	PV factor at		Total PV at	
		15%	16%	15%	16%
1	Rs 35,000	0.870	0.862	Rs 30,450	Rs 30,170
2	80,000	0.756	0.743	60,480	59,440
3	90,000	0.658	0.641	59,220	57,690
4	75,000	0.572	0.552	42,900	41,400
5	20,000	0.497	0.476	9,940	9,520
Total PV				2,02,990	1,98,220

IRR lies between 15 and 16 per cent.

$$\text{By interpolation, IRR} = 15\% + \frac{\text{Rs } 2,990}{\text{Rs } 4,770} = 15\% + 0.63\% = 15.63\%$$

Project Y: Fake payback period is Rs 2,00,000/Rs 49,000 (average CFAT) = 4.0816 According to Table A-4, discount factor closest to 4.0816 for 5 years are 4.100 (at 7%) and 3.983 (at 8%). Since the actual cash inflows are substantial in year 1 itself (Rs 2,18,000 out of total Rs 2,45,000 of 5 years), IRR is likely to be much higher. Since NPV is positive at 10%, the first clear indication is that it is higher than 10%.Given the fact that 89% of cash inflows are received in year 1 itself, IRR is to be significantly higher than 10%. Let us attempt at 19 and 20%.

Year	*CFAT*	*PV factor at*		*Total PV at*	
		19%	*20%*	*19%*	*20%*
1	Rs 2,18,000	0.840	0.833	Rs 1,83,120	Rs 1,81,594
2	10,000	0.706	0.694	7,060	6,940
3	10,000	0.593	0.579	5,930	5,790
4	4,000	0.499	0.482	1,996	1,928
5	3,000	0.419	0.402	1,257	1,206
				1,99,363	1,97,458

IRR is to be lower than 19%; PV of CFAT are now determined at 18%.

Year	*CFAT*	*PV factor at 10%*	*Total PV*
1	Rs 2,18,000	0.847	Rs 1,84,646
2	10,000	0.718	7,180
3	10,000	0.609	6,090
4	4,000	0.516	2,064
5	3,000	0.437	1,311
			2,01,291

By interpolation IRR = $18\% + \frac{\text{Rs } 1,291}{\text{Rs } 1,928} = 18.67\%$

Recommendation: Project X should be preferred as it has higher NPV than Project Y.

6.4. A company has to select one of the two alternative projects whose particulars are given below:

Initial outlay		*Net cash flows*			
		Y_1	Y_2	Y_3	Y_4
Project I	Rs 11,872	Rs 10,000	Rs 2,000	Rs 1,000	Rs 1,000
Project II	10,067	1,000	1,000	2,000	10,000

The company can arrange the fund at 8%. Compute the NPV and IRR of each project and comment on result. (*Calcutta University, 2006*)

Solution

(i) Determination of NPV of projects I and II

Year	*CFAT*		*PV factor 10%*	*Present value*	
	Project I	*Project II*		*Project I*	*Project II*
1	Rs 10,000	Rs 1,000	0.926	Rs 9,260	Rs 926
2	2,000	1,000	0.857	1,714	857
3	1,000	2,000	0.794	794	1,588
4	1,000	10,000	0.735	735	7,350
Total present value				12,503	10,721
Less initial outlay				11,872	10,067
Net present value (Rank)				631 (2)	654 (1)

(ii) Determination of IRR

Project I: Fake payback period is Rs 11,872/Rs 3,500 (average CFAT) = 3.392. According to Table A-4, discount factors closest to 3.392 for 4 years are 3.387 (at 7%) and 3.312 (at 8%). Since the actual CFAT are substantial in year 1 itself (Rs 10,000, out of total of Rs 14,000 of 4

years), IRR would be significantly higher. Since NPV is positive at 8%, the first clear indication is that it is higher than 8%. Let us attempt at 12%

Year	*CFAT*	*PV factor at 12%*	*Total PV at 12%*
1	Rs 10,000	0.893	Rs 8,930
2	2,000	0.797	1,594
3	1,000	0.712	712
4	1,000	0.636	636
			11,872

IRR is 12 per cent.

Project II: Fake payback period is Rs 10,067/Rs 3,500 (average CFAT) = 2.876 According to Table A-4, discount factors closest to 2.876 for 4 years is 2.855 at 15%. Since CFAT for initial 3 years are significantly lower than average CFAT, the actual IRR is likely to be substantially lower than 15%. Given the facts that there is positive NPV at 8% and IRR is 12% for Project I in which substantial CFAT is in year 1 itself, computation of IRR has been attempted at 10%.

Year	*CFAT*	*PV factor at 12%*	*Total PV at 12%*
1	Rs 1,000	0.909	Rs 909
2	1,000	0.826	826
3	2,000	0.751	1,502
4	10,000	0.683	6,830
			10,067

IRR is 10 per cent.

Comment: The company should select Project II. In the case of conflict of rankings, NPV material provides superior results.

6.5 XYZ Ltd. is considering to replace one of its existing machines at a cost of Rs 4,00,000. The existing machine can be sold at its book value i.e., Rs 90,000. However, it has a remaining useful life of 5 years with salvage value zero. It is being depreciated at the rate of 20 per cent under written down value method.

The new machine can be sold for Rs 2,50,000 after 5 years when it will be no longer required. It will be depreciated annually at the rate of 30 per cent under written down value method. The new machine is expected to bring savings of Rs 1,00,000 in manufacturing cost per annum. Should the machine be replaced if the company is in 40 per cent tax bracket and the required rate of return is 10 per cent? Ignore tax on gain or loss on sale of asset.

(Delhi University, 2004)

Solution

(i) Incremental cash outflows:

Cost of new machine	Rs 4,00,000
Less sale process of existing machine	90,000
	3,10,000

(ii) Incremental depreciation (5 = 1 – 5):

Year	*Depreciation on*		*Incremental depreciation*
	New machine @ 30 per cent	*Existing machine @ 20 per cent*	
1	Rs 1,20,000	Rs 18,000	Rs 1,02,000
2	84,000	14,400	69,600

(*Contd*)

(*Contd*)

3	58,800	11,520	47,280
4	41,160	9,216	31.944
5	28,812	7,373	21,439

(iii) Determination of CFAT and NPV

Particulars	*Years*				
	1	*2*	*3*	*4*	*5*
Cost savings	Rs 1,00,000	Rs 1,00,000	Rs 1,00,000	Rs 1,00,000	Rs 1,00,000
Less incremental depreciation	1,02,000	69,600	47,280	31,944	21,439
Net savings in cost	(2,000)	30,400	52,720	68,056	78,561
Less taxes (0.40)	(800)	12,160	21,088	27,222	31,424
Net savings after taxes (EAT)	(1,200)	18,240	31,632	40,834	47,137
CFAT (EAT + Dep)	1,00,800	87,840	78,912	72,778	68,576
Sale value of machine					+ 2,50,000
X PV factor (0.10)	0.909	0.826	0.751	0.683	0.621
Present value	91,627	72,556	59,263	49,707	1,97,836
Total present value (t = 1 – 5)					4,70,989
Less cash outflows					3,10,000
Net present value					1,60,989

(iv) **Recommendation:** Since the net present value for the proposal is positive, the existing machine should be replaced.

6.6 *AC* Ltd. has just installed machine *X* at a cost of Rs 4,00,000 having useful life of 5 years with no residual value. The annual value of production is estimated at 1,50,000 units which can be sold at Rs 12 per unit. Annual operating costs are estimated at Rs 4,00,000 (excluding depreciation) at this output level. Fixed costs are estimated at Rs 6 per unit (excluding depreciation) for the same level of output.

The company has just come across another machine *Y* having same useful life and capable of giving same output. Annual operating cost is expected at Rs 3,60,000 (excluding depreciation). There will be no change in fixed costs. Capital cost of the machine is Rs 5,00,000 with nil residual value.

The company can sell the machine *X* at Rs 1,00,000. But the cost of dismantling and removal will amount Rs 30,000. The operating with machine *X* has not yet started and the company wants to sell machine X and purchase machine *Y*.

AC Ltd. provides depreciation under straight line method. Assume corporate tax @ 40 per cent. The cost of capital may be assumed at 14 per cent.

(a) Advise whether the company should opt for replacement.

(b) Will there be any change in your view, if machine *X* has not been installed but the company is only selecting any one of the two machines? *(Calcutta University, 2001)*

Solution

(i) **Financial Evaluation: Whether the Company should opt for Replacement**

Incremental cash outflows:	
Cost of machine *Y*	Rs 5,00,000
Less sale proceeds from machine × Rs 1,00,000 – Rs 30,000)	70,000
Less tax advantage on loss due to sale of machine (Rs 4,00,000 – Rs 30,000) × 0.40	1,32,000
	2,98,000

Determination of CFAT and NPV

Savings in operating costs	Rs 40,000
Less incremental depreciation (Rs 1,00,000 – Rs 80,000)	20,000
Net cost savings/Earnings before taxes	20,000
Less taxes (0.4)	8,000
Profit after taxes (EAT)	12,000
CFAT (EAT + Depreciation) (for years 5 = 1-5)	32,000
PV of annuity at 14% for 5 years	3.432
Total present value	Rs 1,09,824
Less incremental cash outflows	2,98,000
Net present value	(1,88,176)

Recommendation: Since NPV is negative, the company should not opt for replacement.

(ii) **Determination of CFAT and NPV of machines *X* and *Y***

Particulars	*Machine X*	*Machine Y*
Sales revenue	Rs 18,00,000	Rs 18,00,000
Less costs:		
Operating cost (variable)	4,00,000	3,60,000
Fixed cost	9,00,000	9,00,000
Depreciation (D)	80,000	1,00,000
Earnings before taxes	4,20,000	4,40,000
Taxes (0.40)	1,68,000	1,76,000
Earnings after taxes (EAT)	2,52,000	2,64,000
CFAT (EAT + D) for t = 1-5	3,32,000	3,64,.000
Annuity of PV (0.14) for 5 years	3.432	3.432
Total PV	11,39,424	12,49,248
Less cash outflows	4,00,000	5,00,000
NPV	7,39,424	7,49,248

Recommendation: Since NPV of Machine *Y* is higher, Machine *Y* should be installed if the company is selecting only one machine.

6.7 NC Ltd. is considering a number of capital investment projects for which Rs 2,00,000 have been allocated. The following projects are under consideration

Project	*Investment*	*NPV*
A	Rs 1,20,000	Rs 25,000
B	1,00,000	20,000
C	80,000	20,000
D	60,000	20,000
E	40,000	15,000
F	10,000	5,000

Projects *A* and *B* are mutually exclusive. If project *A* is undertaken, the initial cost of *C* is reduced by Rs 10,000 (without affecting its benefits), if project *B* is undertaken the initial cost of *D* is reduced by Rs 10,000 (without affecting its benefits). The benefit-cost ratio of unutilized funds is 0.90.

Which projects should be chosen? *(Calcutta University, 2000)*

Solution

Determination of Present Value Index (PI) of Projects

Project	*Investment*	*NPV*	*Gross PV*	*PI*	*Ranking*
A	Rs 1,20,000	Rs 25,000	Rs 1,45,000	1.208	V
B	1,00,000	20,000	1,20,000	1.20	VI
C	80,000	20,000	1,00,000	1.25	IV
D	60,000	20,000	80,000	1.333	III
E	40,000	15,000	55,000	1.375	II
F	10,000	5,00	15,000	1.50	I

Possible Combination of Investment Projects

(i) Project	*Investment*	*NPV*
F	10,000	5,000
E	40,000	15,000
D	60,000	20,000
C	80,000	20,000
	1,90,000	60,000

Rs 10,000 is unutilized which has benefit cost ratio of 0.90 i.e. Rs 9,000.

(i) If project *B* is undertaken:

Project	*Investment*	*NPV*
B	1,00,000	20,000
D	50,000	20,000
E	40,000	15,000
F	10,000	5,000
	2,00,000	60,000

(ii) If project *A* is undertaken:

Project	*Investment*	*NPV*
A	1,20,000	25,000
C	70,000	20,000
F	10,000	5,000
	2,00,000	50,000

Recommendation: Projects *C, D, E, F* should be choosen as they yield maximum NPV.

Chapter

7

Concept and Measurement of Cost of Capital

Learning Objectives

1. Understand the basic assumptions, relationships, concepts and specific sources of capital underlying the cost of capital.
2. Determine the cost of long-term debt using calculations and an approximation (short-cut) technique
3. Compute the cost of preference shares.
4. Calculate the cost of equity shares using (i) dividend valuation approach and (ii) capital asset pricing model (CAPM) approach and convert it into cost of retained earnings.
5. Find the weighted average/overall cost of capital and discuss the alternative weighting schemes—historical (book values as well as market values) and marginal.

INTRODUCTION

The discussions in Chapters 5 and 6 relating to capital budgeting have shown the relevance of a certain required rate of return as a decision criterion. Such a rate is the cost of capital of a firm. Apart from its usefulness as an operational criterion to accept/reject an investment proposal, cost of capital is also an important factor in designing capital structure. The relationship of cost of capital and capital structure of the firm is explored in part four. This Chapter is devoted to a discussion of the concept and measurement of cost of capital. Section 1 covers the importance of, and elaborates on the concept of, cost of capital. The measurement of the specific cost of capital is examined in Section 2. Section 3 deals with the measurement of overall cost of capital and the related issues of determining the relative weights. The corporate practices followed in India are summarised in Section 4. The major points are summarised in the last Section.

SECTION I IMPORTANCE AND CONCEPT

Importance

As mentioned above, the cost of capital is an important element, as a basic input information, in capital investment decisions. In the present value method of discounted cash flow technique, the cost of capital is used as the discount rate to calculate the NPV. The profitability index or benefit-cost ratio method similarly employs it to determine the present value of future cash inflows. When the internal rate of return method is used, the computed IRR is compared with the cost of capital. The cost of capital, thus, constitutes an integral part of investment decisions. It provides a yardstick to measure the worth of investment proposal and, thus, performs the role of accept-reject criterion. This underlines the crucial significance of cost of capital. It is also referred to as *cut-off rate, target rate, hurdle rate, minimum required rate of return, standard return* and so on.

The cost of capital, as an operational criterion, is related to the firms' objective of wealth maximisation. The accept-reject rules require that a firm should avail of only such investment opportunities as promise a rate of return higher than the cost of capital. Conversely, the firm would be well advised to reject proposals whose rates of return are less than the cost of capital. If the firm accepts a proposal having a rate of return higher than the cost of capital, it implies that the proposal yields returns higher than the minimum required by the investors and the prices of shares will increase and, thus, the shareholders' wealth. By virtue of the same logic, the shareholders' wealth will decline on the acceptance of a proposal in which the actual return is less than the cost of capital. The cost of capital, thus, provides a rational mechanism for making optimum investment decisions. In brief, *the cost of capital is important because of its practical utility as an acceptance-rejection decision criterion.*

The considerable significance of cost of capital in terms of its practical utility notwithstanding, it is probably the most controversial topic in financial management. There are varying opinions as to how this can be computed. In view of the crucial operational significance of this concept, our focus is on the general framework for the computation of cost of capital. We first define the term cost of capital in general terms. This is followed by a detailed account of the measurement of cost of capital—both specific as well as overall—of different sources of financing.

Definition

Cost of capital is the rate of return that a firm must earn on its project/ investments to maintain its market value and attract funds.

In operational terms, **cost of capital** refers to the discount rate that is used in determining the present value of the estimated future cash proceeds and eventually deciding whether the project is worth undertaking or not. In this sense, it is defined as the *minimum rate of return that a firm must earn on its investment for the market value of the firm to remain unchanged.*

The cost of capital is visualised as being composed of several elements. These elements are the cost of each component of capital. The term 'component' means the different sources from which funds are raised by a firm. Obviously, each source of funds or each component of capital has its cost. For example, equity capital has a cost, so also preference share capital and so on. The cost of each source or component is called **specific cost** of capital. When these specific costs are combined to arrive at overall cost of capital, it is referred to as the **weighted cost of capital**. The terms, *cost of capital, weighted cost of capital, composite*

cost of capital and combined cost of capital are used interchangeably in this book. In other words, the term, cost of capital, as the acceptance criterion for investment proposals, is used in the sense of the combined cost of all sources of financing. This is mainly because our focus is on the valuation of the firm as a whole.[1]

Assumptions

The theory of cost of capital is based on certain assumptions. A basic assumption of traditional cost of capital analysis is that the firm's business and financial risks are unaffected by the acceptance and financing of projects.[2] **Business risk** measures the variability in operating profits [earnings before interest and taxes (EBIT)] due to change in sales. If a firm accepts a project that is considerably more risky than the average, the suppliers of the funds are quite likely to increase the cost of funds as there is an increased probability of committing default on the part of the firm in making payments of their money. A debenture-holder will charge a higher rate of interest to compensate for increased risk. There is similarly an increased uncertainty from the point of equity holders of getting dividend from the firm. Therefore, they will also require a higher return as a compensation for the increased risk. In analysing the cost of capital in this chapter, we assume that there would be no change whatsoever in the business risk complexion of the firm as a result of acceptance of new investment proposals.

Business risk is the risk to the firm of being unable to cover fixed operating costs.

The capital budgeting decision determines the business risk complexion of the firm. The financing decision determines its **financial risk**. In general, the greater the proportion of long-term debt in the capital structure of the firm, the greater is the financial risk because there is a need for a larger amount of periodic interest payment and principal repayment at the time of maturity. In such a situation, obviously, the firm requires higher operating profits to cover these charges. If it fails to earn adequate operating profits to cover such financial charges, it may be forced into cash insolvency. Thus, with the increase in the proportion of debt commitments and preference shares in its capital structure, fixed charges increase. All other things being the same, the probability that the firm will be unable to meet these fixed charges also increases. As the firm continues to lever itself, the probability of cash insolvency, which may lead to legal bankruptcy, increases.[3] Clearly, therefore, as a firm's financial structure shifts towards a more highly levered position, the increased financial risk associated with the firm is recognised by the suppliers of funds. They compensate for this increased risk by charging higher rates of interest or requiring greater returns. In short, they react in much the same way as they would in the case of increasing business risks.[4] In the analysis of the cost of capital in this Chapter, however, the firm's financial structure is assumed to remain fixed. In the absence of such an assumption, it would be quite difficult to find its cost of capital, as the selection of a particular source of financing would change the cost of other sources of financing. In operational terms, the assumption of a constant capital structure implies that the additional funds required to finance the new project are to be raised in the same proportion as the firm's existing financing.

Financial risk is the risk of being unable to cover required financial obligations such as interest and preference dividends.

For the purpose of capital budgeting decisions, benefits from undertaking a proposed project are evaluated on an after-tax basis. In fact, only the cost of debt requires tax adjustment as interest paid on debt is deductible expense from the point of view of determining taxable

income whereas dividends paid either to preference shareholders or to equity-holders are not eligible items as a source of deduction to determine taxable income.

To sum up, it may be said that cost of capital (k) consists of the following three components:

(i) the riskless cost of the particular type of financing, r_j;
(ii) the business risk premium, b; and
(iii) the financial risk premium, f

Or $k = r_j + b + f$

Since the business and financial risks are assumed to be constant, the changing cost of each type of capital, j, over time should be affected by the change in the supply of, and demand for, each type of funds.

Explicit and Implicit Costs

The cost of capital can be either **explicit or implicit**. The distinction between explicit and implicit costs is important from the point of view of the computation of the cost of capital.

> The explicit cost of any source of capital is the discount rate that equates the present value of the cash inflows that are incremental to the taking of the financing opportunity with the present value of its incremental cash outflows.[5]

When firms raise funds from different sources, there is a series of cash flows. Initially, there is cash inflow to the extent of the amount raised. This is followed by a series of cash outflows in respect of interest payments, repayment of principal, or payment of dividends. For example, a firm raises Rs 5,00,000 through the sale of 10 per cent perpetual debentures. There will be a cash inflow of Rs 5,00,000 followed by an annual cash outflow of Rs 50,000. The rate of return that equates the present value of cash inflows (Rs 5,00,000) with the present value of cash outflows (Rs 50,000) would be the explicit cost.

The determination of the explicit cost of capital is similar to the determination of the IRR, with one difference. While in the computation of the IRR, the cash outflows (assuming conventional flows) are involved in the beginning, followed by cash inflows subsequently, it is exactly opposite with the explicit cost of capital. Here, as shown above, the cash flows take place only once and there is a series of cash outflows subsequently.

The general formula for the explicit cost of capital of any source of raising finance would be as follows:

$$CI_0 = \sum_{t=1}^{n} \frac{CO_t}{(1+C)^t} \tag{7.1}$$

Where CI_0 = initial cash inflow, that is, net cash proceeds received by the firm from the capital source at time O, $CO_1 + CO_2 \ldots + CO_n$ = cash outflows at times 1, 2 ... n, that is, cash payment from the firm to the capital source. If CI_0 is received in instalments, then, CI_0

$$CI_0 + \frac{CI_1}{(1+C)^1} + \frac{CI_2}{(1+C)^2} + \frac{CI_3}{(1+C)^3} + \ldots + \frac{CI_n}{(1+C)^n}$$

$$= \frac{CO_1}{(1+C)^1} + \frac{CO_2}{(1+C)^2} + \frac{CO_3}{(1+C)^3} + \ldots + \frac{CO_n}{(1+C)^n} \tag{7.2}$$

It is evident from the above mathematical formulation that the **explicit cost** of capital is the '*rate of return of the cash flows of the financing opportunity.*'[6] In other words, it is the internal rate of return that the firm pays to procure financing. On the basis of the above formula, we can easily find out that the explicit cost of an interest-free loan is zero per cent because the discount rate that equates the present value of a future sum with an equivalent sum received today is zero. The explicit cost of capital of a loan bearing interest is that discount rate which equates the present value of the future cash outflows with the net amount of funds initially provided by the loan. The explicit cost of capital of a gift is minus 100 per cent. The explicit cost of capital derived from the sale of an asset is a discount rate that equates the present value of the future cash flows foregone by the asset's sale with the net proceeds to the firm resulting from its liquidation. The explicit cost of funds supplied by increases in certain liabilities such as accounts payable and accrued taxes is zero per cent unless, of course, penalties are incurred or discounts lost owing to the increase in these liabilities.[7]

Explicit cost is the rate that the firm pays to procure financing.

The explicit cost of capital is concerned with the incremental cash flows that result directly from raising funds. Retained earnings used in the firm involve no future cash flows to, or from, the firm. Therefore, the explicit cost of retained earnings is minus 100 per cent. There are no future interest or principal payments imposed by the retention of earnings. There are no additional shares created and sold to outsiders on which dividends will be paid. From this, it should, however, not be concluded that retained earnings have no cost. (In fact, they also have costs like other sources of raising finance have). The retained earnings are undistributed profits of the company belonging to the shareholders. Given the ultimate objective of the firm to maximise the wealth of shareholders, the cost of retained earning would be equivalent to the **opportunity cost** of earning by investing elsewhere by the shareholders themselves or by the company itself. **Opportunity costs** are technically referred to as **implicit cost of capital**. The **implicit cost of capital** of funds raised and invested by the firm may, therefore, be defined as 'the rate of return associated with the best investment opportunity for the firm and its shareholders that would be foregone, if the projects presently under consideration by the firm were accepted.'[8] The cost of retained earnings is an opportunity cost or implicit capital cost, in the sense that it is the rate of return at which the shareholders could have invested these funds had they been distributed to them.[9] However, other forms of financing also have implicit cost once they are invested. The explicit cost arises when funds are *raised*, whereas the implicit costs arise when funds are *used*. Viewed in this perspective, implicit costs are ubiquitous. They arise whenever funds are used no matter what the source.

Implicit cost is the rate of return associated with the best investment opportunity foregone.

SECTION 2 MEASUREMENT OF SPECIFIC COSTS

The term cost of capital, as a decision criterion, is the overall cost. This is the combined cost of the specific costs associated with specific sources of financing. The cost of the different sources of financing represents the components of the combined cost. The computation of the cost of capital, therefore, involves two steps: **(i)** the computation of the different elements of the cost in terms of the cost of the different sources of finance (specific costs), and **(ii)** the calculation of the overall cost by combining the specific costs into a composite cost.

The first step in the measurement of the cost of capital of the firm is the calculation of the cost of individual sources of raising funds. Apart from its relevance to the measurement of the combined cost, the specific cost will also indicate the relative cost of pursuing one line of financing rather than another. From the viewpoint of capital budgeting decision, the long-term sources of funds are relevant as they constitute the major sources of financing of fixed assets. In calculating the cost of capital, therefore, the focus is on long-term funds. In other words, the specific costs have to be calculated for **(i)** long-term debt (including debentures); **(ii)** preference shares; **(iii)** equity capital; and **(iv)** retained earnings.

Cost of debt is the after tax cost of long-term funds through borrowing.

Net cash proceeds are the funds actually received from the sale of security.

Flotation cost is the total cost of issuing and selling securities.

Cost of Debt

The calculation of the **cost of debt** is relatively easy. The cost of funds raised through debt in the form of debentures or loan from financial institutions can be determined from Eq. 7.1. To apply the formulation of explicit cost of debt, we need data regarding: **(i)** the **net cash proceeds**/inflows (the issue price of debentures/amount of loan minus all **flotation costs**) from specific source of debt, and **(ii)** the net cash outflows in terms of the amount of periodic interest payment and repayment of principal in instalments or in lump sum on maturity. The interest payments made by the firm on debt issues qualify for tax deduction in determining net taxable income. Therefore, the effective cash outflows is less than the actual payment of interest made by the firm to the debt holders by the amount of tax shield on interest payment.[10] The debt can be either perpetual/irredeemable or redeemable.

Cost of Perpetual Debt The measurement of the cost of perpetual debt is conceptually relatively easy. It is the rate of return which the lenders expect. The debt carries a certain rate of interest. The coupon interest rate or the market yield on debt can be said to represent an approximation of the cost of debt. The nominal/coupon rate of interest on debt is the before-tax cost of debt. Since the effective cost of debt is the tax-adjusted rate of interest, the before-tax cost of debt should be adjusted for the tax effect. Finally, the bonds and debentures (debt) can be issued at **(i)** par, **(ii)** discount, and **(iii)** premium. The coupon rate of interest will require adjustment to find out the true cost of debt. Symbolically,

$$k_i = \frac{I}{SV} \tag{7.3}$$

$$k_d = \frac{I}{SV}(1 - t) \tag{7.4}$$

k_i = Before-tax cost of debt
k_d = Tax-adjusted cost of debt
I = Annual interest payment
SV = Sale proceeds of the bond/debenture
t = Tax rate

The calculation is illustrated in Example 7.1.

Example 7.1

A company has 10 per cent perpetual debt of Rs 1,00,000. The tax rate is 35 per cent. Determine the cost of capital (before tax as well as after tax) assuming the debt is issued at **(i)** par, **(ii)** 10 per cent discount, and **(iii)** 10 per cent premium.

Solution

(i) Debt issued at par

Before-tax cost, $k_i = \text{Rs}\,\frac{10,000}{1,00,000} = 10$ per cent

After-tax cost, $k_d = k_i (1 - t) = 10\% (1 - 0.35) = 6.5$ per cent

(ii) Issued at discount

Before-tax cost, $k_i = \text{Rs}\,\frac{10,000}{90,000} = 11.11$ per cent

After-tax cost, $k_d = 11.11\% (1 - 0.35) = 7.22$ per cent

(iii) Issued at premium

Before-tax cost, $k_i = \text{Rs}\,\frac{10,000}{1,10,000} = 9.09$ per cent

After-tax cost, $k_d = 9.09\% (1 - 0.35) = 5.91$ per cent

Cost of Redeemable Debt In the case of calculation of cost of redeemable debt, account has to be taken, in addition to interest payments, of the repayment of the principal. When the amount of principal is repaid in one lump sum at the time of maturity, the cost of debt would be given by solving Eq. 7.5. If, however, the repayments are in a number of instalments, the cost of debt can be calculated on the basis of Eq. 7.6.

$$CI_0 = \sum_{t=1}^{n} \frac{COI_t}{(1 + k_d)^t} + \frac{COP_n}{(1 + k_d)^n} \qquad \textbf{(7.5)}$$

where CI_0 = Net cash proceeds from issue of debentures or from raising debt

$COI_1 + COI_2 + \ldots + COI_n$ = Cash outflow on interest payments in time period 1,2 and so on up to the year of maturity *after adjusting tax savings on interest payment.*

COP_n = Principal repayment in the year of maturity

k_d = Cost of debt.

If the repayment of debt is in a number of instalments instead of one lump sum payment, the equation would be:

$$CI_0 = \sum_{t=1}^{n} \frac{COI_t + COP_t}{(1 + k_d)^t} \qquad \textbf{(7.6)}$$

Example 7.2

A company issues a new 10 per cent debentures of Rs 1,000 face value to be redeemed after 10 years The debenture is expected to be sold at 5 per cent discount. It will also involve floatation costs of 5 per cent of face value. The company's tax rate is 35 per cent. What would the cost of debt be? Illustrate the computations using **(i)** trial and error approach and **(ii)** shortcut method.

Solution

(i) Trial and Error/Long Approach

Cash Flow Pattern of the Debentures

Years	*Cash flow*
0	+ Rs 900 (Rs 1,000 – Rs 100, that is, par value *less* flotation cost less discount)
1 – 10	– Rs 100 (interest outgo)
10	– Rs 1,000 (repayment of principal at maturity).

We are to determine the value of k_d in the following equation:

$$\text{Rs } 900 = \sum_{t=1}^{10} \frac{\text{Rs } 65}{(1 + k_d)^t} + \frac{\text{Rs } 1{,}000}{(1 + k_d)^{10}}$$

The value of k_d for this equation would be the cost of debt. The value of k_d can be obtained, as in the case of IRR, by trial and error.

Determination of PV at 7% and 8% Rates of Interest

Year(s)	*Cash outflows*	*PV factor at*		*Total PV at*	
		7%	*8%*	*7%*	*8%*
1-10	Rs 65	7.024	6.710 (Table A-4)	Rs 456.56	Rs 436.15
10	1,000	0.508	0.463 (Table A-3)	508.00	463.00
				964.56	899.15

The value of k_d would be 8 per cent.

(ii) Shortcut Method: The formula for approximating the effective cost of debt can, as a shortcut, be shown in the Equation (7.7):

$$k_d = \frac{I(1-t) + (f + d + pr - pi)^* / N_m}{(RV + SV)/2} \quad \textbf{(7.7)}$$

where I = Annual interest payment

RV = Redeemable value of debentures/debt

SV = Net sales proceeds from the issue of debenture/debt (face value of debt minus issue expenses)

* = Can also be written as RV – SV

N_m = Term of debt

f = Flotation cost

d = Discount on issue of debentures

pi = Premium on issue of debentures

pr = Premium on redemption of debentures

t = Tax rate

$$k_d = \frac{\text{Rs } 100\,(1 - 0.35) + (\text{Rs } 50 + \text{Rs } 50)/10}{(\text{Rs } 900 + \text{Rs } 1{,}000)/2} = 7.9 \text{ per cent}$$

Example 7.3

A company issues 11 per cent debentures of Rs 100 for an amount aggregating Rs 1,00,000 at 10 per cent premium, redeemable at par after five years. The company's tax rate is 35 per cent. Determine the cost of debt, using the shortcut method.

Solution

$$k_i = \frac{[\text{Rs } 11(1 - 0.35) - \text{Rs } (10/5)]}{(\text{Rs } 110 + \text{Rs } 100)/2} = 4.9 \text{ per cent}$$

The shortcut, however, cannot be applied when the principal is repaid in a number of instalments in lieu of one lump sum repayment. We can compute the value of k_d with the help of Eq. 7.6.

Example 7.4

A company has issued 10 per cent debentures aggregating Rs 1,00,000. The flotation cost is 4 per cent. The company has agreed to repay the debentures at par in 5 equal annual instalments starting at the end of year 1. The company's rate of tax is 35 per cent. Find the cost of debt.

Solution

Net proceeds from the sale of debenture = Rs 96,000.

Since the cash outflows are higher in the initial years than the average (Rs 24,500), let us try to determine PV at 7 per cent and 8 per cent.

Cash outflows	*PV factor at*		*Total PV at*	
	7%	*8%*	*7%*	*8%*
26,500 [@]	0.935	0.926	Rs 24,777	Rs 24,539
25,200	0.873	0.857	22,000	21,596
23,900	0.816	0.794	19,502	18,977
22,600	0.763	0.735	17,244	16,611
21,300	0.713	0.681	15,187	14,505
			98,710	96,228

[@]Rs 20,000 principal + Rs 10,000 interest (1 – 0.35)

The value of k_d = 8 per cent.

To conclude, conceptually speaking, the calculation of the cost of debt is relatively easy. Moreover, debt is the cheapest source of long-term funds from the point of view of the company. In the first place, it is the safest form of investment from the point of view of the creditors because they are the first claimants on the company's assets at the time of its liquidation. Likewise, they are the first to be paid their interest before any dividend is paid to preference and equity shareholders. In fact, they are to be paid the interest even if the company incurs losses. Therefore, the suppliers' required rate of return on debt instruments is lower *vis-a-vis* other financial instruments, and, hence, lower cost of debt to the firm. Another, and more important, reason for debt having the lowest cost is the tax-deductibility of interest payments. The tax benefit would, however, be available only when the firm is profitable and pay taxes. A firm which suffers losses would not be required to pay any tax and its cost of debt would be before-tax cost (k_i) and not after-tax cost (k_d).

In practice, the corporates are normally likely to have multiple debt issues most likely subject to different interest rates. To determine the overall cost of debt, cost of each debt issue is to be separately computed. The weighted average of costs of all debt issues would be the cost of debt of the firm as a whole.

Cost of Preference Shares

The computation of the cost of preference shares is conceptually difficult as compared to the cost of debt. In the case of debt, as shown above, the interest rate is the basis of calculating cost, as payment of a specific amount of interest is legal commitment on the part of the firm. There is no such obligation in regard to preference dividend. It is true that a fixed dividend rate is stipulated on preference shares. It is also true that holders of such shares have a preferential right as regards payments of dividend as well as return of principal, as compared to the ordinary shareholders. But, unlike debt, there is no risk of legal bankruptcy if the firm does not pay the dividends due to the holders of such shares. Nevertheless, firms can be

expected to pay the stipulated dividend, if there are sufficient profits, for a number of reasons. First, the preference shareholders, as already observed, carry a prior right to receive dividends over the equity shareholders. Unless, therefore, the firm pays out the dividend to its preference shareholders, it will not be able to pay anything to its ordinary shareholders. Moreover, the preference shares are usually cumulative which means that preference dividend will get accumulated till it is paid. As long as it remains in arrears, nothing can be paid to the equity holders. Further, non-payment of preference dividend may entitle their holders to participate in the management of the firm as voting rights are conferred on them in such cases. Above all, the firm may encounter difficulty in raising further equity capital mainly because the non-payment of preference dividend adversely affects the prospects of ordinary shareholders.

Cost of preference share capital is the annual preference share dividend divided by the net proceeds from the sale of preference shares.

Therefore, the stipulated dividend on preference shares, like the interest on debt, constitutes the basis for the calculation of the cost of preference shares. The **cost of preference capital** may be defined as the dividend expected by the preference shareholders.

However, unlike interest payments on debt, dividend payable on preference shares is not tax-deducible because preference dividend is not a charge on earnings or an item of expenditure; it is an appropriation of earnings. In other words, they are paid out of after-tax earnings of the company. Therefore, no adjustment is required for taxes while computing the cost of preference capital.

There are two types of preference shares: **(i) irredeemable**, and **(ii) redeemable**. The first category is a kind of perpetual security in that the principal is not to be returned for a long time or is likely to be available till the life of the company. The redeemable preference shares are issued with a maturity date so that the principal will be repaid at some future date. Accordingly, the cost of preference is calculated separately for these situations.

Perpetual Security The cost of preference shares which has no specific maturity date is given by Eq. (7.8) and Eq. (7.8A):

$$k_p = \frac{D_p}{P_0 (1 - f)} \tag{7.8}$$

$$k_p = \frac{D_p (1 + D_t)}{P_0 (1 - f)} \tag{7.8A}$$

where k_p = Cost of preference capital
D_p = Constant annual dividend payment
P_0 = Expected sales price of preference shares
f = Flotation costs as a percentage of sales price
D_t = Tax on preference dividend

Example 7.5

A company issues 11 per cent irredeemable preference shares of the face value of Rs 100 each. Flotation costs are estimated at 5 per cent of the expected sale price. **(a)** What is the k_p, if preference shares are issued at **(i)** par value, **(ii)** 10 per cent premium, and **(iii)** 5 per cent discount? **(b)** Also, compute k_p in these situations assuming 13.125 per cent dividend tax.

Solution

(a) (i) Issued at par

$$k_p = \frac{\text{Rs } 11}{\text{Rs } 100\,(1-0.05)} = 11.6 \text{ per cent}$$

(ii) Issued at premium

$$k_p = \frac{\text{Rs } 11}{\text{Rs } 110\,(1-0.05)} = 10.5 \text{ per cent}$$

(iii) Issued at discount

$$k_p = \frac{\text{Rs } 11}{\text{Rs } 95\,(1-0.05)} = 12.2 \text{ per cent}$$

(b) (i) Issued at par

$$k_p = \frac{\text{Rs } 11(1.13125) = \text{Rs } 12.44}{\text{Rs } 95} = 13.1 \text{ per cent}$$

(ii) Issued at premium

$$k_p = \frac{\text{Rs } 12.44}{\text{Rs } 104.5} = 11.9 \text{ per cent}$$

(iii) Issued at discount

$$k_p = \frac{\text{Rs } 12.44}{\text{Rs } 90.25} = 13.8 \text{ per cent}$$

Cost of Redeemable Preference Capital The explicit cost of preference shares in such a situation is the discount rate that equates the net proceeds of the sale of preference shares with the present value of the future dividends and principal repayments. The appropriate formula to calculate cost is given by Eq. (7.9).

$$P_0(1-f) = \frac{D_{p_1}}{(1+k_p)^1} + \frac{D_{p_2}}{(1+k_p)^2} + \ldots + \frac{D_{p_n}}{(1+k_p)^n} + \frac{P_n}{(1+k_p)^n}$$

$$P_0(1-f) = \sum_{t=1}^{n} \frac{D_{p_t}}{(1+k_p)^t} + \frac{P_n}{(1+k_p)^n} \qquad \textbf{(7.9)}$$

where P_0 = Expected sale price of preference shares
f = Floatation cost as percentage of P_0
D_p = Dividends paid on preference shares
P_n = Repayment of preference capital amount

Example 7.6

ABC Ltd has issued 11 per cent preference shares of the face value of Rs 100 each to be redeemed after 10 years. Flotation cost is expected to be 5 per cent. Determine the cost of preference shares (k_p).

Solution

$$\text{Rs } 95 = \sum_{t=1}^{10} \frac{\text{Rs } 11}{(1+k_p)^t} + \frac{\text{Rs } 100}{(1+k_p)^{10}}$$

The value of k_p is likley to be between 11 and 12 per cent as the rate of dividend is 11 per cent.

Determination of the PV at 11 Per Cent and 12 Per Cent

Year	*Cash outflows*	*PV factor at*		*Total PV at*	
		11%	*12%*	*11%*	*12%*
1-10	Rs 11	5.889	5.65	Rs 64.78	Rs 62.15
10	100	0.352	0.322	35.15	32.20
				99.93	94.35

k_p = 11.9 per cent

Cost of Equity Capital

The cost of equity capital is by far, conceptually speaking, the most difficult and controversial cost to measure. It has been shown in the preceding discussions that the coupon rate of interest which forms the basis of calculation of cost of debt can be estimated with a high degree of accuracy since interest payments as well as the return of the principal are contractual obligations. The return on preference shares, although not a contractual obligation, can also be estimated fairly accurately as they are fixed in terms of the stipulations governing the issue of such shares. In contrast, the return to the equity-holders solely depends upon the discretion of the company management. Apart from the absence of any definite commitment to receive dividend, the equity shareholders rank at the bottom as claimants on the assets of the company at the time of its liquidation. It may, therefore, *prima facie*, appear that equity capital does not carry any cost. But this is not true. Equity capital, like other sources of funds, does certainly involve a cost to the firm. It may be recalled that the objective of financial management is to maximise shareholders' wealth and the maximisation of market price of shares is the operational substitute for wealth maximisation. When equity-holders invest their funds they also expect returns in the form of dividends. The market value of shares is a function of the return that the shareholders expect and get. If the company does not meet the requirements of its shareholders and pay dividends, it will have an adverse effect on the market price of shares. A policy of not paying dividends by a firm would be in conflict, in other words, with its basic objective, namely, net present value maximisation. The equity shares, thus, implicitly involve a return in terms of the dividend expected by the investors and, therefore, carry a cost. In fact, the cost of equity capital is relatively the highest among all the sources of funds. The investors purchase the shares, as already mentioned, in the expectation of a certain rate of return. The quantum of the rate of return, depends, *inter alia*, on the business risk and financial risk of a company. The equity shares involve the highest degree of financial risk since they are entitled to receive dividend and return of principal after all other obligations of the firm are met. As a compensation to the higher risk exposure, holders of such securities expect a higher return and, therefore, higher cost is associated with them.

Therefore, one simple approach suggested to determine cost of equity is to add a judgmental risk premium of 3 to 5 percentage points to the interest rate paid by the firm on its own long-term debt. Such a method may be referred to as **debt-yield plus risk premium approach**.[12] Although this method does not ensure a precise cost of equity, it gets us into the right ballpark.[13] There is no direct basis of knowing the return the firm's equity investors require on their investments. Therefore, it is to be estimated.[14]

Cost of equity capital is the rate at which investors discount the expected dividends of the firm to determine its share value.

Conceptually, the **cost of equity capital**, k_e, may be defined as *the minimum rate of return that a firm must earn on the equity-financed portion of an investment project in order to leave unchanged the market price of the shares.*[15]

The measurement of the above required rate of return is the measurement of the cost of equity capital. There are two possible approaches that can be employed to calculate the cost of equity capital: **(i)** dividend approach, and **(ii)** capital asset pricing model approach.

Dividend Approach One approach to calculate the cost of equity capital is based on the **dividend valuation model**. According to this approach, the cost of equity capital is calculated on the basis of a required rate of return in terms of the future dividends to be paid on the shares. The cost of equity capital, k_e, is, accordingly, defined as *the discount rate that equates the present value of all expected future dividends per share with the net proceeds of the sale (or the current market price) of a share.*

Dividend valuation model assumes that the value of a share equals the present value of all future dividends that it is expected to provide over an indefinite period.

The process of determining k_e is similar to that used in calculating the explicit before-tax cost of debt (k_d) and cost of preference capital (k_p). The two elements of the calculation of k_e on the basis of the dividend approach are **(i)** net proceeds from the sale of a share/current market price of a share, and **(ii)** dividends and capital gains expected on the share. In arriving at the first, that is, the sale proceeds/current price, adjustments for flotation cost and discount/premium are necessary. In the case of dividends, the investors expect a rate of dividend which will not be constant over the years but will grow. The growth in expected dividends in future may be either at a uniform normal rate perpetually or it may vary so that for a few years it may be at level higher than in subsequent years after which it will increase at a normal rate. While calculating the cost of equity capital, therefore, the dividend approach takes into account expected dividends under different growth assumptions.

The cost of equity capital can be measured with the following equations:

(A) When dividends are expected to grow at a uniform rate perpetually:

$$P_0(1-f) = \frac{D_0(1+g)^1}{(1+k_e)^1} + \frac{D_0(1+g)^2}{(1+k_e)^2} + \ldots + \frac{D_0(1+g)^n}{(1+k_e)^n} = \sum_{t=1}^{n} \frac{D_1(1+g)^{t-1}}{(1+k_e)^t} \qquad \textbf{(7.10)}$$

k_e in Eq. 7.10 is the rate of return (discount rate) which equates the two sides of the equation.

Simplifying Eq. 7.10, we get

$$P_0 = \frac{D_1}{k_e - g} \qquad \textbf{(7.11)}$$

$$k_e = \frac{D_1}{P_0} + g \qquad \textbf{(7.12)}$$

where D_1 = Expected dividend per share
P_0 = Net proceeds per share/current market price
g = Growth in expected dividends

The calculation of k_e on the basis of Eq. 7.12 is based on certain assumptions with respect to the behaviour of investors and their ability to forecast future values:

- the market value of shares depends upon the expected dividends;
- investors can formulate subjective probability distribution of dividends per share expected to be paid in various future periods;

- the initial dividend, D_0, is greater than zero ($D_0 > 0$);
- the dividend pay-out ratio is constant;
- investors can accurately measure the riskiness of the firm so as to agree on the rate at which to discount the dividends.

Note: Under the provisions of Section 115(O), of the Income Tax Act, 1961, a domestic company is liable to pay tax at a flat rate of 15 per cent (plus surcharge) on dividends declared/ distri-buted/paid on/after April 1, 2010. The payment of the dividend tax will reduce the growth (g) in dividends:

$g = b.r$, where b = retention rate, r = rate of return.

$$b = 1 - \left[\frac{DPS\,(1 + Dt)}{EPS}\right] = \left[\frac{EPS - DPS\,(1 + D_t)}{EPS}\right]$$

where Dt = Dividend tax

$r = EPS/P_0$

$$\therefore \quad g = b \cdot r = \frac{EPS}{P_0} \times \frac{EPS - [DPS\,(1 + Dt)]}{EPS} = \left[\frac{EPS - DPS\,(1 + D_t)}{P_0}\right] \qquad \textbf{(7.12A)}$$

Obviously, g without Dt would be higher.

(B) Under different growth assumptions of dividends over the years:

Equation 7.12 will have to be modified to take into account two (or more, if necessary) growth rates. The solution in the following Equation (7.13) for k_e would give the cost of equity capital:

$$P_0 = \sum_{t=1}^{n} \frac{D_0\,(1 + g_b)^{t-1}}{(1 + k_e)^t} + \sum_{t=n+1}^{\infty} \frac{D_n\,(1 + g_c)^{t-1}}{(1 + k_e)^t} \qquad \textbf{(7.13)}$$

where g_b = Rate of growth in earlier years

g_c = Constant growth in later years

Example 7.7

Suppose that dividend per share of a firm is expected to be Re 1 per share next year and is expected to grow at 6 per cent per year perpetually. Determine the cost of equity capital, assuming the market price per share is Rs 25.

Solution

This is a case of constant growth of expected dividends. The k_e can be calculated by using Equation 7.12. Thus,

$$k_e = \frac{D_1}{P_0} + g = \frac{\text{Rs } 1}{\text{Rs } 25} + 0.06 = 10 \text{ per cent}$$

The dividend approach can be used to determine the expected market value of a share in different years. The expected value of a share of the hypothetical firm in Example 7.7 at the end of years 1 and 2 would be as follows, applying Eq. 7.12.

(i) Price at the end of the first year (P_1) = $\dfrac{D_2}{k_e - g} = \dfrac{\text{Rs } 1.06}{0.10 - 0.06} = \text{Rs } 26.50$

(ii) $P_2 = \dfrac{D_3}{k_e - g} = \dfrac{\text{Rs } 1.124}{0.10 - 0.06} = \text{Rs } 28$

In case company's past growth rate has been abnormally high or low, either due to its own unique situation or due to general economic fluctuations, historic growth rates **(g)** may not be reliable. In such situations, dividend growth forecasts should be based on factors such as projected sales, profit margins and competitive factors.[16] Accordingly, k_e would be as follows:

$$k_e = \frac{D_1}{P_0} + \text{Growth rate as projected} \qquad \textbf{(7.13-A)}$$

Another method for estimating **g** can be conceived in terms of the company's projected retention rate and its expected future rate of return on equity. More profitable firms retain a large proportion of their earnings for reinvestment and will, therefore, tend to have higher growth rate compared to less profitable firms which distribute a large proportion of their earnings as dividends.[17]

In brief, careful analysis and sound judgments are essential and play more important role in determining the k_e *vis-à-vis* the k_d and the k_p.

However, the dividend growth model approach is beset with a number of practical problems and drawbacks. The major ones are: **(1)** It is applicable only to those corporates which pay dividends. Its results are really applicable to cases where a reasonably steady growth is likely to occur; **(2)** Cost of equity is very sensitive to the estimated growth. As explained earlier, it is not easy to estimate its value; **(3)** The approach does not explicitly reckon risk factor. There is no allowance for the degree of risk associated with the estimated growth rate for dividends.[18]

Example 7.8

From the undermentioned facts determine the cost of equity shares of company X:

(i) Current market price of a share = Rs 150.

(ii) Cost of floatation per share on new shares, Rs 3.

(iii) Dividend paid on the outstanding shares over the past five years:

Year	*Dividend per share*
1	Rs 10.50
2	11.02
3	11.58
4	12.16
5	12.76
6	13.40

(iv) Assume a fixed dividend pay out ratio.

(v) Expected dividend on the new shares at the end of the current year is Rs 14.10 per share.

Solution

As a first step, we have to estimate the growth rate in dividends. Using the compound interest table (Table A-1), the annual growth rate of dividends would be approximately 5 per cent. (During the five years the dividends have increased from Rs 10.50 to Rs 13.40, giving a compound factor of 1.276, that is, Rs 13.40/Rs 10.50. The sum of Re 1 would accumulate to Rs 1.276 in five years @ 5 per cent interest).

$$k_e = \frac{\text{Rs } 14.10}{\text{Rs } 147\ (\text{Rs } 150 - \text{Rs } 3)} + 5\% = 14.6 \text{ per cent}$$

Example 7.9

Z Ltd is foreseeing a growth rate of 12 per cent per annum in the next 2 years. The growth rate is likely to fall to 10 per cent for the third year and the fourth year. After that, the growth rate is expected to stabilise at 8 per cent per annum. If the last dividend was Rs 1.50 per share and the investors' required rate of return is 16 per cent, find out the intrinsic value per share of Z Ltd as of date.

Solution

Intrinsic value of *Z* Ltd = the sum of: (i) *PV* of dividends payments during 1-4 years and (ii) *PV* of expected market price at the end of the fourth year based on a constant growth of 8 per cent.

Present value of dividends, year 1-4

Years	*Dividend*	*PVIF (0.16)*	*Total PV*
1	Rs 1.68	0.862	Rs 1.45
2	1.88	0.743	1.40
3	2.07	0.641	1.33
4	2.28	0.552	1.26
			5.44

$$P_4 = D_5/(k_e - g) = \frac{\text{Rs } 2.28\ (1.08)}{16\% - 8\%} = \text{Rs } 30.78$$

PV of Rs 30.78 = Rs 30.78 × 0.552 = Rs 16.99

Intrinsic value of share = Rs 5.44 + Rs 16.99 = Rs 22.43

Capital Asset Pricing Model Approach Another technique that can be used to estimate the cost of equity is the capital asset pricing model (CAPM) approach. We first discuss the CAPM.[19] As an approach to measure the cost of equity capital, it is described subsequently.

The CAPM explains the behaviour of security prices and provides a mechanism whereby investors could assess the impact of proposed security investment on their overall portfolio risk and return. In other words, it formally describes the risk-return trade-off for securities. It is based on certain assumptions. The basic assumptions of CAPM are related to **(a)** the efficiency of the security markets and **(b)** investor preferences.

The efficient market assumption implies that **(i)** all investors have common (homogeneous) expectations regarding the expected returns, variances and correlation of returns among all securities; **(ii)** all investors have the same information about securities; **(iii)** there are no restrictions on investments; **(iv)** there are no taxes; **(v)** there are no transaction costs; and **(vi)** no single investor can affect market price significantly.

Diversifiable/ unsystematic risk is the portion of a security's risk that is attributable to firm-specific random causes; can be eliminated through diversification.

The implication of investors' preference assumption is that all investors prefer the security that provides the highest return for a given level of risk or the lowest amount of risk for a given level of return, that is, the investors are risk averse.

The risk to which security investment is exposed falls into two groups: **(i) diversifiable**/unsystematic, and **(ii)** non-diversifiable/systematic. The first represents that portion of the total risk of an investment that can be eliminated/minimised through diversification. The events/factors that cause such risks vary from firm to firm. The sources of such risks include management capabilities and decisions, strikes, unique government regulations, availability or otherwise of raw materials, competition, level of operating and financial leverage of the firm, and so on.

Non-diversifiable risk is the relevant portion of a security's risk that is attributable to market factors that affect all firms; cannot be eliminated through diversification.

The systematic/**non-diversifiable risk** is attributable to factors that affect all firms. Illustrative sources of such risks are interest rate changes, inflation or purchasing power change, changes in investor expectations about the overall performance of the economy and political changes, and so on. As unsystematic risk can be eliminated by an investor through diversification,

the systematic risk is the only relevant risk. Therefore, an investor (firm) should be concerned, according to CAPM, solely with the non-diversifiable (systematic) risk.

Systematic risk can be measured in relation to the risk of a diversified portfolio which is commonly referred to as the **market portfolio** or **the market**. According to CAPM, the non-diversifiable risk of an investment/ security/ asset is assessed in terms of the *beta* coefficient. *Beta* is a measure of the volatility of a security's return relative to the returns of a broad-based market portfolio. Alternatively, it is an index of the degree of responsiveness or *co-movement* of return on an investment with the market return. The beta for the market portfolio as measured by the broad-based market index equals one. Beta coefficient of 1 would imply that the risk of the specified security is equal to the market; the interpretation of zero coefficient is that there is no market-related risk to the investment. A negative coefficient would indicate a relationship in the opposite direction. The 'going' required rate of return in the market for a given amount of systematic risk is called the Security Market Line (SML).

Capital asset pricing model (CAPM) describes the relationship between the required return or cost of equity capital and the non-diversifiable risk of a firm measured by beta coefficient, *b*.

With reference to the cost of capital perspective, the **CAPM** describes the relationship between the required rate of return, or the cost of equity capital, and the non-diversifiable or relevant risk, of the firm as reflected in its index of non-diversifiable risk, that is, beta. Symbolically,

$$K_e = R_f + b\,(K_m - R_f) \qquad \textbf{(7.14)}$$

Where K_e = cost of equity capital
R_f = the rate of return required on a risk-free asset/security/investment
K_m = the required rate of return on the market portfolio of assets that can be viewed as the average rate of return on all assets.
b = the beta coefficient

The computation of the cost of equity capital using the CAPM approach is shown in Example 7.10.

Example 7.10

The Hypothetical Ltd wishes to calculate its cost of equity capital using the capital asset pricing model approach. From the information provided to the firm by its investment advisors along with the firms' own analysis, it is found that the risk-free rate of return equals 10 per cent; the firm's beta equals 1.50 and the return on the market portfolio equals 12.5 per cent. Compute the cost of equity capital.

Solution

Substituting the values in Eq. 7.14

$$K_e = 10\% + [1.5 \times (12.5\% - 10\%)] = 13.75 \text{ per cent}$$

Example 7.11

As an investment manager you are given the following information

	Investment in equity shares of	*Initial price*	*Dividends*	*Year-end market price*	*Beta risk factor*
A	Cement Ltd	Rs 25	Rs 2	Rs 50	0.80
	Steel Ltd	35	2	60	0.70
	Liquor Ltd	45	2	135	0.50
B	Government of India Bonds	1,000	140	1,005	0.99
	Risk-free return, 8 per cent				

You are required to calculate (i) expected rate of returns of market portfolio, and (ii) expected return in each security, using capital asset pricing model.

Solution

(i) Expected Returns on Market Portfolio

	Security	Return: Dividends	Return: Capital appreciation	Return: Total	Investment
A	Cement Ltd	Rs 2	Rs 25	Rs 27	Rs 25
	Steel Ltd	2	25	27	35
	Liquor Ltd	2	90	92	45
B	Government of India Bonds	140	5	145	1,000
		146	145	291	1,105

Rate of return (expected) on market portfolio = Rs 291/Rs 1,105 = 26.33 per cent

(ii) Expected Returns on Individual Security (in per cent)

$k_e = R_f + b(km - R_f)$	
Cement Ltd = 8% + 0.8 (26.33% − 8%)	22.66
Steel Ltd = 8% + 0.7 (26.33% − 8%)	20.83
Liquor Ltd = 8% + 0.5 (26.33% − 8%)	17.16
Government of India Bonds = 8% + 0.99 (26.33% − 8%)	26.15

The capital assets pricing model (CAPM) approach to calculate the cost of equity capital is different from the dividend valuation approach in some respects. In the first place, the CAPM approach directly considers the risk as reflected in beta in order to determine the K_e. The valuation model does not consider the risk; it rather uses the market price as a reflection of the expected risk-return preference of investors in the market. Secondly, the dividend model can be adjusted for flotation cost to estimate the cost of the new equity shares. The CAPM approach is incapable of such adjustment as the model does not include the market price which has to be adjusted. However, its big virtue is that it can be used to determine cost of equity for corporates which either do not pay dividends or are not subject to steady growth rate.

Both the dividend and CAPM approaches are theoretically sound. But major problems are encountered in the practical application of the CAPM approach in collecting data—which may not be readily available or in a country like India may be altogether absent—regarding expected future returns, the most appropriate estimate of the risk-free rate and the best estimates of the security's *beta*. Moreover, beta measure of risk considers only the systematic risk. Poorly diversified investors may be more interested in total risk rather than in systematic risk only. In such cases the CAPM may tend to underestimate the required rate of such investor. For these reasons, the use of the dividend approach would appear to be more appropriate to measure the cost of equity capital.

In brief, various methods of estimating k_e are most likely to provide different amounts because each method relies on different assumptions. There are two ways to deal with the situation: **(1)** Each estimate of k_e should be looked at to ascertain that its value is neither too high nor too low. It should intuitively appear to be reasonable; **(2)** Average the various estimates of k_e.[20]

Cost of Retained Earnings

Retained earnings, as a source of finance for investment proposals, differ from other sources like debt, preference shares and equities. The use of debt is associated with a contractual obligation to pay a fixed rate of interest to the suppliers of funds and, often, repayment of

principal at some predetermined date. An almost similar kind of stipulation applies to the use of preference shares also. In the case of ordinary shares, although there is no provision for any predetermined payment to the shareholders, yet a certain expected rate of dividend provides a starting point for the computation of cost of equity capital. That retained earnings do not involve any formal arrangement to become a source of funds is obvious. In other words, there is no obligation, formal or implied, on a firm to pay a return on retained earnings. Apparently, retained earnings may appear to carry no cost since they represent funds which have not been raised from outside. The contention that retained earnings are free of cost, however, is not correct. On the contrary, they do involve cost like any other source.

It is true that a firm is not obliged to pay a return (dividend or interest) on retained earnings. But retention of earnings does have implications for the shareholders of the firm. If earnings were not retained, they would have been paid out to the ordinary shareholders as dividends. In other words, retention of earnings implies withholding of dividends from holders of ordinary shares. When earnings are, thus, retained, shareholders are forced to forego dividends. The dividends foregone by the equity-holders are, in fact, an opportunity cost. Thus, retained earnings involve opportunity cost. In other words, the firm is implicitly required to earn on the retained earnings at least equal to the rate that would have been earned by the shareholders if they were distributed to them. This is the cost of retained earnings. Therefore, the cost of retained earnings may be defined as *opportunity cost in terms of dividends foregone by/withheld from the equity shareholders*.

The alternative use of retained earnings is based on 'external-yield criterion'.[21] According to this approach, the alternative to retained earnings is external investment of funds by the firm itself. In other words the opportunity cost of retention of earnings is the rate of return that could be earned by investing the funds in another enterprise by the firm instead of what would be obtained by the shareholders on other investments. The firm should estimate the yield it can earn from external investment opportunities by investing its retained earnings there. While doing so, the firm should bear in mind that it selects such investment opportunities as have the same degree of risk as that of the firm itself. The rate of return that could be thus earned constitutes the opportunity cost of retained earnings. Such a return would give the cost of retained earnings, k_r. The k_r under the assumption of external-yield criterion would be approximately k_e. The merits of this approach are obvious. The k_r here is simply the return on direct investment by the firm itself. Since the investments of funds are assumed to be made by the firm itself, the return would not be affected by the tax brackets in which the various shareholders of the firm are. The approach, in other words, can be consistently applied. The external-yield criterion, therefore, represents an economically justifiable opportunity cost.

Cost of retained earnings is the same as the cost of an equivalent fully subscribed issue of additional shares, which is measured by the cost of equity capital.

In brief, the **cost of retained earnings** represents an opportunity cost in terms of the return on their investment in another enterprise by the firm whose cost of retained earnings is being considered. The opportunity cost given by the external-yield criterion which can be consistently applied can be said to measure the k_r, which is likely to be equal to the k_e. Therefore, k_e should be used as k_r but the latter would be lower than the former due to differences in flotation cost and due to dividend payment tax.

SECTION 3 COMPUTATION OF OVERALL COST OF CAPITAL

The calculations of the cost of specific sources, namely, debt, preference shares, equity shares and retained earnings have been shown in the preceding discussions. In this section we

Weighted average cost of capital is the expected average future cost of funds over the long run found by weighting the cost of each specific type of capital by its proportion in the firm's capital structure.

propose to dwell on the computation of the overall cost of capital. The term cost of capital means the overall composite cost of capital defined *as* **weighted average** *of the cost of each specific type of fund.* The use of *weighted* average and not the *simple* average is warranted by the fact that the proportions of various sources of funds in the capital structure of a firm are different. To be representative, therefore, the overall cost of capital should take into account the relative proportions of different sources and hence the *weighted* average.

The computation of the overall cost of capital (represented symbolically by k_o) involves the following steps:

1. Assigning weights to specific costs.
2. Multiplying the cost of each of the sources by the appropriate weights.
3. Dividing the total weighted cost by the total weights.

The crucial part of the exercise is the decision regarding appropriate weights and the related aspects. We first illustrate the relevant aspects of the choice of the weights. This is followed by the mechanics of computation of k_0 which is relatively simple.

Assignment of Weights

The aspects relevant to the selection of appropriate weights are **(i)** Historical weights versus Marginal weights; **(ii)** Historical weights can be—(a) Book value weights or (b) Market value weights.

Historical versus Marginal Weights The first aspect of the decision regarding the selection of appropriate weights for computing the overall cost of capital is: which system of weighting—marginal or historical—is preferable? The critical assumption in any weighting system is that *the firm will raise capital in the specified proportions.*

Marginal weights use proportion of each type of capital to the total capital to be raised.

Marginal Weights The use of **marginal weights** involves weighting the specific costs by the proportion of each type of fund to the total funds to be raised. The marginal weights represent the percentage share of different financing sources the firm intends to raise/employ. The basis of assigning relative weights is, therefore, new/additional/incremental issue of funds and, hence, marginal weights.

In using marginal weights, we are concerned with the actual amounts of each type of financing used in raising additional funds to finance new projects by the company. In fact, the use of marginal weights is more attuned to the actual process of financing projects. Another merit of marginal weights is that their use also reflects the fact that the firm does not have a great deal of control over the amount of financing obtained through retained earnings or other sources which are influenced by several factors, such as, temper of the market, investors' preference and so on.

What is the relative suitability of marginal weights to compute the overall cost of capital? The composite cost of capital is computed, it would be recalled, to be used as an investment criterion. The capital budgeting decision is concerned with the selection of new investment proposals. As already mentioned, the cost of capital, conceptually speaking, which is relevant is the cost of the new capital to be raised to finance the current capital expenditure decision, that is, marginal cost. It is, therefore, argued that the weights must correspond to the proportions of financing inputs the firm intends to employ, that is, the combined cost of capital

should be calculated by employing marginal weights. If marginal weights are not used, the implication is that new capital is raised in proportions other than those used to calculate this cost. As a result,[22] the real overall cost of capital will be different from that calculated and used for asset-selection decision. There is obviously a bias in the exercise. If the real cost is more than the calculated one, certain investment proposals will be accepted that will have the effect of leaving the investor worse off than before because the potential profitability has been overestimated. On the other hand, if the real cost is less than the measured cost, projects that could increase the shareholders' wealth would be rejected. Finally, the problem of choosing between book-value weights and market value weights does not arise in the case of marginal weights.

However, the marginal weighting system suffers from serious limitations. One major criticism[23] of the use of marginal weights is that this approach does not consider the long-term implications of the firm's current financing. Since capital expenditure decisions are long-term investments of the firm, attention should be given to the long-term implications of any financing strategy. Using cheaper sources of funds to finance a given project may place the firm in a position where more expensive equity financing will have to be raised to finance a future project. For example, a firm may be able to sell debt at an after-tax cost of 9 per cent. If the best investment project has currently available returns of 10 per cent and the weighted average cost of capital based on marginal weights is used as a decision criterion, the project will be accepted. If next year, the firm must raise equity at a cost of 16 per cent, it will have to reject a project, returning 15 per cent. Thus, **the fact that today's financing affects tomorrow's cost is not considered in using marginal weights**.[24] In other words, the interrelationship among the various methods of financing is ignored if marginal weights are used to calculate the cost of capital.

Historical Weights The alternative to the use of marginal weights is to use **historical weights**. Here, the relative proportions of various sources to the existing capital structure are used to assign weights. In other words, the basis of the weighting system is the funds already employed by the firm. The use of the historical weights is based on the assumption that the firm's existing capital structure is optimal and, therefore, should be maintained in the future. That is, the firm should raise additional funds for financing investments in the same proportion as they are in the existing capital structure. In other words, the existing proportion of various sources of long-term funds will be followed whenever the firm raises additional long-term funds to finance new investment projects. For instance, if the present capital structure of firm has 30 per cent debts, 20 per cent preference shares, 40 per cent equity capital and 10 per cent retained earnings, the company will be assumed to raise incremental funds in the same proportion as it has done in the past. Assume further, that the firm requires additional funds amounting to Rs 1,00,000 to finance a new project. It should be expected, according to the historical weighting system, to raise this sum from different sources in the proportion of 30 per cent (debt), 20 per cent (preference shares), 40 per cent (ordinary shares) and 10 per cent (retained earnings). The break-up of the amount source-wise would be: debt, Rs 30,000; preference capital, Rs 20,000; equity capital, Rs 40,000 and retained earnings, Rs 10,000.

Historic weights are based on actual capital structure proportion to calculate weights.

The problem with historical weighting is that the validity of the assumptions on which it is based is open to question. That firms should raise additional funds from different sources in the same proportion in which they are in the existing capital structure implies that there are no constraints on raising funds from these sources. This is not correct. For instance, the amount of retained earnings may actually fall short of its required share in financing new projects

because firms cannot have control over the retained earnings. Similarly, raising funds from the capital market depends on several factors such as the state of the economy, requirements of investors, temper of the market and so on, over which the firms have obviously no control. There are, thus, practical difficulties in applying historical weights. Yet another problem with the application of the historical weights is that a choice has to be made between the book value weights and market value weights.

As against the above limitations, the system of assigning weights on the basis of the existing capital structure has one outstanding merit. As a decision criterion, the weighted cost of capital based on historical weights takes into account a long-term view. If the cost thus calculated is 12 per cent, using it as a decision-criterion for capital budgeting decision, a project returning 13 per cent next year will be accepted. While it is true that firms actually raise funds in lump sum amounts from one or two sources at a time instead of all the available sources, the use of historical weights to calculate the overall weighted average cost of capital is more consistent with the firm's long-term goal of maximising the owner's wealth. Therefore, the use of historical weights is much more likely to lead to an optimal selection of capital investment projects in the long run.[25] It is probably for this reason that historical weights are commonly used to calculate the weighted cost of capital, and are treated as superior to marginal weights, which, as already indicated, ignore the long-term implications of the firm's current financing.

Market value weights use market values to measure the proportion of each type of capital to calculate weighted average cost of capital.

Book value weights use accounting (book) values to measure the proportion of each type of capital to calculate the weighted average cost of capital.

Book Value and Market Value Weights The second aspect of assigning weights to various sources of finance in calculating the composite cost of capital relates to the choice between book value weights and market value weights. This problem will arise only in the case of historical weights.

Both these methods have their own merits. In theory, the use of **market value weights** for calculating the cost of capital is more appealing than the use of book value weights because: **(i)** market values of securities closely approximate the actual amount to be received from their sale; **(ii)** the costs of the specific sources of finance which constitute the capital structure of the firm are calculated using prevailing market prices. However, there are practical difficulties in its use as calculating the market value of securities may present difficulties, particularly the market values of retained earnings. Moreover, weights based on market values are likely to fluctuate widely.

On the other hand, the merits of **book value weights** are operational in nature. For one thing, book values are readily available from the published records of the firm. Also, firms set their capital structure targets in terms of book values rather than market values. Finally, the analysis of capital structure in terms of debt-equity ratio is based on book value.

In brief, the alternatives—book values and market values of securities—have their own commendable features. While the book value is operationally convenient, the market value basis is theoretically consistent and sound, and therefore a better indicator of a firm's true capital structure.

Mechanics of Computation

Example 7.12 (Book Value Weights)

We now illustrate the mechanics of computation of the weighted average cost of capital.

(a) A firm's after-tax cost of capital of the specific sources is as follows:

Cost of debt	8	per cent
Cost of preference shares (including dividend tax)	14	
Cost of equity funds	17	

(b) The following is the capital structure:

Source	*Amount*
Debt	Rs 3,00,000
Preference capital	2,00,000
Equity capital	5,00,000
	10,00,000

(c) Calculate the weighted average cost of capital, k_0, using book value weights.

Solution

TABLE 7.1 Computation of Weighted Average Cost of Capital (Book Value Weights)

Source of funds	*Amount*	*Proportion*		*Cost (%)*	*Weighted cost (3 × 4)*
(1)	*(2)*	*(3)*		*(4)*	*(5)*
Debt	Rs 3,00,000	0.3	(30)	0.08	0.024
Preference capital	2,00,000	0.2	(20)	0.14	0.028
Equity capital	5,00,000	0.5	(50)	0.17	0.085
	10,00,000	1.00	(100)		0.137
Weighted average cost of capital = 13.7 per cent					

An alternative method of determining the k_0 is to compute, as shown in Table 7.2, the total cost of capital and then divide this figure by the total capital. This procedure obviously avoids fractional calculations.

TABLE 7.2 Computation of Weighted Average Cost of Capital (Alternative Method)

Sources	*Amount*	*Cost (%)*	*Total cost (2 × 3)*
(1)	*(2)*	*(3)*	*(4)*
Debt	Rs 3,00,000	8	Rs 24,000
Preference capital	2,00,000	14	28,000
Equity capital	5,00,000	17	85,000
Total	10,00,000		1,37,000

Weighted average cost of capital $= \dfrac{\text{Rs } 1,37,000}{\text{Rs } 10,00,000} \times 100 = 13.7$ per cent

Example 7.13 (Market Value Weights)

From the information contained in Example 7.12, calculate the weighted average cost of capital, assuming that the market values of different sources of funds are as follows:

Source	*Market value*
Debt	Rs 2,70,000
Preference shares	2,30,000
Equity and retained earnings	7,50,000
Total	12,50,000

Solution

(1) The determination of the market value of retained earnings presents operational difficulties. The market value of retained earnings can be indirectly estimated. A possible criterion has been suggested by Gitman,[26] according to which, since retained earnings are treated as equity capital for purpose of calculation of cost of specific source of funds, the market value of the ordinary shares may be taken to

represent the combined market value of equity shares and retained earnings. The separate market values of retained earnings and ordinary shares may be found by allocating to each of these a percentage of the total market value equal to their percentage share of the total based on book values.

On the basis of the foregoing criterion, the sum of Rs 7,50,000 in Example 7.13 is allocated between equity capital and retained earnings as follows:

Source of funds	*Book value*	*Per cent of book value*	*Market value*
(1)	*(2)*	*(3)*	*(4)*
Equity shares	Rs 4,00,000	80	Rs 6,00,000*
Retained earnings	1,00,000	20	1,50,000**

*(0.8 × Rs 7,50,000)
**(0.20 × Rs 7,50,000)

(2) After the determination of market value, k_0 is calculated as shown in Table 7.3.

TABLE 7.3 Computation of Weighted Average Cost of Capital (Market Value Weights)

Sources	*Market value*	*Cost (per cent)*	*Total cost (3 × 2)*
(1)	*(2)*	*(3)*	*(4)*
Debt	Rs 2,70,000	8	Rs 21,600
Preference shares	2,30,000	14	32,200
Equity capital	6,00,000	17	1,02,000
Retained earnings	1,50,000	17	25,500
Total	12,50,000		1,81,300

k_0 = (Rs 1,81,300/Rs 12,50,000) × 100 = 14.5 per cent

One notable point that emerges from the computation of the weighted average cost of capital based respectively on book value weights and market value weights is that the k_0 with market value weights is higher. This is mainly due to the fact that equity shares have market values considerably greater than their book values. Since these sources of long-term funds have higher specific costs, the overall cost increases.

In operational terms, if book value weighted average cost of capital is used, some projects would be accepted that would not be acceptable based on the market value approach. The results given by the market value based weights are obviously better as a decision criterion.

***Example* 7.14 (Marginal Weights)** The firm of Example 7.12 wishes to raise Rs 5,00,000 for expansion of its plant. It estimates that Rs 1,00,000 will be available as retained earnings and the balance of the additional funds will be raised as follows:

Long-term debt	Rs 3,00,000
Preference shares	1,00,000

Using marginal weights, compute the weighted average cost of capital.

Solution The computation is illustrated in Table 7.4.

TABLE 7.4 Weighted Average Cost of Capital (Marginal Weights)

Sources of funds	*Amount*	*Proportion*	*Cost (%)*	*Total cost (2 × 4)*
(1)	*(2)*	*(3)*	*(4)*	*(5)*
Debt	Rs 3,00,000	0.60 (60)	8	Rs 24,000

(*Contd.*)

(*Contd.*)

Preference shares	1,00,000	0.20	(20)	14	14,000
Retained earnings	1,00,000	0.20	(20)	17	17,000
	5,00,000	1.00	(100)		55,000

Weighted average cost of capital = (Rs 55,000/Rs 5,00,000) × 100 = 11 per cent

This cost is substantially lower than the weighted cost calculated using either book values or market values of historical weights. This is because debt finance has been used in large amount. Since only a limited amount of debt financing can be raised for a given equity base, it is quite likely that the firm will have to use primarily expensive equity financing for future projects. Obviously, this is not a happy situation because a project which gives a return of, say, 12 per cent this year will be accepted as the k_0 is only 11 per cent but next year another project which may give a higher return might have to be rejected because equity financing will imply/entail a higher k_0. The use of historical market value weights in calculating k_0 is much more likely to lead to an optimal selection of capital investment projects in the long run and, therefore, it should be preferred as the basis of assigning weights to calculate the composite cost of capital.

Summary

- The cost of capital is an integral part of investment decisions as it is used to measure the worth of investment proposal. It is used as a discount rate in determining the present value of future cash flows associated with capital projects. Conceptually, it is the minimum rate of return that a firm must earn on its investments so as to leave market price of its shares unchanged. It is also referred to as cut-off rate, target rate, hurdle rate, required rate of return and so on.
- In operational terms, it is defined as the weighted average cost of capital (k_0) of all long-term sources of finance. The major long-term sources of funds are (i) debt, (ii) preference shares, (iii) equity capital, and (iv) retained earnings. Thus, it comprises of several components in terms of specific cost of each source of finance. When these specific costs are combined, it results in the weighted average cost of capital.
- The cost of capital can be explicit or implicit. The explicit cost of capital is associated with the raising of funds (from debt, preference shares and equity). The explicit cost of any source of capital (C) is the discount rate that equates the present value of the cash inflows (CI_o) that are incremental to the taking of financing opportunity with the present value of its incremental cash outflows (CO_t). Symbolically, $CI_o = \sum_{t=1}^{n} \frac{CO_t}{(1+C)^t}$

  Its determination is similar to the determination of the internal rate of return (IRR). It is the internal rate of return that the firm pays to procure financing.
- Retained earnings involve no future cash flows to, or from, the firm. Therefore, the retained earnings do not have explicit cost. However, they carry implicit cost in terms of the opportunity cost of the foregone alternative (s) in terms of the rate of return at which the shareholders could have invested these funds had they been distributed to them/or not retained by the firm.
- There are four types of specific costs, namely, cost of debt (k_d), cost of preference shares (k_p), cost of equity capital (k_e) and cost of retained earnings (k_r).

- The debt carries a certain rate of interest. Interest qualifies for tax deduction in determining tax liability. Therefore, the effective cost of debt is less than the actual interest payment made by the firm by the amount of tax shield it provides. The debt can be either perpetual or redeemable.
- In the case of perpetual debt, it is computed dividing effective interest payment, i.e., $I(1-t)$ by the amount of debt/sale proceeds of debentures or bonds (SV). Symbolically, $K_d = \frac{I(1-t)}{SV}$
- In the case of redeemable debt, the repayment of debt principal (COP) either in instalments or in lump sum (besides interest, COI) is also taken into account. k_d is computed based on the following equations:

$$CI_0 = \sum_{t=1}^{n} \frac{COI_t}{(1+k_d)^t}(1-t) + \frac{COP_n}{(1+k_d)^n}$$ (When principal is paid in lump sum)

Alternatively, $K_d = \frac{I(1-t) + (\text{Redeemable value}, RV - SV/N)}{(RV+SV)/2}$

$$CI_0 = \sum_{t=1}^{n} \frac{COI_t}{(1+k_d)^t}(1-t) + \frac{COP_t}{(1+k_d)^t}$$ (When debt is paid in instalments)

- The cost of debt is generally the lowest among all sources partly because the risk involved is low but mainly because interest paid on debt is tax deductible.
- The cost of preference share (k_p) is akin to k_d. However, unlike interest payment on debt, dividend payable on preference shares is not tax deductible from the point of view assessing tax liability. On the contrary, tax (Dt) may be required to be paid on the payment of preference dividend.
- The k_p in the case of irredeemable preference shares is based on dividends payable on them and the sale proceeds obtained by issuing such preference shares, $P_0(1-f)$. In terms of equation:

$$K_p = \frac{D_p(1+Dt)}{P_0(1-f)}$$

- The k_p for redeemable preference shares requiring lump sum repayment (P) is determined on the basis of the following equation:

$$P_0(1-f) = \sum_{t=1}^{n} \frac{D_p(1+Dt)}{(1+k_p)^t} + \frac{P_n}{(1+k_p)^n}$$

In the case of repayment required in instalments:

$$P_0(1-f) = \sum_{t=1}^{n} \frac{D_p(1+Dt)}{(1+k_p)^t} + \frac{P_t}{(1+k_p)^t}$$

- The computation of cost of equity capital (k_e) is conceptually more difficult as the return to the equity-holders solely depends upon the discretion of the company management. It is defined as the minimum rate of return that a corporate must earn on the equity-financed portion of an investment project in order to leave unchanged the market price of the shares.
- There are two approaches to measure k_e: (i) the dividend valuation model approach and (ii) capital asset pricing model (CAPM) approach.

As per the dividend approach, k_e is defined as the discount rate that equates the present value of all expected future dividends per share with the net proceeds of the sale (or the current market price) of a share. In equation terms,

$$P_0 (1 - f) = \sum_{t=1}^{n} \frac{D_1(1+g)^{t-1}}{(1+k_e)^t} \quad \text{Or,} \quad k_e = \frac{D_1}{P_0(1-f)} + g$$

- The CAPM describes the relationship between the required rate of return or the cost of equity capital and the non-diversifiable or relevant risk of the firm as reflected in its index of non-diversifiable risk, that is, beta. Symbolically,

  $K_e = R_f + b(K_m - R_f)$,

  R_f = Required rate of return on risk-free investment
  b = Beta coefficient**, and
  K_m = Required rate of return on market portfolio, that is, the average rate or return on all assets

  $$** = \frac{\sum MJ - N\overline{M}\,\overline{J}}{\sum M^2 - (N\overline{M})^2}, \text{where}$$

  M = Excess in market return over risk-free rate,
  J = Excess in security returns over risk-free rate,
  MJ = Cross product of M and J and
  N = Number of years
- The cost of retained earning (k_r) is equally difficult to calculate in theoretical terms. Since retained earnings essentially involves use of funds, it is associated with an opportunity/implicit cost. The alternative to retained earnings is the investment of the funds by the firm itself in a homogeneous outside investment. Therefore, k_r is equal to k_e. However, it might be slightly lower than k_e in the case of new equity issue due to flotation costs.
- The measurement of the weighted average/overall cost of capital (k_0) involves the choice of appropriate weights. The two systems of assigning weights, namely, historical and marginal, have their own suitability but historical weights appear to be superior to marginal weights as the former take into account the long-term implications of the firm's current financing. With historical weights, a choice is to be made between book value and market value weights. While the book value weights are operationally convenient, the market value basis is theoretically consistent and sound, and therefore, a better indicator of firm's capital structure.
- The k_0 is computed based on the following equation:
  $K_0 = K_dW_d + K_pW_p + K_eW_e + K_rW_r$
  W_d = Percentage of debt to total capital,
  W_p = Percentage of preference shares to total capital,
  W_e = Percentage of external equity to total capital and
  W_r = Percentage of retained earnings to total capital

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2. Gitman, L J, *Principles of Managerial Finance*, Harper & Row, New York 1997, p 33.
3. Van Horne, J C, *op. cit.*, p 220.
4. Gitman, L J, *op. cit.*, p 339.
5. Porterfield, J T S, *op. cit.*, p 45.
6. *Ibid.* p 46.

7. *Ibid.* p 46-51.
8. *Ibid.* p 61.
9. *Ibid.*
10. This apart, there may be additional tax advantage on account of amortisation of flotation costs. For instance, Sec. 35D of the Indian Income Tax Act provides that the aggregate amount of qualifying expenditure under the head of preliminary expenses (of which flotation cost is only one part) is available for amortisation in 10 equal instalments over a period of 10 years, subject to the limit 2.5 per cent of the cost of the project or capital employed. To keep the discussion simple, we have ignored these adjustments. However, in practice, cost of capital should be calculated after providing for the tax benefits accruing out of amortisation of flotation costs.
11. Van Horne, *op. cit.*, p 93.
12. Brigham, E.F. and J.F. Houston, *op.cit*, p.365.
13. Brigham, E.F. and J.F. Houston, *Ibid*, p.365.
14. Ross, S.A., *op.cit.*, p.481.
15. *Ibid*, p 93.
16. Brigham, E.F. and J.F. Houston, *op.cit*, p.366.
17. Brigham, E.F. and J.F. Houston, *Ibid*, pp.366-7.
18. Ross, S.A. et al., *op.cit.*, p.483.
19. For a comprehensive account reference may be made to Moyer, R C, et al., Contemporary Financial Management, West Publishing Co., New York, 1984, pp 123-28.
20. For details refer to Ross, S.A., et al., *op.cit*, pp.490-91.
21. Suggested by Solomon, E, *op. cit.*, pp 53-55.
22. Van Horne, *op. cit.*, p 115.
23. Gitman, L J *op. cit.*, p 354.
24. *Ibid.*
25. *Ibid.*
26. *Ibid.* p 353.

Practical Problems

P.7.1 Calculate the explicit cost of debt for each of the following situations:
(a) Debentures are sold at par and flotation costs are 5 per cent.
(b) Debentures are sold at premium of 10 per cent and flotation costs are 5 per cent of issue price.
(c) Debentures are sold at discount of 5 per cent and flotation costs are 5 per cent of issue price.
Assume: **(i)** coupon rate of interest on debenturs is 10 per cent; **(ii)** face value of debentures is Rs 100; **(iii)** maturity period is 10 years; and **(iv)** tax rate is 35 per cent.

*S*olution

(a) $$k_d = \frac{I\,(1-t) + (RV - SV)/N}{(RV + SV)/2} = \frac{\text{Rs } 10(1 - 0.35) + (\text{Rs } 100 - \text{Rs } 95)/10}{(\text{Rs } 100 + 95)/2} = 7.18 \text{ per cent}$$

Alternatively, $$CI_o = \sum_{t=1}^{n} \frac{COI_t}{(1 + k_d)^t} + \frac{COP_n}{(1 + k_d)^n}$$

$$\text{Rs } 95 = \sum_{t=1}^{10} \frac{\text{Rs } 10\,(1 - 0.35)}{(1 + k_d)^t} + \frac{\text{Rs } 100}{(1 + k_d)^{10}}$$

Year	*CO*	*PVIFA at*		*Total PV at*	
		7%	*8%*	*7%*	*8%*
1-10	Rs 6.5	7.024	6.710	Rs 45.66	Rs 43.61
10	100	0.508	0.463	50.80	46.30
				96.46	89.91

By interpolation, k_d= 7% + (Rs 1.46/6.55 = 0.22) = 7.22 per cent

(b) $$k_d = \frac{\text{Rs } 6.5 + (\text{Rs } 100 - \text{Rs } 104.50)/10}{(\text{Rs } 100 + 104.50)/2} = 5.92 \text{ per cent}$$

Alternatively, $$\text{Rs } 104.50 = \sum_{t=1}^{n} \frac{\text{Rs } 6.5}{(1 + k_d)^t} + \frac{\text{Rs } 100}{(1 + k_d)^{10}}$$

Year	*CO*	*PVIFA at*		*Total PV at*	
		5%	*6%*	*5%*	*6%*
1-10	Rs 6.5	7.722	7.360	Rs 50.19	Rs 47.84
10	100	0.614	0.558	61.40	55.80
				111.59	103.64

By interpolation, k_d = 6% – (Rs 0.86/7.95 = 0.11) = 5.89 per cent

(c) $$k_d = \frac{\text{Rs } 6.5 + (\text{Rs } 100 - \text{Rs } 90.25)/10}{(\text{Rs } 100 + 90.25)/2} = 7.86 \text{ per cent}$$

Alternatively, $$\text{Rs } 90.25 = \sum_{t=1}^{10} \frac{\text{Rs } 6.5}{(1 + k_d)^t} + \frac{\text{Rs } 100}{(1 + k_d)^{10}}$$

Year	*CO*	*PVIFA at*		*Total PV at*	
		7%	*8%*	*7%*	*8%*
1-10	Rs 6.5	7.024	6.710	Rs 45.66	Rs 43.61
10	100	0.508	0.463	50.80	46.30
				96.46	89.91

k_d = 8% – (Rs 0.34/6.55 = 0.05) = 7.95 per cent

P.7.2 Assume everything to be the same in P.7.1 (a) and (b) except that debentures are to be repaid in 10 equal annual instalments commencing from the year-end 1. Determine the cost of debt.

Solution

(i) $$\text{Rs } 95 = \sum_{t=1}^{10} \frac{COI_t + COP_t}{(1 + k_d)^t}$$

Year	*Cash outflows*	*PVIFA at*		*Total PV at*	
		7%	*8%*	*7%*	*8%*
1	Rs 16.5[@]	0.935	0.926	Rs 15.43	Rs 15.28
2	15.85[@@]	0.873	0.857	13.84	13.58
3	15.20	0.816	0.794	12.40	12.07
4	14.55	0.763	0.735	11.10	10.69
5	13.90	0.713	0.681	9.91	9.47

(*Contd.*)

(*Contd.*)

6	13.25	0.666	0.630	8.82	8.35
7	12.60	0.623	0.583	7.85	7.35
8	11.95	0.582	0.540	6.95	6.45
9	11.30	0.544	0.500	6.15	5.65
10	10.65	0.508	0.463	5.41	4.93
				97.86	93.82

Cost of debt = 7% + (Rs 2.86/4.04 = 0.71) = 7.71 per cent

@Rs 100 ÷ 10 years = Rs 10 + Rs 10 interest (1 – 0.35) on Rs 100 = Rs 16.5

@@Rs 10 + Rs 9 interest (1 – 0.35) on Rs 90 = Rs 15.85

(ii) $\text{Rs } 104.50 = \sum_{t=1}^{10} \frac{COI_t + COP_t}{(1 + k_d)^t}$

Year	*Cash outflows*	*PVIFA at*		*Total PV at*	
		5%	*6%*	*5%*	*6%*
1	Rs 16.50	0.952	0.943	Rs 15.71	Rs 15.56
2	15.85	0.907	0.890	14.38	14.11
3	15.20	0.864	0.840	13.13	12.77
4	14.55	0.823	0.792	11.97	11.52
5	13.90	0.784	0.747	10.89	10.38
6	13.25	0.746	0.705	9.88	9.34
7	12.60	0.711	0.665	8.38	8.38
8	11.95	0.677	0.627	8.09	7.49
9	11.30	0.645	0.592	7.29	6.69
10	10.65	0.614	0.558	6.54	5.94
				106.26	102.18

k_d = 5% + (Rs 1.76/4.08 = 0.43) = 5.43 per cent

P.7.3 (a) A company's debentures of the face value of Rs 100 bear an 8 per cent coupon rate. Debentures of this type currently yield 10 per cent. What is the market price of debentures of the company?

(b) What would happen to the market price of the debentures if interest rises to **(i)** 16 per cent, and **(ii)** drops to 12 per cent?

(c) What would be the market price of the debentures in situation (a) if it is assumed that debentures were originally having a 15 year maturity period and the maturity period is 4 years away from now?

(d) Would you pay Rs 90 to purchase debentures specified in situation (c)? Explain.

Solution

(a) The market price of the debenture, $V_d = \frac{\text{Interest on debentures } (I)}{\text{Current interest rate } (k_i)} = \frac{\text{Rs } 8}{0.10} = \text{Rs } 80.$

(b) (i) $V_d = \frac{\text{Rs } 8}{0.16} = \text{Rs } 50$, (ii) $V_d = \frac{\text{Rs } 8}{0.12} = \text{Rs } 66.67$

(c) Determine the PV of **(i)** interest to be received on these debentures for a period of 4 years and **(ii)** principal repayment of Rs 100 at the end of the fourth year using the current interest rate, that is, 10 per cent as discount rate.

Year	*Cash outflows before taxes*	*PV factor at 10%*	*Total PV*
1-4	Rs 8	3.170 (Table A-4)	Rs 25.36
4	100	0.683 (Table A-3)	68.30
			93.66

The market price of the debentures = Rs 93.66.

(d) Yes, we would pay Rs 90 for the purchase of debentures because its current worth (Rs 93.66) is more than the purchase price.

P.7.4 XYZ company has debentures outstanding with 5 years left before maturity. The debentures are currently selling for Rs 90 (the face value is Rs 100). The debentures are to be redeemed at 5 per cent premium. The interest is paid annually at a rate of interest of 12 per cent. The firm's tax rate is 35 per cent. Calculate k_d, using both methods.

Solution

(i) $$k_d = \frac{I(1-t) + (\text{Redemption value} - \text{Market value}) \div 5}{(\text{Redemption value} + \text{Market value}) \div 2}$$

$$= \frac{\text{Rs } 12\,(1 - 0.35) + (\text{Rs } 105 - \text{Rs } 90) \div 5}{(\text{Rs } 105 + \text{Rs } 90) \div 2} \times 100 = 11.1 \text{ per cent}$$

(ii) $$\text{Rs } 90 = \sum_{t=1}^{5} \frac{\text{Rs } 12(1 - 0.35)}{(1 + k_d)^t} + \frac{\text{Rs } 105}{(1 + k_d)^5}$$

The value of k_d is to be determined by trial and error.

Determination of PV at 11% and 12% rates of interest

Year	*Cash outflows after taxes*	*PV factor at*		*Total PV at*	
		11%	*12%*	*11%*	*12%*
1-5	Rs 7.8	3.696	3.605	Rs 28.83	Rs 28.12
5	105	0.593	0.567	62.27	59.54
				91.10	87.66

By interpolation, the value of k_d would be 11% + (Rs 1.10/Rs 3.44 = 0.32) = 11.32 per cent

P.7.5 A company is considering raising Rs 100 lakh by one of the two alternative methods, viz. 14 per cent institutional term loan and 13 per cent non-convertible debentures. The term loan option would attract no major incidental cost. The debentures would have to be issued at a discount of 2.5 per cent and would involve Rs 1 lakh as cost of issue.

Advise the company as to the better option based on the effective cost of capital in each case. Assume a tax rate of 35 per cent.

Solution

(i) Cost of 14 per cent institutional term loan: Rs 14 lakh (1 – 0.35)/Rs 100 lakh = 9.1 per cent

(ii) Cost of 13 per cent non-convertible debentures: Rs 13 lakh (1 – 0.35)/Rs 96.50 lakh* = 8.76 per cent

(*Rs 100 lakhs – Rs 2.5 lakh discount – Rs 1 lakh cost of issue).

Recommendation Raising of funds through non-convertible debentures is a better option.

P.7.6 From the following information, determine the cost of equity capital using the CAPM approach.

(a) Required rate of return on risk-free security, 8 per cent.

(b) Required rate of return on market portfolio of investment is 13 per cent.

(c) The firm's beta is 1.6.

Solution $k_e = R_f + b(K_m - R_f)$

$= 0.08 + 1.6(0.13 - 0.08) = 16.0$ per cent

P.7.7 The beta coefficient of Target Ltd is 1.4. The company has been maintaining 8 per cent rate of growth in dividends and earnings. The last dividend paid was Rs 4 per share. The return on government securities is 10 per cent while the return on market portfolio is 15 per cent. The current market price of one share of Target Ltd. is Rs 36.

(a) What will be the equilibrium price per share of Target Ltd?

(b) Would you advise purchasing the share?

Solution

(a) The required rate of return $(k_e) = R_f + b(k_m - R_f) = 10\% + 1.4(15\% - 10\%) = 17$ per cent

$$\text{Equilibrium price per share } (P_o) = \frac{D_1}{k_e - g} = \frac{\text{Rs } 4\ (1.08)}{17\% - 8\%} = \text{Rs } 48$$

(b) The share of Target Ltd is worth buying as it is undervalued.

P.7.8 Consider the following figures pertainig to risk free rate, market rate and return rate of a security of A Ltd during the last 6 years.

Year	*Risk-free rate (R_f)*	*Market rate (R_m)*	*Security return (R_j)*
1	0.06	0.14	0.08
2	0.05	0.03	0.11
3	0.07	0.21	0.29
4	0.08	0.26	0.25
5	0.09	0.03	0.07
6	0.07	0.11	0.04

On the basis of the above information, you are required to determine the cost of equity capital in the context of CAPM. Past data may be taken as proxy for the future.

Solution

Determination of various required values under CAPM approach

Year	*Risk-free rate (R_f)*	*Market return (K_m)*	*Excess in market returns (M) [col.3 − col.2]*	*$(M)^2$*	*Security return (R_j)*	*Excess in security return (J) [col.6 − col.2]*	*Cross product (MJ) [col.4 × col.7]*
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*
1	0.06	0.14	0.08	0.0064	0.08	0.02	0.0016
2	0.05	0.03	(0.02)	0.0004	0.11	0.06	(0.0012)
3	0.07	0.21	0.14	0.0196	0.29	0.22	0.0308
4	0.08	0.26	0.18	0.0324	0.25	0.17	0.0306
5	0.09	0.03	(0.06)	0.0036	0.07	(0.02)	0.0012
6	0.07	0.11	0.04	0.0016	0.04	(0.03)	(0.0012)
Total	0.42	0.78	0.36	0.0640		0.42	0.0618
Average return	0.07	0.13	0.06	—		0.07	—

Figures in brackets represent negative returns.

$$b = \frac{\Sigma MJ - N\bar{M}\bar{J}}{\Sigma M^2 - N\bar{M}^2} = \frac{0.0618 - 6(0.06 \times 0.07)}{0.0640 - 6 \times (0.06)^2} = \frac{0.0366}{0.0424} = 0.863$$

$k_e = R_f + b(k_m - R_f) = 0.07 + 0.863\ (0.13 - 0.07) = 12.18$ per cent

P.7.9 Investors require a 12 per cent rate of return on equity shares of company Y. What would be the market price of the shares if the previous dividend (D_0) was Rs 2 and investors expect dividends to grow at a constant rate of (a) 4% (b) 0% (c) –4% (d) 11% (e) 12% and (f) 14%?

Solution

(a) $P_0 = \dfrac{\text{Rs } 2.08}{12\% - 4\%} = \text{Rs } 26$

(b) $= \dfrac{\text{Rs } 2.00}{12\%} = 16.67$

(c) $= \dfrac{\text{Rs } 1.92}{12\% - (-4\%)} = 12$

(d) $= \dfrac{\text{Rs } 2.22}{12\% - 11\%} = 222$

(e) $= \dfrac{\text{Rs } 2.24}{12\% - 12\%} =$ Undefined

(f) $= \dfrac{\text{Rs } 2.28}{12\% - 14\%} = (114)$, which is ridiculous (price cannot be negative).

The results in situation (e) and (f) show that the formula does not make sense if k_e is less than or equal to the growth rate.

P.7.10 An investor is contemplating the purchase of equity shares of a company which had paid a dividend of Rs 5 per share last year. The dividends are expected to grow at 6 per cent for ever. The required rate of return on the shares of this company in the capital market is 12 per cent. What will be the maximum price you will recommend the investor to pay for an equity share of the company? Will your answer be different if he wants to hold the equity share for 3 years and 6 years?

Solution

$$P_0 = \frac{\text{Rs } 5.30}{12\% - 6\%} = \text{Rs } 88.33$$

The maximum price we shall recommend the investor to pay for an equity share of the company is Rs 88.33.

The value of the share is not dependent upon the holding period. The value of the share would be the same whether he holds the share for 3 years or 6 years.

P.7.11 A mining company's iron ore reserves are being depleted, and its cost of recovering a declining quantity of iron ore are rising each year. As a consequence, the company's earnings and dividends are declining, at a rate of 8 per cent per year. If the previous year's dividend was Rs 10 and the required rate of return is 15 per cent, what would be the current price of the equity share of the company?

Solution

$$P_0 = \frac{\text{Rs } 9.20}{15\% + 8\%} = \text{Rs } 40$$

The current price of the equity shares of the mining company would be Rs 40.

P.7.12 A large sized chemical company has been expected to grow at 14 per cent per year for the next 4 years and then to grow indefinitely at the same rate as that of the national economy, that is, 5 per cent. The required rate of return on the equity shares is 12 per cent. Assume that the company paid a dividend of Rs 2 per share last year. Determine the market price of the shares today.

Solution The value of equity share = the sum of *PV* of dividend payments during years 1-4 and (ii) *PV* of expected market price at the end of year 4 based on growth rate of 5 per cent.

Year	$D_t = D_0\ (1 + g)^t$	*PV factor at 12%*	*Total PV*
1	Rs $2(1 + 0.14)^1$ = 2.28	0.893	Rs 2.036
2	$2(1 + 0.14)^2$ = 2.60	0.797	2.072
3	$2(1 + 0.14)^3$ = 2.96	0.712	2.108
4	$2(1 + 0.14)^4$ = 3.38	0.636	2.150
			8.37

$$P_4 = \frac{D_5}{(k_e - g_n)} = \frac{(\text{Rs } 3.38)(1 + 0.05)}{12\% - 5\%} = \text{Rs } 50.71$$

g_n = normal growth rate

PV of market price of the share at the end of year 4 = Rs 50.71 × *PV* factor at 12 per cent at the end of year 4 (0.636) = Rs 32.25.

$$P_0 = \text{Rs } 8.37 + \text{Rs } 32.25 = \text{Rs } 40.62$$

The market price of the share would be Rs 40.62.

P.7.13 Mr *X* an investor, purchases an equity share of a growing company, *Y* for Rs 210. He expects the company to pay dividends of Rs 10.5, Rs 11.025 and Rs 11.575 in years 1, 2 and 3, respectively. He expects to sell the shares at a price of Rs 243.10 at the end of 3 years.

(i) Determine the growth rate in dividend.
(ii) Calculate the current dividend yield
(iii) What is the required rate of return of Mr *X* on his equity investments?

Solution

(i) Growth rate in dividend = $D_1(1 + r)^n = D_n$, that is, Rs $10.50(1 + r)^2 = 11.575 = (1 + r)^2 = 11.575 \div 10.50 = 1.1024$ Table A-1 (compounded sum of Re 1) suggests that Re 1 compounds to Rs 1.102 in 2 years at the compound rate of 5 per cent. Therefore, growth rate in dividend is 5 per cent.

(ii) Current dividend yield (D_y) = Expected dividend/Current price = Rs 10.50/210 = 5 per cent

(iii) Required rate of return (K_e) = $(D_1/P_0) + g$, i.e., Rs 10.50/210 + 0.05 = 10 per cent

P.7.14 The Chemicals and Fertilisers Ltd. has been growing at a rate of 18 per cent per year in recent years. This abnormal growth rate is expected to continue for another 4 years; then it is likely to grow at the normal rate (g_n) of 6 per cent. The required rate of return on the shares by the investment community is 12 per cent, and the dividend paid per share last year was Rs 3 (D_0 = Rs 3). At what price, would you, as an investor, be ready to buy the shares of this company now ($t = 0$), and at the end of years 1, 2, 3 and 4, respectively? Will there be any extra advasntage by buying at $t = 0$, or in any of the subsequent four years, assuming all other things remain unchanged?

Solution

Year	$D_0(1 + g)^1 = D_t$	*PV factor (0.12)*	*Total PV*
1	Rs $3(1 + 0.18)^1$ = Rs 3.54	0.893	Rs 3.161
2	$3(1 + 0.18)^2$ = 4.176	0.797	3.328
3	$3(1 + 0.18)^3$ = 4.929	0.712	3.509
4	$3(1 + 0.18)^4$ = 5.817	0.636	3.700
Total PV of dividends			13.7

$$P_4 = D_5/(K_e - g) = D_4(1 + g_n)/0.06 = \text{Rs } 5.817(1.06)/0.06 = \text{Rs } 102.76.$$

PV of Rs 102.76 would be Rs 102.76 × 0.636 (PV factor at 0.12 for four years) = Rs 65.36

$$P_0 = \text{Rs } 65.36 + \text{Rs } 13.7 = \text{Rs } 79$$

I, as an investor, would be prepared to buy the shares of this company at a price less than Rs 79 at $t = 0$.

$$P_1 = \text{PVD}_2 + \text{PVD}_3 + \text{PVD}_4 + \text{PVP}_4$$

Year	*Dividends*	*PV factor (0.12)*	*Total PV*
2	D_2 = Rs 4.176	0.893	Rs 3.729
3	D_3 = 4.929	0.797	3.928
4	D_4 = 5.817	0.712	4.142
Total PV of dividends			11.80

PV of share at the end of year 1 would be: Rs 102.76 × 0.712 (PV factor for 3 years) = Rs 73.17.

$$P_1 = \text{Rs } 11.80 + \text{Rs } 73.17 = \text{Rs } 84.97$$

$$P_2 = \text{PVD}_3 + \text{PVD}_4 + \text{PVP}_4:$$

Year	*Dividends*	*PV factor (0.12)*	*Total PV*
3	D_3 = Rs 4.929	0.893	Rs 4.402
4	D_4 = 5.817	0.797	4.636
Total PV of dividends			9.04

PV of share at the end of year 1 would be = Rs 102.76 × 0.797 (*PV* factor for 2 years) = Rs 81.90.

$$P_2 = \text{Rs } 81.90 + \text{Rs } 9.04 = 90.94$$

$$P_3 = \text{PVD}_4 + \text{PVP}_4:$$

Year	*Cash flows*	*PV factor (0.12)*	*Total PV*
3	D_4 = Rs 5.817	0.893	Rs 5.195
4	P_4 = 102.76	0.893	91.764
	P_3 = 96.96		
	P_4 = 102.76		

There will be no extra advantage by buying shares in any of the subsequent 4 years.

P.7.15

(i) If current earning are Rs 2.76 a share, while 10 years earlier, they were Rs 2, what has been the rate of growth in earnings?

(ii) If a company is paying currently a dividend of Rs 6 per share, whereas 5 years before it was paying Rs 5 per share, what has been the rate of growth in dividends?

(iii) A company which is not subject to growth expects to pay dividend of Rs 12 per share for ever. Calculate the value of a share, assuming 10 per cent as the appropriate discount rate for such a company.

Solution

Case	*Growth (in years)*	*Compound factor*	*Rate of growth*
(i)	10	1.38*	Rs 1.344[1]
(ii)	5	1.20**	1.217[2]

*Rs 2.76/2; **Rs 6/5

[1]Nearest factor, 3 per cent; 2 Nearest factor, 4 per cent

The exact rates of growth would be 3.27 per cent and 3.71 per cent in case (i) and (ii) respectively.

(iii) $P = Cl_i$ = Dividend cash flows/Appropriate discount rate = Rs 12/0.10 = Rs 120

P.7.16 A company is contemplating an issue of new equity shares. The firm's equity shares are currently selling at Rs 125 a share. The historical pattern of dividend payments per share, for the last 5 years is given below:

Year	*Dividend*
1	Rs 10.70
2	11.45
3	12.25
4	13.11
5	14.03

The flotation costs are expected to be 3 per cent of the current selling price of the shares. You are required to determine the following:

(a) growth rate in dividends;

(b) cost of equity capital, assuming growth rate determined under situation (i) continues for ever;

(c) cost of new equity shares.

Solution

(a) Growth rate in dividends = $D_0(1 + r)^n = D_n$ = Rs $10.70(1 + r)^4$ = Rs 14.03

$$(1 + r)^4 = \frac{\text{Rs } 14.03}{\text{Rs } 10.70} = 1.311$$

Table A-1 (Sum of Re 1) suggests that Re 1 compounds to Rs 1.311 in 4 years at the compound rate of 7 per cent. Therefore, growth rate in dividends is 7 per cent.

(b) Cost of equity shares $= \frac{\text{Rs } 14.03(1.07)}{\text{Rs } 125} + 0.07 = 19$ per cent

(c) Cost of new equity shares $= \frac{D_1}{P_0\,(1 - f)} + g = \frac{\text{Rs } 15.01}{\text{Rs } 125(1 - 0.03)} + 7\% = 19.4$ per cent

P.7.17 The shares of a chemical company are selling at Rs 20 per share. The firm had paid dividend @ Rs 2 per share last year. The estimated growth of the company is approximately 5 per cent per year.

(a) Determine the cost of equity capital of the company.

(b) Determine the estimated market price of the equity shares if the anticipated growth rate of the firm **(i)** rises to 8 per cent, and **(ii)** falls to 3 per cent.

Solution

(a) $k_e = (D_1/P_o) + g$ = (Rs 2.10/Rs 20) + 0.05 = 15.5 per cent

(b) **(i)** $P_0 = D/(k_e - g)$ = Rs 2.16/0.075 = Rs 28.80

(ii) P_0 = Rs 1.94/0.185 = Rs 10.49

P.7.18 A company has on its books the following amounts and specific costs of each type of capital.

Type of capital	*Book value*	*Market value*	*Specific costs (%)*
Debt	Rs 4,00,000	Rs 3,80,000	5
Preference	1,00,000	1,10,000	8
Equity	6,00,000		15
Retained earnings	2,00,000	12,00,000	13
	13,00,000	16,90,000	

Determine the weighted average cost of capital using **(a)** Book value weights and, **(b)** Market value weights. How are they different? Can you think of a situation where the weighted average cost of capital would be the same using either of the weights?

Solution

(a) Determination of weighted average cost of capital using book value weights:

Source of capital	*Amount of book value (BV)*	*Specific cost (%) (k)*	*Total costs BV (×) k*
Debt	Rs 4,00,000	5	Rs 20,000
Preference	1,00,000	8	8,000
Equity	6,00,000	15	90,000
Retained earnings	2,00,000	13	26,000
	13,00,000		1,44,000

$$k_0 = \frac{\text{Total cost (Rs 1,44,000)}}{\text{Total amount of capital (Rs 13,00,000)}} \times 100 = 11.1 \text{ per cent}$$

(b) Determination of weighted average cost of capital using market value weights

Source of capital	*Market value (MV)*	*Specific cost (%) (k)*	*Total costs MV (×) k*
Debt	Rs 3,80,000	5	Rs 19,000
Preference	1,10,000	8	8,800
Equity	9,00,000[a]	15	1,35,000
Retained earnings	3,00,000[a]	13	39,000
	16,90,000		2,01,800

$$k_0 = \frac{\text{Rs } 2{,}01{,}800}{\text{Rs } 16{,}90{,}000} \times 100 = 11.9 \text{ per cent}$$

[a] The total market value of equity shares and retained earnings is apportioned three-fourths and one-four respectively on the basis of their book values.

The k_0 based upon market value is greater than k_0 based upon book value because the market value of equity funds is considerably larger than their book value and since these sources of long-term funds have higher specific costs, the overall cost of capital increases.

The weighted average cost of capital would be the same with both the book value weights and market value weights when there is no difference between the book value and the market value of securities used in raising the capital.

P.7.19 Three companies A, B and C are in the same business and hence have similar operating risks. However, the capital structure of each of them is different. The following are the details:

	A	*B*	*C*
Equity share capital (Rs) (Face value Rs 10 per share)	4,00,000	2,50,000	5,00,000
Market value per share (Rs)	15	20	12
Dividend per share (Rs)	2.70	4	2.88
Debentures (Rs)	Nil	1,00,000	2,50,000
Market value (MV) per debenture (Rs)		125	80
Interest rate		10	8

Assume the current levels of dividends are generally expected to continue indefinitely and the income-tax rate is 35 per cent. You are required to compute the weighted average cost of capital (k_0) of each company.

Solution

Cost of debentures:	*A*	*B*	*C*
$I(1-t)/MV$ of debentures (%)	—	Rs 6.5/Rs 125 = 5.2	Rs 5.2/Rs 80 = 6.5
Cost of equity:			
D_t/P_0 (%)	Rs 2.7/Rs 15 = 18	Rs 4/Rs 20 = 20	Rs 2.88/Rs 12 = 24

Weighted average cost of capital (k_0)

Source	*Amount*	*After-tax cost (%)*	*Total cost*
Company A:			
Equity	Rs 6,00,000	18	Rs 1,08,000
Debentures	Nil	—	—
	6,00,000	18	1,08,000
Company B:			
Equity	5,00,000	20	1,00,000
Debentures (1,000 × Rs 125)	1,25,000	5.2	6,500
	6,25,000	17.04	1,06,500
Company C:			
Equity	6,00,000	24	1,44,000
Debentures (2,500 × Rs 80)	2,00,000	6.5	13,000
	8,00,000	19.625	1,57,000

Overall cost of capital: 0.18 (A), 0.17 (B) and 0.196 (C).

P.7.20 A fast growing foreign company wants to expand its total assets by 50 per cent by the end of the current year. Given below are the company's capital structure which it considers to be optimal. There are no short-term debts.

8% Debentures	Rs 4,00,000
9% Preference shares	1,00,000
Equity shares	5,00,000
	10,00,000

New debentures would be sold at 11 per cent coupon rate and will be sold at par. Preference shares will have a 12 per cent rate and will also be sold at par. Equity shares currently selling at Rs 100 can be sold to net the company Rs 95. The shareholders' required rate of return is to be 17 per cent consisting of a dividend yield of 10 per cent and an expected growth rate of 7 per cent. Retained earnings for the year are estimated to be Rs 50,000 (ignore depreciation). The corporate tax is 35 per cent. You are required to calculate the following values:

(a) Assuming all asset expansion (gross expenditure for fixed assets plus related working capital) is included in the capital budget, what is the required amount of capital budget?

(b) How much of the capital budget must be financed by external equity (that is, issue of new equity shares) to maintain the optimal capital structure?

(c) Calculate the cost of **(i)** new issues of equity shares and **(ii)** retained earnings.

(d) Calculate the weighted average cost of capital using marginal weights.

Solution

(a)	(i) Desired level of asset at the end of year	Rs 15,00,000
	(ii) Present level of assets	10,00,000
Required amount of capital budget (a) – (b)		5,00,000

(b) The optimal capital structure of the company requires financing of capital budget in the following proportions: Debts, 40 per cent, preference shares, 10 per cent and equity funds, 50 per cent. In order to maintain the proportion of equity funds at the level of 50 per cent, Rs 2,50,000 (50 per cent of Rs 5,00,000 additional capital budget) should be financed by equity funds. Internal equity funds (retained earnings) of the company are estimated at Rs 50,000. Therefore, Rs 2,00,000 is required to be financed through external equity by issuing new shares.

(c) **(i)** Cost of new equity shares, $k_e = \frac{0.10}{\text{Rs } 95} + 0.07 = 17.5$ per cent

(ii) Cost of retained earnings, $k_r = \frac{10}{\text{Rs } 100} + 0.07 = 17$ per cent

(d) Weighted average cost of capital using marginal weights:
(i) Cost of debt (k_d) = 11% (1 – 0.35) = 9.1 per cent
(ii) Cost of preference shares would be 12 per cent as they will be sold at par and no flotation costs are to be incurred.

Source of capital	*Amount* (A)	*Specific cost (k) (%)*	*Total costs [A (×) k]*
Debt	Rs 2,00,000	7.15	Rs 14,300
Preference shares	50,000	12	6,000
Equity	2,00,000	17.5	35,000
Retained earnings	50,000	17	8,500
	5,00,000		63,800

k_0 = Rs 63,800/5,00,000 = 12.76 per cent

P.7.21 As a financial analyst of a large electronics company, you are required to determine the weighted average cost of capital of the company using **(a)** book value weights and **(b)** market value weights. The following information is available for your perusal.

The company's present book value capital structure is:

Debentures (Rs 100 per debenture)	Rs 8,00,000
Preference shares (Rs 100 per share)	2,00,000
Equity shares (Rs 10 per share)	10,00,000
	20,00,000

All these securities are traded in the capital markets. Recent prices are:

Debentures, Rs 110 per debenture
Preference shares, Rs 120 per share
Equity shares, Rs 22 per share

Anticipated external financing opportunities are:

(i) Rs 100 per debenture redeemable at par; 10 year maturity, 11 per cent coupon rate, 4 per cent flotation costs, sale price, Rs 100.

(ii) Rs 100 preference share redeemable at par; 10 year maturity, 12 per cent dividend rate, 5 per cent flotation costs, sale price, Rs 100.

(iii) Equity shares: Rs 2 per share flotation costs, sale price = Rs 22.

In addition , the dividend expected on the equity share at the end of the year is Rs 2 per share; the anticipated growth rate in dividends is 7 per cent and the firm has the practice of paying all its earnings in the form of dividends. The corporate tax rate is 35 per cent.

Solution

Determination of specific costs:

(i) Cost of debt, $(k_d) = \dfrac{I(1-t)+(f \div N_m)}{(RV+SV) \div 2} = \dfrac{\text{Rs } 11\,(0.35)+(\text{Rs } 4 \div 10)}{(\text{Rs } 100+\text{Rs } 96) \div 2} \times 100 = 7.7$ per cent

(ii) Cost of preference shares $(k_p) = \dfrac{D+(f \div N_m)}{(RV+SV) \div 2} = \dfrac{\text{Rs } 12+(\text{Rs } 5 \div 10)}{(\text{Rs } 100+\text{Rs } 95) \div 2} \times 100 = 12.8$ per cent

(iii) Cost of equity shares $(k_e) = \dfrac{D_1}{P_0\,(1-f)} + g = \dfrac{\text{Rs } 2}{\text{Rs } 20} + 0.07 = 17$ per cent

Using these specific costs we can calculate the book value and market value weights as follows:

(a) **k_0 based on book value weights**

Source of capital (×) k]	*Book value (BV)*	*Specific cost (k) (%)*	*Total costs [BV*
Debentures	Rs 8,00,000	7.7	Rs 61,600
Preference shares	2,00,000	12.8	25,600
Equity shares	10,00,000	17.0	1,70,000
	20,00,000		2,57,200

k_0 = Rs 2,57,200/Rs 20,00,000 = 12.86 per cent

(b) **k_0 based on market value weights**

Source of capital [MV (×) k]	*Market value (MV)*	*Specific cost (k) (%)*	*Total costs*
Debentures	Rs 8,80,000	7.7	Rs 67,760
Preference shares	2,40,000	12.8	30,720
Equity shares	22,00,000	17.0	3,74,000
Total capital	33,20,000		4,72,480

k_0 = Rs 4,72,480/Rs 33,20,000 = 14.23 per cent

P.7.22 From the following capital structure of XYZ Ltd. determine appropriate weighted average cost of capital.

Equity shares (1,00,000)	Rs 38,00,000
Preference shares	8,00,000
Debentures	50,00,000
Bank loan (long-term)	18,00,000
Bank loan (short-term)	14,00,000
Trade creditors	6,00,000

Additional information:

(i) Equity shares include the existing 60,000 shares having current market value of Rs 40 per share and the balance is net proceeds from the new issue in the current year (issue price of the share, Rs 40; flotation cost per share, Rs 5). The projected EPS and DPS for the current year are Rs 8 and Rs 5 respectively.

(ii) Dividend indicated on preference shares is 12 per cent

(iii) Pre-tax cost of debentures—11 per cent

(iv) Interest on bank loan—12 per cent (long-term) and 11.5 per cent (short-term).

(v) Corporate tax: 35 per cent. Dividend tax: 10 per cent

(vi) Market value of preference shares is Rs 8,50,000.

*S*olution

Determination of cost of specific sources:

(i) Equity existing; g = [EPS – DPS $(1 + t)$]/P_0 = [Rs 8 – Rs 5(1 + 0.1)]/Rs 40 = 6.25 per cent

$k_e = (D_1/P_0) + g$ = (Rs 5/40) + 0.0625 = 18.75 per cent

Equity (new issue) = (Rs 5/35) + 0.0625 = 20.54 per cent

(ii) Cost of debentures = 0.11 (1 – 0.35) = 7.15 per cent

(iii) Cost of bank loan = 0.12 (1 – 0.35) = 7.8 per cent

(iv) Cost of preference shares = (Total dividends on preference shares + Dividend tax) ÷ Market value of preference shares

= (Rs 96,000 + Rs 10,000)/Rs 8,50,000 = 12.47 per cent

Determination of overall cost of capital (based on market value, MV weights)

Sources of capital	*MV (1)*	*Cost (per cent) (2)*	*Total cost [1 × 2] (3)*
Equity capital (existing)	Rs 24,00,000	0.1875	Rs 4,50,000
Equity capital (new)	14,00,000	0.2054	2,87,560
Preference shares	8,50,000	0.1247	1,05,995
Debentures	50,00,000	0.715	3,57,500
Long-term bank loan	18,00,000	0.078	1,40,400
	1,14,50,000		13,41,455

K_0 = Rs 13,41,455/Rs 1,14,50,000 = 11.72 per cent.

Mini Case

7.C.1 Malaysian Paints (India) Limited has paid a dividend of 30 per cent on its shares of Rs 10 each in the current financial year. In the opinion of Choksi, finance director, the dividend is expected to grow @ 5 per cent annum. The required rate of return of the company is 15 per cent.

Malaysian Paints is facing tough competition in the market because a large number of multi-national companies have started their operations in India in the same line of business. Therefore, the management of the company is seriously thinking of diversifying the activities of the company. In a quarterly meeting of the Board, a special executive committee consisting of finance director, marketing director and production director was formed. The special committee was chaired by the CMD of the company.

The special executive committee had a brain-storming session and a series of meetings. It suggested the following alternative courses of action for the consideration of the Board:

(i) To increase the dividend growth rate to 6 per cent, and lower the required rate of return to 14 per cent.

(ii) To increase the dividend growth rate to 7 per cent and raise the required rate of return to 17 per cent.

(iii) To raise the required rate of return to 16 per cent and reduce the growth rate of dividend to 4 per cent.

(iv) To increase the dividend growth rate to 8 per cent and increase the required rate of return to 17 per cent.

You are the finance manager of the company. The Board of Directors has confidence in your abilities because, in the past, you have helped the Board in making such decisions. The Board has

requested you to suggest, with calculations, the most suitable course of action for the company (assuming the firm has an objective of maximising its shareholders wealth). State your assumptions if any.

Solution As a finance manage, I will prefer a course of action which maximises the price of shares as the pursuance of such a policy is consistent with the objective of optimal financial decision making. Keeping this perspective in mind, the five courses of action (emerged in brain-storming session) are analysed.

(i) $P_0 = \frac{D_t}{K_{e-g}} = \frac{\text{Rs } 3.15}{15\% - 5\%} = \frac{\text{Rs } 3.15}{10\%} = \text{Rs } 31.50$

(ii) $P_0 = \frac{\text{Rs } 3.18}{14\% - 6\%} = \frac{\text{Rs } 3.18}{8\%} = \text{Rs } 39.75$

(iii) $P_0 = \frac{\text{Rs } 3.21}{17\% - 7\%} = \frac{\text{Rs } 3.21}{10\%} = \text{Rs } 32.10$

(iv) $P_0 = \frac{\text{Rs } 3.12}{16\% - 4\%} = \frac{\text{Rs } 3.12}{12\%} = \text{Rs } 26$

(v) $P_0 = \frac{\text{Rs } 3.24}{17\% - 8\%} = \frac{\text{Rs } 3.24}{9\%} = \text{Rs } 36$

Recommendation Alternative second to increase the dividend growth rate to six per cent and lower the required rate of return to 14 per cent is the most suitable course of action as such an action is likely to fetch the maximum price of equity shares.

Review Questions

RQ. 7.1 Indicate whether the following statements are true or false.

(i) Cost of capital is cost of borrowing funds.
(ii) Equity capital does not carry any cost as a company is under no legal obligation to pay dividends.
(iii) Like equity capital, retained earnings also do not cause any cost to the company.
(iv) Weighted average cost of capital takes into consideration cost of long-term sources of finance.
(v) Retained earnings do not have explicit cost. They carry implicit cost.
(vi) Overall cost of capital decreases on payment of entire long-term debt.
(vii) Cost of retained earning is less then cost of equity.
(viii) Beta is a measure of unsystematic risk.
(ix) Cost of additional equity share capital is the same as that of existing equity share capital.
(x) The higher is the corporate tax rate, the higher is the cost of debt.
(xi) Beta is a measure of systematic risk.
(xii) Cost of debt is higher than cost of equity.
(xiii) Cost of preference share capital is higher than cost of debt.
(xiv) Cost of preference share capital is higher that cost of equity share capital.
(xv) Among all long-term sources of finance, equity capital carries maximum cost.

[Answers: (i) False (ii) False (iii) False (iv) True (v) True (vi) False (vii) True (viii) False (ix) False (x) False (xi) True (xii) False (xiii) True (xiv) False (xv) True]

RQ. 7.2 Discuss how the cost of capital enters into the process of evaluating capital budgeting proposals? Particularly, how is it related to the various discounted cash flow techniques for determining a project's acceptability?

RQ. 7.3 What is financial risk? Is it necessary to assume that firm's financial structure remains unchanged when evaluating the firm's cost of capital? Why is this assumption impractical?

RQ. 7.4 Explain why:

(a) Debt is usually considered the cheapest source of financing available to the firm.

(b) The cost of preference shares is less than the cost of equity.

(c) The cost of retained earnings is less than the cost of new equity.

(d) The cost of equity and retained earnings is not zero.

(e) The cost of capital is dependent only on the cost of long-term funds.

(f) The cost of capital is a hurdle for new investment projects.

(g) The cost of capital is most appropriately measured on an after-tax basis.

RQ. 7.5 Explain the problems faced in determining the cost of capital. How is the cost of capital relevant in capital budgeting decisions?

RQ. 7.6 Examine critically the different approaches to the calculation of cost of equity capital.

RQ. 7.7 Explain the CAPM approach for computing the cost of equity. Discuss the merits and demerits of the approach.

RQ. 7.8 The determination of any explicit cost of capital requires two things: (i) the net proceeds the firm will receive from the particular capital source and (ii) the expected future payments the firm will make to the investors. In spite of the similarity
of estimation problems, it is recognised that the cost of equity (both internal and external) is the most difficult cost to estimate. Briefly explain why this is so.

RQ. 7.9 State briefly the assumptions on which the Gordon (valuation) Model for the cost of equity is based. What does each component of the equation represent?

RQ. 7.10 Discuss the approach to determine the cost of retained earnings. Also explain the rationale behind treating retained earnings as a fully subscribed issue of equity shares.

RQ. 7.11 Other things being equal, explain how the following events would affect the company's weighted average cost of capital:

(a) The corporate income tax rate is increased/ decreased.

(b) The company has started making substantial new investments in assets that are considerably riskier than the company's presently owned assets.

(c) The company begins to make use of substantial amounts of debt to finance its new projects.

(d) The company has repaid its long-term debts.

(e) Flotation costs of issuing new securities increase/ decrease.

RQ. 7.12 What is the weighted average cost of capital? Examine the rationale behind the use of weighted average cost of capital.

RQ. 7.13 The weighted average cost of capital (k_0) may be determined using 'book' or 'market' weights. Compare the pros and cons of using market value weights rather than book value weights in calculating the value of k_0.

RQ. 7.14 Compare the advantages and disadvantages of using marginal as opposed to historical weights for calculating the weighted average cost of capital. Which of the weights are more consistent with the company's goal of wealth maximisation?

Examination Questions

Theory Questions

7.1 "As there is no explicit cost of retained earnings, these funds are free of cost." Critically comment. *(Delhi University, 2008, 2011)*

7.2 Does a firm's tax rate affect its cost of capital? What is the effect of the flotation costs associated with a new security on the firm's cost of capital. *(Delhi University, 2010)*

7.3 Write short note on capital asset pricing model. *(Calcutta University, 2010)*

7.4 Distinguish between specific cost and composite cost. *(Madras University, 2010)*

7.5 What is weighted average cost of capital? *(Madras University, 2010)*

7.6 How is cost of different sources of capital measured? Illustrate and explain. *(Punjab University, 2009 and 2010)*

7.7 "Cost of existing share capital and fresh issue of capital are always same." Do you agree? Give reasons. *(Delhi University, 2009)*

7.8 "Retained earnings have no cost". Is the statement justified? *(Calcutta University, 2009)*

7.9 Write short note on cost of capital. *(Mumbai University, 2009)*

7.10 Write short note on marginal cost of capital. *(Calcutta University, 2008)*

7.11 "Market value weighs are superior to book value weights." Do you agree? *(Delhi University, 2007, 2010)*

7.12 Is debt a cheaper source than equity share capital? *(Punjab University, 2007)*

7.13 What do you mean by cost of capital? Mention any two significances of cost of capital. *(Calcutta University, 2007)*

7.14 Other things being equal, how the following events would affect the company's weighted average cost of capital? (i) The company repays its long-term debt, (ii) The corporate income-tax rate is increased, (iii) The flotation cost of new issues increases. *(Delhi University, 2006)*

7.15 "Cost of retained earnings is same as cost of equity." Comment. *(Delhi University, 2005)*

7.16 Write short note on book value versus market value weights in cost of capital. *(Delhi University, 2005)*

7.17 Explain the concept of explicit versus implicit cost of capital. *(Delhi University, 2005)*

7.18 Define cost of capital *(Punjab University, 2005, 2006)*

7.19 Differentiate between business risk and financial risk of a firm. *(Delhi University, 2005, 2006, 2007, 2008)*

7.20 "New issue of capital is costlier than the retained earnings." How and what makes these two differ? *(Delhi University, 2004)*

7.21 Distinguish between specific costs and weighted average cost of capital. What is the rationale for computing after-tax weighted average cost of capital? *(Calcutta University, 2004)*

7.22 What is the weighted average cost of capital? How will you calculate the weighted average cost of capital? Examine the rationale behind the use of weighted average cost of capital. *(Periyar University, Oct./Nov. 2004)*

7.23 What is the meaning and significance of weighted average cost of capital? *(Mumbai University, November 2003)*

7.24 (a) What are the components of cost of capital?
(b) Explain the steps involved for the computation of weighted average cost of capital. *(Bharatiyar University, April 2003)*

7.25 Explain briefly the following concepts:
(a) Explicit costs of capital *(Delhi University, 2002)*
(b) Weighted average cost of capital of the firm. *(Delhi University, 2003)*

7.26 Why is cost of debt normally less that the cost of equity? Is it always so? *(Mumbai University, November 2002)*

7.27 State in brief the weights that you would take into consideration for computing weighted average cost of capital. Why market value weights are considered superior to the book value weights? *(Calcutta University, 2002)*

7.28 State the different approaches to the calculation of cost of equity. Are retained earnings cost free? *(Delhi University, 2001)*

7.29 Explain the methods of measuring cost of debt capital and cost of equity capital with illustrations. *(Mumbai University, November 2001)*

7.30 Explain briefly the various methods of computing cost of equity capital. Which of them do you consider most appropriate and why? *(Calcutta University, 2001)*

7.31 (a) How would you calculate cost of equity?
(b) What is cost of debt? How would you calculate it?
(c) Define cost of capital. Explain the procedure of computing weighted average cost of capital. *(Bharatiyar University, April 2001)*

7.32 (a) How would you calculate the cost of (i) equity share capital and (ii) retained earnings?
(b) How are the specific costs of (i) debentures and (ii) preference share capital calculated?
(c) How is weighted average cost of capital computed? *(Bharatiyar University, November 2001)*

7.33 Choose the best answer

1. Debt is cheaper because
   (a) Interest is tax-deductible
   (b) Investors' expected rate of return is less
   (c) Investors' risk is less
   (d) All the above
2. Which one of the following has opportunity cost?
   (a) Cost of debt (b) Cost of equity
   (c) Cost of retained earnings (d) Cost of preference shares. *(Bharatiyar University, April 2001)*
3. Which of the following is correct?
   (a) Interest is tax deductible (b) Ordinary dividend is tax deductible
   (c) Preference dividend is tax deductible (d) None of the above. *(Bharatiyar University, November 2001)*

7.34 What weights are available for computing weighted average cost of capital? Explain pros and cons of target capital structure method for the purpose. *(Calcutta University, 2000)*

7.35 Whether the following statement is correct or false? (Give briefly reasons for your answer) debt is a cheaper source of finance. *(Delhi University, 1997)*

7.36 Explain the importance of cost of capital. *(Bangalore University)*

7.37 Discuss the different methods of calculating cost of equity capital. *(Bangalore University)*

7.38 The cost of capital is the minimum rate of return that will maintain the value of a firm's equity shares. (True or false). *(Bangalore University) (Answer is True)*

Numerical Questions

7.1 Assuming that a firm pays income tax at a 40% rate, compute the after tax cost of capital in the following cases: **(i)** 15% preference shares sold at par, **(ii)** A perpetual bond sold at par, coupon rate being 15%, **(iii)** A 10-year 8% Rs 1,000 per bond sold at Rs 950, and **(iv)** An equity share selling at a market price of Rs 110 and paying a current dividend of Rs 10 per share which is expected to grow at a rate of 10%. *(Delhi University, 2011).*

Solution

(i) $K_p = D_p/\text{SV}$ = Rs 15/Rs 100 = 15 per cent

(ii) $k_d = (1 - t)/\text{SV}$ = Rs 15 (0.6)/Rs 100 = 9 per cent

(iii) $k_d = \dfrac{I(1-t) + (RV - SV)/N}{(RV + SV)/2}$

RV = Redeemable value (Rs 1,000 redemption is assumed at par)
SV = Sale value
= [Rs 80(1 – 0.4) + (Rs 1,000 – Rs 950)/10]/[Rs 1,000 + Rs 950)/2
= (Rs 48 + Rs 5)/ Rs 975 = 5.44 per cent.

(iv) $k_c = D_0 (1 + g)/P_0 + g$
= [Rs 10(1 + 0.10)/ Rs 110] + 10% = (Rs 11/Rs 110) + 10% = 10% + 10% = 20 per cent.

7.2 TEXCO Ltd. has capital of 1,00,000 equity shares of Rs 10 each. Its price earning ratio is 10 and earning available to equity shareholders is Rs 6,00,000. The earnings are expected to grow @10% p.a. You are required to compute the cost of equity shares under earnings growth model.
(Calcutta University, 2010)

Solution

Cost of equity (based on earnings approach): k_e = (EPS/MPS) + g = (Rs 6/Rs 60) + 10% = 20%.
MPS = Earnings per share, Rs 6 lakh/1 lakh = Rs 6
MPS = Market price per share, EPS × P/E ratio = Rs 6 × 10 = Rs 60
g = Growth in earnings = 10%

7.3 The shares of a steel company are quoted at Rs 42 per share. The firm had paid a dividend of Rs 4 per share last year. The expected growth in dividend is 5% p.a.

(a) Determine the cost of equity capital of the company.

(b) Determine the market price of the equity share if the anticipated growth rate of the firm **(i)** rises to 8% and **(ii)** falls to 3%. *(Madras University, 2010)*

Solution

(a) $k_e = D_1/P_0 + g$ = (Rs 4.20/Rs 42) + 5% = 10% + 5% = 15%
Where D_1 = Expected dividend at year-end (Rs 4 + 5% = Rs 4.20)
P_0 = Current market price per share (Rs 42)
g = Growth rate (5%)

(b) (i) $P_0 = D_1/(k_e + g)$ = Rs 4.32/(15% – 8%) = Rs 4.32/7% = Rs 61.71
D_1 = Expected dividend at year end Rs 4 + 8% = Rs 4.32

(ii) $P_0 = D_1/(k_e - g)$
D_1 = Rs 4 + 3% = Rs 4.12
P_0 = Rs 4.12/(15% – 3%) = Rs 4.12/12% = Rs 34.33

Market price of share increases to Rs 61.71 when growth rate rises to 8% and it decreases to Rs 34.33 when growth rate decreases to 3% (compared to the current price of Rs 42).

7.4 A company issues 14% preference shares of Rs 100 each. Cost of issue is Rs 5 per share. Calculate the cost of preference capital if these shares are issued at a discount of 5%.
(Punjab University, 2010)

Solution

$K_p = (D_p/SV) \times 100$
Where D_p = Dividend on preference share, Rs 14
SV = Sale proceeds from preference share, Rs 100 – Rs 5 – Rs 5 = Rs 90
k_p = (Rs 14/Rs 90) × 100 = 15.55 per cent.

7.5 X Ltd. issues 9% debentures at a premium of 10%. The cost of flotation are 2%. The tax rate applicable is 60%. Compute cost of debt. *(Punjab University, 2010)*

Solution

k_d = [I (1 – t)/SV] × 100
= [Rs 9 (1 – 0.6)/Rs 107.8) × 100 = (Rs 3.6/Rs 107.8) × 100 = 3.34 per cent.
Where SV = Sale proceeds from debenture, Rs 100 + 10% premium = Rs 110 – 2%. flotation cost, Rs 2.20 = Rs 107.8

7.6 Excel Industries Ltd. has assets of Rs 1,60,000 which have been financed with Rs 52,000 of debt, Rs 90,000 of equity and a general reserve of Rs 18,000. The firm's total profits after interest and taxes for the year ended 31st March, 2009 were Rs 13,500. It pays 8% interest on borrowed funds and is in the 50% tax bracket. It has 900 equity shares of Rs 100 each, selling price at a market price of Rs 120 per share. What is the weighted average cost of capital?

(Pune University, 2010)

Solution

(i) Cost of debt (k_d): ki $(1 - t)$ = 8% (1 – 0.5) = 4%

(ii) Cost of equity (k_e), based on earnings approach
= EPS/MPS: (Rs 15/Rs 120) = 12.5%
EPS = Total profits after taxes Rs 13,500/No. of shares 900 = Rs 15.

(iii) Cost of retained earnings = k_e
Weighted average cost of capital

Source of capital	*Amount (weight)*		*Costs (%)*	*Total cost*	
	BV	*MV*		*BV*	*MV*
Equity share capital	Rs 90,000	Rs 90,000[1]	12.5	Rs 11,250	Rs 11,250
General reserves/ Retained earnings	18,000	18,000[2]	12.5	2,250	2,250
8% Debt	52,000	52,000	4.0	2,080	2,080
	1,60,000	1,60,000		15,580	15,580

1. Market value of shares, Rs 1,08,000 × percentage share of equity share capital to equity funds, 83.33% = Rs 90,000.
2. Market value of shares, Rs 1,08,000 × percentage share of retained earnings to equity funds, 16.67% = Rs 18,000.

K_0 (BV) = Rs 15,580/Rs 1,60,000 = 9.74%
K_0 (MV) = Rs 15,580/Rs 1,60,000 = 9.74%

Weighted average cost of capital is the same by both approaches (BV as well as MV) as there is no difference in book value weights and market value weights (Market price of Rs 1,08,000 = Equity funds, Rs 90,000 equity share capital + Rs 18,000 general reserves).

7.7 A company issues Rs. 10,00,000, 13% debentures at a discount of 5%. The debentures are redeemable after 6 years at a premium of 5%. Calculate before tax and after tax cost of debt, if the tax rate is 50%. *(Madras University, 2010)*

Solution

(i) Before tax cot of debt (ki) = $\dfrac{I + (RV - SV)/N}{(RV + SV)/2}$

Where I = Interest = Rs 13 (face value of debenture is assumed Rs 100)
RV = Redeemable value of debenture, Rs 105
SV = Sale proceeds from debenture, Rs 100 – Rs 5 = Rs 95

$$k_i = \frac{\text{Rs } 13 + (\text{Rs } 105 - \text{Rs } 95)/5}{(\text{Rs } 105 + \text{Rs } 95)/2} = \text{Rs } 15/\text{Rs } 100 = 15\%$$

(ii) After tax cost of debt (k_d) = $\dfrac{1(1 - t) + (RV - SV)/N}{(RV + SV)/2}$

$$= \frac{\text{Rs } 13(1 - 0.5) + \text{Rs } 2}{\text{Rs } 100} = 8.5\%$$

7.8 X Ltd. has assets of Rs 32,00,000 that have been financed by Rs 18,00,000 of equity shares (of Rs 100 each), general reserve of Rs 3,60,000 and debt of Rs 10,40,000. For the year ended 31-03-2010 the company's total profits before interest and taxes were Rs 6,23,000. X Ltd. pays 8% interest on borrowed capital and is in a 40% tax bracket. The market value of equity as on 31-03-2010 was Rs 150 per share. What was the weighted average cost of capital? Use market values as weights.

(Delhi University, 2010)

Solution

Cost of debt (k_d) = 8% (1 – 0.4) = 4.8 per cent

Cost of equity (k_e), based on earnings approach

EBIT	Rs 6,23,000
Less interest (Rs 10,40,000 × 0.08)	83,200
EBT	5,39,800
Less taxes (40%)	2,15,920
EAT	3,23,880
Divided by number of equity shares (N)	18,000
EPS (EAT/N)	Rs 17.99
ke = EPS/MPS i.e., Rs 17.99/Rs 150	11.99%

Determination of WACC (k_0) using market value approach

Sources	*Market value*	*Cost (%)*	*Total cost*
Equity capital (18,000 shares × Rs 150)	Rs 27,00,000	11.99	Rs 3,23,730
Debt	10,40,000	4.8	49,920
	37,40,000		3,73,650
k_0 = Rs 3,73,650/Rs 37,40,000 = 10 per cent			

Note: There is no separate cost of general reserve; market price of share reflects retained earnings.

7.9 The capital structure and specific cost of capital (after tax) of a company are given below:

Sources	*Book value (Rs/lakh)*	*After-tax cost (%)*
Equity share capital (shares of Rs 10 each)	200	18
Retained earnings	100	18
Long-term debt	200	6
	500	

The present market value of equity is Rs 90 per share. Corporate tax rate is 40%.

1. Calculate weighted average cost of capital using: (a) Book value as weights, and (b) Market value as weights.
2. Explain the difference in weighted average costs as above. *(Calcutta University, 2009)*

Solution

Determination of cost of capital using book value and market value weights

(*Amount in Rs lakh*)

Sources of capital	*Weights*		*Costs (%)*	*Total cost*	
	BV	*MV*		*BV*	*MV*
Equity share capital	Rs 200	1,200[1]	18	Rs 36	216
Retained earnings	100	600[2]	18	18	108
Long-term debt	200	200	6	12	12
	500	2,000		66	336

1. Market value of 20 lakh shares × Rs 90 = Rs 1,800 lakh
Market value of equity share capital = Rs 1,800 lakh × 2/3 = Rs 1,200 lakh
2. Market value of retained earnings = Rs 1,800 lakh × 1/3 = Rs 600 lakh.
k_0 = (BV weights) = Rs 66 lakh/Rs 500 lakh = 13.2 per cent
k_0 = (MV weights) = Rs 366 lakh/Rs 2,000 lakh = 16.8 per cent.

7.10 Y Co. Ltd issues 10,000 125 preference shares of Rs 100 each at a premium @10% but redeemable at a premium @20% after 5 years. The company pays under- writing commission @5%. If tax on dividend is 12.5%, surcharge is 2.5% and education cess is 3%, calculate the cost of preference share capital. (*Calcutta University, 2009*)

Solution

$$k_p = \frac{D(1 + DPt) + (RV - SV)/N}{(RV + SV)/2}$$

Dividend payment tax (DPt) = 12.5% + 2.5% surcharge + 3.0% education cess
= 12.5% + 0.3125 + 3% (12.8125) i.e., = 0.3844 = 13.1969 or 13.20%
RV = Rs 100 + Rs 20 redemption premium = Rs 120
SV = Rs 100 + Rs 10 premium – Rs 5.50 Underwriting commission (5% × Rs 110) = Rs 104.50

$$k_p = \frac{\text{Rs } 12(1 + 0.1320) + (\text{Rs } 120 - \text{Rs } 104.50)/5}{(\text{Rs } 120 + \text{Rs } 104.50)/2}$$

= (Rs 13.584 + Rs 3.1) = Rs 16.684/Rs 112.25 = 14.86%

7.11 The capital structure of Falcom Company Ltd as on 31.12-2007 is as follows:

Equity share capital: 10,000 shares of Rs 100 each	Rs 10,00,000
10% Preference shares of Rs 100 each	4,00,000
12% Debentures	6,00,000
	20,00,000

The market price of the company's share is Rs 110 and it is expected that a dividend of Rs 10 per share would be declared after one year. The dividend growth rate is 6%.
(i) If the company is in the 40% tax bracket, calculate weighted average cost of capital.
(ii) The company needs to borrow a fund of Rs 10 lacs for its expansion plan, the rate of interest is 14%, what will be the company's revised weighted average cost of capital? This financing decision is expected to increase dividend from Rs 10 to Rs 12 per share. However, the market price of equity share is expected to decline from Rs 110 to Rs 105 per share.
(*Delhi University, 2009*)

Solution

(i) Determination of cost of specific sources

$k_e = D_1/P_0 + g$ = (Rs 10/Rs 110) + 6% = 9.09 + 6.0 = 15.09 per cent
$k_p = Dp/P_0$ = (Rs 10/Rs 100) = 10 per cent
$k_d = ki\ (1 - t)$ = Rs 12 (1 – 0.4) = 7.2 per cent

Determination of weighted average cost of capital, using book value and market value weights

Source of capital	*Weights*		*Cost (%)*	*Total cost*	
	BV	*MV*		*BV*	*MV*
Equity share capital	Rs 10,00,000	Rs 11,00,000	15.09	Rs 1,50,900	Rs 1,65,990
10% Preference shares	4,00,000	4,00,000	10.00	40,000	40,000
12% Debentures	6,00,000	6,00,000	7.2	43,200	43,200
	20,00,000	21,00,000		2,34,100	2,49,190

k_0(BV weights) = Rs 2,34,100/Rs 20,00,000 = 11.705 per cent
k_0(MV weights) = Rs 2,49,190/Rs 21,00,000 = 11.866 per cent

(ii) Determination of cost of specific sources

k_e = (Rs 12/Rs 105) + 6% (assuming unchanged) = 17.43 per cent

k_d (new) = 14% (1 – 0.4) = 8.4 per cent

k_p = 10 per cent

k_d (existing) = 7.2 per cent

Determination of weighted average to cost of capital using book value and market value weights

Source of capital	*Weights*		*Cost (%)*	*Total cost*	
	BV	*MV*		*BV*	*MV*
Equity share capital	Rs 10,00,000	Rs 10,50,000	17.43	Rs 1,74,300	Rs 1,83,015
10% Preference shares	4,00,000	4,00,000	10.00	40,000	40,000
12% Debentures	6,00,000	6,00,000	7.20	43,200	43,200
14% Debt	10,00,000	10,00,000	8.40	84,000	84,000
	30,00,000	30,50,000		3,41,500	3,50,215

k_0 = (BV weights) = Rs 3,41,500/Rs 30,00,000 = 11.38 per cent

k_0 = (MV weights) = Rs 3,50,215/Rs 30,50,000 = 11.48 per cent

7.12 A company has issued 12% debentures of Rs 100 each at par some time ago. The debentures are currently selling at Rs 80 per debenture, equity shareholders expect a premium of 4% over the yield on debenture of the company. Compute the cost of equity capital.

(University of Punjab, 2008)

Solution

Yield on debenture (%) = (Interest/current market price) × 100 = (Rs 12/Rs 80) × 100 = 15%

Cost of equity (k_e) = Yield on debenture + Risk premium = 15% + 4% = 19%.

7.13 ABC Ltd is producing baby toys. The cost of capital of the company is to be computed at the end of 2006 for evaluating investment proposals for 2007. The following data is available for the company:

12% Debentures	Rs 15,00,000
14% Preference shares	10,00,000
Equity capital	25,00,000
Retained earnings	10,00,000
	60,00,000

The corporate tax rate is 40%. Preference shares are being sold at their par value. The equity shareholders expect a return of 16% on their capital. The personal tax rate of the shareholders is 30%. The brokerage is 2%. Find out the weighted average cost of capital of the company.

(University of Punjab, 2008)

Solution

Determination of cost of specific sources:

k_d (cost of debentures): I (1 – t); Rs 12 (1 – 0.4) = 7.2 per cent

k_p (cost of preference shares): D_p/SV; (Rs 14/Rs 100) = 14 per cent

k_e = (cost of equity): Required rate of return = 16 per cent

k_r = (cost of retained earnings) = k_e (1 – tp) (1 – b)

where tp = personal tax rate, 40%; b = Brokerage incurred by investor, 2%

k_r = 16% (1 – 0.4) (1 – 0.98) – 9.41 per cent.

Determination of weighted average cost of capital

Sources of funds	*Amount*	*Cost (%)*	*Total amount*
Equity capital	Rs 25,00,000	16.00	Rs 4,00,000
Retained earnings	10,00,000	9.41	94,100
14% Preference shares	10,00,000	14.00	1,40,000
12% Debentures	15,00,000	7.20	1,08,000
	60,00,000		7,42,100

Weighted average cost of capital (k_0) = (Rs 7,42,100/Rs 60,00,000) = 12.37%

7.14 RIL Ltd. opts for the following capital structure:

Equity shares (1,00,000 shares)	Rs 50,00,000
15% Debentures	50,00,000
Total	1,00,00,000

The company is expected to declare a dividend of Rs 5 per share. The market price per share is Rs 50. The dividend is expected to grow at 10%. Compute weighted average cost of capital of RIL Ltd. assuming 50 per cent tax rate. *(Calcutta University, 2008)*

Solution

$k_e = D_1/P_0 + g$ = (Rs 5/Rs 50) + 10% = 20%

$k_d = (1 - t)$ = 15% (1 – 0.5) = 7.5%

Weighted average cost of capital, based on book value weights

Sources of funds	*Amount Rs lakh*	*Cost (%)*	*Total amount Rs lakh*
Equity share capital	50	20	10
15% Debentures	50	7.5	3.75
	100		13.75

k_0 = Rs 13.75/Rs 100 = 13.75%.

7.15 The following is the capital structure of ABC Ltd.

Equity share capital (face value Rs 10 each)	Rs 5,00,000
12% Preference shares capital (face value Rs 100)	4,00,000
8% Debentures (face value Rs 100)	6,00,000
	15,00,000

Equity shares are currently selling at Rs 15 each. The company paid a dividend of Rs 2 per share for the last year. The dividends are expected to increase at 5% p.a. The preference shares and debentures are being traded at 90% and 80%. Tax rate applicable to company is 40%.

Find out the weighted average cost of capital of the firm using: **(i)** book value weights, and **(ii)** market value weights. State under what situation the WACC calculated on BV and MV bases would be same. *(Delhi University, 2008)*

Solution

Determination of cost of specific sources:

k_e = (Rs 2.10/Rs 15) + 5% = 14% + 5% = 19 per cent.

k_p = Rs 12/Rs 90 = 13.33 per cent

$k_d = k_i (1 - t)$/market price = Rs 4.8/Rs 80 = 6 per cent

Statement showing determination of WACC, using book value and market value weights

Source of capital	*Weights*		*Cost (%)*	*Total cost*	
	BV	*MV*		*BV*	*MV*
Equity share capital	Rs 5,00,000	Rs 7,50,000	19.00	Rs 95,000	Rs 1,42,500
12% Preference shares	4,00,000	3,60,000	13.33	53,320	47,988
8% Debentures	6,00,000	4,80,000	6.00	36,000	28,800
	15,00,000	15,90,000		1,84,320	2,19,288

k_0 = (BV) weights) = Rs 1,84,320/Rs 15,00,000 = 12.29 per cent
k_0 = (MV) weights) = Rs 2,19,288/Rs 15,90,000 = 13.79 per cent

The WACC computed on BV and MV bases would be the same when BV and MV weights are same, implying there is no difference between market value and book value of securities.

7.16 Sriganesh Industries Limited issues 5,000 12% Debentures of Rs 100 each at par. The tax rate is 40%. Calculate before and after tax cost of debt. *(Bangalore University, 2007)*

Solution

Cost of debt (before tax), k_i = I/SV = Rs 12/Rs 100 = 12%
Cost of debt (after tax), k_d = I $(1 - t)$/SV = Rs 12 (1 – 0.4)/ Rs 100 = 7.2%

7.17 B. Ltd. has 25,000 equity shares of Rs 10 each outstanding. These are currently selling at Rs 20. It also has 1,000 debentures of Rs 100 each bearing a coupon rate of 10%. Debentures are selling at Rs 125 in the market. A dividend of Rs 3 per share has just been paid on equity shares. Tax rate is 35% and growth rate is expected to be 5%. Calculate the weighted average cost of capital. *(Delhi University, 2007)*

Solution

Determination of cost of specific sources:

k_e = (Rs 3.15/Rs 20) + 5% = 15.75% + 5% = 20.75 per cent
$k_d = k_i (1 - t)$/Market price = Rs 6.5/Rs 125 = 5.2 per cent

Statement showing WACC (k_0), using book value and market value weights

Source of capital	*Weights*		*Cost (%)*	*Total cost*	
	BV	*MV*		*BV*	*MV*
Equity share capital	Rs 2,50,000	Rs 5,00,000	20.75	Rs 51,875	Rs 1,03,750
10% Debentures	1,00,000	1,25,000	5.2	5,200	6,500
	3,50,000	6,25,000		57,075	1,10,250

k_0 = (BV weights) = Rs 57,075/Rs 3,50,000 = 16.31 per cent
k_0 = (MV weights) = Rs 1,10,250/Rs 6,25,000 = 17.64 per cent

7.18 2,00,000 debentures of Rs 250 each are being issued at 5% discount. Coupon rate is 15%. Flotation costs are likely to be 5% of the face value. Redemption will be after 8 years at a premium of 5%. Tax rate is 40%. Determine the true cost of this debt. *(Delhi University, 2007)*

Solution

$$k_d = \frac{I(1-t) + (\text{RV} - \text{SV})/\text{N}}{(\text{RV} + \text{SV})/2}$$

$$= \frac{\text{Rs } 37.50^{1}\ (1 - 0.4) + (\text{Rs } 262.50^{2} - \text{Rs } 225^{3}.0)/8 \text{ years}}{(\text{Rs } 262.50 + \text{Rs } 225.0)/2 = \text{Rs } 243.75}$$

$$= \frac{\text{Rs } 22.50 + \text{Rs } 37.5/8 = \text{Rs } 4.6875 = \text{Rs } 27.1875}{\text{Rs } 243.75} = 11.15 \text{ per cent}$$

Working Notes

1. Coupon rate 15% × Rs 250 face value = Rs 37.50
2. Rs 250 + 5% premium or Rs 12.50 = Rs 262.50
3. Rs 250 – 5% discount (or Rs 12.50) – 5% flotation costs (or Rs 12.50) = Rs 225.

7.19 A company plans to issue 1,000 new shares of Rs 100 each at par. The flotation costs are expected to be at 5% of the share price. The company pays a dividend of Rs 10 per share initially and growth in dividend is expected to be 5%. Compute cost of new issue of equity shares.

(Punjab University, 2007)

Solution

$k_e = [D_1/P_0 (1 - f)] + g$

where D_1 = Expected dividend at year-end, Rs 10.

$P_0 (1 - f)$ = Proceeds from new equity issue, net of flotation cost, Rs 100 – Rs 5 = Rs 95.

G = Growth rate in dividends.

k_e = (Rs 10/Rs 95) + 5% = 10.53% + 5% = 15.53 per cent

7.20 The capital structure and other information of a company are given below:

Source	*Amount (Rs in lakh)*	*After tax-cost of capital (%)*
Equity (Rs 100 each)	100	14
Reserves and surplus	50	?
Debentures	200	?
	350	

The market value of equity share is Rs 300 per share. The company uses market value weights for computing average cost of capital. The corporate tax rate is 40 per cent while the average cost of capital is 10 per cent. What is cost of reserves and surplus, and cost of debt (before tax)?

(Calcutta University, 2007)

Solution

Cost of reserves and surplus (or retained earnings) is equal to cost of equity = 14%

Let us further assumed that cost of debentures (after tax) is y.

Statement showing determination of total cost

Sources of capital	*Market value (in Rs lakh)*	*Cost (%)*	*Total cost (in Rs lakh)*
Equity	Rs 200[1]	14	Rs 28.0
Reserves and surplus	100[2]	14	14.0
Debentures	200	*y*	200 *y*
	500		200*y* + 42

k_0 = TC/Total market value

10% = Rs 42 lakh + 200y/Rs 500 lakh

Rs 50 lakh = Rs 42 lakh + 200 y

$200y$ = Rs 8 lakh

y = Rs 8/200 = 4%

Cost of debt (before tax), $k_i = k_d/(1 - t)$ = 4%/(1 – 0.4) = 6.67 per cent

Working Notes

1. Market value of equity capital = Rs 300 lakh market value of shares x Proportion of equity capital to equity funds, 2/3 = Rs 200 lakh.
2. Market value of reserves and surplus = Rs 300 lakh × 1/3 -= Rs 100 lakh

7.21 X & Co. has issued 12% redeemable preference shares of face value Rs 100 for Rs 10 lakh. These shares are expected to be sold at 5% discount, it will also involve flotation cost of Rs 5 per share. The shares are redeemable at a premium of 5% after 10 years. Calculate the cost of redeemable preference share, if the rate of tax is 50%. Ignore dividend tax. *(Calcutta University, 2007)*

Solution

$$k_p = \frac{Dp + (RV - SV)/N}{(RV + SV)/2}$$

$$= \frac{\text{Rs } 12 + (\text{Rs } 105 - \text{Rs } 90)/10}{(\text{Rs } 105 + \text{Rs } 90)/2} = \frac{\text{Rs } 12 + \text{Rs } 1.5}{\text{Rs } 97.5} = 13.85\%$$

RV = Rs 100 + Rs 5 redemption premium = Rs 105
SV = Rs 100 – Rs 5 discount – Rs 5 flotation cost = Rs 90

7.22 Rima & Co. has issued 12% debentures of face value Rs 100 for Rs 10 lakh. The debenture is expected to be sold at 5% discount. It will also involve flotation costs of Rs 5 per debenture. The debentures are redeemable at a premium of 5% after 10 years. Calculate the cost of debenture if the tax rate is 50%. *(Calcutta University, 2007)*

Solution

$$k_d = \frac{(1 - t) + (RV - SV)/N}{(RV + SV)/2}$$

$$= \frac{\text{Rs } 12(1 - 0.5) + (\text{Rs } 105^{@} - \text{Rs } 90^{*})/10}{(\text{Rs } 105 + \text{Rs } 90)/2} = 7.69\%$$

[@]= Rs 100 + redemption premium of Rs 5 = Rs 105
[*] = Rs 100 – Rs 5 discount – Rs 5 flotation cost = Rs 90

7.23 Determine the weighted average cost of capital using book value weights based on the following data:

Book value structure:	Rs 8,00,000
14% Debentures (Rs 100 per debenture)	2,00,000
15% Preference shares (Rs 100 per share)	10,00,000
Equity shares (Rs 10 per share)	20,00,000

Recent market price of all these securities are: Debentures, Rs 110 per debenture; Preference shares, Rs 120 per share; Equity shares: Rs 22 per share.

Dividend expected on equity shares at the end of the year is Rs 2 per share; anticipated growth rate in dividends is 7%. The company pays all its earnings in the form of dividends. Corporate tax rate is 40%. *(Delhi University, 2007)*

Solution

Determination of cost of specific sources

k_e = (Rs 2/Rs 22) +7% = 9.09% + 7% = 16.09 per cent
k_p = (Rs 15/Rs 120) = 12.5 per cent
k_d = Rs 14 (1 – 0.4)/ Rs 110 = Rs 8.4/Rs 110 = 7.64 per cent

Statement showing WACC (k^0), using book value weights

Sources of capital	*BV weights*	*Cost (%)*	*Total cost*
Equity share capital	Rs 10,00,000	16.09	Rs 1,60,900
Preference share capital	2,00,000	12.5	25,000
Debentures	8,00,000	7.64	61,120
	20,00,000		2,47,020

k_0 (BV Weights) = Rs 2,47,020/Rs 20,00,000 = 12.35 per cent

7.24 Indrani Ltd. has the following capital structure: Rs (in lakhs)

Equity shares capital (10 lakh shares)	100
12% preference share capital (10,000 shares)	10
Retained earnings	120
14% Debentures (70,000 debentures)	70
14% Term loan	100
	400

The market price per equity share is Rs 25. The next expected dividend per share is Rs 2 and is expected to grow at 8%. The preference shares are redeemable after 7 years at par and are currently quoted at Rs 75 per share. The debentures are redeemable after 6 years at par and their current market quotation is Rs 90 per debenture. The tax rate applicable to the firm is 50%. You are requested to compute weighted average cost or capital of the company using **(a)** book value, **(b)** market value as weights. *(Calcutta University, 2006)*

Solution

(i) Determination of cost of specific sources

$k_e = D_1/P_0 + g$ = (Rs 2/Rs 25) + 8% = 16 per cent
$k_r = k_e$ i.e., 16 per cent

$$k_p = \frac{\text{Dp} + (\text{RV} - \text{MV})/\text{N}}{(\text{RV} + \text{MV})/2}, \text{ where MV = Current market value/price per share}$$

$$= \frac{\text{Rs 12} + (\text{Rs 100} - \text{Rs 75})/7}{(\text{Rs 100} + \text{Rs 75})/2} = \frac{\text{Rs 12} + \text{Rs 3.57}}{\text{Rs 87.5}} = 17.79\%$$

$$k_d = \frac{\text{I}(1 - t) + (\text{RV} - \text{MN})/\text{N}}{(\text{RV} + \text{MV})/2}$$

$$= \frac{\text{Rs 14} + (\text{Rs 1} - 0.5) + (\text{Rs 100} - \text{Rs 90})/6}{(\text{Rs 100} + \text{Rs 90})/2 = \text{Rs 95}} = \frac{\text{Rs 7} + \text{Rs 1.67}}{\text{Rs 95}} = 9.12\%$$

Cost of term loan (k_l) = I (1 − t) = Rs 14 (1 − 0.5) = 7%

(ii) Determination of weighted average cost of capital, using book value (BV) and market value (MV) weights

Source of capital	*Weights*		*Cost (%)*	*Total cost*	
	BV	*MV*		*BV*	*MV*
Equity share capital	Rs 100	113.64[1]	16	Rs 16.000	Rs 18.182
12% Preference shares	10	7.50	17.79	1.779	1.334
Retained earnings	120	136.36[2]	16	19.200	21.818
14% Debentures	70	63.00	9.12	6.384	5.746
14% Term loan	100	100.00	7.00	7.000	7.000
	400	420.50		50.363	54.080

1. Market value of shares Rs 250 lakh × percentage of equity capital to equity funds (at book value) i.e., 10/22 = Rs 113.64.

2. Rs 250 lakh × percentage share of retained earnings to equity funds i.e., 12/22 = Rs 136.36

k_0 = (BV basis) = (Total cost/Total book value) × 100 = (Rs 50.363 lakh/Rs 400 lakh) × 100 = 12.59 per cent.

k_0 = (MV basis) = (Total cost/Total market value) × 100 = (Rs 54.080 lakh/Rs 420.50 lakh) × 100 = 12.86 per cent.

7.25 A company's share is currently quoted in the market at Rs 20. The company expects to pay a dividend of Rs 2 per share at year-end and the investors expect a growth rate of 5% per year.

You are required to calculate **(a)** cost of equity capital of the company and **(b)** the market price per share, if the anticipated growth rate dividend is 7%. *(Calcutta University, 2006)*

Solution

(a) $k_e = D_1/P_0 + g$ = Rs 2/Rs 20 + 5% = 15 per cent.

(b) $\dfrac{D_1}{k_e - g} = \dfrac{\text{Rs } 2}{15\% - 7\% = 8\%} = \text{Rs } 25$

7.26 A company issues 12% redeemable preference shares of Rs 100 each at 5% premium redeemable after 15 years at 10% premium. If the flotation cost of each share is Rs 2, what is the value of k_p (cost of preference share) to the company? *(Calcutta University, 2006)*

Solution

$$k_p = \frac{D_p + (RV - SV)/N}{(RV + SV)/2}$$

$$= \frac{\text{Rs } 12 + (\text{Rs } 110 - \text{Rs } 103)/15}{(\text{Rs } 110 + \text{Rs } 103)/2} = \frac{\text{Rs } 12 + 0.4667 = \text{Rs } 12.4667}{\text{Rs } 106.5} = 11.71 \text{ per cent}$$

RV = Rs 100 + 10% premium = Rs 110

SV = Rs 100 − 5% premium − Rs 2 Flotation cost = Rs 103

7.27 A company issues 10,000 preference shares of Rs 100 each redeemable after 10 years at a premium of 5%. The cost of issue is at Rs 2 per share. Calculate cost of preference share.

(Punjab University, 2006)

Solution

Cost of preference share $(k_p) = \dfrac{D_p + (RV - SV)/N}{(RV + SV)/2}$

where, D_p = Dividend payable on preference share, Rs 10

RV = Redeemable value of preference share, Rs 105

SV = Sale proceeds from preference share, Rs 98

$$k_p = \frac{\text{Rs } 10 + (\text{Rs } 105 - \text{Rs } 98)/10}{(\text{Rs } 105 + \text{Rs } 98)/2} = (\text{Rs } 10 + \text{Rs } 0.7)/\ \text{Rs } 101.5 = 10.54 \text{ per cent}$$

7.28 (a) Equity share of A Ltd is currently selling in the market at Rs 100. Dividends paid in the last 5 years are Rs 4.00, Rs 4.25, Rs 4.60, Rs 4.85 and Rs 5.05. The company wants to issue new equity shares and has been advised to price them at Rs 90. Flotation costs are likely to be Rs 8 per share. Calculate the growth rate, cost of existing and new equity for the company.

(b) Equity share of P Ltd. is currently priced at Rs 60. Dividend expected at the end of one year from now is Rs 6. Cost of equity for companies of similar risk is 18%. What is the expected growth rate?

What is expected to happen to MPS if due to some adverse development in the market, the growth rate projection is revised down to 5%. (*Delhi University, 2006*)

Solution

(a) Growth rate = $\frac{\text{Dividend paid at year-end 5}}{\text{Dividends paid at year-end}} = \frac{\text{Rs } 5.05}{4} = 1.2625$

Reference to Table A-4 indicates rate of growth is 6 per cent.

k_e (existing) = Rs 5.05 (1.06)/ Rs 100 = 5.35% + 6% = 11.35 per cent

k_e (new) = [Rs 5.35/(Rs 90 – Rs 8)] + 6% = 6.52% + 6% = 12.52 per cent.

(b) $P_0 = \frac{D_t}{k_e - g}$ or Rs 60 = $\frac{\text{Rs } 6}{(18\% - g)}$

Rs 60 (18% – g) = Rs 6

= 10.8 – 60g = Rs 6 = Rs 4.8 = 60g

g = 4.8/60 = 0.08 = 8 per cent

Determination of MPS where g is 5%:

D (1 + g) = D_1

D_0 = D/(1 + g) or = Rs 6/108 = Rs 5.56

D_1 (revised) = Rs 5.56 (1.05) = Rs 5.84

P_0 = Rs 5.84/(18% – 5%) = Rs 5.84/0.13 = Rs 44.92

Market price of share would decline from Rs 60 to Rs 44.92 due to lower growth rate.

7.29 A company's share is quoted in the market at Rs 40 currently. The company pays a dividend of Rs 2 per share and investors expect a growth rate of 10% per year. Compute: **(i)** The company's cost of equity capital; **(ii)** If anticipated growth rate is 11% p.a., the market price per share using cost of equity capital calculated above. *(Delhi University, 2005)*

Solution

(i) k_e = (Rs 2.20/Rs 40) + 10% = 5.5% + 10% = 15.5 per cent

(ii) P_0 = $D_t/(k_e - g)$ or Rs 2.22/(15.5% – 11%) = Rs 49.33

7.30 From the following information in respect of a company for the year ended 31.12.03, calculate weighted average cost of capital taking market values as weights:

(Rs in lakh)

(i) Capital structure

Equity shares (Rs 100 each)	Rs 200
Reserves and surplus	100
10% Bonds (Rs 1,000 each)	200
	500

(ii) Current market prices: Equity Rs 300 per share; Bond Rs 1,010 per unit. **(iii)** Corporate tax: 40 per cent **(iv)** Current dividend per share: Rs 20. Tax on dividend is 10 per cent. Future growth rate in dividend may be taken as a proxy of the average of the annual growth rates. The company's past dividends per share were as follows:

Year	*Dividend*
1998	Rs 12.50
1999	13.00
2000	14.00
2001	15.50
2002	17.50

(Calcutta University, 2004)

Solution

Determination of specific costs:

(i) Cost of equity (k_e) = (D_1/P_0) + g

$g = D_0 (1 + r)^n = D_n$ or Rs 12.50 $(1 + r)^4$ = Rs 17.50

$(1 + r)^4$ = Rs 17.50/Rs 12.50 = 1.4. Table A.1 (sum of Re 1) suggest that Re 1 compounds to Rs 1.4 in 4 years at the compound rate of 9 per cent approximately. Therefore, g is 9 per cent. It may be noted that the value of g already takes into account dividend tax factor and hence no separate adjustment.

K_e = (Rs 20(1.09)/Rs 300) + 9% = 7.27% + 9% = 16.27 per cent

(ii) There is no separate market value of reserves and surplus/retained earnings. Their cost is equal to k_e

(iii) Cost of 10 per cent bonds = 10%(1 – 0.4) = 6 per cent

Determination of k_0 using Market Value as Weights

Source of finance	*Amount*	*After-tax cost (%)*	*Total cost*
Equity funds	Rs 300 lakh	16.27%	Rs 48.81 lakh
10% Bonds	200	6.00	12.00
	500		60.81

K_0 = (Rs 60.81 lakh/Rs 500 lakh) × 100 = 12.16 per cent.

7.31 State in brief the weights that you would take into consideration for computing weighted average cost of capital. Why market value weights are considered superior to the book value weights? Wisconson Company has assets of Rs 32,00,000 that have been financed by Rs 18,00,000 of Equity shares (of Rs 100 each), General Reserve of Rs 3,60,000 and Debt of Rs 10,40,000. For the year ended 31.03.02 the company's total profits before interest and taxes were Rs 6,23,200. Wisconson pays 8 per cent interest on borrowed capital and is in a 40 per cent tax bracket. The market value of equity as on 31.03.02 was Rs 150 per share. What was the weighted average cost of capital? Use market values as weights. *(Calcutta University, 2002)*

Solution

There are two systems of assigning weights, namely, historical and marginal; historical weights are superior to marginal weights as the former take into account the long-term implications of the firm's current financing. When historical weights are to be employed, a choice is to be made between book value and market value weights. While the book value weights are operationally convenient, the market value basis is theoretically consistent and sound, and therefore, a better indicator of corporate's capital structure. The major reason is the costs of specific sources of finance which constitute the capital structure of a corporate are calculated using prevailing market prices.

Determination of specific costs:

Earnings before interest and taxes	Rs 6,23,200
Less interest (0.08 × Rs 10,40,000)	83,200
Earnings before taxes	5,40,000
Less taxes (0.40)	2,16,000
Earnings available for equity-holders	3,24,000
Divided by number of equity shares	18,000
Earnings per share (EPS) (Rs 3,24,000/18,000)	18
Market price per share (MPS), given	Rs 150
Cost of equity (Rs 18/Rs 150) × 100	12 per cent
Cost of debt 8% (1 – 0.4)	4.8 per cent
Cost of retained earnings = Cost of equity	12 per cent

Determination of Weighted Average Cost of Capital (k_0) using Market Value Weights

Source	*Amount*	*After-tax cost (%)*	*Total cost*
Equity funds	Rs 27,00,000	12%	Rs 3,24,000
Debt	10,40,000	4.8	49,920
	37,40,000		3,73,920

K_0 = (Rs 3,73,920/Rs 37,40,000) × 100 = 10.00 per cent

Notes: **(i)** Cost of equity is calculated with reference to earnings approach. **(ii)** Cost of retained earnings is equal to cost of equity. There is no separate market value of general reserves. Market value per share of Rs 150 factors general reserve also.

Chapter

8

Analysis of Risk and Uncertainty

Learning Objectives

1. Discuss the basic risk concept and its precise expression—sensitivity analysis
2. Understand the calculation and practical aspects of risk-adjusted discount rate (RADR) and certainty-equivalent (CEs) as basic risk-adjusted techniques
3. Explain the probability distribution approach to deal with risks
4. Illustrate the decision-tree approach to evaluate risky investment proposals

INTRODUCTION

This Chapter discusses the risk and uncertainty associated with capital budgeting. The importance of the risk dimension in capital budgeting can hardly be overstressed. In fact, profitability and risk are closely related. It is very likely that a project which is potentially very profitable may also increase the perceived risk of the firm. This trade-off between risk and profitability would have a bearing on the investors' perception of the firm before and after the acceptance of a specific pro-posal. If the acceptance of a proposal, for instance, makes a firm more risky, the investors would not look to it with favour. This may have an adverse implication for the market price of shares, total valuation of the firm and its goal. It is therefore necessary to incorporate the risk factor in the analysis of capital budgeting. The present Chapter is concerned with methods for doing this. The effect on the risk of the firm as a whole has not been covered here; the focus is on the project risk. Section 1 of the Chapter explores the basic risk concepts. The discussion of the various methods for incorporating the risk factor into the capital budgeting decisions for an individual investment proposal is the theme of Section 2. The last Section presents a summary of the main points.

SECTION I DESCRIPTION AND MEASUREMENT OF RISK

Definition of Risk

As already observed, risk analysis should be incorporated in the capital budgeting exercise. In general, other things being equal, a firm would be well advised to accept a project which is less risky and reject those that involve more risk. This recommendation is consistent with the assumption that the management is averse to risk.

The capital budgeting decision is based on the benefits derived from the project. These benefits are measured in terms of cash flows. As shown in Chapter 9, these cash flows are estimates. The estimation of future returns is done on the basis of various assumptions. The actual returns in terms of cash inflows depend, in other words, on a variety of factors such as price, sales volume, effectiveness of the advertising campaign, competition, cost of raw materials, manufacturing costs and so on. Each of these, in turn, depends on other variables like the state of economy, the rate of inflation, and so on. The accuracy of the estimates of future returns and, therefore, the reliability of the investment decision would largely depend upon the precision with which these factors are forecast. There are strong reasons to believe that howsoever carefully the factors having a bearing on future returns emanating from the project are forecast, the actual returns will not precisely correspond to the estimate. In other words, the actual returns will vary from the estimate. This is technically referred to as risk.

Risk is the variability in the actual returns in relation to the estimated returns.

The term **risk** with reference to capital budgeting/investment dec-ision may, therefore, be defined as the variability in the actual returns emanating from a project over its working life, in relation to the estimated return as forecast at the time of the initial capital budgeting decision.

The decision situations with reference to risk analysis in capital budgeting decisions can be bro-ken up into three types[1]: **(i)** uncertainty, **(ii)** risk, and **(iii)** certainty. The risk situation is one in which the probabilities of occurrence of a particular event are known. These probabilities are not known under the uncertainty situation. The difference between risk and uncertainty, therefore, lies in the fact that variability is less in risk than in uncertainty. In other words, in a strict mathematical sense, there is a distinction between the two:

> Risk refers to a set of unique outcomes for a given event which can be assigned probabilities, while uncertainty refers to the outcomes of a given event which are too unsure to be assigned probabilities.[2]

That is, risk exists when the decision maker is in a position to assign probabilities to various outcomes (i.e. probability distribution is known to him). This happens when the decision maker has some historical data on the basis of which he assigns probabilities to other projects of the same type. Uncertainty exists when the decision maker has no historical data from which to develop a probability distribution, and must make intelligent guesses in order to develop a subjective pro-bability distribution. For example, if the proposed project is completely new to the firm, the decision maker, through research and consultation with others,may be able to subjectively assign probabilities to various outcomes.[3] Throughout this chapter, however, the terms **risk** and **uncertainty** will be used interchangeably to refer to an uncertain decision making situation.

It is, then, obvious that if the future returns are certain, that is, if they could be forecast accurately, there would be no risk involved in such situations. The less accurately they are

fore-cast, the more likely would be the risk involved in the investment decision. The variability of returns and, hence, risk would vary with the type of project. For instance, lease–purchase capital budgeting will, according to this criterion, have no risk since no variability is associated with the returns. This is because the firm purchases the asset to give it on lease for a specified number of annual lease payments. The return, in other words, is absolutely certain. Another example of risk-free investment is the various types of government and government-guaranteed securities. Excepting these few cases, the investment decision is faced with the problem of uncertain returns, which vary widely depending on the nature and purpose of the decision. Thus, the capital budgeting decision for starting a new product will have more uncertain returns than the one involving ex-pansion of an existing one. Further, the estimates of returns from cost-reduction type of capital budgeting will be subject to a lower degree of risk, than the revenue-expanding capital budgeting project.

In brief, risk, with reference to capital budgeting, results from the variation between the estimated and the actual returns. The greater the variability between the two, the more risky is the project. In the discussions that follow, we will discuss the measures to quantify risk in more precise terms.

Sensitivity Analysis

One measure which expresses risk in more precise terms is **sensitivity analysis**. It provides infor-mation as to how sensitive the estimated project parameters, namely, the expected cash flow, the discount rate and the project life are to estimation errors. The analysis on these lines is important as the future is always uncertain and there will always be estimation errors. Sensitivity analysis takes care of estimation errors by using a number of possible outcomes in evaluating a project. The method adopted under sensitivity analysis is to evaluate a project using a number of estimated cash flows to provide to the decision maker an insight into the variability of the outcomes.

Sensitivity analysis is a behavioural approach that uses a number of possible values for a given variable to assess its impact on a firm's returns.

Sensitivity analysis provides different cash flow estimates under three assumptions: **(i)** the worst (i.e. the most pessimistic), **(ii)** the expected (i.e. the most likely), and **(iii)** the best (i.e. the most optimistic) outcomes associated with the project. This is illustrated in Example 8.1.

Example 8.1

From the undermentioned facts, compute the net present values (NPVs) of the two projects for each of the possible cash flows, using sensitivity analysis.

Particulars	*Project X ('000)*	*Project Y ('000)*
Initial cash outlays (t = 0)	Rs 40	Rs 40
Cash inflow estimates (t = 1 – 15)		
Worst	6	0
Most-likely	8	8
Best	10	16
Required rate of return	0.10	0.10
Economic life (years)	15	15

Solution

The NPV of each project, assuming a 10 per cent required rate of return, can be calculated for each of the possible cash flows. Table A-4 indicates that the present value interest factor annuity (PVIFA) of Re 1 for 15 years at 10 per cent discount is 7.606. Multiplying each possible cash flow by PVIFA, we get, (Table 8.1):

TABLE 8.1 Determination of NPV

	Project X		*Project Y*	
Expected cash inflows	*PV*	*NPV*	*PV*	*NPV*
Worst	Rs 45,636	Rs 5,636	Nil	(Rs 40,000)
Most likely	60,848	20,848	Rs 60,848	20,848
Best	76,060	36,060	1,21,696	81,696

Table 8.1 demonstrates that sensitivity analysis can produce some very useful information about projects that appear equally desirable on the basis of the most likely estimates of their cash flows. Project X is less risky than Project Y. The actual selection of the project (assuming that the projects are mutually exclusive) will depend on the decision maker's attitude towards risk. If the decision maker is conservative, he will select Project X as there is no possibility of suffering losses. On the other hand, if he is willing to take risks, he will choose Project Y as it has the possibility of paying a very high return as compared to project X. Sensitivity analysis, in spite of being crude, does provide the decision maker with more than one estimate of the project's outcome and, thus, an insight into the variability of the returns.

Assigning Probability It has been shown above that sensitivity analysis provides more than one estimate of the future return of a project. It is, therefore, superior to single-figure forecast as it gives a more precise idea regarding the variability of the returns. But it has a limitation in that it does not disclose the chances of occurrence of these variations. To remedy this shortcoming of sensitivity analysis so as to provide a more accurate forecast, the probability of the occurring variations should also be given. Probability assignment to expected cash flows, therefore, would provide a more precise measure of the variability of cashflows. The concept of probability is helpful as it indicates the percentage chance of occurrence of each possible cash flow. For instance, if some expected cash flow has 0.6 probability of occurrence, it means that the given cash flow is likely to be obtained in 6 out of 10 times (i.e. 60 per cent). Likewise, if a cash flow has a probability of 1, it is certain to occur (as in the case of purchase–lease capital budgeting decision that is, the chances of its occurrence are 100 per cent). With zero probability, the cash flow estimate will never materialise. Thus, probability of obtaining particular cash flow estimates would be between zero and one.

The quantification of variability of returns involves two steps. First, depending on the chance of occurrence of a particular cash flow estimate, probabilities are assigned. The assignment of pro-babilities can be *objective* or *subjective*. Objective probability refers to the assignment of a probability which is based on a large number of observations, under independent and identical situations, on the basis of the experience of happening or not happening of the event. However, objective probability is not of much use in capital budgeting situations because they do not satisfy the requirement of independent observations repeated over time. They are rather based on single event. Probability assignments which are not based on objective evidence

of a large number of trials of identical events are called subjective or personal probability assignments. The assignment of probabilities to cash flow estimates is subjective.

The second step is to estimate the expected return on the project. The returns are expressed in terms of expected monetary values. The expected value of a project is a weighted average return, where the weights are the probabilities assigned to the various expected events, that is, the expected monetary values of the estimated cash flows multiplied by the probabilities.

The procedure for assigning probabilities and determining the expected value is illustrated in Table 8.2 by using the NPVs for projects X and Y of Example 8.1.

TABLE 8.2 Calculation of Expected Values

Possible NPV	*Probability of the NPV occurrence*	*NPV (×) Probability*	
Project X			
Rs 5,636	0.25		Rs 1,409
20,848	0.50		10,424
36,060	0.25		9,015
	1.00	Expected NPV	20,848
Project Y			
(40,000)	0.25		(10,000)
20,848	0.50		10,424
81,696	0.25		20,424
	1.00	Expected NPV	20,848

The mechanism for calculating the expected monetary value and the NPV of these estimates is further illustrated in Example 8.2.

Example 8.2

The following information is available regarding the expected cash flows generated, and their probability for company X. What is the expected return on the project? Assuming 10 per cent as the discount rate, find out the present values of the expected monetary values.

Year 1		*Year 2*		*Year 3*	
Cash flows	*Probability*	*Cash flows*	*Probability*	*Cash flows*	*Probability*
Rs 3,000	0.25	Rs 3,000	0.50	Rs 3,000	0.25
6,000	0.50	6,000	0.25	6,000	0.25
8,000	0.25	8,000	0.25	8,000	0.50

Solution

TABLE 8.3 **(i)** Calculation of Expected Monetary Values

Year 1			*Year 2*			*Year 3*		
Cash flows	*Probability*	*Monetary values*	*Cash flows*	*Probability*	*Monetary values*	*Cash flows*	*Probability*	*Monetary values*
Rs 3,000	0.25	Rs 750	Rs 3,000	0.50	Rs 1,500	Rs 3,000	0.25	Rs 750
6,000	0.50	3,000	6,000	0.25	1,500	6,000	0.25	1,500
8,000	0.25	2,000	8,000	0.25	2,000	8,000	0.50	4,000
Total		5,750			5,000			6,250

(ii) Calculation of Present Values

Year 1	Rs 5,750 × 0.909	= Rs 5,226.75
Year 2	5,000 × 0.826	4,130.00
Year 3	6,250 × 0.751	4,693.75
Total		14,050.50

Sensitivity analysis can also be used to ascertain how change in key variables (say, sales volume, sales price, variable costs, operating fixed costs, cost of capital and so on) affect the expected outcome (measured in terms of NPV) of the proposed investment project. For the purpose of analysis, only one variable is considered, holding the effect of other variables constant, at a point of time.

Assume a manufacturing company determines a positive NPV of Rs 5 lakh for a new investment project requiring a cash outlay of Rs 25 lakh. Its management may find it useful to know the impact of change in sales price (±5 per cent) on the NPV of the project. Assume further that the sensitivity analysis indicating a drop in selling price by 5 per cent will cause NPV to be negative. Evidently, it signals that the project is highly risky. On the contrary, if it is found that the NPV continues to be positive even with 25 per cent drop in sales, the project can be viewed as one which has low risk.

Likewise, the management may carry out sensitivity exercises in relation to increase in variable costs. Assuming that 5 per cent increase in variable costs converts the status of positive NPV to negative NPV, the project will be designated as a risky one. In this way, sensitivity analysis can be carried out with respect to identified critical variables to the base NPV. The project is said to be highly sensitive if the small change brings out a magnified change in NPV. These examples eloquently demonstrate the usefulness of sensitivity analysis as a technique of assessing the risks associated with the proposed project.

It will be equally useful to have a graphic presentation to assess the impact of change in key variables on the NPV; the more steep the curve is, the more sensitive/risky the project is, a flatter curve is the manifestation of the low risk.

Thus, the primary objective of sensitivity analysis is to determine how sensitive the NPV is to changes in any of the key variables and to identify which variable has the most significant impact on the NPV. Clearly, sensitivity analysis brings a good insight/feel to the decision maker about the riskiness of the project.

SECTION 2 RISK EVALUATION APPROACHES

This section examines the popular techniques to handle risk. They are:

1. Risk-adjusted Discount Rate Approach
2. Certainty-Equivalent Approach
3. Probability Distribution Approach
4. Decision-tree Approach.

Risk adjusted discount rate is a method to incorporate risk in the discount rate employed in computing the present values.

Risk-adjusted Discount Rate Approach

The Risk-adjusted Discount Rate (RAD) Approach is one of the simplest and the most widely used methods for incorporating risk into the capital budgeting decision. Under this method, the amount of risk inherent in a project is incorporated in the discount rate employed in the present value

calculations. Relatively risky projects would have relatively high discount rates and relatively safer projects would have relatively lower discount rates. For example, we would use a very low RAD if we intend to purchase a risk-free asset such as treasury bills. On the other hand, a much higher RAD would be used if we intend to invest in a new project which introduces a new product into an untried market. In fact, in practice, the companies may be using different RADs for different types of projects. For instance, RAD may be, say, 10 per cent for projects involving expansion programmes, 15 per cent for new projects and a still higher rate, say, 20 per cent if the project is concerned with introducing a new product to new types of customers.

The risk-adjusted discount rates presumably represent the differential risk in different classes of investments. The rationale for using different RADs for different projects is as follows. The rate of discount or the cost of capital (k) is the minimum acceptable required rate of return. It is the rate which the investors demand in providing capital to the firm for an investment having a specified risk since such rate is available elsewhere in the economy on assets of similar risk. Therefore, if the project earns less than the rates earned in the economy for that risk, the shareholders will be earning less than the prevailing rate for that risk level, and the market value of the company's shares will fall. The cost of capital, therefore, represents the investors' time preference for money for a typical investment project. Thus, the cost of capital is equivalent to the prevailing rate in the market on that risk class of investment. A well-accepted economic premise is that the required rate of return should increase as risk increases. Therefore, the greater the riskiness of the project, the greater should be the discount rate and *vice versa*. The risk-adjusted discount rate is the discount rate which combines time as well as risk preference of investors.

The use of a single rate of discount without considering the differing risk of various projects would be logically inconsistent with the firm's goal of shareholders' wealth maximisation.

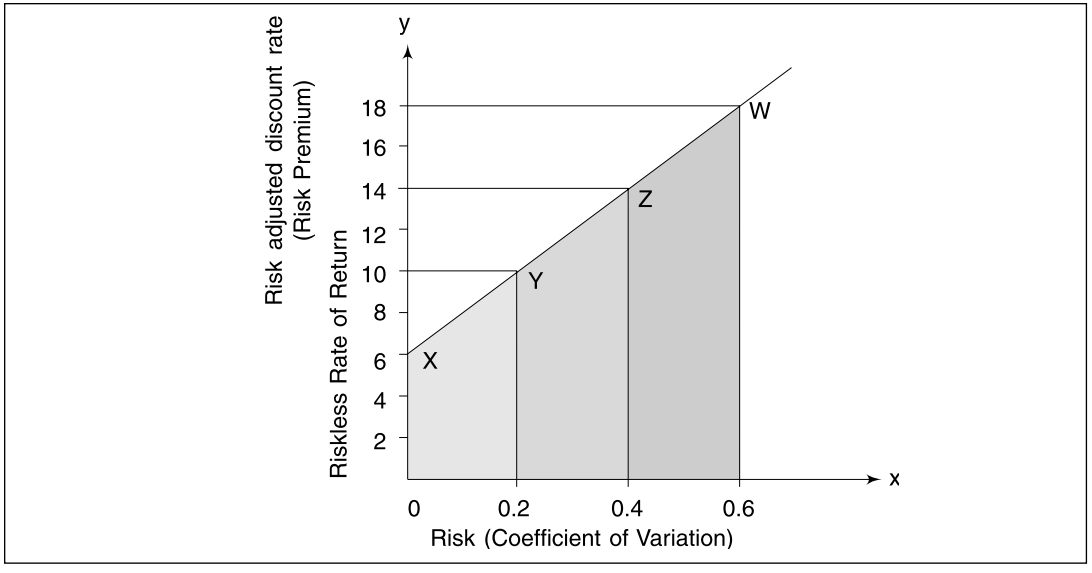


FIGURE 8.1 Risk and Required Return

Figure 8.1 portrays the relationship between the amount of risk and the required *k*. It indicates that cash flows of project X with no risk will be discounted at the lowest rate (6 per cent). But as the risk (measured in terms of coefficient of variation) increases, the cash flows of other Projects (Y, Z and W) have to be discounted at progressively higher rates, viz. 10 per cent, 14 per cent and 18 per cents respectively.

Accept-reject Decision The Risk-adjusted Discount Rate Approach can be used with both the NPV and the IRR. If the NPV method is used to evaluate capital expenditure decision, NPV would be calculated using the risk-adjusted rate. If the NPV is positive, the proposal would qualify for acceptance. A negative NPV would signify that the project should be rejected. In case of the *IRR* as a decision criterion, the internal rate of return (*r*) would be compared with the risk-adjusted re-quired rate of return. If the *r* exceeds the risk-adjusted rate, the proposal would be accepted, otherwise not.

The risk associated with future returns has two dimensions. First, as already mentioned, the degree of risk of different projects may be different at a particular point of time because of the nature of the proposals such as expansion or new products and so on. The risk may also be different in the case of the same project over time. That is to say, the return at the end of the second year may be more risky than that at the end of the first year and so on. We have illustrated below the calculations of the NPV in both types of situations.

We shall be using the following equation for the purpose of determining NPV under the RAD method.

$$NPV = \sum_{t=1}^{n} \frac{CFAT_t}{(1 + K_r)^t} - CO \qquad \textbf{(8.3)}$$

where $CFAT_t$ = expected *CFAT* in year *t*, K_r = risk-adjusted discount rate,
CO = cash outflows

Thus, projects are evaluated on the basis of future cash flow projections and an appropriate discount rate. Example 8.5 clarifies how the K_r can be used to evaluate capital budgeting projects.

Example 8.5

Cash outlays		(Rs 1,00,000)
CFAT	Year 1	50,000
	Year 2	60,000
	Year 3	40,000

Riskless rate of return = 6 per cent

Risk-adjusted rate of return for the current project = 20 per cent

Solution

$$\text{NPV} = (\text{Rs } 1{,}00{,}000) + \frac{\text{Rs } 50{,}000}{(1 + .20)} + \frac{\text{Rs } 60{,}000}{(1 + .20)^2} + \frac{\text{Rs } 40{,}000}{(1 + .20)^3} = (\text{Rs } 1{,}00{,}000) +$$

$$[\text{Rs } 50{,}000\ (0.833)] + [\text{Rs } 60{,}000\ (0.694)] + [\text{Rs } 40{,}000\ (0.579)] = \text{Rs } 6{,}410$$

Given the expected cash flows and estimated risk-adjusted discount rate (K_r), the project's expected NPV is positive and the project should be accepted.

If the risk-adjusted discount rate is 28 per cent, the NPV will be negative (Rs 5,550). Then, the project will have to be rejected. If the riskiness of the return from the same project differs for future periods,

different rates of discount for different future periods can be used. Thus, in Example 8.5, if it is felt that the cash flow is riskier for the second and the third year compared to the first year, a higher discount rate would be used for the return in the second year than that for the first year and so on. Let the rate of discount be 20 per cent, 22 per cent and 25 per cent for the returns for the years 1, 2 and 3 respectively. Then NPV = (Rs 1,00,000) + Rs 50,000 (0.833) + Rs 60,000 (0.672) + Rs 40,000 (0.512) = Rs 2,450.

Evaluation The Risk-adjusted Discount Rate Approach to incorporate risk in the capital budgeting analysis has certain virtues. First, it is simple to calculate and easy to understand. Moreover, companies in actual practice apply different standards of cost of capital for different projects. It has, therefore, the merit of operational feasibility.

However, it is beset with certain operational and conceptual difficulties. The principal operational difficulty of this approach to the incorporation of risk relates to the determination of the risk-adjusted discount rate. While it is logical to assume that projects which involve more risk should be discounted at a higher rate and *vice-versa*, the difficulty encountered is how to precisely ex-press a higher risk in terms of a higher discount rate. In other words, determining an appropriate discount rate in consonance with differing degrees of risks of various projects or, over the years for the same project, is bound to be arbitrary and, therefore, inconsistent in application. It is doubtful if the exercise would give objective results.

The second criticism of this approach is that it does not make direct use of the information available from the probability distribution of expected future cash.[4] Moreover, conceptually, this approach adjusts the wrong element. It is the future cash flow of a project which is subject to risk. What is needed is that the cash flow should be adjusted and not the required rate of return.

Finally, the process of adding the risk premium to the discount rate leads to a compounding of risk over time. This is not a theoretically desirable practice. It is because the discounting process should only take into account time value considerations and not risk considerations. In other words, this method implies that risk necessarily increases with time and, therefore, proposals in which risk does not necessarily increase with time may not be properly evaluated by this method.

In brief, this approach can at best be described as a crude method of incorporating risk into capital budgeting analysis.

Certainty-Equivalent Approach

Certainty equivalents are risk adjusted factors that represent the per cent of estimated cash inflow that investors would be satisfied to receive for certain rather than the cash inflows that are possible/uncertain for each year.

The certainty-equivalent approach (CEA), as an alternative to the risk-adjusted rate method, over-comes some of the weaknesses of the latter method. Under the former approach, the riskiness of the project is taken into consideration by adjusting the expected cash flows and not the discount rate. This method eliminates the problem arising out of the inclusion of risk premium in the discounting process.

Steps Involved The incorporation of risk in the investment decision on the basis of the certainty-equivalent approach involves the following steps.

Comparable Riskless Flow As already observed, the incorporation of risk in capital budgeting analysis is done, according to this approach, by modifying the expected cash inflows. The first step, therefore, involves the determination of the basis for modifying the cash flows to adjust for

risk. The risk adjustment factor is expressed in terms of a certainty-equivalent coefficient. The certainty-equivalent coefficient represents the relationship between certain (riskless) cash flows and uncertain (risky) cash flows. Thus, the coefficient is equal to:

$$\frac{\text{Riskless cash flow}}{\text{Risky cash flow}} \qquad \textbf{(8.4)}$$

Investment decisions are associated with risk as the future returns are uncertain in the sense that the actual returns are likely to vary from the estimates. If the returns could be made certain, there would be no element of risk. It can reasonably be expected that investors would prefer a relatively smaller but certain cash flows rather than an uncertain, though slightly larger cash flow. How much less they would accept would depend on their perception or utility preference with respect to risk. Therefore, depending on the perception, the first step in the use of the certainty-equivalent approach is to ascertain riskless cash flows comparable to the expected cash flows streams from the project.

Suppose a project is expected to generate a cash flow amounting to Rs 20,000. Since this in-volves risk, a smaller but certain cash flow would be as acceptable to the firm as this one. Let us assume that, on the basis of the utility preference of the management with respect to risk, the firm would rank a certain cash flow of Rs 12,000 as equal to an uncertain cash flow of Rs 20,000. In other words, the certainty-equivalent of Rs 20,000 is Rs 12,000. Or, the comparable risky flow for the riskless flow of Rs 12,000 is Rs 20,000. Thus, the certainty equivalent coefficient is 0.60 (Rs 12,000 ÷ Rs 20,000). This coefficient, when multiplied by the risky cash flow, would generate the riskless cash flows, that is, 0.6 × Rs 20,000 = Rs 12,000.

The coefficient is a fractional amount which can assume a value between 0 and 1. There is an inverse relationship between the degree of risk and the value of the coefficient; the higher the risk associated with the projected cash flow, the lower is the coefficient.

Present Value Calculations After the expected cash flows have been converted into certainty-equivalents, the second step under this approach is to calculate their present values. The rate of discount used for the purpose is the *risk-free rate* or the rate which appropriately reflects the time value of money. It is the same discount rate which is used for computing the present values in the normal course of evaluating capital expenditure. This rate differs from the rate used in the risk-adjusted discount method in that the latter is a modified version of the former.

Accept-Reject Rule The decision-criterion here can either be the NPV method or the IRR method. Using the NPV method, the proposal would be accepted if the NPV of the certainty-equivalent cash flow is positive, otherwise it would be rejected. If the IRR method is employed, the internal rate of return (r), that equates the present value of certainty-equivalent cash inflows with the present value of the cash outflows, would be compared with the risk-free discount rate. As is the practice with this method, if r exceeds the risk-free rate, the investment project would be accepted. If not, it would be rejected.

The mathematical formulation to give the NPV would be:

$$\text{NPV} = \frac{a_1 CFAT_1}{(1+i)^1} + \frac{a_2 CFAT_2}{(1+i)^2} + \frac{a_3 CFAT_3}{(1+i)^3} + \ldots + \frac{a_n CFAT_n}{(1+i)^n} - CO$$

$$= \sum_{t=1}^{n} \frac{a_t CFAT_t}{(1+i)^t} - CO \qquad \textbf{(8.5)}$$

where a_t = certainty-equivalent coefficient for year t, i = riskless interest rate, CO = Cash outflow

We illustrate below the certainty-equivalent approach to adjust risk to capital budgeting analysis on the basis of Example 8.5.

Let us further assume that the certainty-equivalent coefficients for future cash inflows in different years are:

Year	*Coefficient*
1	0.90
2	0.70
3	0.60

The certainty-equivalent cash inflows would be as follows:

Year 1 = Rs 45,000 (coefficient 0.9 × Rs 50,000, the expected cash inflows)
Year 2 = Rs 42,000 (0.70 × Rs 60,000)
Year 3 = Rs 24,000 (0.60 × Rs 40,000)

This would be discounted by the riskless rate of return, which is, 6 per cent. Substituting the value in Equation (8.5), $NPV = \frac{\text{Rs } 45{,}000}{(1+0.06)^1} + \frac{\text{Rs } 42{,}000}{(1+0.06)^2} + \frac{\text{Rs } 24{,}000}{(1+0.06)^3} - \text{Rs } 1{,}00{,}000$

= Rs 45,000 (0.943) + Rs 42,000 (0.890) + Rs 24,000 (0.840) – Rs 1,00,000 = (Rs 25)

Since the NPV is negative, the project should be rejected. This decision is in conflict with the decision using the risk-adjusted discount rate where K = 20 per cent. Thus, both these methods may not yield identical results.

Evaluation The certainty-equivalent approach has the merit of being simple to calculate. Another merit of this approach is that it incorporates risk by modifying the cash flows which are subject to risk. It is, therefore, conceptually superior to the time-adjusted discount rate approach.

Its weaknesses arise out of the practical problems of implementation. The crucial element in the application of this approach is the certainty-equivalent coefficient. It depends upon the utility preferences of the management and the perception of the investors. Being a subjective estimate, it cannot be objective, precise and consistent. The conclusions based on such an estimate would be open to question. Another weakness of this method is that it does not directly use the probability distribution of possible cash flows. Moreover, it is not as intuitively appealing as the risk-adjusted discount rate approach and is more difficult to calculate as well as understand.

However, despite these shortcomings, the certainty-equivalent approach is theoretically superior to the risk-adjusted discount rate approach.[5] The reasons, in brief, are as follows.[6] The risk-adjusted discount rate method implies increasing risk over time when the discount rate, K, is constant. It may well be the case that this assumption is appropriate. However, management is unable to consider increasing risk explicitly with this approach and make serious errors in measuring risk over time. For many projects, risk does increase with the length of time in future. As a result, the assumption implicit in the risk-adjusted discount rate approach may well be valid. However, all projects do not necessarily conform to this pattern. For example, an investment proposal may be more risky in the initial years, but when established it may not be that risky, for instance, a tree plantation. In such circumstances, the assumption of risk increasing with the length of time is not valid. This project would be penalised by the

risk-adjusted discount rate approach. With the certainty-equivalent ap-proach, management is able to specify directly the degree of risk for a particular future period and then discount the cash flow back to the present value, employing the time value of money. For this reason, the certainty-equivalent approach is superior to the risk-adjusted discounted rate method.

We have discussed so far two common techniques of handling risk in capital budgeting. They are at best crude attempts to incorporate risk. Their major shortcoming is that specifying the ap-propriate degree of risk for an investment project is beset with serious operational problems. Another common weakness of both these methods is that they cannot be consistently applied to various projects and over time. A method to incorporate risk in the capital budgeting analysis should possess two attributes: **(a)** it should be able to specify in precise terms the appropriate degree of risk, and **(b)** these specifications should be consistently applied. **The methods that satisfy these two requirements of a satisfactory approach are: (i) Probability Distribution Approach and (ii) Decision-tree Approach.**

Probability Distribution Approach

In the earlier part of this chapter dealing with basic risk concepts, we had introduced the use of the concept of probability for incorporating risk in evaluating capital budgeting proposals. As already observed, the probability distribution of cash flows over time provides valuable information about the expected value of return and the dispersion of the probability distribution of possible returns. On the basis of this information an accept-reject decision can be taken. We discuss the application of probability theory to capital budgeting in this section.

Dependent cash flows are cash flows in a period which depend upon the cash flows in the preceding periods.

Independent cash flows are cash flows not affected by cash flows in the preceding or following years.

The application of this theory in analysing risk in capital budgeting depends upon the behaviour of the cash flows, from the point of view of behavioural cash flows being **(i)** independent, or **(ii)** dependent. The assumption that cash flows are independent over time signifies that future cash flows are not affected by the cash flows in the preceding or following years. Thus, cash flows in year 3 are not dependent on cash flows in year 2 and so on. When cash flows in one period depend upon the cash flows in previous periods, they are referred to as dependent cash flows.

Independent Cash FLows Over Time The mathematical formulation to determine the expected values of the probability distribution of NPV for any project is:

$$NPV = \sum_{t=1}^{n} \frac{\overline{CF_t}}{(1+i)^t} - CO \qquad \textbf{(8.6)}$$

where $\overline{CF_t}$ is the expected value of net CFAT in period t and i is the riskless rate of interest. The standard deviation of the probability distribution of NPV is equal to

$$\sigma\ (NPV) = \sqrt{\sum_{t=1}^{n} \frac{\sigma_t^2}{(1+i)^{2t}}} \qquad \textbf{(8.7)}$$

where σ_t is the standard deviation of the probability distribution of expected cash flows for period t, σ_t would be calculated as follows:

$$\sigma_t = \sqrt{\sum_{J=1}^{m} (CF_{jt} - \overline{CF_t})^2 \cdot P_{jt}} \qquad \textbf{(8.8)}$$

The above calculations of the standard deviation and the *NPV* will produce significant volume of information for evaluating the risk of the investment proposal. The calculations are illustrated in Example 8.6.

Example 8.6

Suppose there is a project which involves initial cost of Rs 20,000 (cost at $t = 0$). It is expected to generate net cash flows during the first 3 years with the probability as shown in Table 8.7. Risk free rate of return is 10 per cent.

TABLE 8.7 Expected Cash Flows

Year 1		Year 2		Year 3	
Probability	*Net cash flows*	*Probability*	*Net cash flows*	*Probability*	*Net cash flows*
0.10	Rs 6,000	0.10	Rs 4,000	0.10	Rs 2,000
0.25	8,000	0.25	6,000	0.25	4,000
0.30	10,000	0.30	8,000	0.30	6,000
0.25	12,000	0.25	10,000	0.25	8,000
0.10	14,000	0.10	12,000	0.10	10,000

Solution

(i) Expected Values: For the calculation of standard deviation for different periods, the expected values are to be calculated first. These are calculated in Table 8.8.

(ii) The standard deviation of possible net cash flows is:

$$\sigma_t = \sqrt{\sum_{j=1}^{m} \left(CF_{jt} - \overline{CF_t}\right)^2 \cdot P_{jt}}$$

Thus, the standard deviation for period 1 is:

$$\sigma_1 = \sqrt{\begin{aligned}&[0.10(6{,}000 - 10{,}000)^2 + 0.25(8{,}000 - 10{,}000)^2 + 0.30(10{,}000 - 10{,}000)^2 \\ &+ 0.25(12{,}000 - 10{,}000)^2 + 0.10(14{,}000 - 10{,}000)^2] = \text{Rs } 2{,}280\end{aligned}}$$

When calculated on similar lines the standard deviations for periods 2 and 3 (σ_2 and σ_3) also work out to Rs 2,280.

(iii) NPV= Rs 10,000 (0.909) + Rs 8,000 (0.826) + Rs 6,000 (0.751) – Rs 20,000 = Rs 204.

TABLE 8.8 Calculation of Expected Values of Each Period

Time period	*Probability* (1)	*Net cash flow* (2)	*Expected value (1 × 2)* (3)
Year 1	0.10	Rs 6,000	Rs 600
	0.25	8,000	2,000
	0.30	10,000	3,000
	0.25	12,000	3,000
	0.10	14,000	1,400
			$\overline{CF_1}$ = 10,000

(*Contd.*)

(*Contd.*)

	0.10	4,000	400
	0.25	6,000	1,500
Year 2	0.30	8,000	2,400
	0.25	10,000	2,500
	0.10	12,000	1,200
			$\overline{CF_2}$ = 8,000
	0.10	2,000	200
	0.25	4,000	1,000
Year 3	0.30	6,000	1,800
	0.25	8,000	2,000
	0.10	10,000	1,000
			$\overline{CF_3}$ = 6,000

(iv) The standard deviation under the assumption of independence of cash flows over time:

$$\sigma = \sqrt{\sum_{t=1}^{n} \frac{\sigma_t^2}{(1+i)^{2t}}} = \sqrt{\frac{\text{Rs } (2{,}280)^2}{(1.10)^2} + \frac{\text{Rs } (2{,}280)^2}{(1.10)^4} + \frac{\text{Rs } (2{,}280)^2}{(1.10)^6}} = \text{Rs } 3{,}283$$

Normal Probability Distribution We can make use of the normal probability distribution to further analyse the element of risk in capital budgeting. The use of the normal probability distribution will enable the decision maker to have an idea of the probability of different expected values of NPV, that is, the probability of NPV having the value of zero or less; greater than zero and within the range of two values, say, Rs 1,000 and Rs 1,500 and so on. If the probability of having NPV of zero or less is considerably low, say, .01, it implies that the risk in the project is negligible. Thus, the normal probability distribution is an important statistical technique in the hands of decision makers for evaluating the riskiness of a project.

The normal probability distribution as shown in Fig. 8.2 has a number of useful properties.

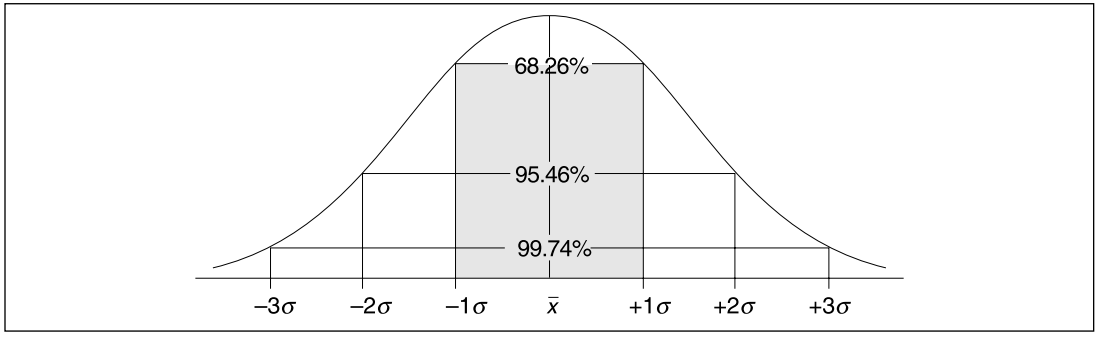


FIGURE 8.2 Normal Curve

The area under the normal curve, representing the normal probability distribution, is equal to 1 (0.5 on either side of the mean). The curve has its maximum height at its expected value (mean). The distribution (curve) theoretically runs from minus infinity to plus infinity. The probability of occurrence beyond $3\sigma_s$ is very near zero (0.26 per cent).

For any normal distribution, the probability of an outcome falling within plus or minus 1σ from the mean is 0.6826 or 68.26 per cent. If we take the range within $2\sigma_s$ (X ± 2σ), the probability of an occurrence within this range is 95.46 and 99.74 per cent of all outcomes and lie within $3\sigma_s$ of the $\overline{X}$.

Example 8.7

Assume that a project has a mean of Rs 40 and standard deviation of Rs 20. The management wants to determine the probability of the NPV under the following ranges: **(i)** Zero or less, **(ii)** Greater than zero, **(iii)** Between the range of Rs 25 and Rs 45, **(iv)** Between the range of Rs 15 and Rs 30.

Solution

(i) Zero or less: The first step is to determine the difference between the expected outcome X and the expected net present value $\overline{X}$. The second step is to standardise the difference (as obtained in the first step) by the standard deviation of the possible net present values. Then, the resultant quotient is to be seen in statistical tables of the area under the normal curve. Such a table (Table Z) is given at the end of the book. The table contains values for various standard normal distribution functions. Z is the value which we obtain through the first two steps, that is:

$$Z = \frac{0 - \text{Rs } 40}{\text{Rs } 20} = -2.0$$

This is also illustrated in Fig. 8.3.

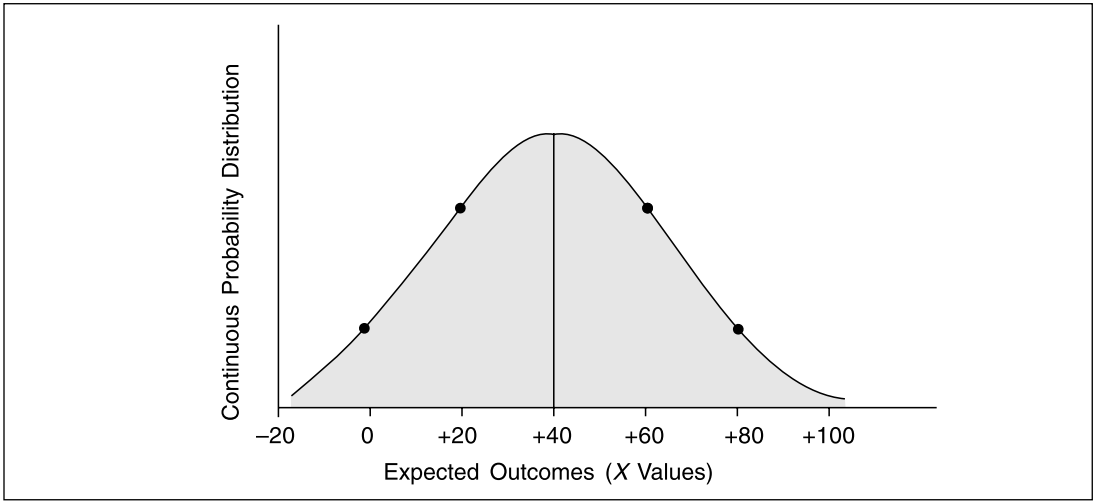


FIGURE 8.3

The figure of –2 indicates that a NPV of 0 lies 2 standard deviation to the left of the expected value of the probability distribution of possible NPV. Table Z indicates that the probability of the value within the range of 0 to 40 is 0.4772. Since the area of the left-hand side of the normal curve is equal to 0.5, the probability of NPV being zero or less would be 0.0228, that is, 0.5 – 0.4772. It means that there is 2.28 per cent probability that the NPV of the project will be zero or less.

(ii) Greater than zero: The probability for the NPV being greater than zero would be equal to 97.72 per cent, that is, 100 – 2.28 per cent probability of NPV being zero or less.

(iii) Between the range of Rs 25 and Rs 45: The first step is to calculate the value of Z for two ranges: (a) between Rs 25 and Rs 40, and (b) between Rs 40 and Rs 45. The second and the last step is to sum up the probabilities obtained for these values of Z:

$$Z_1 = \frac{\text{Rs } 25 - \text{Rs } 40}{\text{Rs } 20} = -0.75$$

$$Z_2 = \frac{\text{Rs } 45 - \text{Rs } 40}{\text{Rs } 20} = +0.25$$

The area as per Table Z for the respective values of –0.75 and 0.25 is 0.2734 and 0.0987 respectively. Summing up, we have 0.3721. In other words, there is 37.21 per cent probability of NPV being within the range of Rs 25 and Rs 45. (It maybe noted that the negative signs for the value of Z in any way does not affect the way Table Z is to be consulted. It simply reflects that the value lies to the left of the mean value).

(iv) Between the range of Rs 15 and Rs 30:

$$Z_1 = \frac{\text{Rs } 15 - \text{Rs } 40}{\text{Rs } 20} = -1.25 \qquad Z_2 = \frac{\text{Rs } 30 - \text{Rs } 40}{\text{Rs } 20} = -0.50$$

According to Table Z, the area for respective values –1.25 and –0.5 is 0.3944 and 0.1915. The probability of having value between Rs 15 and 40 is 39.44 per cent, while the probability of having value between Rs 30 and 40 = 19.15 per cent. Therefore, the probability of having value between Rs 15 and Rs 30 would be 20.29 per cent = (39.44 per cent – 19.15 per cent).

The application of the probability distribution approach in evaluating risky projects is comprehensively illustrated in Example 8.8.

Example 8.8

The Cautious Ltd is considering a proposal for the purchase of a new machine requiring an outlay of Rs 1,500 lakh. Its estimate of the cash flow distribution for the three-year life of the machine is given below (amount in Rs lakh):

Period 1		*Period 2*		*Period 3*	
Cash flows	*Probability*	*Cash flows*	*Probability*	*Cash flows*	*Probability*
Rs 800	0.1	Rs 800	0.1	Rs 1,200	0.2
600	0.2	700	0.3	900	0.5
400	0.4	600	0.4	600	0.2
200	0.3	500	0.2	300	0.1

The probability distribution is assumed to be independent. Risk-free rate of interest is 5 per cent. From the above information, determine the following: **(i)** the expected NPV of the project; **(ii)** the standard deviation of the probability distribution of NPV; **(iii)** the probability that the NPV will be **(a)** zero or less (assuming that the distribution is normal); **(b)** greater than zero; and **(c)** at least equal to the mean; **(iv)** the profitability index of the expected value; and **(v)** the probability that the profitability index will be less than 1.

Solution

TABLE 8.9 (i) Determination of Expected NPV

(Rs lakh)

Period 1			*Period 2*			*Period 3*		
CF	P_j	*Cash flow* ($CF \times P_j$)	*CF*	P_j	*Cash flow* ($CF \times P_j$)	*CF*	P_j	*Cash flow* ($CF \times P_j$)
800	0.1	80	800	0.1	80	1,200	0.2	240
600	0.2	120	700	0.3	210	900	0.5	450
400	0.4	160	600	0.4	240	600	0.2	120
200	0.3	60	500	0.2	100	300	0.1	30
Mean ($\overline{CF_1}$)		420	Mean ($\overline{CF_2}$)		630	Mean ($\overline{CF_3}$)		840

NPV = Rs 420 (0.952) + Rs 630 (0.907) + Rs 840 (0.864) – Rs 1,500 = Rs 197 lakh.

(ii) Standard Deviation of Expected Cash Flow for Period, *t*

Period 1

$(CF_{j1} - \overline{CF_1})^2 (\times) P_{j1} = (CF_{j1} - \overline{CF_1})^2 P_{j1}$

Rs 1,44,400 × 0.1 = Rs 14,440
32,400 × 0.2 = 6,480
400 × 0.4 = 160
48,400 × 0.3 = 14,520

$\Sigma(CF_{j1} - \overline{CF_1})^2 P_{j1}$ = 35,600 $\quad \sigma_1 = \sqrt{35,600} = 188$

Period 2

$(CF_{j2} - \overline{CF_2})^2 (\times) P_{j2} = (CF_{j2} - \overline{CF_2})^2 P_{j2}$

Rs 28,900 × 0.1 = Rs 2,890
4,900 × 0.3 = 1,470
900 × 16,900 × 0.2 = 3,380

$\Sigma(CF_{j2} - \overline{CF_2})^2 P_{j2}$ = 8,100 $\quad \sigma_2 = \sqrt{8,100} = 90$

Period 3

$(CF_{j3} - \overline{CF_3})^2 (\times) P_{j3} = (CF_{j3} - \overline{CF_3})^2 P_{j3}$

Rs 1,29,600 × 0.2 = Rs 25,920
3,600 × 0.5 = 1,800
57,600 × 0.2 = 11,520
2,91,600 × 0.1 = 29,160

$\Sigma(CF_{j3} - \overline{CF_3})^2 P_{j3}$ = Rs 68,400 $\quad \sigma_3 = \sqrt{68,400} = 262$

Calculation of standard deviation about NPV:

$$\sigma(NPV) = \sqrt{\sum_{t=1}^{n} \frac{\sigma_{2t}}{(1+i)^{2t}}} = \sqrt{\frac{\text{Rs } (188)^2}{(1+0.05)^2} + \frac{\text{Rs } (90)^2}{(1+0.05)^4} + \frac{\text{Rs } (262)^2}{(1+0.05)^6}}$$

$$= \sqrt{\frac{\text{Rs } 35,520}{1.102} + \frac{\text{Rs } 8,100}{1.216} + \frac{\text{Rs } 68,400}{1.340}} = \text{Rs } 300$$

(iii) (a) Calculation of Probability of the NPV Being Zero or Less: $Z = \dfrac{0 - 197}{300} = -.6567$

According to Table *Z*, the probability of the NPV being zero is = 0.2454, that is, 24.54 per cent. Therefore, the probability of the NPV being zero or less would be 0.5 – 0.2454 = 0.2546 or 25.46 per cent.

(b) The probability of the NPV being greater than zero would be 1 – 0.2546 = 0.7454 or 74.54 per cent

(c) At least equal to mean: $Z = \frac{197 - 197}{300} = 0$

Reading from the normal distribution table, we get the probability corresponding to 0 as 0. Therefore, the probability of having NPV at least equal to mean would be equivalent to the area to the right of the curve, that is, 0.5 = 50 per cent.

(iv) Profitability Index: $= \frac{PV \text{ of cash inflows}}{PV \text{ of cash outflows}} = \frac{\text{Rs } 197 + \text{Rs } 1{,}500}{\text{Rs } 1{,}500} = 1.13$

(v) The probability of the index being less than 1: For the index to be 1 or less, the NPV would have to be zero or negative. Thus, the probability would be equal to 25.46 per cent as calculated in part (iii) (a) of the answer.

Decision-tree Approach

The Decision-tree Approach (DT) is another useful alternative for evaluating risky investment pro-posals. The outstanding feature of this method is that it takes into account the impact of all probabilistic estimates of potential outcomes. In other words, every possible outcome is weighed in probabilistic terms and then evaluated. The DT approach is especially useful for situations in which decisions at one point of time also affect the decisions of the firm at some later date. Another useful application of the DT approach is for projects which require decisions to be made in sequential parts.

Decision tree is a pictorial representation in tree form which indicates the magnitude, probability and inter-relationships of all possible outcomes.

A **decision tree** is a pictorial representation in tree form which indicates the magnitude, probability and inter-relationship of all possible outcomes.[7] The format of the exercise of the investment decision has an appearance of a tree with branches and, therefore, this method is referred to as the decision-tree method. A decision tree shows the sequential cash flows and the NPV of the proposed project under different circumstances. In Example 8.9 we illustrate the application of this method to a particular investment decision problem.

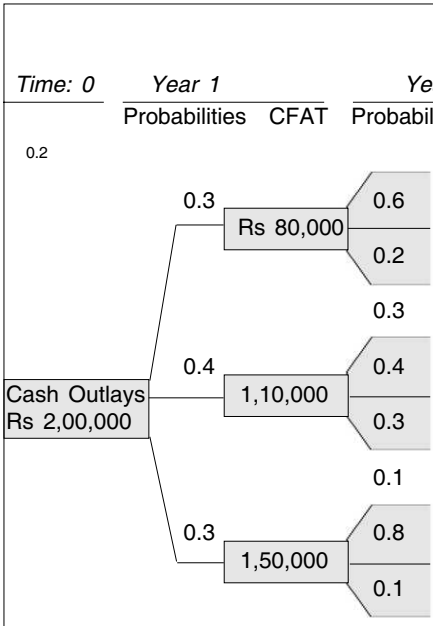
Example 8.9

Suppose a firm has an investment proposal, requiring an outlay of Rs 2,00,000 at present ($t = 0$). The investment proposal is expected to have 2 years' economic life with no salvage value. In year 1, there is a 0.3 probability (30 per cent chance) that CFAT will be Rs 80,000; a 0.4 probability (40 per cent chance) that CFAT will be Rs 1,10,000 and a 0.3 probability (30 per cent chance) that CFAT will be Rs 1,50,000. In year 2, the CFAT possibilities depend on the CFAT that occurs in year 1. That is, the CFAT for the year 2 are conditional on CFAT for the year 1. Accordingly, the probabilities assigned with the CFAT of the year 2 are conditional probabilities. The estimated conditional CFAT and their associated conditional probabilities are as follows:

If $CFAT_1$ = Rs 80,000		*If $CFAT_1$ = Rs 1,10,000*		*If $CFAT_1$ = Rs 1,50,000*	
$CFAT_2$	*Probability*	*$CFAT_2$*	*Probability*	*$CFAT_2$*	*Probability*
Rs 40,000	0.2	Rs 1,30,000	0.3	Rs 1,60,000	0.1
1,00,000	0.6	1,50,000	0.4	2,00,000	0.8
1,50,000	0.2	1,60,000	0.3	2,40,000	0.1

Solution

The estimated values have been portrayed in Fig. 8.4.



Path	Expected NPV at 8% rate of discount	Joint Probability (P_j)**	Expected NPV (×) P_j
Rs 40,000	1	Rs (– 91,640)	0.06	Rs (– 5,498.4)
1,00,000	2	(–40,220)	0.18	(–7,239.6)
1,50,000	3	(–2,630)	0.06	(–157.8)
1,30,000	4	13,270	0.12	1,592.4
1,50,000	5	30,410	0.16	4,865.6
1,60,000	6	38,980	0.12	4,677.6
1,60,000	7	76,020	0.03	2,280.6
2,00,000	8	1,10,300	0.24	26,472.0
2,40,000	9	1,44,580	0.03	4,337.4
		1.00	31,329.8

* *PV* factors for years 1 and 2 at 8% discount rate as per Table A-3 are 0.926 and 0.857 respectively. Multiply $CFAT_1$ by 0.926 and $CFAT_2$ by 0.857; summing up, we get total *PV* for individual possible *CFAT*; substracting Rs. 2,00,000 (CO), we get the *NPV*.

** Product of probabilities of *CFAT* for years 1 and 2.

FIGURE 8.4 Decision Tree

It may be noted that the DT figure covers all the dimensions of the problem: **(i)** the timing of the CFAT, **(ii)** the possible CFAT outcomes in each year (including the conditional nature of the CFAT outcomes in year 2), and the probabilities associated with these outcomes. The DT shows 9 distinct possibilities, the project could assume if accepted. For example, one possibility is that the CFAT for the year one may amount to Rs 80,000 and for the year 2 Rs 40,000. A close perusal of Fig. 8.4 would also indicate that this is the worst event that could happen. Assuming a 8 per cent risk free/discount rate for the project, the NPV would be negative. Likewise, the best outcome that could occur is $CFAT_1$ = Rs 1,50,000 and $CFAT_2$ = Rs 2,40,000. The NPV would be the highest among all the 9 possible combinations. Figure 8.4 shows the NPV at 8 per cent discount rate of each of the estimated CFATs.

The expected NPV ($\overline{NPV}$) of the project is given by the following mathematical formulation:

$$\overline{NPV} = \sum_{j=1}^{m} P_j NPV_j \qquad \textbf{(8.9)}$$

where P_j = The probability of the jth path occurring which is equal to the joint probability along the path;

NPV_j = NPV of the jth path occurring.

In our example, the joint probability, P_j for the worst path is 0.06 (0.3 × 0.2) and for the best path is 0.03 (0.3 × 0.1). The sum of all these joint probabilities must be equal to 1. The last column shows the expected NPV ($\overline{NPV}$), which is obtained by summing up the product of NPV of jth path and the corresponding probability of jth path ($EP_j \times NPV_j$). The sum of these weighted NPVs is positive and, therefore, the project should be accepted.

This approach has the advantage of exhibiting a bird's eye view of all the possibilities asso-ciated with the proposed project. It also makes the management aware well in advance of the adverse possibilities (when the NPV is negative). The conditional nature of CFAT associated with the project is clearly shown. The primary limitation of the method is that the decision tree format may itself become very unwieldy, complex and difficult to understand and construct if the number of years of the expected life of the project and the number of possible outcomes for each year are large. For instance, if we have a 3 year project, there will be 27 paths and, 60,000 paths if the project life is 10 years, assuming only 3 possible outcomes.

Summary

- Risk refers to the variability in the actual returns *vis-à-vis* the estimated returns, in terms of cash flows.
- Sensitivity analysis provides information as to how sensitive the various estimated project parameters, namely, cash flows, cost of capital and project's economic life are to estimation errors. The estimates are normally made under three assumptions: (i) the most pessimistic, (ii) the most likely and (iii) the most optimistic.
- There are four important methods of incorporating risk: (1) Risk adjusted discount rate (RAD) approach, (2) Certainty equivalent (CE) approach, (3) Probability distribution (PD) approach and (4) Decision-tree (DT) approach.
- According to the RAD approach, the element of risk is incorporated by adjusting the required rate of return, using higher discount rates for more risky projects and lower disocunt rates for less risky projects. The $NPV = \sum_{t=1}^{n} \frac{CFAT_t}{(1+k_r)^t} - CO$.
- The CE approach adjusts the risk through the cash flows associated with the projects with the help of certainty-equivalent coefficient. The CE coefficient (a) indicates the relationship bet-ween riskless cash flows and risky cash flows. The $NPV = \sum_{t=1}^{n} \frac{a_t\ CFAT_1}{(1+i)^t} - CO$.
- The PD approach illustrates the analysis of risk through the application of probability distribution, assuming independence of cash flows over time. The steps involved are: (i) Determination of expected NPV, (ii) computation of standard deviation of expected cash flows and (iii) calculation of probability of different value of NPV based on Z value. The value of $Z = (X_t - \overline{X})/\sigma$.
- The DT approach takes into account the impact of all probable estimates of potential out-comes. Every possible outcome is weighed in probability terms and then evaluated, assuming dependence of cash flows. The expected $NPV\ (\overline{NPV}) = \sum_{j=1}^{m} P_j\ NPV_j$.

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2. Osteryoung, J S Capital Budgeting: *Long-Term Asset Selection*, Grid, (Columbus, Ohio), 1979, p 155.
3. Gitman, L J, Principles of Managerial Finance, Harper and Row, New York, 1997, p 310.
4. Osteryoung, J S, *op. cit.,* p 161.
5. For an illustration of this superiority, refer to Robichek, A and S C Myers, *Optional Financing Decision*, Prentice-Hall, Englewood Cliffs, 1965, pp 82-86. See also Van Horne *op. cit.*, pp 128-30.
6. Van Horne, *op. cit.,* p 129.
7. Osteryoung, *op. cit.,* p 162.

Practical Problems

P.8.1 A textile company is considering two mutually exclusive investment proposals. Their expected cash flow streams (CFAT) are given as follows:

Year	*Proposal X (Rs thousand)*	*Proposal Y (Rs thousand)*
0	(500)	(700)
1	145	100
2	145	110
3	145	130
4	145	150
5	145	160
6	145	150
7		120
8		120
9		110
10		100

The company employs the risk-adjusted method of evaluating risky projects and selects the appropriate required rate of return as follows:

Project pay back	*Required rate of return (percentage)*
Less than 1 year	8
1 to 5 years	10
5 to 10 years	12
Over 10 years	15

Which proposal should be acceptable to the company?

Solution

(i) Pay back period (PB) for Proposal X:

$$= \frac{\text{Rs } 5{,}00{,}000}{\text{Rs } 1{,}45{,}000} = 3.448 \text{ years.}$$

The appropriate risk adjusted rate of return for pay back period of 3.448 years is 0.10.

(ii) Pay back period for proposal Y:

Year	*Cash flows (Rs thousand)*	*Cumulative cash flows (Rs thousand)*
1	100	100
2	110	210
3	130	340
4	150	490
5	160	650
6	150	800

The pay back period for Proposal Y is 5 years and 4 months and the appropriate risk adjusted rate of return is 0.12.

(iii) Net present value of proposal X:

Years	*CFAT*	*PV factor (at 0.10)*	*Total PV*
1-6	Rs 1,45,000	4.355	Rs 6,31,475
Less: Cash outflows			5,00,000
NPV			1,31,475

(iv) Net present value of proposal Y:

Year	*CFAT (Rs thousand)*	*PV factor (at 0.12)*	*Total PV*
1	100	0.893	Rs 89,300
2	110	0.797	87,670
3	130	0.712	92,560
4	150	0.636	95,400
5	160	0.567	90,720
6	150	0.507	76,050
7	120	0.452	54,240
8	120	0.404	48,480
9	110	0.361	39,710
10	100	0.322	32,200
Total PV			7,06,330
Less: Cash outflows			7,00,000
NPV			6,330

Proposal X should be acceptable to the company as its NPV is higher than that of Proposal Y.

P.8.2 A company employs certainty-equivalent approach in the evaluation of risky investments. The capital budgeting department of the company has developed the following information regarding a new project:

Year	*Expected CFAT (Rs thoudsand)*	*Certainty-equivalent quotient*
0	200	1.0
1	160	0.8
2	140	0.7
3	130	0.6
4	120	0.4
5	80	0.3

The firm's cost of equity capital is 18 per cent; its cost of debt is 9 per cent and the riskless rate of interest in the market on the government securities is 6 per cent. Should the project be accepted?

Solution

Determination of NPV

Year	*Expected CFAT (Rs thousand)*	*Certainty-equivalent (CE)*	*Adjusted CFAT (CFAT × CE) (Rs thousand)*	*PV factor (at 0.06)*	*Total PV*
0	(200)	1.0	(200)	1.000	Rs (2,00,000)
1	160	0.8	128	0.943	1,20,704
2	140	0.7	98	0.890	87,220
3	130	0.6	78	0.840	65,520
4	120	0.4	48	0.792	38,016
5	80	0.3	24	0.747	17,928
NPV					1,29,388

The project should be accepted.

P.8.3 The Delta Corporation is considering an investment in one of the two mutually exclusive proposals: Project A which involves an initial outlay of Rs 1,70,000 and Project B which has an outlay of Rs.1,50,000. The Certainty-Equivalent Approach is employed in evaluating risky investments. The current yield on treasury bills is 0.05 and the company uses this as the riskless rate. The expected values of net cash flows with their respective certainty-equivalents are:

Year	*Project A*		*Project B*	
	Cash flow (Rs thousand)	*Certainty-equivalent*	*Cash flows (Rs thousand)*	*Certainty-equivalent*
1	90	0.8	90	0.9
2	100	0.7	90	0.8
3	110	0.5	100	0.6

(i) Which project should be acceptable to the company?
(ii) Which project is riskier? How do you know?
(iii) If the company was to use the risk-adjusted discount rate method, which project would be analysed with higher rate?

Solution

(i) Determination of NPV of project A

Year	*CFAT (Rs thousand)*	*CE*	*Adjusted CFAT (CFAT × CE) (Rs thousand)*	*PV factor (at 0.05)*	*Total PV*
1	90	0.8	72	0.952	Rs 68,544
2	100	0.7	70	0.907	63,490
3	110	0.5	55	0.864	47,520
Total PV					1,79,554
Less: Initial outlay					1,70,000
NPV					9,554

(ii) Determination of NPV of project B

Year	*CFAT (Rs thousand)*	*CE*	*Adjusted CFAT (CFAT × CE) (Rs thousand)*	*PV factor (at 0.05)*	*Total PV*
1	90	0.9	81	0.952	Rs 77,112
2	90	0.8	72	0.907	65,304
3	100	0.6	60	0.864	51,840
					1,94,256
Less: Initial outlay					1,50,000
NPV					44,256

The NPV being greater, Project B should be acceptable to the company.

(ii) Project A is riskier. It is because certainty-equivalent associated with expected CFAT of Project A is lower.

(iii) Project A being more risky would be analysed using a higher discount rate, if the company was to use risk-adjusted discount rate method.

Review Questions

RQ.8.1 Indicate whether the following statements are true or false.

(i) Coefficient of variation is an absolute measure of risk.

(ii) Sensitivity analysis is an absolute measure of risk.

(iii) The estimates under sensitivity analysis are normally made under two categories.

(iv) The higher the value of the coefficient of variation, the lower is the degree of the risk associated with the proposed investment project.

(v) Simulation technique shows the impact of changes in all the variables on the distribution of probable values of NPV, in one iteration only.

(vi) The higher is the risk, the higher is the certainty equivalent coefficient.

(vii) Conceptually the terms risk and uncertainty can be used interchangeably.

(viii) Projects involving expansions programmes of existing products employ the same risk adjusted discount rate as those required to be used for new products meant for the new types of customers.

(ix) Risk-adjusted discount rate approach is conceptually superior to certainty-equivalent approach to incorporate risk factor in evaluating investment projects.

(x) Risk-free rate of return is employed as a discount rate to evaluate investment projects using certainty equivalent approach.

(xi) The probability distribution approach determines probability of different values of NPV based on Z value.

(xii) The decision-tree approach shows the select/important probable outcomes along with their probabilities.

[Answers: (i) False (ii) True (iii) False (iv) False (v) False (vi) False (vii) False (viii) False (ix) False (x) True (xi) True (xii) False]

RQ.8.2 What makes risk important in the selection of projects? Explain briefly the various methods of evaluating risky projects? Can you think of a capital budgeting project that would have perfectly certain returns?

RQ.8.3 What is the sensitivity approach for dealing with project risk? What is one of the most common methods used to evaluate projects using sensitivity analysis?

RQ.8.4 Why are cash flow estimates for distant years usually less reliable than for more immediate years? How can this time factor be accommodated when evaluating the riskiness of a project?

RQ.8.5 **(a)** What similarities are there between the risk-adjusted discount rate method and the certainty-equivalent Method?
(b) Enumerate the fundamental conceptual differences between the two methods.
(c) Discuss the comparative advantages and disadvantages of each.

RQ.8.6 How is risk assessed for a particular investment by using a probability distribution? Take a simple example to illustrate the method.

RQ.8.7 When would the use of tree diagrams be beneficial? When would it be impossible to use them?

Examination Questions

Theory Questions

8.1 What are similarities and differences between the risk-adjusted discount rate and the certainty equivalent methods for incorporating risk into capital budgeting decision. *(Delhi University, 2010)*

8.2 Differentiate between risk-adjusted discount rate and certainty equivalent methods of incorporation of risk in capital budgeting. *(Delhi University, 2008)*

8.3 What are the steps in decision-tree analysis? Explain in brief. *(Calcutta University, 2002)*

8.4 Explain the concept of business risk. *(Mumbai University, November 2001)*

8.5 The certainty equivalent approach is theoretically superior to the risk adjusted discount rate. Do you agree? Give reasons. *(Delhi University, 2000)*

8.6 Why is it said that a capital budgeting decision under conditions of risk ultimately hinges upon the risk preference of the decision maker? *(Calcutta University, 2000)*

Numerical Questions

8.1 A company uses certainty equivalent approach to evaluate risky projects. It has collected the following details for a project which is under consideration:

Year	*CFAT*	*Certainty equivalent*
0	2,00,000	1.0
1	1,60,000	0.8
2	1,40,000	0.7
3	1,30,000	0.6
4	1,20,000	0.4
5	80,000	0.3

Risk free rate of return is 8%. Should the project be accepted? (*Delhi University, 2007*)

Solution

Determination of NPV of proposed project

Year	*Estimated CFAT*	*Certainty -equivalent*	*Certain CFAT*	*PV factor at 8%*	*Total PV*
1	Rs 1,60,000	0.8	Rs 1,28,000	0.926	Rs 1,18,528
2	1,40,000	0.7	98,000	0.857	83,986
3	1,30,000	0.6	78,000	0.794	61.392
4	1,20,000	0.4	48,000	0.735	35,280
5	80,000	0.3	24,000	0.681	16,344
Total present value					3,16,070
Less cash outflows					2,00,000
Net present value					1,16,070

Recommendation: Since NPV is positive, the project should be accepted.

8.2 A company is considering two mutually exclusive projects. The company uses a certainty equivalent approach. The estimated cash flow and certainty equivalents for each project are as follows:

	Project 1		*Project 2*	
Year	*Cash flow*	*Certainty-equivalents*	*Cash flow*	*Certainty-equivalents*
0	Rs (–30,000)	1.00	Rs (–40,000)	1.00
1	15,000	0.95	25,000	0.90
2	18,000	0.85	20,000	0.80
3	20,000	0.70	25,000	0.70
4	20,000	0.65	18,000	0.60

Which project should be accepted, if the risk free rate of return of the firm is 10%?

(*Delbi University, 2007*)

Solution

Determination of NPV of projects 1 and 2

Year	*Estimated CFAT*	*Certainty equivalents*	*Certain CFAT*	*PV factor at 10%*	*Total PV*
Project 1:					
1	Rs 15,000	0.95	Rs 14,250	0.909	Rs 12,953
2	18,000	0.85	15,300	0.826	12,638
3	20,000	0.70	14,000	0.751	10.514
4	20,000	0.65	13,000	0.683	8,879
Total present value					44,984
Less cash outflows					30,000
Net present value					14,984
Project 2:					
1	Rs 25,000	0.90	Rs 22,500	0.909	Rs 20,453
2	20,000	0.80	16,000	0.826	13,216
3	25,000	0.70	17,500	0.751	13,142
4	18,000	0.60	10,800	0.683	7,376
Total present value					54,187
Less cash outflows					40,000
Net present value					14,187

Recommendation: Since NPV of project 1 is higher than project 2, project 1 should be accepted.

PART 4

CURRENT ASSETS MANAGEMENT

Our discussion in Part III of this book related to the management of the fixed assets which yield returns over a period of time. In practice, a firm has also to employ short-term assets and short-run resources of financing. The management of such assets, described as working capital management or current assets management, (short-term financial management) is one of the most important aspects of the overall financial management. Technically, working capital management is an integral part of the overall financial management. To that extent, it is similar to the long-term decision making process because both entail an analysis of the effect of risk and profitability.

The problems involved in the management of working capital differ from those in the management of fixed assets. In the first place, fixed assets are acquired to be retained in the business over a period of time and yield returns over the life of the assets. Probably, the most notable feature of such assets, from the view point of financial analysis, is the time dimension. The operational implication is

that discounting and compounding techniques to adjust the value of benefits accruing from such assets over time play a fairly significant role in financial management. In contrast, the stock-in-trade of working capital management, by definition, is short-term assets which loses its identity fairly quickly, usually within an operating cycle not exceeding a year. In the management of working capital, therefore, the time factor is not at all crucial as a decision variable.

Yet another notable feature of short-term assets is the question of profitability *versus* liquidity and the related aspect of risk. If the size of such assets is large, the liquidity position would improve, but profitability would be adversely affected as funds will remain idle. conversely, if the holdings of such assets are relatively small, the overall profitability will no doubt increase, but it will have an adverse effect on the liquidity position and make the firm more risk–prone. Working capital management should, therefore, aim at striking a balance such that there is an optimum amount of short-term assets. The purpose of this part is to provide an insight into the problems of managing working capital. There are two issues involved: first, the overview of working capital management in terms of the basic concepts, basic relationships between different kinds of short-term assets and liabilities, their financing and so on. It has been covered in Chapters 9 and 10. Chapter 9 presents an in-depth discussion of the theory of working capital management. The basic concepts/strategies/policies are covered in the Chapter. Chapter 9 also deals with the planning of working capital and its determinants. Some important aspects of the financing of working capital in India are covered in Chapter 10. Secondly, the components of working capital, the individual assets, are covered in the subsequent chapters of this Part. The chapters 11 through 13 respectively analyse the management of cash and marketable securities, receivables and inventory.

Chapter

9

Working Capital Management—An Overview

Learning Objectives

1. Understand the three definitions of working capital: gross, net and zero
2. Explain policies related to current assets management
3. Discuss, in terms of profitability and risk, the aggressive financing strategy and the conservative financing strategy for total-permanent and seasonal-fund requirements
4. Analyse the need for working capital as related to operating/cash cycle, permanent and temporary working capital
5. Describe in general terms the factors having a bearing on the total quantum of working capital required
6. Review the computation of working capital, using both the cash cost approach and the operating cycle approach

INTRODUCTION

This chapter presents an overview of working capital management. Section 1 explains the nature of working capital and the determination of financing mix. Section 2 is concerned with the planning of working capital requirements. The main points are summarised in the last Section.

SECTION I NATURE OF WORKING CAPITAL

This Section explains the nature of working capital in terms of the basic concepts, strategies and policies of working capital management. It also illustrates the determination of financing mix.

Working capital management is concerned with the problems that arise in attempting to manage the current assets, the current liabilities and the interrelationship that exists between them. The term *current assets* refer to those assets which in the ordinary course of business can be, or will be, converted into cash within one year without undergoing a diminution in

value and without disrupting the operations of the firm. The major current assets are cash, marketable securities, accounts receivable and inventory. Current liabilities are those liabilities which are intended, at their inception, to be paid in the ordinary course of business, within a year, out of the current assets or earnings of the concern. The basic current liabilities are accounts payable, bills payable, bank overdraft, and outstanding expenses. *The goal of working capital management is to manage the firm's current assets and liabilities in such a way that a satisfactory level of working capital is maintained.* This is so because if the firm cannot maintain a satisfactory level of working capital, it is likely to become insolvent and may even be forced into bankruptcy. The current assets should be large enough to cover its current liabilities in order to ensure a reasonable margin of safety. Each of the current assets must be managed efficiently in order to maintain the liquidity of the firm while not keeping too high a level of any one of them. Each of the short-term sources of financing must be continuously managed to ensure that they are obtained and used in the best possible way. *The interaction between current assets and current liabilities is, therefore, the main theme of the theory of working management.*

Concepts and Definitions of Working Capital

There are two concepts of working capital: gross and net.

Gross working capital means the current assets which represent the proportion of investment that circulates from one form to another in the ordinary conduct of business.

The term **gross working capital**, also referred to as working capital, means the total current assets.

The term **net working capital** can be defined in two ways: **(i)** the most common definition of net working capital (NWC) is the difference between current assets and current liabilities; and **(ii)** alternate definition of NWC is that portion of current assets which is financed with long-term funds.[1]

Net working capital is the difference between current assets and current liabilities or alternatively the portion of current assets financed with long-term funds.

The task of the financial manager in managing working capital efficiently is to ensure sufficient liquidity in the operations of the enterprise. The liquidity of a business firm is measured by its ability to satisfy short-term obligations as they become due. The three basic measures of a firm's overall liquidity are **(i)** the current ratio, **(ii)** the acid-test ratio, and **(iii)** the net working capital. The suitability of the first two measures has already been discussed in detail in Chapter 6. In brief, they are very useful in interfirm comparisons of liquidity. Net working capital (NWC), as a measure of liquidity, is not very useful for comparing the performance of different firms, but it is quite useful for internal control. The NWC helps in comparing the liquidity of the same firm over time. *For purpose of working capital management, therefore, NWC can be said to measure the liquidity of the firm. In other words, the goal of working capital management is to manage the current assets and liabilities in such a way that an acceptable level of NWC is maintained.*

The Common Definition of NWC and its Implications *NWC is commonly defined as the difference between current assets and current liabilities.* Efficient working capital management requires that firms should operate with some amount of NWC, the exact amount varying from firm to firm and depending, among other things, on the nature of industry. The theoretical justification for the use of NWC to measure liquidity is based on the premise that the greater

the margin by which the current assets cover the short-term obligations, the more is the ability to pay obligations when they become due for payment. The NWC is necessary because the cash outflows and inflows do not coincide. In other words, it is the *non-synchronous* nature of cash flows that makes NWC necessary. In general, the cash outflows resulting from payment of current liabilities are relatively predictable. The cash inflows are, however, difficult to predict. The more predictable the cash inflows are, the less NWC will be required. A firm, say an electricity generation company, with almost certain and predictable cash inflows can operate with little or no NWC. But where cash inflows are uncertain, it will be necessary to maintain current assets at a level adequate to cover current liabilities, that is, there must be NWC.

Alternative Definition of NWC *NWC can alternatively be defined as that part of the current assets which are financed with long-term funds.* Since current liabilities represent sources of short-term funds, as long as current assets exceed the current liabilities, the excess must be financed with long-term funds.

Concept of Zero Working Capital[2] The zero working capital (ZWC) concept of net working capital differs from the commonly used concept of working capital (CA – CL). The ZWC = Inventories (+) Receivables (-) Payables. The rationale is that inventories and receivables are the major constituents of current assets which affect sales. Further, suppliers finance inventories through account payable.

Zero working Capital is inventory plus receivables minus payables.

There are financial benefits of reducing the working capital. First, it results in a one-time release of cash flow. Second, the release of cash flow enhances the firm's earnings. Put differently, permanent reduction in working capital funds results in less financial costs (saving in capital costs). The zero working capital concept forces the corporates to produce and deliver faster. This, in turn, may help to gain new business. With low inventories, storage cost as well as loss due to obsolete inventories are also minimised, leading to another set of savings in operating costs. Just-in-time method of inventory control facilitate carrying relatively low level of raw-material inventories. Efficient production system (production in tune with sales) can further help in reducing work-in-process and finished goods inventories.

In reality, however, it may not be possible for most firms to operate at zero working capital. Yet, the concept is important as it focuses that the firms should strive for carrying minimum safety stock of inventories, pursuing good credit collection policies leading to minimum investment in debtors and bargaining for maximum credit payment period from suppliers. These measures would result in financial and production economies, leading to higher return on investments.

Policies Related to Current Assets Investment

There are three alternative policies related to the total amount of investments made in current assets: **(1)** Relaxed, **(2)** Aggressive and **(3)** Moderate. These policies differ in respect of the total amount of current assets carried to support any given level of sales.[3] As a result, these policies have an impact on current assets turnover ratio.

Relaxed Current Assets Investment Policy This refers to the policy where the firms carry relatively large amounts of cash and cash-equivalents, inventories and receivables. They use liberal credit policy implying relatively longer time-span of credit period extended to debtors, as a means of promoting sales (**explained in Chapter 12**). In view of the relatively

Relaxed policy involves large amounts of cash/ cash-equivalents, receivables and inventory.

higher amount of investment in current assets, the current assets turnover ratio of such firms tend to be relatively low.

Aggressive policy implies minimum cash/cash equivalents, receivables and inventory.

Aggressive Current Assets Investment Policy This refers to the policy where the firm's holdings of cash and cash-equivalents, inventories and receivables are minimised. Since there is relatively lower amount of current assets to support given level of sales, the current assets turnover ratio tends to be high.

Under such a policy, the firm would hold minimum level of safety stocks of cash and inventories, and would pursue a tight/strict credit policy for credit sales (though at times, it runs the risk of losing sales). An aggressive/restricted/lean-and-mean current assets investment policy generally provides the highest expected return on investment. At the same time, it entails the greatest risk[4] The reverse is true for a relaxed policy.

Moderate Current Assets Investment Policy This falls between the above two extreme policies in terms of current assets carried as well as expected return and risk.

Determining Financing Mix

One of the most important decisions, involved in the management of working capital is how current assets will be financed. There are, broadly speaking, two sources from which funds can be raised for current asset financing; **(i)** short-term sources (current liabilities), and **(ii)** long-term sources, such as share capital, long-term borrowings, internally generated resources like retained earnings and so on. What proportion of current assets should be financed by current liabilities and how much by long-term resources? *Decisions on such questions will determine the financing mix.*

Financing mix is the choice of sources of financing of current assets.

There are three basic approaches to determine an appropriate **financing mix**: **(a)** Hedging approach, also called the Matching approach; **(b)** Conservative approach, and **(c)** Trade-off between these two.

Matching approach to financing is the process of matching maturities of debt with the maturities of the financial needs.

Hedging Approach The term 'hedging' is often used in the sense of a risk-reducing investment strategy involving transactions of a simultaneous but opposing nature so that the effect of one is likely to counterbalance the effect of the other. With reference to an appropriate financing-mix, the term hedging can be said to refer to the process of matching maturities of debt with the maturities of financial needs.[5] This approach to the financing decision to determine an appropriate financing mix is, therefore, also called as **Matching approach**.

According to this approach, the maturity of the source of funds should match the nature of the assets to be financed. For the purpose of analysis, the current assets can be broadly classified into two classes:

1. those which are required in a certain amount for a given level of operation and, hence, do not vary over time.
2. those which fluctuate over time.

The hedging approach suggests that long-term funds should be used to finance the fixed portion of current assets requirements as spelt out in (1) above, in a manner similar to the financing of fixed assets. The purely temporary requirements, that is, the seasonal variations over and above the permanent financing needs should be appropriately financed with short-term

funds (current liabilities). This approach, therefore, divides the requirements of total funds into permanent and seasonal components, each being financed by a different source. This has been illustrated in Table 9.1.

TABLE 9.1 Estimated Total Funds Requirements of Hypothetical Ltd *(Amount in Rs lakh)*

Month	*Total funds required*	*Permanent requirements*	*Seasonal requirements*
(1)	*(2)*	*(3)*	*(4)*
January	Rs 8,500	Rs 6,900	Rs 1,600
February	8,000	6,900	1,100
March	7,500	6,900	600
April	7,000	6,900	100
May	6,900	6,900	0
June	7,150	6,900	250
July	8,000	6,900	1,100
August	8,350	6,900	1,450
September	8,500	6,900	1,600
October	9,000	6,900	2,100
November	8,000	6,900	1,100
December	7,500	6,900	600
			11,600

According to the hedging approach, the **permanent portion** of funds required (Col.3) should be financed with long-term funds and the **seasonal portion** (Col.4) with short-term funds. With this approach, the short-term financing requirements (current assets) would be just equal to the short-term financing available (current liabilities).

Permanent needs implies financing needs for fixed assets plus the permanent portion of current assets which remain unchanged over the year.

Seasonal portion implies the financing requirements for temporary current assets which vary over the year.

Conservative financing approach is a strategy by which the firm finances all funds requirement, with long-term funds for emergencies or unexpected outflows.

Conservative Approach This approach suggests that the estimated requirement of total funds should be met from long-term sources; the use of short-term funds should be restricted to only emergency situations or when there is an unexpected outflow of funds. In the case of the Hypothetical Ltd in Table 9.1, the total requirements, including the entire Rs 9,000 needed in October, will be financed by long-run sources. The short-term funds will be used only to meet contingencies. The amounts given in column 4 of Table 9.1 represent the extent to which short-term financial needs are being financed by long-term funds, that is, the NWC. The NWC reaches the highest level (Rs 2,100) in October (Rs 9,000 – Rs 6,900). Any long-term financing in excess of Rs 6,900 in permanent financing the needs of the company represents NWC.

Comparison of Hedging Approach with Conservative Approach A comparison of the two approaches can be made on the basis of **(i)** cost considerations, and **(ii)** risk considerations.

Cost Considerations The cost of these financing plans has a bearing on the profitability of the enterprise. We assume that the cost of short-term funds and long-term funds is 3 per cent and 8 per cent respectively.

Hedging Plan The cost of financing under the hedging plan can be estimated as follows:

(i) Cost of short-term funds: The cost of short-term funds = average annual short-term loan x interest rate.

Average annual short-term loan = total of monthly seasonal requirements (Col.4) divided by the number of months.

Average annual short-term loan = Rs 11,600 lakh ÷ 12 = Rs 966.67 lakh.

Short-term cost = Rs 966.67 lakh × 0.03 = Rs 29 lakh.

(ii) Cost of long-term funds = (Average annual long-term fund requirement) × (annual interest rate) = Rs 6,900 lakh × 0.08 = Rs 552 lakh.

(iii) Total cost under hedging plan = total of (i) + (ii) = Rs 29 lakh + Rs 552 lakh = Rs 581 lakh

Conservative Plan The cost of financing under the conservative plan is equal to the cost of the long-term funds, that is, annual average loan, multiplied by the long-term rate of interest = Rs 9,000 lakh × 0.08 = Rs 720 lakh.

Thus, the cost of financing under the conservative approach (Rs 720 lakh) is higher than the cost using the hedging approach (Rs 581 lakh). The conservative plan for financing is more expensive because the available funds are not fully utilised during certain periods; moreover, interest has to be paid for funds which are not actually needed (i.e. the period when there is NWC).

Risk Considerations The two approaches can also be contrasted on the basis of the risk involved.

Hedging Approach The hedging approach is more risky in comparison to the conservative approach. There are two reasons for this. First, there is, as already observed, no NWC with the hedging approach because no long-term funds are used to finance short-term seasonal needs, that is, current assets are just equal to current liabilities. On the other hand, the conservative approach has a fairly high level of NWC. Secondly, the hedging plan is risky because it involves almost full utilisation of the capacity to use short-term funds and in emergency situations it may be difficult to satisfy the short-term needs.

Conservative Approach With the conservative approach, in contrast, the company does not use any of its short-term borrowings. Therefore, the firm has sufficient short-term borrowing capacity to cover unexpected financial needs and avoid technical insolvency.

To summarise, the hedging approach is a high profit (low cost)-high risk (no NWC) approach to determine an appropriate financing-mix. In contrast, the conservative approach is low profit (high cost)-low risk (high NWC). The contrast between these approaches is indicative of the need for trade-off between profitability and risk.

Acceptable financing strategy is a trade-off between matching and conservative financing strategies.

A Trade-off between the Hedging and Conservative Approaches It has been shown that the hedging approach is associated with high profits as well as high risk, while the conservative approach provides low profits and low risk. Obviously, neither approach by itself would serve the purpose of efficient working capital management. A trade-off between these two extremes would give an **acceptable financing strategy**. The third approach–trade-off between the two approaches–strikes a balance and provides a financing plan that lies between these two extremes.

The exact trade-off between risk and profitability will differ from case to case depending on risk perception of the decision makers. One possible trade-off could be assumed to be equal to the average of the minimum and maximum monthly requirements of funds during a given period of time. This level of requirement of funds may be financed through long-run sources and for any additional financing need, short-term funds may be used. The breakdown of the requirement of funds of the Hypothetical Ltd between long-term and short-term sources under the trade-off plans is shown in Table 9.2.

TABLE 9.2 Trade-off between Hedging and Conservative Approaches

(*Amount in Rs Lakh*)

Month	*Total funds required*	*Permanent requirements*	*Seasonal requirements*
(1)	*(2)*	*(3)*	*(4)*
January	Rs 8,500	Rs 7,950	Rs 550
February	8,000	7,950	50
March	7,500	7,950	0
April	7,000	7,950	0
May	6,900	7,950	0
June	7,150	7,950	0
July	8,000	7,950	50
August	8,350	7,950	400
September	8,500	7,950	550
October	9,000	7,950	1,050
November	8,000	7,950	50
December	7,500	7,950	0
			2,700

The figures in Table 9.2 reveal that the maximum fund required is Rs 9,000 lakh (October) and the minimum is Rs 6,900 lakh (May). The average $\left(\frac{\text{Rs 9,000 lakh + Rs 6,900 lakh}}{2}\right)$ = Rs 7,950 lakh. In other words, the company should use Rs 7,950 lakh each month (Col.3) in the form of long-term funds and raise additional funds, if needed, through short-term resources (current liabilities). It is clear from the table that no short-term funds are required during 5 months, namely, March, April, May, June and December, because long-term funds available exceed the total requirements for funds. In the remaining 7 months, the company will have to use short-term funds totalling Rs 2,700 lakh (Col. 4).

Cost of the Financing Plan under the Trade-off Approach

(i) Cost of short-term funds: = (Average annual short-term funds required) × (Rate of short-term interest) = Rs 2,700 lakh/12 = Rs 225 lakh × 0.03 = Rs 6.75 lakh

(ii) Cost of long-term funds = (Average long-term funds required) × (Rate of interest on long-term funds) = Rs 7,950 lakh × 0.08 = Rs 636 lakh

(iii) Total cost of the trade-off plan = Rs 6.75 lakh + Rs 636 lakh = Rs 642.75 lakh

Risk Consideration The NWC under this plan would be Rs 1,050 lakh (Rs 7,950 lakh – Rs 6,900 lakh).

Comparison of the Trade-off Plan with the Hedging and Conservative Approaches For a comparison of the three approaches to determine an appropriate financing-mix, the summary of the results of these approaches on profitability and risk is given in Table 9.3.

TABLE 9.3 Comparision of Trade-off Plan *(Amount in Rs Lakh)*

Financing Plan	*Maximum NWC**	*Degree of risk*	*Total cost of financing*	*Level of profits*
(1)	*(2)*	*(3)*	*(4)*	*(5)*
Hedging	0	Highest	Rs 581.00	Highest
Trade-off	Rs 1,050	Intermediate	642.75	Intermediate
Conservative	2,100	Lowest	720.00	Lowest

*The minimum level would be zero in each case.

Interpretation From the summary of results in Table 9.3, it can be seen clearly that the hedging approach is the most risky while the conservative approach is the least risky. The trade-off plan stands midway; less risky than the hedging approach but more risky than the conservative approach. The measure of risk is the level of NWC. From the point of view of profitability (as reflected in the level of total cost of financing plan) a similar kind of relationship is found to exist, the trade-off plan lying between the other two approaches. The preceding analysis, thus, established the trade-off between profitability and risk. In this connection two generalisations are warranted: **(i)** the lower the NWC, the higher is the risk present, and **(ii)** the higher the risk of insolvency, the higher is the expected profits.

SECTION 2 PLANNING OF WORKING CAPITAL

This Section is concerned with the planning of working capital requirements. The aspects covered here are the need for working capital, the determinants of working capital and its computation.

Need for Working Capital

The need for working capital (gross) or current assets cannot be overemphasized. Given the objective of financial decision making to maximsie the shareholders' wealth, it is necessary to generate sufficient profits. The extent to which profits can be earned will naturally depend, among other things, upon the magnitude of the sales. A successful sales programme is, in other words, necessary for earning profits by any business enterprise. However, sales do not convert into cash instantly; there is invariably a time-lag between the sale of goods and the receipt of cash. There is, therefore, a need for working capital in the form of current assets to deal with the problem arising out of the lack of immediate realisation of cash against goods sold. Therefore, sufficient working capital is necessary to sustain sales activity. Technically, this is referred to as the **operating** *or cash cycle*. The operating cycle can be said to be at the heart of the need for working capital. 'The continuing flow from cash to suppliers, to inventory, to accounts receivable and back into cash is what is called the operating cycle'.[6] In other words, the term cash cycle refers to the length of time necessary to complete the following cycle of events:

Operating cycle implies the continuing flow from cash to suppliers, to inventory to accounts receivable and back into cash.

1. Conversion of cash into inventory;

2. Conversion of inventory into receivables;
3. Conversion of receivables into cash.

The operating cycle, which is a continuous process, is shown in Fig. 9.1.

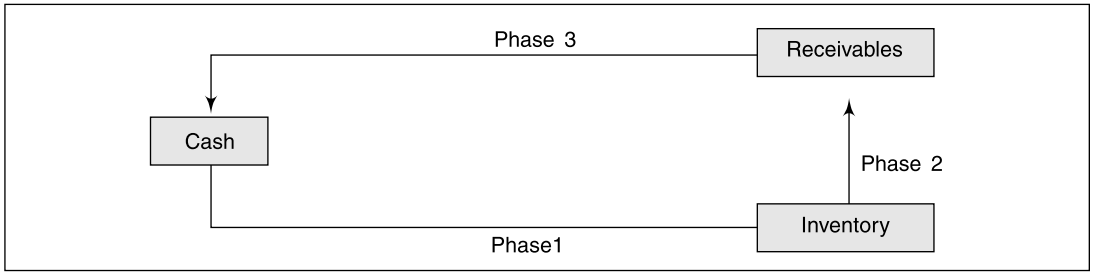


FIGURE 9.1 *Operating Cycle*

If it were possible to complete the sequences instantaneously, there would be no need for current assets (working capital). But since it is not possible, the firm is forced to have current assets. Since cash inflows and outflows do not match, firms have to necessarily keep cash or invest in short-term liquid securities so that they will be in a position to meet obligations when they become due. Similarly, firms must have adequate inventory to guard against the possibility of not being able to meet demand for their products. Adequate inventory, therefore, provides a cushion against being out of stock. If firms have to be competitive, they must sell goods to their customers on credit which necessitates the holding of accounts receivable. It is in these ways that an adequate level of working capital is absolutely necessary for smooth sales activity which, in turn, enhances the owner's wealth.

The operating cycle consists of three phases. In phase 1, cash gets converted into inventory. This includes purchase of raw materials, conversion of raw materials into work-in-progress, finished goods and finally the transfer of goods to stock at the end of the manufacturing process. In the case of trading organisations, this phase is shorter as there would be no manufacturing activity and cash is directly converted into inventory. The phase is, of course, totally absent in the case of service organisations.

In phase II of the cycle, the inventory is converted into receivables as credit sales are made to customers. Firms which do not sell on credit obviously not have phase II of the operating cycle.

The last phase, phase III, represents the stage when receivables are collected. This phase completes the operating cycle. Thus, the firm has moved from cash to inventory, to receivables and to cash again.

Permanent and Temporary Working Capital The operating cycle, thus, creates the need for current assets (working capital). However, the need does not come to an end after the cycle is completed. It continues to exist. To explain this continuing need of current assets, a distinction should be drawn between *permanent* and *temporary* working capital.

Permanent (fixed) working capital is a certain minimum level of working capital on a continuous and uninterrupted basis.

Business activity does not come to an end after the realisation of cash from customers. For a company, the process is continuous and, hence, the need for a regular supply of working capital. However, the magnitude of working capital required is not constant, but fluctuating. To carry on

business, a certain minimum level of working capital is necessary on a continuous and uninterrupted basis. For all practical purposes, this requirement has to be met permanently as with other fixed assets. This requirement is referred to as **permanent or fixed working capital**.

Temporary (fluctuating/ variable) working capital is the working capital needed to meet seasonal as well as unforeseen requirements.

Any amount over and above the permanent level of working capital is **temporary**, **fluctuating or variable working capital**.[7] The position of the required working capital is needed to meet fluctuations in demand consequent upon changes in production and sales as a result of seasonal changes. The basic distinction between permanent and temporary working capital is illustrated in Fig. 9.2.

Figure 9.2 shows that the permanent level is fairly constant, while temporary working capital is fluctuating–increasing and decreasing in accordance with seasonal demands. In the case of an expanding firm, the permanent working capital line may not be horizontal. This is because the demand for permanent current assets might be increasing (or decreasing) to support a rising level of activity. In that case the line would be a rising one as shown in Fig. 9.3.

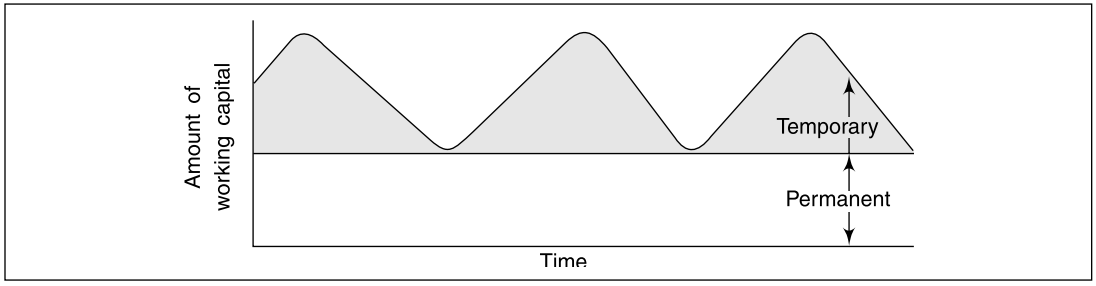


FIGURE 9.2 *Permanent and Temporary Working Capital*

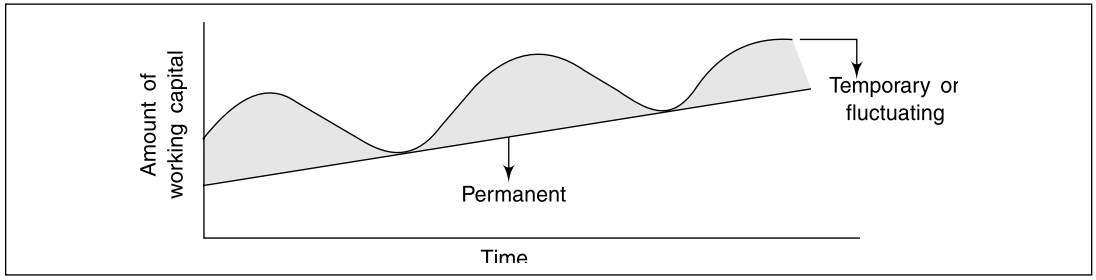


FIGURE 9.3 *Permanent and Temporary Working Capital*

Both kinds of working capital are necessary to facilitate the sales process through the operating cycle. Temporary working capital is created to meet liquidity requirements that are of a purely transient nature.

Changes in Working Capital The changes in the level of working capital occur for the following three basic reasons: **(i)** changes in the level of sales and/or operating expenses, **(ii)** policy changes, and **(iii)** changes in technology.

Changes in Sales and Operating Expenses The first factor causing a change in the working capital requirement is a change in the sales and operating expenses. The changes in this factor may be due to three reasons: First, there may be a *long-run* trend of change. For instance, the price of a raw material, say oil, may constantly rise, necessitating the holding of a large inventory. The *secular* trends would mainly affect the need for permanent current assets. In the second place, *cyclical* changes in the economy leading to ups and downs in business activity influence the level of working capital, both permanent and temporary. The third source of change is seasonality in sales activity. Seasonality–peaks and troughs–can be said to be the main source of variation in the level of temporary working capital.

Current assets policy is the relationship between current assets and sales volume.

The change in sales and operating expenses may be either in the form of an increase or decrease. An increase in the volume of sales is bound to be accompanied by higher levels of cash, inventory and receivables. The decline in sales has exactly the opposite effect–a decline in the need for working capital. A change in the operating expenses–rise or fall–has a similar effect on the levels of working capital.

Policy Changes The second major cause of changes in the level of working capital is because of policy changes initiated by the management. There is a wide choice in the matter of **current assets policy**. The term current asset policy may be defined as the relationship between current assets and sales volume. A firm following a conservative policy in this respect having a very high level of current assets in relation to sales may deliberately opt for a less conservative policy and *vice versa*. These conscious managerial decisions certainly have an impact on the level of working capital.

Technological Changes Finally, technological changes can cause significant changes in the level of working capital. If a new process emerges as a result of technological developments, which shortens the operating cycle, it reduces the need for working capital and *vice versa*.

Determinants of Working Capital

A firm should plan its operations in such a way that it should have neither too much nor too little working capital. The total working capital requirement is determined by a wide variety of factors. These factors, however, affect different enterprises differently. They also vary from time to time. In general, the following factors are involved in a proper assessment of the quantum of working capital required.

General Nature of Business The working capital requirements of an enterprise are basically related to the conduct of business. Enterprises fall into some broad categories depending on the nature of their business. For instance, public utilities have certain features which have a bearing on their working capital needs. The two relevant features are: **(i)** the cash nature of business, that is, cash sale, and **(ii)** sale of services rather than commodities. In view of these features, they do not maintain big inventories and have, therefore, probably the least requirement of working capital. At the other extreme are trading and financial enterprises. The nature of their business is such that they have to maintain a sufficient amount of cash, inventories and book debts. They have necessarily to invest proportionately large amounts in working capital. The manufacturing enterprises fall, in a sense, between these two extremes. The industrial concerns require fairly large amounts of working capital though it varies from industry to industry depending on their asset structure. The proportion of current assets to total assets measures the relative requirements of working capital of various industries. Available

data in respect of companies in India confirm the wide variations in the use of working capital by different enterprises. The percentage of current assets to total assets was found to be the lowest in hotels, restaurants and eating houses (10-20 per cent range), while in electricity generation and supply it was in the range of 20-30 per cent. The enterprises in the tobacco, construction and trading groups had, as is to be expected, the highest component of working capital (80-90 per cent range). The other industrial groups fall between these limits though there are very wide inter-industry variations.[8]

Production Cycle Another factor which has a bearing on the quantum of working capital is the production cycle. The term 'production or manufacturing cycle' refers to the time involved in the manufacture of goods. It covers the time-span between the procurement of raw materials and the completion of the manufacturing process leading to the production of finished goods. Funds have to be necessarily tied up during the process of manufacture, necessitating *enhanced* working capital. In other words, there is some time gap before raw materials become finished goods. To sustain such activities the need for working capital is obvious. The longer the time-span (i.e. the production cycle), the larger will be the tied-up funds and, therefore, the larger is the working capital needed and *vice versa*. There are enterprises which, due to the nature of business, have a short operating cycle. A distillery, which has an ageing process, has generally to make a relatively heavy investment in inventory. The other extreme is provided by a bakery. The bakeries sell their products at short intervals and have a very high inventory turnover. The investment in inventory and, consequently, working capital is not very large.

Further, even within the same group of industries, the operating cycle may be different due to technological considerations. For economy in working capital, that process should be selected which has a shorter manufacturing process. Having selected a particular process of manufacture, steps should be taken to ensure that the cycle is completed in the expected time. This underlines the need for effective organisation and coordination at all levels of the enterprise. Appropriate policies concerning terms of credit for raw materials and other supplies can help in reducing working capital requirements. Often, companies manufacturing heavy machinery and equipment minimise the investment in inventory or working capital by requiring advance payment from customers as work proceeds against orders. Thus, a part of the financial burden relating to the manufacturing cycle time is passed on to others.

Business Cycle The working capital requirements are also determined by the nature of the business cycle. Business fluctuations lead to cyclical and seasonal changes which, in turn, cause a shift in the working capital position, particularly for temporary working capital requirements. The variations in business conditions may be in two directions: **(i)** *upward phase* when boom conditions prevail, and **(ii)** *downswing phase* when economic activity is marked by a decline. During the upswing of business activity, the need for working capital is likely to grow to cover the lag between increased sales and receipt of cash as well as to finance purchases of additional material to cater to the expansion of the level of activity. Additional funds may be required to invest in plant and machinery to meet the increased demand. The downswing phase of the business cycle has exactly an opposite effect on the level of working capital requirement. The decline in the economy is associated with a fall in the volume of sales which, in turn, leads to a fall in the level of inventories and book debts. The need for working capital in recessionary conditions is bound to decline. In brief, business fluctuations influence the size of working capital mainly through the effect on inventories. The response of inventory to business cycles is mild or violent according to nature of the business cycle.

Production Policy The quantum of working capital is also determined by production policy. In the case of certain lines of business, the demand for products is seasonal, that is, they are purchased during certain months of the year. What kind of production policy should be followed in such cases? There are two options open to such enterprises: either they confine their production only to periods when goods are purchased or they follow a steady production policy throughout the year and produce goods at a level to meet the peak demand. In the former case, there are serious production problems. During the slack season, the firms have to maintain their working force and physical facilities without adequate production and sale. When the peak period arrives, the firms have to operate at full capacity to meet the demand. This kind of arrangement would not only be expensive but also inconvenient. Thus, serious difficulties will be encountered in trying to match production to the ebb and flow of the seasonal demand pattern. A better alternative is a steady production policy independent of shifts in demand for the finished goods. This means a large accumulation of finished goods (inventories) during the off-season and their abrupt sale during the peak season. The progressive accumulation of stock naturally requires an increasing amount of working capital which remains tied up for some months. Working capital planning has to incorporate this pattern of requirement of funds when production and seasonal sales are steady. This strategy (steady production policy) is, however, not necessarily adopted by everyone. It may be possible, for instance, for some to follow a policy of diversification which enables them to engage the working force and the physical facilities in some other activity. If this is possible, there will be no major working capital problem. Moreover, the nature of some products may be such that accumulation of inventories may create special risk and cost problems. For them, a production policy in tune with the changing demands may be preferable. Therefore, production policies have to be formulated on the basis of the individual setting of each enterprise and the magnitude and dimension of the working capital problems will accordingly vary.

Credit Policy The credit policy relating to sales and purchases also affects the working capital. The credit policy influences the requirement of working capital in two ways: **(i)** through credit terms granted by the firm to its customers/buyers of goods; **(ii)** credit terms available to the firm from its creditors.

The credit terms granted to customers have a bearing on the magnitude of working capital by determining the level of book debts. The credit sales result in higher book debts (receivables). Higher book debts mean more working capital. On the other hand, if liberal credit terms are available from the suppliers of goods (trade creditors), the need for working capital is less. The working capital requirements of a business are, thus, affected by the terms of purchase and sale, and the role given to credit by a company in its dealings with creditors and debtors.

Credit terms fixed by an enterprise are affected by the prevailing trade practices as well as changing economic conditions. If, for example, competition is keen, there would be pressure to grant generous credit terms. Nevertheless, there is wide scope for managerial discretion in working out a suitable credit policy relevant to each customer based on the merits of each case. For instance, liberal credit facilities can be extended on the basis of credit rating. This will avoid the problem of having excess working capital. Similarly, the collection procedure can be so framed that funds, which would otherwise be available for meeting operating needs[9] are not locked up. Thus, adoption of rationalised credit policies would be a significant factor in determining the working capital needs of an enterprise.

Such discretion may, however, not be available to a company which operates in a highly competitive market. To win and retain customers, it may be forced, among other things, to offer generous credit terms to them. The investment in book debts will consequently be of a higher order, necessitating large working capital in another way. To be able to enjoy consumer patronage on a continuous basis, a firm will have to offer a variety of products quite unlike a firm which has a hold on the market and, hence, does not need special efforts to satisfy customer requirements. The consequence of a higher level of inventories would be an additional need for working capital. The degree of competition is, therefore, an important factor influencing working capital requirements.

Growth and Expansion As a company grows, it is logical to expect that a larger amount of working capital is required. It is, of course, difficult to determine precisely the relationship between the growth in the volume of business of a company and the increase in its working capital. The composition of working capital in a growing company also shifts with economic circumstances and corporate practices. Other things being equal, growth industries require more working capital than those that are static. 'The critical fact, however, is that the need for increased working capital funds does not follow the growth in business activities but precedes it.'[10] Advance planning of working capital is, therefore, a continuing necessity for a growing concern. Or else, the company may have substantial earnings but little cash.

Vagaries in the Availability of Raw Material The availability or otherwise of certain raw materials on a continuous basis without interruption would sometimes affect the requirement of working capital. There may be some materials which cannot be procured easily either because of their sources are few or they are irregular. To sustain smooth production, therefore, the firm might be compelled to purchase and stock them far in excess of genuine production needs. This will result in an excessive inventory of such materials. The procurement of some essential raw materials is difficult because of their sporadic supply. This happens very often with raw materials which are in short supply and are controlled to ensure equitable distribution. The buyer has in such cases very limited options as to the quantum and timing of procurement. It may so happen that a bulk consignment may be available but the firm may be short of funds, while when surplus funds are available the commodities may be in short supply. This element of uncertainty would lead to a relatively high level of working capital. Finally, some raw materials may be available only during certain seasons. They would have to be necessarily obtained, when available, to provide for a period when supplies are lean. This will cause seasonal fluctuations in working capital requirements.

Profit Level The level of profits earned differ from enterprise to enterprise. In general, the nature of the product, hold on the market, quality of management and monopoly power would by and large determine the profit earned by a firm. *A priori*, it can be generalised that a firm dealing in a high quality product, having a good marketing arrangement and enjoying monopoly power in the market, is likely to earn high profits and vice versa. Higher profit margin would improve the prospects of generating more internal funds thereby contributing to the working capital pool. *The net profit is a source of working capital to the extent that it has been earned in cash.* The cash profit can be found by adjusting non-cash items such as depreciation, outstanding expenses and losses written off, in the net profit. But, in practice, the net cash inflows from operations cannot be considered as cash available for use at the end of cash cycle. Even as the company's operations are in progress, cash is used for augmenting

stock, book debts and fixed assets.[11] It must, therefore, be seen that cash generation has been used for furthering the interest of the enterprise. It is in this context that elaborate planning and projections of expected activities and the resulting cash inflows on a day-to-day, week-to-week and month-to-month basis assume importance because steps can then be taken to deal with surplus and deficit cash.

The availability of internal funds for working capital requirements is determined not merely by the profit margin but also by the manner of appropriating profits. The availability of such funds would depend upon the profit appropriations for taxation, dividend, reserves and depreciations.

Level of Taxes The first appropriation out of profits is payment or provision for tax. The amount of taxes to be paid is determined by the prevailing tax regulations. The management has no discretion in this respect. Very often, taxes have to be paid in advance on the basis of the profit of the preceding year. Tax liability is, in a sense, short-term liability payable in cash. An adequate provision for tax payments is, therefore, an important aspect of working capital planning. If tax liability increases, it leads to an increase in the requirement of working capital and vice versa. Management has no discretion in regard to the payment of taxes; in some cases non-payment may invite penal action. There is, however, wide scope to reduce the tax liability through proper tax planning. The service of tax experts can be availed of to take advantage of the various concessions and incentives through avoidance as opposed to evasion of taxes. Tax planning can, therefore, be said to be an integral part of working capital planning.

Dividend Policy Another appropriation of profits which has a bearing on working capital is dividend payment. The payment of dividend consumes cash resources and, thereby, affects working capital to that extent. Conversely, if the firm does not pay dividend but retains the profits, working capital increases. In planning working capital requirements, therefore, a basic question to be decided is whether profits will be retained or paid out to shareholders. In theory, a firm should retain profits to preserve cash resources and, at the same time, it must pay dividends to satisfy the expectations of investors. When profits are relatively small, the choice is between retention and payment. The choice must be made after taking into account all the relevant factors.

There are wide variations in industry practices as regards the interrelationship between working capital requirements and dividend payment. In some cases, shortage of working capital has been a powerful reason for reducing or even skipping dividends in cash. There are occasions, on the other hand, when dividend payments are continued in spite of inadequate earnings in a particular year because of sound liquidity. Sometimes, the dilemma is resolved by the payment of bonus shares. This enables the payment of dividend without draining away the cash resources and, thus, without reducing working capital. Dividend policy, is thus, a significant element in determining the level of working capital in an organisation.

Depreciation Policy Depreciation policy also exerts an influence on the quantum of working capital. Depreciation charges do not involve any cash outflows. The effect of depreciation policy on working capital is, therefore, indirect. In the first place, depreciation affects the tax liability and retention of profits. Depreciation is allowable expenditure in calculating net profits. Enhanced rates of depreciation lower the profits and, therefore, the tax liability and, thus, more cash profits. Higher depreciation also means lower disposable profits and, therefore, a smaller dividend payment. Thus, cash is preserved. In the second place, the selection of the

method of depreciation has important financial implications. If current capital expenditure falls short of the depreciation provision, the working capital position is strengthened and there may be no need for short-term borrowing. If, on the other hand, the current capital expenditure exceeds the depreciation provision, either outside borrowing will have to be resorted to or a restriction on dividend payment coupled with retention of profits will have to be adopted to prevent the working capital position from being adversely affected. It is in these ways that depreciation policy is relevant to the planning of working capital.

Price Level Changes Changes in the price level also affect the requirements of working capital. Rising prices necessitate the use of more funds for maintaining an existing level of activity. For the same level of current assets, higher cash outlays are required. The effect of rising prices is that a higher amount of working capital is needed. However, in the case of companies which can raise their prices proportionately, there is no serious problem regarding working capital. Moreover, the price rise does not have a uniform effect on all commodities. It is likely that some firms may not be affected at all. In brief, the implications of changing price levels on working capital position vary from company to company depending on the nature of its operations, its standing in the market and other relevant considerations.

Operating Efficiency The operating efficiency of the management is also an important determinant of the level of working capital. The management can contribute to a sound working capital position through operating efficiency. Although the management cannot control the rise in prices, it can ensure the efficient utilisation of resources by eliminating waste, improving coordination, and a fuller utilisation of existing resources, and so on. Efficiency of operations accelerates the pace of cash cycle and improves the working capital turnover. It releases the pressure on working capital by improving profitability and improving the internal generation of funds.

To conclude, the level of working capital is determined by a wide variety of factors which are partly internal to the firm and partly external (environmental) to it. Efficient working capital management requires efficient planning and a constant review of the needs for an appropriate working capital strategy.

Computation of Working Capital

The two components of working capital (WC) are current assets (CA) and current liabilities (CL). They have a bearing on the cash operating cycle. In order to calculate the working capital needs, what is required is the holding period of various types of inventories, the credit collection period and the credit payment period. Working capital also depends on the budgeted level of activity in terms of production/sales. The calculation of WC is based on the assumption that the production/sales is carried on evenly throughout the year and all costs accrue similarly. As the working capital requirements are related to the cost excluding depreciation and not to the sale price, WC is computed with reference to cash cost. The cash cost approach is comprehensive and superior to the operating cycle approach based on holding period of debtors and inventories and payment period of creditors. Some problems have been solved, however, using the operating cycle approach also.

The steps involved in estimating the different items of CA and CL are as follows:

Estimation of Current Assets: *Raw Materials Inventory* The investment in raw materials inventory is estimated on the basis of Eq. 9.1.

$$\frac{\text{Budgeted production (in units)} \times \text{Cost of raw material(s) per unit} \times \text{Average inventory holding period (months/days)}}{\text{12 months/365 days}} \quad \textbf{(9.1)}$$

Work-in-Process (W/P) Inventory The relevant costs to determine work-in-process inventory are the proportionate share of cost of raw materials and conversion costs (labour and manufacturing overhead costs excluding depreciation).[12] In case, full unit of raw material is required in the beginning, the unit cost of work-in-proess would be higher, that is, cost of full unit + 50 per cent of conversion cost, compared to the raw material requirement throughout the production cycle; W/P is normally equivalent to 50 per cent of total cost of production. Symbolically,

$$\frac{\text{Budgeted production (in units)} \times \text{Estimated work-in-process cost per unit} \times \text{Average time span of work-in-progress inventory (months/days)}}{\text{12 months/365 days}} \quad \textbf{(9.2)}$$

Finished Goods Inventory Working capital required to finance the inished goods inventory is given by factors summed up in Eq. 9.3.

$$\frac{\text{Budgeted production (in units)} \times \text{Cost of goods produced per unit (excluding depreciation)} \times \text{Finished goods holding period (months/days)}}{\text{12 months/365 days}} \quad \textbf{(9.3)}$$

Debtors The WC tied up in debtors should be estimated in relation to total cost price (excluding depreciation) Symbolically,

$$\frac{\text{Budgeted credit sales (in units)} \times \text{Cost of sales per unit excluding depreciation} \times \text{Average debt collection period (months/days)}}{\text{12 months/365 days}} \quad \textbf{(9.4)}$$

Cash and Bank Balances Apart from WC needs for financing inventories and debtors, firms also find it useful to have some minimum cash balances with them. It is difficult to lay down the exact procedure of determining such an amount. This would primarily be based on the motives for holding cash balances[13] of the business firm, attitude of management toward risk, the access to the borrowing sources in times of need and past experience, and so on.

Estimation of Current Liabilities The working capital needs of business firms are lower to the that extent such needs are met through the current liabilities (other than bank credit[14]) arising in the ordinary course of business. The important current liabilities (CL), in this context are, trade-creditors, wages and overheads:

Trade Creditors

$$\frac{\text{Budgeted yearly production (in units)} \times \text{Raw material cost per unit} \times \text{Credit period allowed by creditors (months/days)}}{\text{12 months/365 days}} \quad \textbf{(9.5)}$$

Note: Proportional adjustment should be made to cash purchases of raw materials.

Direct Wages

$$\frac{\text{Budgeted yearly production (in units)} \times \text{Direct labour cost per unit} \times \text{Average time-lag in payment of wages (months/days)}}{\text{12 months/365 days}} \quad \textbf{(9.6)}$$

The average credit period for the payment of wages approximates to a half-a-month in the case of monthly wage payment: The first days' monthly wages are paid on the 30th day of the month, extending credit for 29 days, the second day's wages are, again, paid on the 30th, extending credit for 28 days, and so on. Average credit period approximates to half-a-month.

Overheads (Other Than Depreciation and Amortisation)

$$\frac{\text{Budgeted yearly production (in units)} \times \text{Overhead cost per unit} \times \text{Average time-lag in payment of overheads (months/days)}}{\text{12 months/365 days}} \quad \textbf{(9.7)}$$

The amount of overheads may be separately calculated for different types of overheads. In the case of selling overheads, the relevant item would be sales volume instead of production volume.

The computation of working capital is summarised in Format 9.1.

FORMAT 9.1 *Determination of Working Capital*

	Amount
(I) *Estimation of Current Asset*:	
(a) Minimum desired cash and bank balances	
(b) Inventories	
Raw material	
Work-in-process	
Finished Goods	
(c) Debtors*	
Total Current Assets	
(II) *Estimation of Current Liabilities*:	
(a) Creditors**	
(b) Wages	
(c) Overheads	
Total Current Liabilities	
(III) *Net Working Capital (I – II)*	
Add margin for contingency	
(IV) Net Working Capital Required	

*If payment is received in advance, the item would be listed in CL.
**If advance payment is to be made to creditors, the item would appear under CA. The same would be the treatment for advance payment of wages and overheads.

Summary

- Working capital management is concerned with the problems that arise in managing the current assets (CA), current liabilities (CL) and the interrelationships between them. Its opera-tional goal is to manage the CA and CL in such a way that a satisfactory/acceptable level of net working capital (NWC) is maintained.
- There are three concepts of working capital (WC): gross, net and zero. The gross WC means the total CA. The NWC is the difference between the CA and CL. Zero WC = inventories plus receivables minus payables.
- The NWC is necessary due to non-synchronous nature of expected cash inflows and required cash outflows. The more predictable the cash inflows are, the less NWC will be required and *vice-versa.* The NWC represents the liquidity position of a firm.
- The NWC has a bearing on liquidity, profitability and risk of becoming technically insolvent. In general, the greater is the NWC, the higher is the liquidity, the lower is the risk and the profit-ability, and *vice-versa.* The trade-off between profitability and risk is an important element in the evaluation of the level of NWC of a firm.
- Determination of financing mix is another important constituent of WC management. The financing mix refers to the proportion of CA to be financed by short-term sources (CL) and long-term sources (such as share capital and long-term borrowings). It is concerned with deter-mination of relative share of these two broad sources in financing CA.
- There are three approaches to determine an appropriate financing mix: **(i)** hedging/matching approach, **(ii)** conservative approach and **(iii)** trade-off between these two.
- According to hedging approach, long-term funds should be used to finance the permanent/ core part of the CA and the purely temporary and seasonal requirements (over and above the permanent needs) should be met out of short-term funds. This approach is a high profit-high risk financing mix.
- According to the conservative approach, the estimated total requirements of the CA should be financed from long-term sources. The short-term sources of finance should be used only in emergency situations. The firm has NWC equal to the excess of long-term financing over the permanent requirement. This approach is a low-profit, low-risk combination.
- Neither the hedging approach nor the conservative approach is suitable for determining an appropriate financing mix. A trade-off between these two extreme approaches would give an acceptable financing strategy.
- The need for working capital (WC) arises from the cash/operating cycle of a firm. It refers to the length of time required to complete the following sequence of events: conversion of cash into inventory, inventory into receivables and receivables into cash. The operating cycle creates the need for working capital and its length in terms of time-span required to complete the cycle is the major determinant of the firm's working capital needs.
- Working capital can be **(i)** permanent and **(ii)** temporary. While the permanent component reflects the need for a certain irreducible level of current assets on a continuous and uninterrupted basis, the temporary portion is needed to meet seasonal and other temporary requirements. While permanent working capital requirements should be financed from long-term sources, short-term funds should be used to finance temporary working capital needs of a firm.
- Working capital requirements are determined by a variety of factors. These factors, however, affect different enterprises differently. In general, the factors relevant for proper assessment of the quantum of working capital required are: general nature of business, production cycle,

business cycle, production policy, credit policy, growth and expansion, availability of raw materials, profit-level, level of taxes, dividend policy, depreciation policy, price level changes and operating efficiency.

- Manufacturing and trading enterprises require fairly large amounts of working capital to maintain a sufficient amount of cash, inventories and book debts to support their production (purchases) and sales activity. Service enterprises (like public utilities) and hotels, restaurants and eating houses need to carry less WC.
- The longer is the production cycle, the larger is the WC needed or *vice-versa.*
- While during boom conditions, reflecting upswing in business activity, the need for WC is likely to grow to cater to the increased level of activity, the need for working capital in the downswing phase/recessionary conditions tend to be low due to fall in the volume of sales and production.
- While the liberal credit policy offered to customers would necessitate more working capital, tight credit terms would reduce its requirement. The liberal credit terms available from creditors/ suppliers of materials would be an offsetting factor.
- Growth industries and firms require more working capital.
- To meet vagaries in the unavailability, a firm should have excess inventory of raw materials to sustain smooth production. Such a firm would tend to have high level of WC.
- Cash profit, *per-se*, should not be viewed as a source of financing WC. The actual availability of such funds would depend upon the firm's requirement for payment of dividend, payment of loan instalment, creation of sinking fund, purchase of fixed assets, and so on. In case these requirements are substantial, cash profit is not likely to be available to meet the needs of a firm. Alternatively, only adjusted cash profits after provisioning for these requirements should be reckoned for WC financing.
- The payment of dividend consumes cash resources and, therefore, decreases WC of a firm. Conversely, the non-payment of dividend increases WC.
- Higher depreciation (enhanced rates of depreciations) has a positive impact on WC for two reasons: **(i)** lower tax liability and, hence, more cash profits and **(ii)** lower disposable profits and, therefore, a smaller dividend payment. They imply more cash with a corporate.
- Rising prices in input costs (without corresponding increase or less than a proportionate increase in selling prices of products) necessitates more WC to sustain an existing level of activity.
- Efficiency of operations accelerates the pace of cash cycle and improves the WC turnover resulting in reduced requirement of WC.
- A firm should have adequate WC to support its budgeted level of activity in terms of production/ sales. It should have neither more nor less WC than required. While the excessive WC adversely affects its profits, the inadequate WC interrupts its smooth operations. Therefore, its correct computation is an important constituent of efficient WC management.
- There are two components of WC, namely, CA and CL. Each component is to be separately estimated to determine the correct amount of WC. The relevant factors are the holding periods of the various types of inventories, debtors collection period, creditors payment period, budgeted yearly production/sales, cost of goods produced, cost of sales, average time-lag in payment of wages and other overheads, minimum cash balances and so on.
- Working capital requirements are to be computed with reference to cash costs (excluding depreciation) and not the sale price as depreciation is a non-cash cost and, hence, does not need WC. The investment required to finance debtors are at cost price. The 'cash cost approach' is appropriate to determine WC requirement of a firm.

References

1. Gitman, L J, *Principles of Managerial Finance*, Harper and Row, New York, 1997, p. 150.
2. For details, refer to Brigham, E.F. and J.F. Houston, *Op.cit.*, p.570-71.
3. Brigham, E.F. and J.F. Houston, *Op.cit.*, p.572.
4. Brigham, E.F. and J.F. Houston, *Ibid.*, p.573.
5. *Ibid*., p. 157.
6. Joy, O M, *Introduction to Financial Management*, Richard D Irwin, Homewood, Ill. 1977, p. 406.
7. *Ibid*., p. 407.
8. Ramamoorthy, V E, *Working Capital Management*, Institute of Financial Management and Research Madras, 1976, p. 54.
9. These aspects are covered in detail in Chapter 15.
10. Ramamoorthy, V E, *op. cit*., p. 58.
11. *Ibid*., p. 60.
12. Administrative overheads are normally ignored for valuation of work-in-process. Depreciation is excluded as it does not involve any cash expenditure.
13. Please refer to Chapter 11.
14. Bank credit is excluded as it is a source of finance of WC.

Practical Problems

P.9.1 X & Y Ltd is desirous to purchase a business and has consulted you, and one point on which you are asked to advise them, is the average amount of working capital which will be required in the first year's working.

You are given the following estimates and are instructed to add 10 per cent to your computed figure to allow for contingencies.

Particulars	*Amount for the year*
(i) Average amount backed up for stocks:	
Stocks of finished product	Rs 5,000
Stocks of stores and materials	8,000
(ii) Average credit given:	
Inland sales, 6 weeks' credit	3,12,000
Export sales, 1.5 weeks' credit	78,000
(iii) Average time lag in payment of wages and other outgoings:	
Wages, 1.5 weeks	2,60,000
Stocks and materials, 1.5 months	48,000
Rent and royalties, 6 months	10,000
Clerical staff, 0.5 month	62,400
Manager, 0.5 month	4,800
Miscellaneous expenses, 1.5 months	48,000
(iv) Payment in advance:	
Sundry expenses (paid quarterly in advance)	8,000
Undrawn profits on an average throughout the year	11,000

Set up your calculations for the average amount of working capital required.

Solution

TABLE 9.1 Statement to Determine net Working Capital for X & Y Ltd

(a) Current assets:	
(i) Stock of finished product	Rs 5,000
(ii) Stock of stores and materials	8,000
(iii) Debtors:	
Inland sales (Rs 3,12,000 × 6/52)	36,000
Export sales, (Rs 78,000 × 3/104)	2,250
(iv) Advance payment of sundry expenses (Rs 8,000 × 1/4)	2,000
Total investment in current assets	53,250
(b) Current liabilities:	
(i) Wages (Rs 2,60,000 × 3/104)	7,500
(ii) Stocks/materials, (Rs 48,000 × 3/24)	6,000
(iii) Rent, royalties, (Rs 10,000 × 6/12)	5,000
(iv) Clerical staff (Rs 62,400 × 1/24)	2,600
(v) Manager (Rs 4,800 × 1/24)	200
(vi) Miscellaneous expenses (Rs 48,000 × 3/24)	6,000
Total estimate of current liabilities	27,300
(c) Net working capital:	
(i) Current assets – Current liabilities (*A* – *B*)	25,950
(ii) *Add* 10 per cent contingency allowance	2,595
Average amount of working capital required	28,545

Assumptions:

(i) A time period of 52 weeks/12 months has been assumed in year.

(ii) Undrawn profit has been ignored in the working capital computation for the following reasons:

(a) For the purpose of determining working capital provided by net profit, it is necessary to adjust the net profit for income tax and dividends/drawings, and so on.

(b) Profit need not always be a source of financing working capital. It may be used for other purposes like purchase of fixed assets, repayment of long-term loans, and so on. Since the firm does not seem to have such uses, Rs 11,000 may be treated as source of working capital. But the WC will not change.

(iii) Actual working capital requirement would be more than what is estimated here as the cash component of current assets is not known.

P.9.2 A proforma cost sheet of a company provides the following particulars:

Particulars	*Amount per unit*
Elements of cost:	
Raw materials	Rs 80
Direct labour	30
Overhead	60
Total cost	170
Profit	30
Selling price	200

The following further particulars are available:

Raw materials in stock, on average, one month; Materials in process (completion stage, 50 per cent), on average, half a month; Finished goods in stock, on average, one month.

Credit allowed by suppliers is one month; Credit allowed to debtors is two months; Average time-lag in payment of wages is 1.5 weeks and one month in overhead expenses; one-fourth of the output is sold against cash; cash in hand and at bank is desired to be mantained at Rs 3,65,000.

You are required to prepare a statement showing the working capital needed to finance a level of activity of 1,04,000 units of production. You may assume that production is carried on evenly throughout the year, and wages and overheads accrue similarly. For calculation purposes, 4 weeks may be taken as equivalent to a month.

Solution

TABLE 9.2 Statement Showing Determination of Net Working Capital

(A) Current assets:	
(i) Stock of materials for 1 month: (1,04,000 × Rs 80 × 4/52)	Rs 6,40,000
(ii) Work-in-progress for 0.5 month:	
(a) Material (1,04,000 × Rs 80 × 2/52) × 0.50	1,60,000
(b) Labour (1,04,000 × Rs 30 × 2/52) × 0.50	60,000
(c) Overheads (1,04,000 × Rs 60 × 2/52) × 0.50	1,20,000
(iii) Finished goods for 1 month: (1,04,000 × Rs 170 × 4/52)	13,60,000
(iv) Debtors for 2 months (78,000 × Rs 170 × 8/52)	20,40,000
(v) Cash in hand and at bank	3,65,000
Total investments in current assets	47,45,000
(B) Current liabilities:	
(i) Creditors, 1 month's purchase of raw materials, (i.e. 1,04,000 × Rs.80 × 4/52)	6,40,000
(ii) Average time-lag in payment of expenses	
(a) Overheads (1,04,000 × Rs 60 × 4/52)	4,80,000
(b) Labour (1,04,000 × Rs 30 × 3/104)	90,000
Total estimate of current liabilities	12,10,000
(C) Net working capital = Current assets − Current liabilities (*A* − *B*)	35,35,000

Working notes and assumptions

(i) 26,000 units have been sold for cash. Therefore, credit sales pertain to 78,000 units only.

(ii) Year has 52 weeks.

(iii) All overheads are assumed to be variable. Presence of depreciation element in overheads will lower the working capital requirement.

P.9.3 While preparing a project report on behalf of a client you have collected the following facts. Estimate the net working capital required for that project. Add 10 per cent to your computed figure to allow contingencies:

Particulars	*Amount per unit*
Estimated cost per unit of production:	
Raw material	Rs 80
Direct labour	30
Overheads (exclusive of depreciation, Rs 10 per unit)	60
Total cash cost	170

Additional information:

Selling price, Rs 200 per unit

Level of activity, 1,04,000 units of production per annum

Raw materials in stock, average 4 weeks

Work in progress (assume 50 per cent completion stage in respect of conversion costs and 100 per cent completion in respect of materials), average 2 weeks
Finished goods in stock, average 4 weeks
Credit allowed by suppliers, average 4 weeks
Credit allowed to debtors, average 8 weeks
Lag in payment of wages, average 1.5 weeks
Cash at bank is expected to be, Rs 25,000.

You may assume that production is carried on evenly throughout the year (52 weeks) and wages and overheads accrue similarly. All sales are on credit basis only.

Solution

TABLE 9.3 Net Working Capital Estimate of a Project

(A) Current assets:	
(i) Raw materials in stock, (1,04,000 × Rs 80 × 4/52)	Rs 6,40,000
(ii) Work-in-progress	
(a) Raw material (1,04,000 × Rs 80 × 2/52)	3,20,000
(b) Direct Labour (1,04,000 × Rs 15 × 2/52)	60,000
(c) Overheads (1,04,000 × Rs 30 × 2/52)	1,20,000
(iii) Finished goods stock: (1,04,000 × Rs 170 × 4/52)	13,60,000
(iv) Debtors: (1,04,000 × Rs 170 × 8/52)	27,20,000
(v) Cash at bank	25,000
Total investment in current assets	52,45,000
(B) Current liabilities:	
(i) Creditors, average 4 weeks: (1,04,000 × Rs 80 × 4/52)	6,40,000
(ii) Lag in payment of wages (1,04,000 × Rs 30 × 1.5/52)	90,000
Total current liabilities	7,30,000
(C) Net working capital: Current assets – Current liabilities	45,15,000
Add: 10 per cent contingencies	4,51,500
Net working capital required	49,66,500

Working Notes

A full unit of raw material is required at the beginning of the manufacturing process and, therefore, total cost of the material, that is, Rs 80 per unit has been taken into consideration, while in the case of expenses, viz. direct labour and overheads, the unit has been finished only to the extent of 50 per cent. Accordingly, Rs 15 and Rs 30 have been charged for direct labour and overheads respectively in valuing work-in-proess.

P.9.4 From the following projections of XYZ & Ltd for the next year, you are required to determine the working capital required by the company.

Annual sales, Rs 14,40,000
Costof production (including depreciation of Rs 1,20,000), Rs 12,00,000
Raw material purchases, Rs 7,05,000
Monthly expenditure, Rs 30,000
Estimated opening stock of raw materials, Rs 140,000
Estimated closing stock of raw materials, Rs 1,25,000
Inventory norms:
Raw materials, 2 months
Work-in-process, 1/2 month
Finished goods, 1 month

The firm enjoys a credit of half-a-month on its purchases and allows one month credit on its supplies. On sales orders, the company receives an advance of Rs 15,000.

You may assume that production is carried out evenly throughout the year and minimum cash balance desired to be maintained is Rs 35,000.

Solution

TABLE 9.4 Statement Showing Determination of Net Working Capital

(A)	Current assets:			
	Cash balance			Rs 35,000
	Inventories:			
	Raw materials:	Opening stock	Rs 1,40,000	
		Add: Purchases	7,05,000	
		Less: Closing stock	1,25,000	
		Annual consumption	7,20,000	
		Two months requirement: (Rs 7,20,000 × 2/12)		1,20,000
	Work-in-process: (Rs 10,80,000 × 1/24)			45,000
	Finished goods: (Rs 10,80,000 × 1/12)			90,000
	Debtors: (Rs 10,80,000 × 1/12)			90,000@
	Total current assets			3,80,000
(B)	Current liabilities:			
	Trade creditors: (Rs 7,05,000 × 1/24)			29,375
	Advance received from debtors		15,000	
	Total current liabilities			44,375
(C)	Net working capital (*A* – *B*)			3,35,625

@It is assumed that there is neither opening nor closing stock of finished stock and, therefore, cost of sales is Rs 10,80,000 excluding depreciation.

Monthly expenditure is excluded as the cost of production includes it (Rs 7.2 lakh, raw materials + Rs 3.6 lakh, other expenses @ Rs 30,000 per month).

P.9.5 From the following data, compute the duration of the operating cycle for each of the two years and comment on the increase/decrease:

Particulars	*Year 1*	*Year 2*
Stocks:		
Raw materials	Rs 20,000	Rs 27,000
Work-in-process	14,000	18,000
Finished goods	21,000	24,000
Purchase of raw materials	96,000	1,35,000
Cost of goods sold	1,40,000	1,80,000
Sales	1,60,000	2,00,000
Debtors	32,000	50,000
Creditors	16,000	18,000

Assume 360 days per year for computations purposes.

Solution

TABLE 9.5 Determination of Operating Cycle

Particulars	*Year 1 (Days)*	*Year 2 (Days)*
(i) Raw materials holding period:		
$\frac{360 \text{ days} \times \text{Stock of raw meteriasls}}{\text{Cost of raw material consumede}}$	$\left(\frac{360 \times \text{Rs } 20{,}000}{\text{Rs } 96{,}000}\right) = 75$	$\left(\frac{360 \times \text{Rs } 27{,}000}{\text{Rs } 1{,}35{,}000}\right) = 72$
(assumed to be equivalent to purchases)		
(ii) *Less:* Creditors payment period:		
$\frac{360 \text{ days} \times \text{Creditors}}{\text{Purchases}}$	$\left(\frac{360 \times \text{Rs } 16{,}000}{\text{Rs } 96{,}000}\right) = (60)$	$\left(\frac{360 \times \text{Rs } 18{,}000}{\text{Rs}1{,}35{,}000}\right) = (48)$
(iii) Work-in-process holding period:		
$\frac{360 \text{ days} \times \text{Stock of WIP}}{\text{Cost of goods manufactured}}$	$\left(\frac{360 \times \text{Rs } 14{,}000}{\text{Rs } 1{,}40{,}000}\right) = 36$	$\left(\frac{360 \times \text{Rs } 18{,}000}{\text{Rs } 1{,}80{,}000}\right) = 36$
(assumed equal to cost of goods sold)		
(iv) Finished goods holding period:		
$\frac{360 \text{ days} \times \text{Stock of finished goods}}{\text{Cost of goods sold}}$	$\left(\frac{360 \times \text{Rs } 21{,}000}{\text{Rs } 1{,}40{,}000}\right) = 54$	$\left(\frac{360 \times \text{Rs } 24{,}000}{\text{Rs } 1{,}80{,}000}\right) = 48$
(v) Debtors collection period:		
$\frac{360 \text{ days} \times \text{Debtors}}{\text{Credit sales}}$	$\left(\frac{360 \times \text{Rs } 32{,}000}{\text{Rs } 1{,}60{,}000}\right) = 72$	$\left(\frac{360 \times \text{Rs } 50{,}000}{\text{Rs } 2{,}00{,}000}\right) = 90$
(assumed equal to total sales)		
Duration of operating cycle [sum of (i) to (v)]	= 177	= 198

The duration of the operating cycle has increased by 21 days in year 2 compared to year 1. It will necessitate more working capital in year 2. This increase has been primarily caused by an increase in debtors collection period and decrease in creditors payment period (as shown below):

Increase in debtors collection period	18 days
Decrease in creditors payment period	12
Less: Decrease in raw material holding period	(3)
Less: Decrease in finished goods holding period	(6)
Net increase in operating cycle	21

P.9.6 From the following information, extracted from the books of a manufacturing company, compute the operating cycle in days:

Period covered: 365 days Average period of credit allowed by suppliers, 16 days
Other data are as follows:

	(*Rs '000*)
Average debtors (outstanding)	480
Raw material consumption	4,400
Total production cost	10,000
Total cost of sales	10,500
Sales for the year	16,000
Value of average stock maintained:	
Raw material	320
Work-in-process	350
Finished goods	260

Solution

TABLE 9.6 Determination of Operating Cycle *(amount in '000)*

	Particulars	*Days*
(i)	Raw material holding period (365 days × Rs 320/4,400)	27
(ii)	*Less:* Creditors payment period	(16)
(iii)	Work-in-process holding period (365 days × Rs 350/Rs 10,000)	13
(iv)	Finished goods holding period (365 days × Rs 260/Rs 10,000)	9
(v)	Debtors collection period (365 days × Rs 480/Rs 16,000) (sales given are assumed equal to credit sales)	11
Duration of operating cycle		44

P.9.7 You are supplied with the following information in respect of XYZ Ltd for the ensuing year:

Production of the year, 69,000 units
Finished goods in store, 3 months
Raw material in store, 2 months' consumption
Production process, 1 month
Credit allowed by creditors, 2 months
Credit given to debtors, 3 months
Selling price per unit, Rs 50
Raw material, 50 per cent of selling price
Direct wages, 10 per cent of selling price
Manufacturing and administrative overheads, 16 per cent of selling price
Selling overheads, 4 per cent of selling price

There is a regular production and sales cycle and wages overheads accrue evenly. Wages are paid in the next month of accrual. Material is introduced in the beginning of the production cycle. You are required to ascertain its working capital requirement.

Solution

TABLE 9.7 Statement Showing Working Capital Requirement

(A) Current assets:	
(i) Raw material in store (69,000 × Rs 25 × 2/12)	Rs 2,87,500
(ii) Work-in-process (69,000 × Rs 31.5* × 1/12) (*Material, Rs 25 + 0.50 × (Rs 5, Direct wages + Rs 8, Manufacturing and other administrative overheads)	1,81,125
(iii) Finished goods in store (69,000 × Rs 38 × 3/12)	6,55,500
(iv) Debtors (69,000 × Rs 40 × 3/12)	6,90,000
Total current assets	18,14,125
(B) Current liabilities:	
(i) Creditors (69,000 × Rs 25 × 2/12)	2,87,500
(ii) Wages (69,000 × Rs 5 × 1/12)	28,750
Total current liabilities	3,16,250
(C) Net working capital (*A* – *B*)	14,97,875

Assumptions: (i) Conversion costs (wages, manufacturing and other administrative overheads) are assumed to be equivalent to 50 per cent to determine WIP **(ii)** sales are credit sales and equivalent to units produced (69,000).

P.9.8 *X* Ltd sells goods at a gross profit of 20 per cent. It includes depreciation as a part of cost of production. The following figures for the 12 month-period ending March 31, current year are given to enable you to ascertain the requirements of working capital of the company on a cash cost basis.

In your working, you are required to assume that:

(i) A safety margin of 15 per cent will be maintained;
(ii) Cash is to be held to the extent of 50 per cent of current liabilities;
(iii) There will be no work-in-progress;
(iv) Tax is to be ignored;
(v) Finished goods are to be valued at manufacturing costs. Stocks of raw materials and finished goods are kept at one month's requirements.

Sales at 2 month's credit, Rs 27,00,000
Materials consumed (suppliers' credit is for 2 months), Rs 6,75,000
Wages (paid on the last day of the month), Rs 5,40,000
Manufacturing expenses outstanding at the end of the year (cash expenses are paid one month in arrear), Rs 60,000
Total administrative expenses (paid as above), Rs 180,000
Sales promotion expenses (paid quarterly in advance), Rs 90,000

Solution

TABLE 9.8 Statement Showing Determination of Working Capital

(A) Current assets:	
(i) Raw materials (Rs 6,75,000/12)	Rs 56,250
(ii) Finished goods (Rs 19,35,000/12)	1,61,250
(iii) Debtors (Rs 22,05,000 × 2/12)	3,67,500
(iv) Sales promotion expenses (Rs 90,000 × 3/12)	22,500
(v) Cash in hand (Rs 2,10,000 × 0.50)	1,05,000
Total current assets	7,12,500

(*Contd.*)

(*Contd.*)

(B) Current liabilities:	
(i) Creditors (Rs 6,75,000 × 2/12)	1,12,500
(ii) Manufacturing expenses	60,000
(iii) Administrative expenses (Rs 1,80,000/12)	15,000
(iv) Wages (Rs 5,40,000 × 1/24)	22,500
Total current liabilities	2,10,000
(C) Net working capital (A – B)	5,02,500
Add: Safety margin (0.15 × Rs 5,02,500)	75,375
Working capital required on cash cost basis	5,77,875

Working Notes

(i)	Determination of manufacturing expenses		
	Sales		Rs 27,00,000
	Less: Gross profit margin (Rs 27 lakh × 0.20)		5,40,000
	Total manufacturing costs		21,60,000
	Less: Cost of materials consumed	Rs 6,75,000	
	Less: Wages	5,40,000	12,15,000
	Manufacturing expenses (balancing figure)		9,45,000
(ii)	Cash manufacturing expenses (Rs 60,000 × 12)		7,20,000
(iii)	Depreciation (Rs 9,45,000 – Rs 7,20,000)		2,25,000
(iv)	Cash manufacturing costs (Rs 21,60,000 – Rs 2,25,000)		19,35,000
(v)	Cash cost of sales (Rs 19,35,000 + Rs 1,80,000 + Rs 90,000)		22,05,000

P.9.9 On April 1 of the current year, the board of directors of Dowell Ltd wishes to know the amount of working capital that will be required to meet the programme of activity they have planned for the year. The following information is available:

(i) Issued and paid-up capital, Rs 2,00,000.

(ii) 5% Debentures (secured on assets), Rs 50,000.

(iii) Fixed assets valued at Rs 1,25,000 on March 31 of the previous year.

(iv) Production during the previous year was 60,000 units; it is planned that this level of activity should be maintained during the present year.

(v) The expected ratios of cost to selling price are - raw materials 60 per cent, direct wages 10 per cent and overheads 20 per cent.

(vi) Raw materials are expected to remain in store for an average of two months before these are issued for production.

(vii) Each unit of production is expected to be in process for one month. Full unit of raw materials is required in the beginning of production.

(viii) Finished goods will stay in warehouse for approximately three months.

(ix) Creditors allow credit for 2 months from the date of delivery of raw materials.

(x) Credit allowed to debtors is 3 months from the date of dispatch.

(xi) Selling price per unit is Rs 5.

(xii) There is a regular production and sales cycle.

Prepare: working capital requirement forecast.

Solution

TABLE 9.9 Forecast of Working Capital of Dowell Ltd

(A)	Current assets:	
	(i) Raw materials (60,000 × Rs 3 × 2/12)	Rs 30,000
	(ii) Work-in-process (60,000 × Rs 3.75 × 1/12) (Rs 3 material cost + 50 per cent of wages and overheads i.e., Rs 1.5)	18,750
	(iii) Finished goods (60,000 × Rs 4.5 × 3/12)	67,500
	(iv) Debtors (60,000 × Rs 4.5 × 3/12)	67,500
	Total current assets	1,83,750
(B)	Current liabilities: Creditors (60,000 × Rs 3 × 2/12)	30,000
(C)	Net working capital *(A – B)*	1,53,750

Mini Case

9.C.1 Strong Cement Company Ltd has an installed capacity of producing 1.25 lakh tonnes of cement per annum; its present capacity utilisation is 80 per cent. The major raw material to manufacture cement is limestone which is obtained from the company's own mechanised mine located near the plant. The company produces cement in 200 kgs bags. From the information given below, determine the net working capital (NWC) requirement of the company for the current year.

Cost structure per bag of cement (estimated)

Gypsum	Rs 25
Limestone	15
Coal	30
Packing material	10
Direct labour	50
Factory overheads (including depreciation of Rs 10)	30
Administrative overheads	20
Selling overheads	25
Total cost	205
Profit margin	45
Selling price	250
Add: Sale tax (10 per cent of selling price)	25
Invoice price to consumers	275

Additional information:

(i) Desired holding period of raw materials:
Gypsum, 3 months
Limestone, 1 month
Coal, 2.5 months
Packing material, 1.5 months

(ii) The product is in process for a period of 0.5 month (assume full units of materials, namely gypsum limestone and coal are required in the beginning; other conversion costs are to be taken at 50 per cent).

(iii) Finished goods are in stock for a period of 1 month before they are sold.

(iv) Debtors are extended credit for a period 3 months.

(v) Average time lag in payment of wages is approximately 0.5 month and of overheads, 1 month.
(vi) Average time lag in payment of sales tax is 1.5 months.
(vii) The credit period extended by various suppliers are:
Gypsum, 2 months
Coal, 1 month
Packing material, 0.5 month.
(viii) Minimum desired cash balance is Rs 25 lakh.
You may state your assumptions, if any.

Solution

Statement Showing Determination of Net Working Capital of Strong Cement Company Ltd

Current assets:		
Minimum desired cash balance		Rs 25,00,000
Raw materials:		
Gypsum (5 lakh bags[1] × Rs 25 × 3/12)		31,25,000
Limestone (5 lakh bags × Rs 15 × 1/12)		6,25,000
Coal (5 lakh bags × Rs 30 × 2.5/12)		31,25,000
Packing material (5 lakh bags × Rs 10 × 1.5/12)		6,25,000
Work-in-process: (5 lakh bags × Rs 115 × 1/24)		23,95,833
— Raw material cost 100 per cent (Rs 25 + Rs 15 + Rs 30)	Rs 70	
— Other conversion costs (Rs 50 + Rs 20 cash factory overheads + Rs 20) × 0.5	45	
	115	
Finished goods (5 lakh bags × Rs 170** × 1/12)		70,83,333
Debtors (5 lakh bags × Rs 220** × 3/12)		2,75,00,000
Total		4,69,79,166
Current liabilities:		
Creditors:		
Gypsum (5 lakh bags × Rs 25 × 2/12)		20,83,333
Coal (5 lakh bags × Rs 30 × 1/12)		12,50,000
Packing material (5 lakh bags × Rs 10 × 1/24)		2,08,333
Wages (5 lakh bags × Rs 50 × 1/24)		10,41,667
Overheads (5 lakh bags × Rs 65 × 1/12)		27,08,333
Sales tax (5 lakh bags × Rs 25 × 1.5/12)		15,62,500
Total		88,54,166
NWC		3,81,25,000

*1.25 lakh tons × 0.8 = 1 lakh ton/200 kgs = 5,00,000 bags
**(Total cost, Rs 205 – Depreciation, Rs 10 – selling overheads, Rs 25)
***(Cash cost, Rs 195 + sale tax, Rs 25)

Review Questions

RQ.9.1 Indicate whether the following statements are true or false.
(i) Working capital is primarily required due to non-synchronous nature of the expected cash inflows and required cash outflows.
(ii) Higher net working capital leads to higher liquidity and higher profitability.

(iii) Conservative approach warrants that long-term funds should be used to finance the permanent part of the current assets and the temporary/seasonal requirements should be financed by short-term funds.

(iv) According to hedging approach, current assets should be financed from long-term sources.

(v) Trade-off plan, in general, is considered an appropriate financing strategy for working capital.

(vi) There is an inverse relationship between the length of operating cycle of a firm and its working capital requirements.

(vii) In general, manufacturing enterprises require higher working capital than trading firms.

(viii) The longer the production cycle, the higher is the working capital needed or *vice-versa*.

(ix) There is a positive correlation between level of business activity and working capital needs of a business firm.

(x) Efficiency of operation accelerates the pace of cash cycle of a firm but it does not affect its working capital requirements.

(xi) A firm should carry higher working capital than required to execute smoothly its planned level of business activity.

(xii) The entire sum of net profit earned by a corporate can, *per-se*, be considered a source of financing working capital.

(xiii) Cash cost approach is an appropriate basis of computing working capital requirements of a business firm.

(xiv) Working capital tied up with debtors should be estimated in relation to the selling price.

(xv) From the perspective of determining net working capital, all current liabilities including short-term sources of finance are considered.

[Answers: (i) True (ii) False (iii) False (iv) False (v) True (vi) False (vii) True (viii) True (ix) True (x) False (xi) False (xii) False (xiii) True (xiv) False (xv) False]

RQ.9.2 How are net working capital, liquidity, technical insovlency, and risk related?

RQ.9.3 What is the basic premise of the hedging approach for meeting funds requirements? What are the effects of this approach on the profitability and risk?

RQ.9.4 What is the conservative approach to financing funds requirements? What kind of profitability-risk trade-off is involved?

RQ.9.5 If a firm has constant funds requirement throughout the year, which, if any, of the three financing plans is preferable? Why?

RQ.9.6 Length of operating cycle is a major determinant of working capital needs of a business firm. Explain.

RQ.9.7 Distinguish between: (a) Gross working capital and Net working capital, (b) Permanent and Temporary working capital (c) Production and operating cycle.

RQ.9.8 Write short note on zero working capital.

Examination Questions

Theory Questions

9.1 Differentiate between gross working capital and net working capital. (*Pune University, 2010*)
9.2 What is working capital management? Explain the concept of operating cycle. (*Pune University, 2010*)
9.3 Differentiate between gross working capital and net working capital. (*Punjab University, 2010*)
9.4 What is the concept of working capital? (*Punjab University, 2010*)
9.5 What do you understand by working capital management? (*Madras University, 2010*)
9.6 Explain various types of working capital. (*Madras University, 2010*)
9.7 State the operating cycle concept of working capital. (*Calcutta University, 2009*)
9.8 Explain various types of working capital. (*Mumbai University, 2009*)
9.9 Explain the determining factors of working capital needs of a manufacturing concern. (*Delhi University, 2009*)
9.10 Write short note on working capital cycle. (*Pune University, 2009*)
9.11 Define working capital and discuss the various factors which determine the working capital needs of a firm. (*Punjab University, 2009*)
9.12 What are the factors determining working capital requirements? (*Mumbai University, 2009*)
9.13 Define and distinguish between permanent working capital and fluctuating working capital. (*Calcutta University, 2008*)
9.14 What do you understand by gross working capital and net working capital? Give examples. (*Calcutta University, 2007*)
9.15 State the factors which determine working capital requirements of a manufacturing firm. (*Calcutta University, 2007*)
9.16 Explain the factors affecting investment in working capital. (*Delhi University, 2005, 2007*)
9.17 Working capital management deals with decisions regarding the appropriate mix and level of current assets and current liabilities." Elucidate the statement. *(Delhi University, 2004)*
9.18 Explain the principal motives for holding cash. *(Periyar University, Oct./Nov. 2004)*
9.19 What are the two important characteristics of current assets? State their implications for working capital management. *(Delhi University, 2002)*
9.20 What are the concepts of working capital? *(Bharatiyar University, April 2001)*
9.21 Choose the correct answer. Generally, a fast growing firm requires
(a) Decreasing amount of current assets.
(b) Increasing amount of current assets.
(c) Stable level of current assets.
(d) None of the above. *(Bharatiyar University, November 2001)*
9.22 Explain the factors having a bearing on working capital needs. *(Delhi University, 1999)*
9.23 (a) Whether the following statement is correct or false. Give briefly reasons for your answers: The operating cycle begins with the acquisition of raw materials and ends with the conversion of raw materials into finished products.
(b) What are two important characteristics of current assets? What are their implications for working capital management? Also discuss the factors to be considered in determining working capital requirements of a firm. *(Delhi University, 1997)*
9.23 What is the importance of adequate working capital? (*Bangalore University*)
9.24 What is working capital? What factors determine its requirements? (*Bangalore University*)
9.25 Net working capital is that portion of a firm's current assets which is financed by long-term funds.
(*True or False*) (*Bangalore University*) (*Answer 'True'*)

9.26 Choose the correct answer:
The operating cycle means
(a) The accounting period of the business
(b) The time gap between the sales and their actual realization in cash
(c) The period for which business expense have been incurred
(d) None of these (Bangalore University
(Answer 'd')

Numerical Questions

9.1 A company provides you the following facts. Estimate the net working capital required for the project.
Estimated cost per unit of production:

Cost element	*Amount*
Raw material	Rs 80
Director labour	30
Overheads (including depreciation, Rs 10 per unit)	70
Total cost	180

Additional information:
(i) Selling price: Rs 200 per unit
(ii) Level of activity: 1,56,000 units of production per annum
(iii) Raw materials in stock: average 4 weeks
(iv) Work-in-process (assume 50 per cent completion stage in respect of conversion costs and 100 percent completion in respect of materials): average 2 weeks.
(v) Finished goods in stock: average 4 weeks
(vi) Credit allowed by suppliers: average 4 weeks
(vii) Credit allowed to debtors: average 8 weeks
(viii) Lag in payment of wages: average 1.5 weeks
(ix) Cash at bank is expected to be Rs 25,000
You may assume that production is carried on evenly during the year. All sales are on credit basis. Add 10% to your computed figure to allow for contingencies. (*Delhi University, 2011*)

Solution

Statement showing determination of net working capital required for project

(A) Current assets:	
(i) Cash at bank	Rs 25,000
(ii) Raw materials (1,56,000 units × Rs 80 × 4/52)	9,60,000
(iii) Work-in-process (1,56,000 units × Rs 125[@] × 2/52)	7,50,000
(iv) Finished goods (1,56,000 units × Rs 170[@@] × 4/52)	20,40,000
(v) Debtors (1,56,000 units × Rs 170 × 8/52)	40,80,000
Total current assets	78,65,000
(B) Current liabilities:	
(i) Creditors (1,56,000 units × Rs 80 × 4/52)	9,60,000
(ii) Wages (1,56,000 units × Rs 30 × 1.5/52)	1,35,000
Total current liabilities	10,95,000
(C) Net working capital (*A* – *B*)	67,60,000
(D) Add 10% contingency allowance	6,76,000
(E) Net working capital required (*C* + *D*)	74,36,000

[@] = Rs 80 (full unit cost of raw material) + 0.5 (cash conversion costs (Rs 30 + Rs 60) = Rs 125.
[@@] = Investment in finished goods/debtors would be at cash costs (Rs 180 – Rs 10 depreciation) excluding depreciation.

52 weeks have been taken as equivalent to 1 year.

9.2 Estimate the working capital requirement for the coming year from the following information of a manufacturing company.

Expected annual sales is 1,30,000 units of Rs 10 per unit. The anticipated ratios of cost to selling price are: Raw-material, 50% and Direct wages, 15%. Budgeted overhead is Rs 52,000 per annum including Rs 10,000 for depreciation.

Planned stock will include raw material for Rs 50,000 and 7,500 units of finished goods. Credit allowed to debtors is 4 weeks. Credit expected to be received from suppliers is 3 weeks. Overhead and wages payment will be made 1 week after their incurrence. Material will stay in the process for 2 weeks.

Cash in hand to be maintained is 10% of total working capital. Assume that production is carried on evenly throughout the year. Raw material are introduced at the beginning of the process and wages and overhead accrue evenly during processing.

(*Calcutta University, 2010*)

Solution

Statement showing determination of net working capital of a manufacturing company.

(A) Current assets other than cash:	
(i) Raw materials	Rs 50,000
(ii) Work-in-process (1,30,000 units × Rs 5.9115[@] × 2/52)	29,558
(iii) Finished goods (7,500 units × Rs 6.823)	51,572
(iv) Debtors (1,30,000 units × Rs 6.823 × 4/52)	68,230
Total	1,98,960
(B) Current liabilities	
Creditors (1,30,000 units × Rs 5 × 3/52)	37,500
Wages (1,30,000 units × Rs 1.5 × 1/52)	3,750
Overheads (Rs 42,000 per year × 1/52)	808
Total current liabilities	42,058
(C) Net working capital other than cash (*A* – *B*)	1,56,902
Add cash (10% of net working capital or 1/9 of Rs 1,56,902)	17,434
Net working capital (including cash)	1,74,336

[@]Cost per unit:

Raw material (50% × Rs 10)	Rs 5
Direct wages (15% × Rs 10)	1.50
Cash overheads Rs 42,000/1,30,000 units	0.323
Total	6.823

Investment in work-in-process:

Raw material (100%), Rs 5 + conversion costs 0.5 (Rs 1.823) = Rs 5.9115

9.3 *XY* Ltd. sells its products on a gross profit of 20% on sales. The following information is extracted from its annual accounts for the year ended 31st March, 2008:

Sales (3 months credit)	Rs 40,00,000
Raw materials	12,00,000
Wages (15 das in arrears)	9,60,000
Manufacturing expenses (one month in arrears)	12,00,000
Administration expenses (one month in arrears)	4,80,000
Sales promotion expenses (payable half yearly in advance)	2,00,000

The company enjoys one month's credit from suppliers of raw materials and maintain 2 months stock of raw materials and one and a half months finished goods. Cash balance is maintained at Rs 1,00,000 as a precautionary balance. Assuming a 10% margin, find out the working capital requirements of *XY* Ltd. Cost of sales of computation of debtors and stock of finished goods may be taken at sales minus gross profit as per rate of gross profit given. (*University of Punjab, 2010*)

Solution

Statement showing determination of net working capital of *XY* Ltd.

(A) Current assets:	
(i) Cash balance	Rs 1,00,000
(ii) Raw materials (Rs 12,00,000 × 2/12)	2,00,000
(iii) Finished goods (Rs 32,00,000[@] × 1.5/12)	4,00,000
(iv) Debtors (Rs 32,00,000[*] × 3/12)	8,00,000
(v) Sales promotion expenses (Rs 2,00,000 × ½)	1,00,000
Total current assets	16,00,000
(B) Current liabilities:	
(i) Creditors (Rs 12,00,000 × 1/12)	1,00,000
(ii) Wages (Rs 9,60,000 × 0.5/12)	40,000
(iii) Manufacturing expenses (Rs 12,00,000 × 1/12)	1,00,000
(iv) Administrative expenses (Rs 4,80,000 × 1/12)	40,000
Total current liabilities	2,80,000
(C) Net working capital	13,20,000
Add 10% margin	1,32,000
Working capital requirement	14,52,000

@ (Rs 40,00,000 – 20% profit, Rs 8,00,000) = Rs 32,00,000.

9.4 Godrej company sells goods in the home market and earns a gross profit of 20% on sales. Its annual figures are as follows: Sales, Rs 3,00,000; Materials used, Rs 1,08,000; Wages, Rs 96,000; Manufacturing expenses, Rs 30,000; Administrative expenses, Rs 12,000; Depreciation, Rs 12,000; Selling expenses, Rs 18,000.

Additional Information: **(a)** Credit given by suppliers 2 months, **(b)** Credit allowed to customers 1 month, **(c)** Average time lag in payment of wages ½ month, **(d)** Average time lag in payment of administrative expenses 1 month, **(e)** Selling expenses are paid quarterly in advance, **(f)** Raw materials and finished goods are in stock for 1 month, and **(g)** Cash balance estimated to be maintained at Rs 30,000.

You are required to prepare a statement of working capital requirement.

(*Madras University, 2010*)

Solution

Statement showing determination of net working capital of Godrej Company.

(A) Current assets:	
(i) Desired cash balance	Rs 30,000
(ii) Raw materials (Rs 1,08,000 × 1/12)	9,000
(iii) Finished goods (Rs 2,46,000[@] × 1/12)	20,500
(iv) Debtors (Rs 2,58,000[@@] × 1/12)	21,500
(v) Selling expenses paid in advance (Rs 18,000 × ¼)	4,500
Total current assets	85,000
(B) Current liabilities:	
(i) Creditors (Rs 1,08,000 × 2/12)	18,000
(ii) Wages (Rs 96,000 × 0.5/12)	4,000
(iii) Administrative expenses (Rs 12,000 × 1/12)	1,000
Total current liabilities	23,000
(C) Net working capital (*A* – *B*)	62,500

[@]Cost of production (cash):

Cost of raw material used	Rs 1,08,000
Wages	96,000
Manufacturing expense (assumed excluding depreciation)	30,000
Administrative expenses	12,000
	2,46,000

(Note: It is assumed that finished goods are valued at total cost of goods produced including administrative expenses).

@@Cash cost of sales:

Cost of goods sold (Rs 3,00,000 × 0.8)	Rs 2,40,000
Less depreciation	12,000
Cash cost of goods sold	2,28,000
Administrative expenses	12,000
Selling expenses	18,000
	2,58,000

Gross profit rate of 20% implies cost of goods sold (inclusive of depreciation) is 80% of sales revenue.

9.5 A Ltd plans to sell 30,000 units next year. The expected cost structure is as follows:

Particulars	*Rs (per unit)*
Raw material	100
Manufacturing expenses	30
Selling, administration and financial expenses	20
Selling price	200

The duration at various stages of the operating cycle is expected to be as follows:

Raw material stage	2 months
Work-in-progress stage	1 months
Finished stage	½ months
Debtors stage	1 months

Assuming the monthly sale of 2,500 units, estimate the gross working capital requirements if the desired cash balance is 5% of the gross working capital and W-I-P is 25% complete with respect to manufacturing expenses.

(Pune University, 2010)

Solution

Statement showing determination of gross working capital

Raw material (2,500 units × 2 months × Rs 100)	Rs 5,00,000
Work-in-process (2,500 units × 1 month × Rs 107.50@)	2,68,750
Finished goods (2,500 units × 0.5 month × Rs 130*)	1,62,500
Debtors (2,500 units × 1 month × Rs 150)	3,75,000
Total current assets (other than cash)	13,06,250
Add desired cash balance (Rs 13,06,250 × 5/95)	68,750
Gross working capital	13,75,000

@100% complete in respect of raw material, Rs 100 + 25% complete in respect of manufacturing expenses (Rs 30 × 0.25) = Rs 107.50

@@Finished goods have been valued at cost of production (Rs 100 + Rs 30) = Rs 130.

9.6 From the following information, prepare a statement showing working capital requirement for Sathe Industrial Work Pvt. Ltd. Pune. Budgeted sales (Rs 10 per unit) = Rs 2,60,000.

Analysis of selling price:

Raw material	Rs 3.00
Direct labour	4.00
Overheads	2.00
	9.00
Profit	1.00
Selling price	10.00

It is estimated that: **(a)** Raw material are carried in stock for three weeks and finished goods for two weeks, **(b)** Factory processing will take three weeks, **(c)** Suppliers will give full five weeks credit, and **(d)** Customers will require eight weeks credit.

It may be assumed that production and overhead accrue evenly through out the year.

(*Pune University, 2010*)

Solution

Statement showing determination of net working capital requirements

(A)	Current assets:	
	Raw materials (26,000 units × Rs 3 × 3/52)	Rs 4,500
	Work-in-process (26,000 units × Rs 9 × 0.5[@] × 3/52)	6,750
	Finished goods (26,000 units × Rs 9 × 2/52)	9,000
	Debtors (26,000 units × Rs 9 × 8/52)	36,000
	Total current assets	56,250
(B)	Current liabilities:	
	Creditors (26,000 units × Rs 3 × 5/52)	7,500
(C)	Net working capital	48,750

[@]In absence of information, work-in-process has been assumed to be completed 50% in respect of all cost inputs.

Notes

(i) Presence of depreciation element in overheads would lower working capital requirement.

(ii) Requirement to maintain minimum desired cash balance would increase working capital requirements.

9.7 M/s. Sameera Ltd. submits following details of its costs. Calculate working capital requirements.

Particulars	*Cost (per unit)*
Raw materials	Rs 400
Direct labour	150
Overhead (includes depreciation and amortization, Rs 50)	350
Total cost	900

Additional data: **(a)** Minimum cash balance, Rs 40,000, **(b)** Profit per unit 150, output p.a. 52,000 units, **(c)** Raw material remain in stores average 4 weeks, **(d)** Credit to customers average 8 weeks and received from supplier average 4 week and **(e)** Finished goods average 4 weeks. Partly finished goods average 2 weeks. (stage of completion 100% material and 50% for other elements of cost).

(*Pune University, 2010*)

Solution

Statement showing determination of working capital requirements of Sameera Limited.

(A) Current assets:	
(i) Minimum desired cash balance	Rs 40,000
(ii) Raw material (52,000 units × Rs 400 × 4/52)	16,00,000
(iii) Work-in-process (52,000 units × Rs 625[@] × 2/52)	12,50,000
(iv) Finished goods (52,000 units × Rs 850 × 4/52)	34,00,000
(v) Debtors (52,000 units × Rs 850 × 8/52)	68,00,000
Total current assets	1,30,90,000
(B) Current liabilities:	
Creditors (52,000 units × Rs 400 × 4/52)	16,00,000
(C) Net working capital (*A* – *B*)	1,24,90,000

[@]Rs 400 + 50% (Rs 150 + Rs 300 cash overheads, excluding depreciation and amortisation) = Rs 625.

9.8 Calculate net working capital requirement of *XYZ* Co. from the following information:

Particulars	*Amount*
Annual sales	Rs 14,40,000
Cost of production (including depreciation, Rs 1,20,000)	12,00,000
Raw material purchased	7,05,000
Anticipated opening stock of raw material	1,40,000
Anticipated closing stock of raw material	1,25,000

Additional information:

1. Inventory Norms: Raw material, 2 months, Work-in-progress, 15 days, Finished goods, 1 month.
2. Company enjoys a credit of 15 days on its purchases and allows one month credit on its supplies.
3. Assume that production is carried on evenly throughout the year and minimum cash balance required is Rs 10,000. Assume 10% margin. (*Pune University, 2009*)

Solution

Statement showing determination of net working capital

(A) Current assets:		
(i) Minimum cash balance		Rs 10,000
(ii) Raw materials:		
Opening stock	Rs 1,40,000	
Add materials purchased	7,05,000	
Less closing stock	(1,25,000)	
Annual consumption	7,20,000	
Two months requirement (Rs 7,20,000 × 2/12)		1,20,000
(iii) Work-in-process (Rs 10,80,000 × 0.5/12)		45,000
(iv) Finished goods (Rs 10,80,000 × 1/12)		90,000
(v) Debtors (Rs 10,80,000 × 1/12)		90,000[@]
Total current assets		3,55,000
(B) Current liabilities:		
Creditors (Rs 7,05,000 × 0.5/12)		29,375
(C) Net working capital (*A* – *B*)		3,25,625
Add 10 per cent margin		32,563
Net working capital required		3,58,168

[@]It is assumed that opening stock of finished goods is equal to its closing stock. Cost of sales, therefore, is equal to cost of production, excluding depreciation.

9.9 The following cost percentages to the sales have been extracted from the cost sheet:

Materials	50%
Labour	20
Overheads	10
Total cost	80
Profit	20
Sales	100

Production and sales in 2007 was 1,20,000 units and it is proposed to maintain the same during 2008.

Additional information:

(i) Raw materials are expected to remain in stores for an average period of one month.
(ii) Finished goods are to stay in warehouse on an average for one month.
(iii) Debtors are allowed two months credit.
(iv) Each unit of production will be in process for an average of one and half months.
(v) Sale price per unit is Rs 12.
(vi) Keep 10%margin of safety on net working capital.
(vii) Production and sales are spread evenly through out the year.
(viii) Credit allowed by suppliers is two months.
(ix) Average time-lag in payment of wages and overheads is one month.

Prepare statement showing working capital requirement for 2008.

(*Adapted Mumbai University, 2009*)

Solution

Statement showing net working capital requirements

(A) Current assets:	
(i) Raw materials (1,20,000 units × Rs 6 × ½)	Rs 60,000
(ii) Work-in process (1,20,000 units × Rs 9.6 × 0.5[@] × 1.5/12)	72,000
(iii) Finished goods (1,20,000 units × Rs 9.6 × 1/12)	96,000
(iv) Debtors (1,20,000 units × Rs 9.6 × 2/12)	1,92,000
Total current assets	4,20,000
(B) Current liabilities:	
(i) Creditors (1,20,000 units × Rs 6 × 2/12)	1,20,000
(ii) Wages (1,20,000 units × Rs 2.4 × 1/12)	24,000
(iii) Overheads (1,20,000 units × Rs 1.2 1/12)	12,000
Total current liabilities	1,56,000
(C) Net working capital (*A* – *B*)	2,64,000
Add 10 pr cent margin of safety	26,400
Net working capital required	2,90,400

[@]In absence of information, work-in-process has been assumed to be completed 50% in respect of all inputs (materials and conversion costs).

Note

(i) Presence of depreciation element in overheads will lower the working capital requirement.
(ii) Working capital requirement would be more by minimum desired cash balance required to be maintained.

9.10 Determine the working capital requirement from the following particulars: Annual budget figures for: (Rs Lakhs)

Raw Materials	480
Direct Wages	240
Overheads	180
	900
Sales	1,000

Additional information:

(i) Average stock level of raw materials: 18 days.
(ii) Credit sales: 20 days credit is normal.
(iii) Finished goods are held in stock for a period of 10 days before they are released for sale.
(iv) Process period is for 12 days.
(v) The company enjoys 30 days credit facilities for purchase.
(vi) Estimated cash and bank balance: 10% of total working capital.

Assumptions: **(a)** 1 year = 360 days, **(b)** Raw materials are introduced at the beginning of a manufacturing process and labour and overheads accrue evenly. (*Calcutta University, 2009*)

Solution

Statement showing determination of net working capital (Rs Lakhs)

(A) Current assets (other than cash):	
(i) Raw material (Rs 480 lakh × 18/360)	Rs 24
(ii) Work-in-process (Rs 690 lakh[@] × 12/360)	23
(iii) Finished goods (Rs 900 lakh × 10/360)	25
(iv) Debtors (Rs 900 lakh × 20/360)	50
Total	122
(B) Current liabilities	
Creditors (Rs 480 lakh × 30/360)	40
(C) Net working capital (*A* – *B*) other than cash	82
Add cash 10% of net working capital or 1/9 of Rs 82 lakh	9.11
(D) Net working capital (including cash)	91.11

[@]100% raw material cost — Rs 480 lakh

Plus 50% of conversion costs (Rs 240 lakh + Rs 180 lakh) — 210 lakh

Rs 690 lakh

9.11 *X* Ltd. seeks your advice to estimate the working capital needed to finance a level of activity of 1,50,000 units of output for the year. The following details are available regarding the cost structure of the product:

Raw materials	50
Direct wages	18
Overheads	12
Total	80
Profit	20
Selling price	100

Other information:

(a) Raw materials are held in stock, on an average, for two months.
(b) Work in progress (100% complete in regard to materials and 50% for labour and overheads) has, on an average, half a month duration.
(c) Finished goods remain in warehouse, on an average, for a month.
(d) Suppliers of materials extend credit for one month.
(e) Debtors are allowed credit for two months.
(f) A minimum cash balance of Rs 20,000 is expected to be maintained.

You may assume that the production pattern is even throughout the year.

(*Punjab University, 2009*)

Solution

Statement showing determination of net working capital

(A) Current assets:	
(i) Minimum cash balance	Rs 20,000
(ii) Raw materials (1,50,000 units × Rs 50 × 2/12)	12,50,000
(iii) Work-in-process (1,50,000 units <1 Rs 65[@] × 0.5/12)	4,06,250
(iv) Finished goods (1,50,000 units × Rs 80 × 1/12)	10,00,000
(v) Debtors (1,50,000 units × Rs 80 × 2/12)	20,00,000
Total current assets	46,76,250
(B) Current liabilities:	
Creditors (1,50,000 units × Rs 50 × 1/12)	6,25,000
(C) Net working capital (*A* – *B*)	40,51,250

[@]Rs 50 material cost + 0.50 (Rs 30 conversion costs) = Rs 65

Note

(i) There are no cash sales, **(ii)** Actual working capital requirement would be less due to depreciation included in overhead cost.

9.12 A proforma cost sheet of a company provides the following particulars:

Elements of cost: Material : 40% of sales, Wages: 20% of sales, and Overheads: 20% of sales

The following other information is available:

(a) A level of activity of 1 lakh units is proposed to be maintained in the next year.

(b) Selling price per unit is Rs 24.

(c) Raw materials are expected to remain in stores for an average period of two months

(d) Materials remain in process on average half a month. (assume 50% complete in respect of conversion costs and 100% in respect of materials)

(e) Finished goods are expected to be in store for an average period one month.

(f) Credit allowed to debtors in one month.

(g) Credit allowed by suppliers is for half a month.

Assuming that sales and production follow a constant pattern, prepare a statement of working capital for the company.

(*Adapted, Punjab University, 2008 and 2010*)

Solution

Statement showing working capital requirement

(A) Current assets:	
(i) Raw materials (1,00,000 units × Rs 9.6 × 2/12)	Rs 1,60,000
(ii) Work-in-process (1,00,000 units × Rs 14.4[@] × 0.5/12)	60,000
(iii) Finished goods (1,00,000 units × Rs 19.2 × 1/12)	1,60,000
(iv) Debtors (1,00,000 units × Rs 19.2 × 1/12)	1,60,000
Total current assets	5,40,000
(B) Current liabilities:	
Creditors (1,00,000 units × Rs 9.6 × 0.5/12)	40,000
(C) Net working capital (*A* – *B*)	5,00,000

[@]Rs 9.6 Raw material + 0.5 × (other conversion costs Rs 9.6) = Rs 14.4.

Solution

(i) It is assumed that alls ales are on credit basis.

(ii) Actual working capital requirement would be more by the amount of minimum desired cash balance needed to support production and sales; it would be less also due to element of depreciation (to be excluded) from overheads.

9.13 The management of Virgo Ltd has called for a statement showing the working capital needed to finance a level of activity of 3,00,000 units of output for the year. The cost structure of the company is as follows:

	Cost per unit
Raw material (direct)	Rs 20
Labor	5
Overheads	15
Total cost	40
Profit	10
Selling price	50

Past trends indicate that:
Raw material are held in stock on an average for two months.
Work in progress (50% complete) will approximate to half a monthly production.
Finished goods remain in the warehouse on an average for one month.
Suppliers for materials extend one month's credit.
For debtors two months credit is usually allowed.
A minimum cash balance of Rs 25,000 is expected to be maintained.
The production pattern is assumed to be uniform throughout the year. (*Pune University, 2008*)

Solution

Statement showing determination of net working capital requirement of Virgo Limited

(A) Current assets:	
(i) Minimum desired cash balance	Rs 25,000
(ii) Raw materials (3,00,000 units × Rs 20 × 2/12)	10,00,000
(iii) Work-in-process (3,00,000 units × Rs 20 × 1/24)	2,50,000
(iv) Finished goods (3,00,000 units × Rs 40 × 1/12)	10,00,000
(v) Debtors (3,00,000 units × Rs 40 × 2/12)	20,00,000
Total current assets	42,75,000
(B) Current liabilities:	
Creditors (3,00,000 units × Rs 20 × 1/12)	5,00,000
(C) Net working capital (*A* – *B*)	37,75,000

9.14 P&G Ltd. furnishes below its cost and other data:
Unit cost

Raw material	Rs 30
Direct labour	20
Overhead	?
Profit (25% on selling price)	?
Unit selling price	100

Additional information is as follows:

Average raw material:	
in stock	–1 month
in process	–½ month
Credit allowed by suppliers	–1½ month
Credit allowed to debtors	–3 months
Time lag in payment:	
Wages	–½ month
Overhead	–1 month

Cash balance is assumed to be Rs 1,00,000 and 70% of sales are credit sales.
Assuming that production is carried on evenly throughout the year, you are required to determine the working capital requirement of the P&G Ltd. to achieve an output level of 1,20,000 units p.a. (*Calcutta University, 2008*)

Solution

Statement showing determination of net working capital of P&G Ltd.

(A) Current assets:	
(i) Cash balance	Rs 1,00,000
(ii) Raw material (1,20,000 units × Rs 30 1/12)	3,00,000
(iii) Work in process (1,20,000 units × Rs 75* × 0.5@ × 1/24)	1,87,500
(iv) Finished goods	NIL
(v) Debtors (1,20,000 units × 0.7 × Rs 75 × 3/12)	15,75,000
Total current assets	21,62,500
(B) Current liabilities:	
(i) Creditors (1,20,000 units × Rs 30 × 1.5/12)	4,50,000
(ii) Wages (1,20,000 units × Rs 20 × 0.5/12)	1,00,000
(iii) Overheads (1,20,000 units × Rs 25 × 1/12)	2,50,000
Total current liabilities	8,00,000
(C) Net working capital (*A* – *B*)	13,62,250

@In absence of information, work-in-process is assumed to be at 50 per cent completion stage in respect of all inputs.

*Statement showing computation of overheads costs:

Unit selling price	Rs 100
Less profit (25% of selling price)	25
Total cost	75
Less raw material and labour costs (Rs 30 + Rs 20)	50
Overhead (balancing figure)	25

9.15 Calculate the working capital requirement for Horizon Ltd. from the following information:

Raw material	Rs 160
Direct labour	60
Overhead	120
Total cost	340
Profit	60
Selling price	400

Raw material is held in stock on an average for four weeks. Materials are in process on an average for two weeks. Finished goods are in stock on an average for four weeks. Credit allowed by supplier four weeks. Credit allowed to debtor eight weeks. Lag in payment of wages 1½ weeks. Time lag in payment of overload expenses four weeks. Cash sales, ¼ of total sales, Cash in hand/bank, Rs 50,000, Expected level of production, 1,04,000 units, One year is taken as 52 weeks. Production is carried on evenly throughout the year. (*Delhi University, 2008*)

Solution

Statement showing determination of net working capital requirements of Horizon Limited

(A) Current assets:	
(i) Cash in hand/bank	Rs 50,000
(ii) Raw materials (1,04,000 units × Rs 160 × 4/52)	12,80,000
(iii) Work-in-process (1,04,000 units × Rs 340 × 0.5@ × 2/52)	6,80,000
(iv) Finished goods (1,04,000 units × Rs 340 × 4/52)	27,20,000
(v) Debtors (1,04,000 units × 0.75@@ × Rs 340 × 8/52)	40,80,000
Total current assets	88,10,000

(*Contd.*)

(*Contd.*)

(B) Current liabilities:	
(i) Creditors (1,04,000 units × Rs 160 × 4/52)	12,80,000
(ii) Wages (1,04,000 units × Rs 60 × 1.5/52)	1,80,000
(iii) Overhead (1,04,000 units × Rs 120 × 4/52)	9,60,000
Total current liabilities	24,20,000
(C) Net working capital (*A* – *B*)	63,90,000

[@]In absence of information, work-in-process is assumed to be at 50 per cent completion stage in respect of all inputs;
[@@]75 per cent sales are on credit.

9.16 Estimate the working capital requirement from the following particulars:

Production for the year	69,000 units
Finished goods in store	3 months
Raw materials in store	2 months
Production process	1 month
Credit allowed by suppliers	2 months
Credit allowed to debtors	3 months
Selling price per unit	Rs 50
Raw material cost	50% of selling price
Direct wages	10% of selling price
Manufacturing overheads	16% of selling price
Selling overheads	4% of selling price

There is a regular production and sales cycle and wages and overheads accrue uniformly. Wages are paid with a lag of one month. Assume that full material is issued to the production in the beginning of the production process. (*Delhi University, 2007, 2010*)

Solution

Statement showing working capital requirement

(A) Current assets	
(i) Raw material in store (69,000 × Rs 25 × 2/12)	Rs 2,87,500
(ii) Work-in-process (69,0000 × Rs 31.5[*] × 1/12) (*Material, Rs 25 + 0.50 × (Rs 5, Direct wages + Rs 8, Manufacturing and other administrative overheads)	1,81,125
(iii) Finished goods in store (69,000 × Rs 38 × 3/12)	6,55,500
(iv) Debtors (69,000 × Rs 40 × 3/12)	6,90,000
Total current assets	18,14,125
(B) Current liabilities:	
(i) Creditors (69,000 × Rs 25 × 2/12)	2,87,500
(ii) Wages (69,000 × Rs 5 × 1/12)	28,750
Total current liabilities	3,16,250
(C) Net working capital (*A* – *B*)	14,97,875

9.17 A trading company's forecast sales and other particulars are given below:

Forecast annual sales	Rs 1,30,000
Net profit on cost of sales	25%
Average credit allowed to debtors	8 weeks
Average credit allowed by creditors	6 weeks
Average stock carrying (to meet sales)	4 weeks

Determine forecast working capital of the company. Estimated cash on hand and at bank, Rs 5,000. (*Calcutta University, 2007*)

Solution

Statement showing determination of net working capital of a trading company

(A) Current assets:	
(i) Cash in hand and at bank	Rs 5,000
(ii) Finished goods stock (Rs 1,04,000@ × 4/52)	8,000
(iii) Debtors (Rs 1,04,000 × 8/52)	16,000
Total current assets	29,000
(B) Current liabilities:	
(i) Creditors (Rs 1,04,000 × 6/52)	12,000
(ii) Net working capital	17,000

[@]Determination of cost of sales:

Sales – net profit = cost of sales. Net profit is 25% on cost of sales. Accordingly, if cost of sales is Rs 100, sales are Rs 125 (or cost of sales is 4/5 of sales). Therefore, cost of sales is Rs 1,30,000 × 4/5 = Rs 1,04,000. In the case of trading concerns, it represents purchases of finished goods requirements of a year.

9.18 From the following information extracted from the books of a manufacturing concern, compute the operating cycle in days:

Period covered	365 days
Average period of credit allowed by suppliers	16 days
	(Rs 000)
Rate of material consumption	4,400
Average of total debtors outstanding	480
Total production cost	10,000
Total cost of sales	10,500
Sales for the year	16,000
Value of average stock maintained:	
Raw material	320
Work in progress	350
Finished goods	260

(*Punjab University, 2007*)

Solution

Determination of operating cycle (Amount in Rs. 000)

Particulars	*Days*
(i) Raw material holding period	
(365 days × Rs 320)/ Rs 4,440, yearly consumption	27
(ii) Less creditors payment period (given)	(16)
(iii) Work-in-process holding period	
(365 days × Rs 350)/ Rs 10,000, yearly production cost	13
(iv) Finished goods holding period	
(365 days × Rs 250)/ Rs 10,500, yearly cost of sales	9
(v) Debtors collection period	
(365 days × Rs 480)/ Rs 16,000, yearly sales, assumed to be credit sales	11
Duration of operating cycle	44

9.19 Rajesh wishes to commence a new trading business and gives the following information:

(i) Total estimated sales in a year will be Rs 12,00,000

(ii) His expenses are estimated as fixed expenses, Rs 2000 p.m. plus variable expenses equal to 5 per cent of his turnover.

(iii) He expects to fix a sale price of each product which will be 25% in excess of his purchase.

(iv) He expects to turnover his stock four times in a year.

(v) The sales and purchases will be evenly spread throughout the year. All sales will be for cash but he expects one month's credit for purchases. Calculate: **(a)** His estimated profit for the year, and **(b)** His average working capital requirements.

(*Punjab University, 2006*)

Solution

(a) Statement showing budgeted profit for the year

Sales revenue	Rs 12,00,000
Less costs:	
Cost of purchases/goods sold (Rs 12,00,000 × 4/5)	9,60,000
Fixed expenses (Rs 2,000 × 12)	24,000
Variable expenses (5% × Rs 12 lakh)	60,000
Profit (before taxes)	1,56,000

(b) Statement showing determination of net working capital

Finished goods stock (Rs 9,60,000 × ¼)	Rs 2,40,000
Plus monthly expenses (fixed Rs 2,000 + Rs 60,000*/12 months i.e., Rs 5,000 variable)	7,000@
Gross working capital	2,47,000
Less time-lag of one month in payment to creditors (Rs 9,60,000 × 1/12)	80,000
Net working capital	1,67,000

*(Sales Rs 12,00,000 × 0.05 = Rs 60,000 variable expenses).

@Obviously working capital would be needed to meet payment of monthly expenses; it is assumed that variable expenses (like fixed expenses) accrue each month and are paid in same month.

9.20 The following annual figures relate to ABC Ltd.

Sales (at two month's credit)	Rs 3,60,000
Materials consumed (suppliers extend two months' credit)	90,000
Wages paid (monthly in arrear)	72,000
Manufacturing expenses outstanding at the end of the year (expenses are paid one month in arrear)	8,000
Total administrative expenses (paid one month in arrear)	24,000
Sales promotion expenses, paid quarterly in advance	12,000

The company sells its products on gross profit of 25% considering depreciation as part of the cost of production. It keeps one month's stock each of raw materials and finished goods and a cash balance of Rs 10,000.

Assuming a 20% safety margin, work out the working capital requirement of the company on cash cost basis. Ignore work in process.

(*Delhi University, 2006*)

Solution

Statement showing determination of net working capital

(A) Current assets:	
(i) Cash in hand	Rs 10,000
(ii) Raw material (Rs 90,000 × 1/12)	7,500
(iii) Finished goods (Rs 2,58,000@ × 1/12)	21,500
(iv) Debtors (Rs 2,94,000@@ × 1/12)	49,000
(v) Sales promotion expenses (Rs 12,000 × 3/12)	3,000
	91,000

(*Contd.*)

(*Contd.*)

(B) Current liabilities	
(i) Creditors (Rs 90,000 × 1/12)	15,000
(ii) Manufacturing expenses (Rs 96,000 × 1/12)	8,000
(iii) Wages (Rs 72,000 × 1/12)	6,000
(iv) Administrative expenses (Rs 24,000 × 1/12)	2,000
	31,000
(C) Net working capital (*A* – *B*)	60,000
Add safety margin (Rs 60,000 × 20%)	12,000
Net working capital required	72,000

@Statement showing cash cost of production

Sales	Rs 3,60,000
Less gross profit margin (0.25 3 Rs 3,60,000)	90,000
Cost of production	2,70,000
Less cost of materials consumed	90,000
Less wages	72,000
Manufacturing expenses (cash + depreciation)	1,08,000
Less cash manufacturing expenses (Rs 8,000 3 12)	96,000
Depreciation	12,000
Cash cost of production (Rs 2,70,000 – Rs 12,000, depreciation)	2,58,000

@@Statement showing cash cost of sales:

Cash cost of production	Rs 2,58,000
Add administrative expenses	24,000
Add sales promotion expenses	12,000
	2,94,000

9.21 From the followings information prepare a statement showing the estimated working capital requirements:

(i)	Projected annual sales	36000 units
(ii)	Analysis of sales:	
	Raw materials	Rs 6 per unit
	Labour	4 per unit
	Overhead	3 per unit
	Profit	2 per unit
	Selling price	15 per unit
(iii)	Additional information:	
	(a) Raw materials in stock	1 month
	(b) Production process	2 months
	(c) Finished goods in store	3 months
	(d) Credit allowed to debtor	4 months
	(e) Credit allowed by suppliers	2 months
	(f) Average time lag in payment of wages and expenses is half-a-month	
	(g) Production is carried on evenly during the year and expenses and wages accrue similarly.	
(iv)	Cash is to kept at 10% at the net working capital.	

(*Calcutta University, 2006*)

Solution

Statement showing determination of net working capital requirements (cash cost approach)

(A) Current assets (other than cash):	
(i) Raw material (36,000 units × Rs 6 × 1/12)	Rs 18,000
(ii) Work-in-process (36,000 units × Rs 13 × 0.5[@] × 2/12)	39,000
(iii) Finished goods (36,000 units × Rs 13 × 3/12)	1,17,000
(iv) Debtors (36,000 units × Rs 13 × 4/12)	1,56,000
Total	3,30,000
(B) Current liabilities:	
(i) Creditors (36,000 units × Rs 6 × 2/12)	36,000
(ii) Wages (36,000 units × Rs 4 × 0.5/12)	6,000
(iii) Overheads (36,000 units × Rs 3 × 0.5/12)	4,500
Total	46,500
(C) Net working capital (other than cash)	2,83,500
Cash (10% of NWC or 1/9 of Rs 2,83,500)	31,500
(D) Net working capital requirement (including cash)	3,15,000

[@]assumed to be at 50 per cent completion stage in respect of all inputs.

9.22 From the following information, prepare an estimate of working capital requirements:

(i) Projected annual sale	52,000 units
(ii) Selling price	Rs 60 per unit
(iii) Raw material cost	40% of selling price
(iv) Direct labour cost	30% of selling price
(v) Overheads	20% of selling price.

Raw materials remain in stock on an average for 3 weeks. Goods remain in production process for 4 weeks on an average. 5 weeks are allowed to debtors to pay while firm gets 3 week credit from suppliers. Finished goods remain in stock for one month. Lag in the payment of wages and overhead expenses is two weeks. 50% of the sales are on cash basis. Assume that goods in process are 100% complete with respect to materials but only 50% in conversion costs.

(*Delhi University, 2006*)

Solution

Statement showing working capital requirements

(A) Current assets:	
(i) Raw materials (52,000 units × Rs 24 × 3/52)	Rs 72,000
(ii) Work-in process (52,000 units × Rs 39[@] × 4/52)	1,56,000
(iii) Finished goods (52,000 units × Rs 54 × 1/52)	2,34,000
(iv) Debtors (52,000 units × 0.5 × Rs 54 × 5/52)	1,35,000
Total current assets	5,97,000
(B) Current liabilities:	
(i) Creditors (52,000 units × Rs 24 × 3/52)	72,000
(ii) Wages (52,000 units × Rs 18 × 2/52)	36,000
(iii) Overheads (52,000 units × Rs 12 × 2/52)	24,000
Total current liabilities	1,32,000
(C) Net working capital (*A* – *B*)	4,65,000

[@]Material costs Rs 24 per unit plus 50 per cent of other conversion costs (Rs 30 × 0.5 = 15). WIP per unit is Rs 39.

9.23 From the following data, compute the duration of the operating cycle for each of the two years and give reasons for the increase/decrease.

Particulars	*Year 1*	*Year 2*
Stock – Raw materials	Rs 20,000	Rs 27,000
Work-in-progress	14,000	18,000
Finished goods	21,000	24,000
Purchases	96,000	1,35,000
Cost of goods sold	1,40,000	1,80,000
Sales	1,60,000	2,00,000
Debtors	32,000	50,000
Creditors	16,000	18,000

Assume 360 days per year for computation purposes. (*Delhi University, 2006*)

Solution

Computation of net operating cycle, years 1 – 2

	Particulars	*Year 1*	*Year 2*
(i)	Raw material holding period:		
	Year 1: 360 days × Rs 20,000/Rs 96,000	75	
	Year 2: 360 days × Rs 27,000/Rs 1,35,000		72
(ii)	Work-in-process period:		
	Year 1: 360 days × Rs 14,000/Rs 1,40,000[@]	36	
	Year 2: 360 days × Rs 18,000/Rs 1,80,000[@]		36
(iii)	Finished goods holding period:		
	Year 1: 360 days × Rs 21,000/Rs 1,40,000	54	
	Year 2: 360 days × Rs 24,000/Rs 1,80,000		48
(iv)	Debtors collection period:		
	Year 1: 360 days × Rs 32,000/Rs 1,60,000	72	
	Year 2: 360 days × Rs 50,000/Rs 2,00,000		90
(v)	Creditors payment period:		
	Year 1: 360 days × Rs 16,000/Rs 96,000	60	
	Year 2: 360 days × Rs 18,000/Rs 1,35,000		48
(vi)	Duration of net operating cycle:		
	Add (i) to (iv) – (v)	177	198

[@]In absence of the value of cost of goods produced, the value of cost of goods sold has been used.

Conclusion: Increase in net operating cycle (21 days) is due to the changes in the following:

Decrease in raw materials holding period	(3 days)
Decrease in finished goods holding period	(6 days)
Increase in debtors collection period	18 days
Decrease in creditors payment period	12 days
(causing increase in net working cycle)	
Net increase in net operating cycle	21 days

9.24 Pranshu Ltd. plans to sell 30,000 units next year. The expected per unit cost of goods is as follows:

Raw material	Rs100
Manufacturing expenses	30
Selling, administration and financial expenses	20
Selling price	200

The duration at various stages of operating cycle is expected to be as follows:

Raw material stage	2 months
Work-in-progress stage	1 month
Finished stage	½ month
Debtors stage	1 month

Assuming monthly sales level of 2,500 units, estimate the gross working capital requirements if the desired cash balance is 5% of the gross working capital requirements and work-in-progress is 25% complete with the respect to manufacturing expenses. (*Delhi University, 2005*)

Solution

Statement showing determination of gross working capital

(i) Raw materials (30,000 units × Rs 100 × 2/12)	Rs 5,00,000
(ii) Work-in-progress (30,000 units × Rs 107.5[@] × 1/12)	2,68,750
(iii) Finished goods (30,000 units × Rs 130[@@] × 3/12)	1,62,500
(iv) Debtors (30,000 units × Rs 150[@@@] × 1/12)	3,75,000
Total current assets (other than cash)	13,06,250
(v) Desired cash balance (Rs 13,06,250 × 5/95)	68,750
Gross working capital	13,75,000

[@]Rs 100 per unit raw materials (full unit of raw materials is required in the beginning of production) plus 25% of Rs 30, i.e., Rs 7.5 = Rs 107.50.

[@@]Rs 100 + Rs 30.

[@@@]Rs 100 + Rs 30 + Rs 20.

9.25 The relevant information of *XYZ* Ltd. for the year ended 2009 is given below:

Sales	: Rs 80,000	
Cost of goods sold	: Rs 56,000	
	Opening	Closing
Inventory	Rs 9,000	Rs 12,000
Accounts Receivable	12,000	16,000
Accounts Payable	7,000	10,000

What is the length of net operating cycle? Assume 365 days in a year.

(*Delhi University, 2005, 2010*)

Solution

Computation of net operating cycle

(i) Inventory holding period (365 × Rs 10,500, Average inventory)/Cost of goods sold, Rs 56,000	68.44
(ii) Add debtors collection period (365 × Rs 14,000, Average debtors)/sales, Rs 80,000	63.88
(iii) Less creditors payment period (365 × Rs 8,500, Average creditors)/purchases[@], Rs 59,000	52.58
Net operating cycle	79.74

[@]Rs 56,000 + closing *AP*, Rs 10,000 – Operating *AP*, Rs 7,000 = Rs 59,000.

9.26 From the following particulars, compute net operating cycle period, number of operating cycles in year and the amount of working capital.

Period covered	360 days
Average period allowed by suppliers	30 days
Average period allowed to debtors	45 days
Raw materials consumed during the year	Rs 6,00,000
Average stock of raw materials	50,000
Work-in-progress inventory	5,40,000
Average work-in-progress inventory	30,000
Finished gods inventory	8,00,000
Average finished goods inventory	40,000
Total cost of sales	8,40,000

(*Adapted Bangalore University*)

Solution

Determination of net operating cycle period, number of operating cycles in a year and working capital required.

Particulars	*Days*
Raw materials holding period (360 days × Rs 50,000/Rs 6,00,000)	30
Less creditors payment period (given)	(30)
Work-in-process holding period (360 × Rs 30,000/Rs 5,40,000)	20
Finished goods holding period (360 × Rs 40,000/Rs 8,00,000)	18
Debtors collection period (given)	45
Duration of operating cycle	83
Number of cycles in a year (365 days/83)	4.4
Working capital required in a year (Cost of sales/No. of cycles): Rs 8,40,000/4.4 cycles	Rs 1,90,909

Chapter

10

Working Capital Financing

Learning Objectives

1. Review the key features and characteristics of, and the costs associated with, trade credit as a source of working capital financing
2. Describe the various forms of bank credit and the modes of security and outline a rating and scoring model used by banks to assess borrowers for lending
3. Explain the key features of commercial papers (CPs) and certificates of deposits (CDs) as sources of working capital financing

INTRODUCTION

After determining the level of working capital, as illustrated in Chapter 9, a firm has to decide how it is to be financed. The need for financing arises mainly because the investment in working capital/current assets, that is, raw materials, work/stock-in-process, finished goods and receivables typically fluctuates during the year. The present chapter discusses the main sources of finance for working capital. Although long-term funds partly finance current assets and provide the margin money for working capital, such assets/working capital are virtually exclusively supported by short-term sources. The main sources of working capital financing, namely, trade credit, bank credit, commercial papers and certificate of deposits are covered in Sections 1-4. The major points are summarised in the last Section.

SECTION I TRADE CREDIT

Features

Trade credit refers to the credit extended by the supplier of goods and services in the normal course of transaction/business/sale of the firm. According to trade practices, cash is not paid immediately for purchases but after an agreed period of time. Thus, deferral of payment (trade credit) represents a source of finance for credit purchases.

Trade credit is the credit extended by suppliers of goods and services in the normal course of business.

There is, however, no formal/specific negotiation for trade credit. It is an informal arrangement between the buyer and the seller. There are no legal instruments/ acknowledgements of debt which are granted on an open account basis. Such credit appears in the records of the buyer of goods as sundry creditors/accounts payable.

A variant of accounts payable is bills/notes payable. Unlike the open account nature of accounts payable, bills/notes payable represent documentary evidence of credit purchases and a formal acknowledgement of obligation to pay for credit purchases on a specified (maturity) date failing which legal/penal action for recovery will follow. A notable feature of bills/notes payable is that they can be rediscounted and the seller does not necessarily have to hold it till maturity to receive payment. However, it creates a legally enforceable obligation on the buyer of goods to pay on maturity whereas the accounts payable have more flexible payment obligations. Although most of the trade credit is on open account as accounts payable, the suppliers of goods do not extend credit indiscriminately. Their decision whether or not to extend the trade credit as well as the quantum is based on a consideration of factors such as earnings record over a period of time, liquidity position of the firm and past record of payment.

Advantages

Trade credit, as a source of short-term/working capital finance, has certain advantages. It is easily, almost automatically, available. Moreover, it is a flexible and spontaneous source of finance. The availability and magnitude of trade credit is related to the size of operations of the firm in terms of sales/purchases. For instance, assume the requirement of credit purchases to support the existing sales is Rs 5 lakh per day. If the purchases are made on a credit of 30 days, the average outstanding accounts payable/trade credit (finance) will amount to Rs 1.5 crore (Rs 5 lakh × 30 days). The increase in purchases of goods to support higher sales level to Rs 6 lakh will imply a trade credit finance of Rs 1.8 crore (Rs 6 lakh × 30 days). If the credit purchases of goods decline, the availability of trade credit will correspondingly decline. Trade credit is also *an informal, spontaneous source of finance.* Not requiring negotiation and formal agreement, trade credit is free from the restrictions associated with formal/negotiated source of finance/credit.

Cash discount period implies the number of days after the beginning of the credit period during which the discount is available.

Cash discount implies a percentage deduction from the purchase price if the buyer pays within a specified time that is shorter than the credit period.

Costs

Trade credit does not involve any explicit interest charge. However, there is an implicit cost of trade credit. It depends on the credit terms offered by the supplier of goods. If the terms of the credit are, say, 45 days net, the payable amount to the supplier of goods is the same whether paid on the date of purchase or on the 45th day and, therefore, trade credit has no cost, that is, it is cost-free. But if the credit terms are, say, 2/15, net 45, that is, there is **cash discount** for prompt payment, the **trade credit period** beyond the **cash discount period** has a cost = [(Discount/1 – Discount) × (360 days/Credit period – Discount period)]. The implicit interest rate/cost = [(0.02/1 – 0.02) × (360/45 – 15)] = 24.5 per cent. Alternatively, the credit terms, 2/15, net 45, imply that the firm (buyer) is entitled to 2 per cent discount for pay-

Trade credit period is the number of days until full payment of an account payable is required.

ment made within 15 days when the entire payment is to be made within 45 days. Since the net amount is due in 45 days, failure to take the discount means paying an extra 2 per cent for using the money for an additional 30 days. If a firm were to pay 2 per cent for every 30-day period over a year, there would be 12 such periods (360 days ÷ 30 days). This represents an annual interest rate/cost of 24 per cent. If the terms of credit are 2/10, net 30, the cost of credit works out to 36.4 per cent. *The smaller the difference between the payment day and the end of the discount period, the larger is the annual interest/cost of trade credit.*

To sum up, as the **cost of trade credit** is generally very high beyond the discount period, firms should avail of the discount on prompt payment. If, however, they are unable to avail of discount, the payment of trade credit should be delayed till the last day of the credit (net) period and beyond without impairing their credit-worthiness. But a precondition for obtaining trade credit particularly by a new company is cultivating good relationship with suppliers of goods and obtaining their confidence by honouring commitments.

Cost of trade credit is the implicit cost of not availing cash discount.

SECTION 2 BANK CREDIT

Bank credit is the primary institutional source of working capital finance in India. In fact, it represents the most important source for financing of current assets.

Forms of Credit

Working capital finance is provided by banks in five ways: **(i)** cash credits/overdrafts, **(ii)** loans, **(iii)** purchase/discount bills, **(iv)** letter of credit and **(v)** working capital term loans.

Cash Credit/Overdrafts Under cash credit/overdraft form/arrangement of bank finance, the bank specifies a predetermined borrowing/credit limit. The borrower can draw/borrow up to the stipulated credit/overdraft limit. Within the specified limit/**line of credit**, any number of drawals/drawings are possible to the extent of his requirements periodically. Similarly, repayments can be made whenever desired during the period. The interest is determined on the basis of the running balance/amount actually utilised by the borrower and not on the sanctioned limit. However, a minimum (commitment) charge may be payable on the unutilised balance irrespective of the level of borrowing for availing of the facility. This form of bank financing of working capital is highly attractive to the borrowers because, firstly, it is flexible in that although borrowed funds are repayable on demand, banks usually do not recall cash advances/roll them over and, secondly, the borrower has the freedom to draw the amount in advance as and when required while the interest liability is only on the amount actually outstanding. However, cash credit/overdraft is inconvenient to the banks and hampers credit planning.

Line of credit is an agreement between a bank and a firm specifying the amount of short-term borrowing the bank would make available to the firm over a given period of time.

Loans Under this arrangement, the entire amount of borrowing is credited to the current account of the borrower or released in cash. The borrower has to pay interest on the total amount. The loans are repayable on demand or in periodic instalments. They can also be

renewed from time to time. As a form of financing, loans imply a financial discipline on the part of the borrowers.

Bills Purchased/Discounted This arrangement is of relatively recent origin in India. With the introduction of the New Bill Market Scheme in 1970 by the Reserve Bank of India (RBI), bank credit is being made available through discounting of *usance bills* by banks. The RBI envisaged the progressive use of bills as an instrument of credit as against the prevailing practice of using the widely-prevalent cash credit arrangement for financing working capital. The cash credit arrangement gave rise to unhealthy practices. As the availability of bank credit was unrelated to production needs, borrowers enjoyed facilities in excess of their legitimate needs. Moreover, it led to double financing. This was possible because credit was taken from different agencies for financing the same activity. This was done, for example, by buying goods on credit from suppliers and raising cash credit by hypothecating the same goods. The bill financing is intended to link credit with the sale and purchase of goods and, thus, eliminate the scope for misuse or diversion of credit to other purposes.

The amount made available under this arrangement is covered by the cash credit and overdraft limit. Before discounting the bill, the bank satisfies itself about the credit-worthiness of the drawer and the genuineness of the bill. To popularise the scheme, the discount rates are fixed at lower rates than those of cash credit, the difference being about 1-1.5 per cent. The discounting banker asks the drawer of the bill (i.e. seller of goods) to have his bill accepted by the drawee (buyers) bank before discounting it. The latter grants acceptance against the cash credit limit, earlier fixed by it, on the basis of the borrowing value of stocks. Therefore, the buyer who buys goods on credit cannot use the same goods as a source of obtaining additional bank credit.

The *modus operandi* of bill finance as a source of working capital financing is that a bill arises out of a trade sale-purchase transaction on credit. The seller of goods draws the bill on the purchaser of goods, payable on demand or after a usance period not exceeding 90 days. On acceptance of the bill by the purchaser, the seller offers it to the bank for discount/purchase. On discounting the bill, the bank releases the funds to the seller. The bill is presented by the bank to the purchaser/acceptor of the bill on due date for payment. The bills can also be rediscounted with the other banks/RBI. However, this form of financing is not popular in the country.

Term Loans for Working Capital Under this arrangement, banks advance loans for 3-7 years repayable in yearly or half-yearly instalments.

Letter of credit is a letter written by a bank stating that the bank guarantees payment of an invoiced amount if all the underlying agreements are met.

Letter of Credit While the other forms of bank credit are direct forms of financing in which banks provide funds as well as bear risk, letter of credit is an indirect form of working capital financing and banks assume only the risk, the credit being provided by the supplier himself.

The purchaser of goods on credit obtains a **letter of credit** from a bank. The bank undertakes the responsibility to make payment to the supplier in case the buyer fails to meet his obligations. Thus, the *modus operandi* of letter of credit is that the supplier sells goods on credit/extends credit (finance) to the purchaser, the bank gives a guarantee and bears risk only in case of default by the purchaser.

Mode of Security

Banks provide credit on the basis of the following modes of security:

Hypothecation is the use of inventory as a security/collateral to obtain a short-term loan.

Hypothecation Under this mode of security, the banks provide credit to borrowers against the security of movable property, usually inventory of goods. The goods hypothecated, however, continue to be in the possession of the owner of these goods (i.e., the borrower). The rights of the lending bank (hypothecatee) depend upon the terms of the contract between the borrower and the lender. Although the bank does not have physical possession of the goods, it has the legal right to sell the goods to realise the outstanding loan. Hypothecation facility is normally not available to new borrowers.

Pledge is the use of goods as security/ collateral to obtain a short-term loan.

Pledge **Pledge**, as a mode of security, is different from hypothecation in that in the former, unlike in the latter, the goods which are offered as security are transferred to the physical possession of the lender. An essential prerequisite of pledge, therefore, is that the goods are in the custody of the bank. The borrower who offers the security is, called a 'pawnor' (pledgor), while the bank is called the 'pawnee' (pledgee). The lodging of the goods by the pledgor to the pledgee is a kind of bailment. Therefore, pledge creates some liabilities for the bank. It must take reasonable care of goods pledged with it. The term '*reasonable care*' means care which a prudent person would take to protect his property. He would be responsible for any loss or damage if he uses the pledged goods for his own purposes. In case of non-payment of the loans, the bank enjoys the right to sell the goods.

Lien is a publicly disclosed legal claim on collateral.

Lien The term '**lien**' refers to the right of a party to retain goods belonging to another party until a debt due to him is paid. Lien can be of two types: **(i)** particular lien, and **(ii)** general lien. Particular lien is a right to retain goods until a claim pertaining to these goods is fully paid. On the other hand, general lien can be applied till all dues of the claimant are paid. Banks usually enjoy general lien.

Mortgage is the additional security of immovable property to obtain short-term loan.

Mortgage It is the transfer of a legal/equitable interest in specific immovable property for securing the payment of debt. The person who parts with the interest in the property is called 'mortgagor' and the bank in whose favour the transfer takes place is the 'mortgagee'. The instrument of transfer is called the 'mortgage deed'. **Mortgage** is, thus, conveyance of interest in the mortgaged property. The mortgage interest in the property is terminated as soon as the debt is paid. Mortgages are taken as an additional security for working capital credit by banks.

Charge Where immovable property of one person is, by the act of parties or by the operation of law, made security for the payment of money to another and the transaction does not amount to mortgage, the latter person is said to have a charge on the property and all the provisions of simple mortgage will apply to such a charge. The provision are as follows:

- A charge is not the transfer of interest in the property though it is security for payment. But mortgage is a transfer of interest in the property.
- A charge may be created by the act of parties or by the operation of law. But a mortgage can be created only by the act of parties.
- A charge need not be made in writing but a mortgage deed must be attested.
- Generally, a charge cannot be enforced against the transferee for consideration without notice. In a mortgage, the transferee of the mortgaged property can acquire the remaining interest in the property, if any is left.

SECTION 3 COMMERCIAL PAPERS

Features

Commerical paper is a form of financing consisting of short-term insecured promissory notes issued by a firm with high credit rating.

The CP is a short-term unsecured negotiable instrument consisting of usance primary notes with a fixed maturity, thus, indicating the short-term obligation of an issuer. It is generally issued by companies as a means of raising short-term debt and, by a process of securitisation, intermediation of the bank is eliminated. The PDs and all-India financial institutions can also issue CPs. It is issued on a discount to face value basis but it can also be issued in interest-bearing form. The issuer promises the buyer a fixed amount at a future date but pledges no assets. His liquidity and earning power are the only guarantee. In other words, the CP is not tied to any specific self liquidating trade transaction in contrast to the commercial bills that arise out of specific trade/commercial transaction. A CP can be issued by a company directly to the investor or through bank/merchant banks (dealers). When the companies directly deal with the investors, rather than use a securities dealer as an intermediary, the CP is called a *direct paper*. Such companies/borrowers announce the current rates of CPs of various maturities. Investors can then select those maturities that closely approximate their holding period and acquire the security/paper directly from the issuer. When CPs are issued by security dealer/dealers on behalf of their corporate customers, they are called *dealer papers*. They buy at a price less the commission and sell at the highest possible level. It is generally backed by a revolving underwriting facility from banks to esnure continuous availability of funds on each roll-over of the CP. Moreover, unlike commercial bills, maturities, within the range can be tailored to specific requirements.

Advantages

A CP, as a short-term financial instrument, has several advantages both to the issuers and the investors. It is a simple instrument and hardly involves any documentation between the issuer and the investor. It is additionally flexible in terms of maturities of the underlying promissory note, which can be tailored to match the cash flow of the issuer. Further, a well rated company can diversify its sources of finance from banks to the short-term money market at a cheaper cost. This is particularly relevant in a system, such as in India, in which reserve requirements on banks are in vogue in the form of SLR and CRR, which raise the effective cost of bank lending. Also, the CP provides investors with returns higher than what they obtain from the banking system. In addition, companies that are able to raise funds through CPs become better known in the financial world and are thereby placed in a more favourable position for raising long-term capital. Thus, there is an in-built incentive for companies to remain financially strong. Unlike bank credit which is secured by a first charge on the current assets, CP is unsecured. There are no limitations on the end-use of funds raised through CPs, and as negotiable/transferable instruments, they are highly liquid. Finally, in the Indian context, the creation of a commercial paper market has resulted in a part of the intercorporate funds flowing into this market, which is under the control of the monetary authorities.

Framework of Indian CP Market

Commercial paper (CP) is an unsecured money market instrument issued in the form of a promissory note. As a privately placed instrument, CP was introduced in India in 1990 with a view to enabling highly rated corporate borrowers to diversify their sources of short-term borrowings and to provide additional instrument to investors. Subsequently, primary/satellite dealers and all-India financial institutions (FIs) were also permitted to issue CP to enable them to meet their short-term funding requirements for their operations. The issue of CP is governed by the directions/guidelines issued by the RBI from time to time. These guidelines provide the broad framework of the CPs market in India. The main elements of the present framework of the Indian CP market, prescribed by the RBI, are outlined below.

Issuers Corporates, primary dealers (PDs) and the all-India financial institutions (FIs) that have been permitted to raise short-term resources under the umbrella limit fixed by the RBI are eligible to issue CP. A corporate would be eligible to issue CP provided **(a)** the tangible net worth of the company, as per the latest audited balance sheet, is not less than Rs 4 crore **(b)** the company has been sanctioned working capital limit by bank(s) or all-India FIs and **(c)** the borrowal account of the company is classified as a standard asset by the financing bank(s)/institution(s). Working capital limit means the aggregate limits including those by way of purchase/discount of bills sanctioned by banks/FIs for meeting the working capital requirements.

Rating Requirements All eligible participants should obtain the credit rating for issuance of the CP from CRISIL Ltd/ICRA Ltd/CARE Ltd/FITCH Ltd or other credit rating agencies specified by the RBI from time to time. The minimum credit rating should be **P-2** of CRISIL or equivalent rating by other agencies. The issuers should ensure at the time of issuance of the CP that the rating obtained is current and has not fallen due for review.

Maturity A CP can be issued for maturities between a minimum of 7 days and a maximum up to one year from the date of issue. The maturity date of the CP should not go beyond the date up to which the credit rating of the issuer is valid.

Denomination A CP can be issued in denominations of Rs 5 lakh or multiples thereof. The amount invested by a single investor should not be less than Rs 5 lakh (face value).

Limits and the Amount of Issue of CP A CP can be issued as a "stand alone" product. The aggregate amount of a CP from an issuer should be within the limit as approved by its Board of Directors or the quantum indicated by the credit rating agency for the specified rating, whichever is lower. Banks and FIs will, however, have the flexibility to fix working capital limits duly taking into account the resource pattern of companies' financing including CPs.

An FI can issue a CP within the overall umbrella limit fixed by the RBI, that is, the issue of the CP together with other instruments, namely, term money borrowings, term deposits, certificates of deposit and inter-corporate deposits should not exceed 100 per cent of its net owned funds, as per the latest audited balance sheet.

The total amount of CP proposed to be issued should be raised within a period of two weeks from the date on which the issuer opens the issue for subscription. The CP may be issued on a single date or in parts on different dates provided that in the latter case, each CP should have the same maturity date. Every issue of CP, including renewal, should be treated as a fresh issue.

Issuing and Paying Agent (IPA) Only a scheduled bank can act as an IPA for issuance of the CPs.

Investment in CP The CP may be issued to and held by individuals, banking companies, other corporate bodies registered or incorporated in India and unincorporated bodies, NRIs and FIIs. However, investment by FIIs should be within the limits set for their investments by the SEBI.

Mode of Issuance The CP can be issued either in the form of a promissory note or in a dematerialised form through any depository approved by and registered with the SEBI. However, banks, FIs and PDs are required to make fresh investments and hold CPs only in dematerialised form. It will be issued at a discount to face value as may be determined by the issuer. No issuer should have the issue of a CP underwritten or co-accepted.

Payment of CP The initial investor should pay the discounted value of the CP by means of a crossed account payee cheque to the account of the issuer through tge IPA. On maturity, when CP is held in physical form, the holder of the CP should present the instrument for payment to the issuer through the IPA. However, when CP is held in demat form, the holder of the CP will have to get it redeemed through the depository and receive payment from the IPA.

Stand-by Facility In view of the CP being a 'stand alone' product, it would not be obligatory in any manner on the part of the banks and FIs to provide stand-by facility to its issuers. They have, however, the flexibility to provide for a CP issue, credit enhancement by way of stand-by assistance/credit back-stop facility and so on, based on their commercial judgment, subject to prudential norms as applicable and with specific approval of their Board of Directors. The non-bank entities including corporates may also provide unconditional and irrevocable guarantee for credit enhancement for a CP issue provided **(i)** the issuer fulfils the eligibility criteria prescribed for issuance of CP **(ii)** the guarantor has a credit rating at least one notch higher than that of the issuer given by an approved credit rating agency and **(iii)** the offer document for CP properly discloses the net worth of the guarantor company, the names of the companies to which it has issued similar guarantees, the extent of the guarantees offered by it, and the conditions under which the guarantee will be invoked.

Procedure for Issuance Every issuer must appoint an IPA for issuance of a CP. He should disclose to the potential investors its financial position as per the standard market practice. After the exchange of deal confirmation between the investor and the issuer, the issuing company should issue physical certificates to the investor or arrange for crediting the CP to the investor's account with a depository. The investors should be given a copy of the IPA certificate to the effect that the issuer has a valid agreement with the IPA and the documents are in order.

Role and Responsibilities The role and responsibilities of the issuer, the issuing and the paying agent (IPA) and credit rating agency (CRA) are set out below.

(a) Issuer With the simplification in the procedure for CP issuance, issuers would now have more flexibility. They would, however, have to ensure that the guidelines and procedures laid down for the CP issuance are strictly adhered to.

(b) Issuing and Paying Agent (IPA) The IPA should ensure that the issuer has the minimum credit rating as stipulated by the RBI and the amount mobilised through issuance of CP is within the quantum indicated by the CRA for the specified rating or as approved by its Board

of Directors, whichever is lower. It has to verify all the documents submitted by the issuer, namely, a copy of the Board resolution, signatures of authorised executants (when CP in physical form), and issue a certificate that the documents are in order. It should also certify that it has a valid agreement with the issuer. The certified copies of original documents verified by the IPA should be held in its custody. Every CP issue should be reported to the RBI. The IPAs, which are NDS members, should report the details of CP issue on NDS platform within two days from the date of completion of the issue. Further, each scheduled bank acting as an IPA, will continue to report CP issuance details as hitherto within three days from the date of completion of the issue, incorporating the specified details till NDS reporting stabilises to the satisfaction of the RBI.

(c) Credit Rating Agency (CRA) The code of conduct prescribed by the SEBI for CRAs for undertaking rating of capital market instruments would be applicable to them for rating a CP. Further, the CRA would henceforth have the discretion to determine the validity period of the rating depending upon its perception about the strength of the issuer. Accordingly, the CRA should at the time of rating, clearly indicate the date when the rating is due for review. While the CRAs can decide the validity period of credit rating, they would have to closely monitor the rating assigned to the issuers *vis-à-vis* their track record at regular intervals and make their revision in the ratings public through their publications and website.

Effective Cost/Interest Yield

As CPs are issued at discount and redeemed at their face value, their effective pre-tax interest yield

$$= \left(\frac{\text{Face value} - \text{Net amount realised}}{\text{Net amount realised}}\right) \times \left(\frac{360}{\text{Maturity period}}\right)$$

where net amount realised = face value – discount – issuing and paying agent (IPA) charges, that is, stamp duty, rating charges, dealing bank fee and fee for stand by facility.

Assuming face value of a CP to be Rs 5,00,000, maturity period to be 90 days, net amount realised = Rs 4,80,000, discount and other charges associated with the issue of CP = 1.5 per cent, the pre-tax effective cost of CP

$$= \frac{\text{Rs } 5{,}00{,}000 - (\text{Rs } 4{,}80{,}000 - \text{Rs } 7{,}500)}{(\text{Rs } 4{,}80{,}000 - \text{Rs } 7{,}500)} \times \left(\frac{360}{90}\right) = 23.3 \text{ per cent}$$

The participants in the market are corporate bodies, banks, mutual funds, the UTI, LIC, GIC and so on, which have surplus funds and are on a lookout for opportunities for short-term investments. The PDs also operate both in the primary and secondary markets for CPs by quoting its bid and offering prices.

Although the CP market has become fairly popular now, a secondary market is yet to develop and when fully developed, it would impart strength and vitality to the money market. Investors, with temporary surplus, would be able to get attractive yields for their short-term funds and borrowers would be able to raise resources at market-related rates. The development of a secondary market with the active participation of the PDs will improve the liquidity of CPs.

SECTION 4 CERTIFICATE OF DEPOSITS (CDs)

Certificate of deposit is a marketable receipt of funds deposited in a bank for a fixed period at a specified rate of interest.

A CD is a document of title to a time deposit and can be distinguished from a conventional time deposit in respect of its free negotiability and, hence, marketability. In other words, CDs are a marketable receipt of funds deposited in a bank for a fixed period at a specified rate of interest. They are bearer documents/instruments and are readily negotiable. They are attractive both to the bankers and the investors in the sense that/he former is not required to encash the deposit prematurely, while the latter can sell the CDs in the srcondary market before its maturity and thereby the instrument has liquidity/ready marketability.

RBI Guidelines

A CD is a negotiable money market instrument, issued in a demat form or a usance promissory note for funds deposited at a bank/other eligible financial institutions (FIs) for a specified time period.

Eligibility The CDs can be issued by **(i)** commercial banks [excluding the RRBs/Local Area Banks (LABs)] and **(ii)** select all-India FIs permitted by the RBI within the umbrella limit fixed by it.

Aggregate Amount Banks can issue CDs depending on their requirements. An FI may issue CDs within the overall umbrella limit fixed by the RBI, that is, issue of CD together with other instruments, namely, term money, term deposits, CPs and inter-corporate deposits should not exceed 100 per cent of its net owned funds as per the latest audited balance sheet.

Minimum Size of Issue and Denominations The minimum amount of a CD should be Rs 1 lakh, that is, the minimum deposit that could be accepted from a single subscriber should not be less than Rs 1 lakh and in multiples of Rs 1 lakh.

Who Can Subscribe The CDs can be subscribed by individuals/corporations/companies/trusts/ funds/ associations and so on. The NRIs may also subscribe to CDs on a non-repatriable basis only. Such CDs cannot be endorsed to another NRI in the secondary market.

Maturity The maturity period of a CD issued by a bank should be between 15 days (minimum) and one year (maximum). The FIs can issue CDs with maturity of 1-3 years.

Discount/Coupon Rate The CDs may be issued at a discount on face value. They can also be issued on floating rate basis provided the methodology of the compiling the floating rate is objective, transparent and market-based. The issuer is free to determine the discount/coupon rate. The interest rate on the floating rate should be set periodically according to the predetermined formula that indicates the spread over a transparent benchmark.

Reserve Requirements Banks have to maintain the appropriate SLR and CRR on the issue price of the CD.

Transferability There is no lock-in period for the CDs. The physical CDs can be freely transferred by endorsement and delivery. The demated CDs can be transferred as per the applicable procedure.

Loans/Buy-backs Loans against CDs and buy-back of CDs by issuer before maturity are not permitted.

Format The CDs should be issued only in demat form. Issuance of CDs in physical form, if any, should be separately reported to the RBI. The issuance of CD would attract stamp duty. There would be no grace period for repayment.

Payment of Certificate The holders of the dematted CD should approach their respective Depository Participants (DPs) and give transfer/delivery instructions to transfer the demat security to the CD Redemption Account maintained by the issuer. The holder should also communicate to the issuer a copy of the delivery instruction given to the DP and intimate the place at which the payment is requested to facilitate prompt payment. The issuer on maturity date would arrange to pay to the holder/transferor.

Duplicate Certificate Duplicate certificates can be issued only in physical form after compliance with the following: **(i)** a notice in at least one local newspaper of loss of CD certificate, **(ii)** lapse of 15 days from the date of notice and **(iii)** execution of an indemnity bond by the investor tot he satisfaction of the issuer of the CD.

Initially, in 1990, CDs were highly popular instruments in the primary market, primarily due to their higher interest rates as compared to normal bank lending rates. However, there has been a relative decline in interest rates after 1991 due to the ease with which banks could access other low cost funds and were, hence, flush with funds, to the extent that the primary market in CDs became almost non-existent. In spite of the effort of the DFHI, the secondary market of this instrument could never come into being. Issues of CDs in India are limited to those periods when all the other sectors of the money market become tight. Due to the absence of a well developed secondary market for investors (mostly cash-rich corporates) it is a 'take and hold to maturity' instrument.

Summary

- Typically, working capital requirements/current assets are financed by a combination of long-term and short-term sources. The important traditional short-term sources of current assets financing are trade credit and bank credit. Two newly emerging sources of working capital finance are factoring and commercial papers.
- Trade credit represents credit extended by suppliers of goods and services in the normal course of transactions of the firm. As cash is not paid immediately for purchase but after an agreed period of time, the deferral of payment (trade credit) represents a source of finance for credit purchases (current assets). It does not involve any explicit interest charge/cost. The implicit cost of trade credit depends on the terms offered by the supplier of goods. When the terms include cash discount for prompt payment, the cost of trade credit is generally very high beyond the discount period.
- Bank credit is the single most important institutional source of working capital finance. It is provided mainly in three forms **(i)** cash credit/overdraft, **(ii)** loans, and **(iii)** purchase/discount of bills. Of these, loans contribute the most important component. The security for working capital advances by banks is in the form of hypothetication or pledge.
- Commercial papers which are unsecured promissory notes issued by firms which enjoy high credit rating are emerging as an innovative short-term source of current assets financing.
- Certificates of deposit is negotiable instrument issued in demat form or as usance promissory note for funds deposited at banks/FIs for a specified time period. It is a marketable receipt of funds. The framework of CD market is prescribed by the RBI.

Review Questions

RQ.10.1 Indicate whether the following statements are true or false.

(i) Trade credit is a spontaneous source of finance.

(ii) There are neither explicit nor implicit financial (interest) costs of trade credit.

(iii) Cash credits and working capital term loans are two ways by which working capital finance is obtained by banks in India.

(iv) Like cash credit, letter of credit is also a direct form of working capital finance provided by banks.

(v) Under hypothecation mode of security, banks provide credit to borrowers against the security of movable property, say, inventory of goods.

(vi) Under hypothecation mode of security, goods hypothecated continue to be in the possession of the borrower.

(vii) Like hypothecation, under pledge mode of security, goods continue to be in possession of the borrower.

(viii) While a mortgage can be created only by the act of parties, a charge may be created by the operation of law also.

(ix) Commercial paper is a short-term secured negotiable instrument of a fixed maturity.

(x) Commercial papers are regulated by the SEBI.

(xi) All public limited companies whose securities are listed on the stock exchange are entitled to raise funds by issuing commercial papers.

(xii) Factoring involves the outright sale of receivables at a discount to a factor to obtain funds.

(xiii) Since factoring involves the outright sale of receivables, bad-debts losses are to be borne by the factor.

(xiv) Rate of commission charged by a factor is the same whether the debts are factored with recourse or without recourse.

(xv) Factoring without resource facilitates off-balance sheet financing.

[Answers: (i) True (ii) False (iii) False (iv) False (v) True (vi) True (vii) False (viii) True (ix) False (x) False (xi) False (xii) True (xiii) False (xiv) False (xv) True]

RQ. 10.2 What are the features of trade credit as a short-term source of working capital finance? How can the cost of trade credit be calculated?

RQ. 10.3 Discuss the main forms of working capital advance by banks. What is the kind of security required by them?

RQ. 10.4 Briefly outline the main elements of the emerging system of bank financing of industry.

RQ. 10.5 Explain and illustrate the turnover method of assessing working capital requirements of borrowers.

RQ. 10.6 Discuss briefly commercial papers as source of working capital finance. How would you compute the cost of commercial papers?

Examination Questions

Theory Questions

10.1 Write a note on commercial paper. (*Madras University, 2010*)

10.2 Write a note on the popularity of trade credit as a source of short-term finance. (*Calcutta University, 2008*)

10.3 Discuss the various short-term source of finance. (*Punjab University, 2006 and 2008*)

10.4 Write short note on commercial paper. (*Calcutta University, Pune University, 2007*)

10.5 Name the sources of permanent working capital. (*Bangalore University, 2006*)

Chapter

11

Management of Cash and Marketable Securities

Learning Objectives

1. Discuss the motives for holding cash and marketable securities
2. Understand the objectives of cash management
3. Describe the factors that determine the required cash balances
4. Outline analytical models for cash management as a normative framework to provide an insight into how cash management should be conducted
5. Review and illustrate cash budget as a cash management tool
6. Demonstrate, using the operating and cash conversion cycles, the three basic strategies for the efficient management of cash to minimise financing/cash balance needs
7. Review popular techniques for speeding up collections and slowing disbursements
8. Understand the basic characteristics of marketable securities and the key features of the popular types of Government and non-Government issues

INTRODUCTION

Cash management is one of the key areas of working capital management. Apart from the fact that it is the most liquid current asset, cash is the common denominator to which all current assets can be reduced because the other major liquid assets, that is, receivables and inventory get eventually converted into cash. This underlines the significance of cash management.

The present Chapter gives a detailed account of the problems involved in managing cash. The first Section outlines the motives for holding cash followed by the objectives of cash management in Section two. Section 3 presents a discussion of the factors determining cash needs. The approaches to derive optimal cash balances, namely, cash management models and cash budgets are examined in depth in Section 4. The basic strategies for efficient management of cash are the subject-matter of Section 5. We have explained specific techniques to manage cash subsequently. The remainder of the chapter is devoted to the discussion of marketable securities and Indian practices. The Chapter concludes with a summary of the major points.

SECTION I MOTIVES FOR HOLDING CASH

Cash is the ready currency to which all liquid assets can be reduced.

Near cash implies marketable securities viewed the same way as cash because of their high liquidity.

Marketable securities are short-term interest earning money market instruments used by firms to obtain a return on temporarily idle funds.

Transaction motive is a motive for holding cash/ near cash to meet routine cash requirements to finance transaction in the normal couse of business.

Precautionary motive is a motive for holding cash/ near-cash as a cushion to meet unexpected contingencies/ demand for cash.

The term **'cash'** with reference to cash management is used in two senses. In a narrow sense, it is used broadly to cover currency and generally accepted equivalents of cash, such as cheques, drafts and demand deposits in banks. The broad view of cash also includes **near-cash** assets, such as **marketable securities** and time deposits in banks. The main characteristics of these is that they can be readily sold and converted into cash. They serve as a reserve pool of liquidity that provides cash quickly when needed. They also provide a short-term investment outlet for excess cash and are also useful for meeting planned outflow of funds. Here, the term *cash management* is employ-ed in the broader sense. Irrespective of the form in which it is held, a distinguishing feature of cash, as an asset, is that it has no earning power. If cash does not earn any return, why is it held? There are four primary motives for maintaining cash balances: **(i)** Transaction motive; **(ii)** Precautionary motive; **(iii)** Speculative motive; and **(iv)** Compensating motive.

Transaction Motive

An important reason for maintaining cash balances is the **transaction motive**. This refers to the holding of cash to meet routine cash requirements to finance the transactions which a firm carries on in the ordinary course of business. A firm enters into a variety of transactions to accomplish its objectives which have to be paid for in the form of cash. For example, cash payments have to be made for purchases, wages, operating expenses, financial charges like interest, taxes, dividends, and so on. Similarly, there is a regular inflow of cash to the firm from sales operations, returns on outside investments, and so on. These receipts and payments constitute a continuous two-way flow of cash. But the inflows (receipts), and outflows (disbursements) do not perfectly coincide or synchronise. At times, receipts exceed outflows while, at other times, payments exceed inflows. To ensure that the firm can meet its obligations when payments become due in a situation in which disbursements are in excess of the current receipts, it must have an adequate cash balance. The requirement of cash balances to meet routine cash needs is known as the **transaction motive** and such motive refers to the holding of cash to meet anticipated obligations whose timing is not perfectly synchronised with cash receipts. If the receipts of cash and its disbursements could exactly coincide in the normal course of operations, a firm would not need cash for transaction purposes. Although a major part of transaction balances are held in cash, a part may also be in such marketable securities whose maturity conforms to the timing of the anticipated payments, such as payment of taxes, dividends, and so on.

Precautionary Motive

In addition to the non-synchronisation of anticipated cash inflows and outflows in the ordinary course of business, a firm may have to pay cash

for purposes which cannot be predicted or anticipated. The unexpected cash needs at short notice may be the result of:

- Floods, strikes and failure of important customers;
- Bills may be presented for settlement earlier than expected;
- Unexpected slow down in collection of accounts receivable;
- Cancellation of some order for goods as the customer is not satisfied; and
- Sharp increase in cost of raw materials.

The cash balances held in reserve for such random and unforeseen fluctuations in cash flows are called as **precautionary balances**. In other words, precautionary motive of holding cash implies the need to hold cash to meet unpredictable obligations. Thus, precautionary cash balance serves to provide **a cushion to meet unexpected contingencies**. The more unpredictable are the cash flows, the larger is the need for such balances.

Another factor which has a bearing on the level of such cash balances is the availability of short-term credit. If a firm can borrow at short notice to pay for unforeseen obligations, it will need to maintain a relatively small balance and *vice versa*.

Such cash balances are usually held in the form of marketable securities so that they earn a return.

Speculative Motive

It refers to the desire of a firm to take advantage of opportunities which present themselves at unexpected moments and which are typically outside the normal course of business. While the precautionary motive is defensive in nature in that firms must make provisions to tide over un-expected contingencies, the **speculative motive** represents a positive and aggressive approach. Firms aim to exploit profitable opportunities and keep cash in reserve to do so. The speculative motive helps to take advantage of:

Speculative motive is a motive for holding cash/ near-cash to quickly take advantage of opportunities typically outside the normal course of business.

- An opportunity to purchase raw materials at a reduced price on payment of immediate cash;
- A chance to speculate on interest rate movements by buying securities when interest rates are expected to decline;
- Delay purchases of raw materials on the anticipation of decline in prices; and
- Make purchase at favourable prices.

Compensating Motive

Yet another motive to hold cash balances is to compensate banks for providing certain services and loans.

Banks provide a variety of services to business firms, such as clearance of cheque, supply of credit information, transfer of funds, and so on. While for some of these services banks charge a commission or fee, for others they seek indirect compensation. Usually clients are required to maintain a minimum balance of cash at the bank. Since this balance cannot be utilised by the firms for transaction purposes, the banks themselves can use the amount to earn a return. Such balances are **compensating balances**.

Compensating motive is a motive for holding cash/ near-cash to compensate banks for providing certain services or loans.

Compensating balances are also required by some loan agreements between a bank and its customers. During periods when the supply of credit

is restricted and interest rates are rising, banks require a borrower to maintain a minimum balance in his account as a condition precedent to the grant of loan. This is presumably to 'compensate' the bank for a rise in the interest rate during the period when the loan will be pending.

The compensating cash balances can take either of two forms: **(i)** an absolute minimum, say, Rs 5 lakh, below which the actual bank balance will never fall; **(ii)** a minimum average balance, say, Rs 5 lakh over the month. The first alternative is more restrictive as the average amount of cash held during the month must be above Rs 5 lakh by the amount of the transaction balance. From the firm's viewpoint, this is obviously dead money. Under the second alternative, the balance could fall to zero one day provided it was Rs 10 lakh some other day with the average working to Rs 5 lakh.

Of the four primary motives of holding cash balances, the two most important are the transactions motive and the compensation motive. Business firms normally do not speculate and need not have speculative balances. The requirement of precautionary balances can be met out of short-term borrowings.

SECTION 2 OBJECTIVES OF CASH MANAGEMENT

The basic objectives of cash management are two-fold: **(a)** to meet the cash disbursement needs (payment schedule); and **(b)** to minimise funds committed to cash balances. These are conflicting and mutually contradictory and the task of cash management is to reconcile them.

Meeting Payments Schedule

In the normal course of business, firms have to make payments of cash on a continuous and regular basis to suppliers of goods, employees and so on. At the same time, there is a constant inflow of cash through collections from debtors. Cash is, therefore, aptly described as the 'oil to lubricate the ever-turning wheels of business: without it the process grinds to a stop'.[1] A basic objective of cash management is to meet the payment schedule, that is, to have sufficient cash to meet the cash disbursement needs of a firm.

The importance of sufficient cash to meet the payment schedule can hardly be overemphasised. The advantages of adequate cash are: **(i)** it prevents insolvency or bankruptcy arising out of the inability of a firm to meet its obligations; **(ii)** the relationship with the bank is not strained; **(iii)** it helps in fostering good relations with trade creditors and suppliers of raw materials, as prompt payment may help their own cash management; **(iv)** a cash discount can be availed of if payment is made within the due date. For example, a firm is entitled to a 2 per cent discount for a payment made within 10 days when the entire payment is to be made within 30 days. Since the net amount is due in 30 days, failure to take the discount means paying an extra 2 per cent for using the money for an additional 20 days. If a firm were to pay 2 per cent for every 20-day period over a year, there would be 18 such periods (360 days ÷ 20 days). This represents an annual interest rate of 36 per cent;[2] **(v)** it leads to a strong credit rating which enables the firm to purchase goods on favourable terms and to maintain its line of credit with banks and other sources of credit; **(vi)** to take advantage of favourable business opportunities that may be available periodically; and finally, **(vii)** the firm can meet unanticipated cash expenditure with a minimum of strain during emergencies, such as strikes, fires or a new marketing campaign by competitors. Keeping large cash balances, however, implies a high cost. The advantage of prompt payment of cash can well be realised by **sufficient** and not **excessive** cash.

Minimising Funds Committed to Cash Balances

The second objective of cash management is to minimise cash balances. In minimising the cash balances, two conflicting aspects have to be reconciled. A high level of cash balances will, as shown above, ensure prompt payment together with all the advantages. But it also implies that large funds will remain idle, as cash is a non-earning asset and the firm will have to forego profits. A low level of cash balances, on the other hand, may mean failure to meet the payment schedule. The aim of cash management, therefore, should be to have an optimal amount of cash balances.

Keeping in view these conflicting aspects of cash management, we propose to discuss the planning/determination of the need for cash balances. There are two aspects involved in cash planning: first, an examination of those factors which have a bearing on the firm's required cash balances; second, a review of the approaches to achieve optimum cash balances.

SECTION 3 FACTORS DETERMINING CASH NEEDS

The factors that determine the required cash balances are: **(i)** synchronisation of cash flows, **(ii)** short costs, **(iii)** excess cash balance, **(iv)** procurement and management, and **(v)** uncertainty.

Synchronisation of Cash Flows

The need for maintaining cash balances arises from the non-synchronisation of the inflows and outflows of cash: if the receipts and payments of cash perfectly coincide or balance each other, there would be no need for cash balances. The first consideration in determining the cash need is, therefore, the extent of non-synchronisation of cash receipts and disbursements. For this purpose, the inflows and outflows have to be forecast over a period of time, depending upon the planning horizon which is typically a one-year period with each of the 12 months being a subperiod. The technique adopted is a cash budget. The preparation of a cash budget is discussed in the next section of this chapter. A properly prepared budget will pinpoint the months/periods when the firm will have an excess or a shortage of cash.

Short Costs

Another general factor to be considered in determining cash needs is the cost associated with a shortfall in the cash needs. The cash forecast presented in the cash budget would reveal periods of cash shortages. In addition, there may be some unexpected shortfall. Every shortage of cash–whether expected or unexpected–involves a cost 'depending upon the severity, duration and frequency of the shortfall and how the shortage is covered. Expenses incurred as a result of shortfall are called **short costs**'.[3] Included in the short costs are the following:

(i) **Transaction costs** associated with raising cash to tide over the shortage. This is usually the *brokerage* incurred in relation to the sale of some short-term near-cash assets such as marketable securities.

(ii) **Borrowing costs** associated with borrowing to cover the shortage. These include items such as interest on loan, commitment charges and other expenses relating to the loan.

(iii) **Loss of cash-discount,** that is, a substantial loss because of a temporary shortage of cash.

(iv) Cost associated with deterioration of the credit rating which is reflected in higher bank charges on loans, stoppage of supplies, demands for cash payment, refusal to sell, loss of image and the attendant decline in sales and profits.

(v) Penalty rates by banks to meet a shortfall in compensating balances.

Excess Cash Balance Costs

The cost of having excessively large cash balances is known as the *excess cash balance cost*. If large funds are idle, the implication is that the firm has missed opportunities to invest those funds and has thereby lost interest which it would otherwise have earned. This loss of interest is primarily the excess cost.

Procurement and Management

These are the costs associated with establishing and operating cash management staff and activities. They are generally fixed and are mainly accounted for by salary, storage, handling of securi-ties, and so on.

Uncertainty and Cash Management

Finally, the impact of uncertainty on cash management strategy is also relevant as cash flows cannot be predicted with complete accuracy. The first requirement is a precautionary cushion to cope with irregularities in cash flows, unexpected delays in collections and disbursements, defaults and unexpected cash needs.

The impact of uncertainty on cash management can, however, be mitigated through **(i)** improved forecasting of tax payments, capital expenditure, dividends, and so on; and **(ii)** increased ability to borrow through overdraft facility.

SECTION 4 DETERMINING CASH NEED

After the examination of the pertinent considerations and cost that determine cash needs, the next aspect relates to the determination of cash needs.

There are two approaches to derive an optimal cash balance, namely, **(a)** minimising cost cash models and **(b)** cash budget.

Cash Management/Conversion Models

Baumol Model is a model that provides for cost-efficient transactional balances and assumes that the demand for cash can be predicted with certainty and determines the optimal conversion size/ lot.

While it is true that financial managers need not necessarily follow cash management models exactly but a familiarity with them provides an insight into the normative framework as to how cash management should be conducted. This section, therefore, attempts to outline the following analytical models for cash management: **(i)** Baumol Model, **(ii)** Miller-Orr Model and **(iii)** Orgler's Model. The Control Theory Model Approach is highly mathematical and outside the scope of this book.[4]

Baumol Model[5] The purpose of this model is to determine the minimum cost amount of cash that a financial manager can obtain by converting securities to cash, considering the cost of conversion and the counterbalancing cost of keeping idle cash balances which otherwise could have

been invested in marketable securities. The total cost associated with cash management, according to this model, has two elements: **(i)** cost of converting marketable securities into cash and **(ii)** the lost opportunity cost.

The *conversion costs* are incurred each time marketable securities are converted into cash. Symbolically,

$$\text{Total conversion cost per period} = \frac{Tb}{C} \qquad \textbf{(11.1)}$$

Where b = cost per conversion assumed to be independent of the size of the transaction,

T =total transaction cash needs for the period,

C =value of marketable securities sold at each conversion.

The *opportunity cost* is derived from the lost/forfeited interest rate (i) that could have been earned on the investment of cash balances. The total opportunity cost is the interest rate times the average cash balance kept by the firm. The model assumes a constant and a certain pattern of cash outflows. At the beginning of each period, the firm starts with a cash balance which it gradually spends until at the end of the period it has a zero cash balance and must replenish its each supply to the level of cash balance in the beginning. Symbolically, the average lost opportunity cost.

$$i\left(\frac{C}{2}\right) \qquad \textbf{(11.2)}$$

Where i = interest rate that could have been earned.

$C/2$ = the average cash balance that is, the beginning cash (C) plus the ending cash balance of the period (zero) divided by 2.

The total cost associated with cash management comprising total conversion cost plus opportunity cost of not investing cash until needed in interest-bearing instruments can be symbolically expressed as:

$$i\left(\frac{C}{2}\right) + \left(\frac{Tb}{C}\right) \qquad \textbf{(11.3)}$$

To minimise the cost, therefore, the model attempts to determine the **optimal conversion amount**, that is, the cash withdrawal which costs the least. The reason is that a firm should not keep the total beginning cash balance during the entire period as it is not needed at the beginning of the period. For example, if the period were one thirty day month, only one-thirtieth of the opening cash balance each day will be required. This means if only one-thirtieth of the entire amount is withdrawn, the rest could be left invested in interest-earning marketable securities. As a result, on the one-thirtieth of the cash not needed to the last day of the month, twenty-nine day's interest could be earned by the firm and so on. Symbolically, the optimal conversion amount (C),

Optimal conversion size/ amount is the cost of minimising quantity in which to convert marketable securities to cash or cash to marketable securities.

$$C = \sqrt{\frac{2bt}{i}} \qquad \textbf{(11.4)}$$

The model in terms of of Eq. 11.4 has important implications. First, as the total cash needs for transaction rises because of expansion/diversification, the optimal withdrawal increases less than proportionately. This is the result of economy of scale in cash management. Each project does not need its own additional cash balances. It only needs enough additions to

the general cash balance of the firm to facilitate expanded operations. Secondly, as the opportunity interest rate (i) increases, the optimal cash withdrawal decreases. This is so because as (i) increases it is more costly to forfeit the investment opportunity and financial managers want to keep as much cash invested in securities for as long as possible. They can afford to do this at the higher interest rates because at those higher rates any shortfall costs caused by a lower withdrawal are offset.

In sum, the Baumol Model of cash management is very simplistic. Further, its assumptions of certainty and regularity of withdrawal of cash do not realistically reflect the actual situation in any firm. Also, the model is concerned only with transaction balances and not with precautionary balances. In addition, the assumed fixed nature of the cash withdrawals is also not realistic.

Nevertheless, the model does clearly and concisely demonstrate the economies of scale and the counteracting nature of the conversion and opportunity costs which are undoubtedly major considerations in any financial manager's cash management strategy.

Example 11.1

The ABC Ltd requires Rs 30 lakh in cash to meet its transaction needs during the next three-month cash planning period. It holds marketable securities of an equal amount. The annual yield on these marketable securities is 20 per cent. The conversion of these securities into cash entails a fixed cost of Rs 3,000 per transaction. Using Baumol model, compute the amount of marketable securities converted into cash per order. Assuming ABC Ltd can sell its marketable securities in any of the five lot sizes: Rs 1,50,000, 3,00,000, 6,00,000, 7,50,000 and 15,00,000, prepare a table indicating the economic lot size using numerical analysis.

Solution

$$C = \sqrt{\frac{2bT}{i}},$$

where C = optimal conversion amount/amount of marketable securities converted into cash per order; b = cost of conversion into cash per lot/transaction; T = projected cash requirement during the planning period; i = interest rate earned per planning period on investment in marketable securities.

$$= \sqrt{\frac{2 \times \text{Rs } 3{,}000 \times \text{Rs } 30{,}00{,}000}{0.05^{@}}} = \text{Rs } 6{,}00{,}000$$

@Annual yield 20 per cent/4 = 5 per cent.

TABLE 11.1 Optimal Cash Conversion Size/Lot

1. Total cash requirement *(Rs lakh)*	30	30	30	30	30
2. Lot size *(Rs lakh)*	1.5	3	6	7.5	15
3. Number of lots (1 ÷ 2)	20	10	5	4	2
4. Conversion cost per lot *(Rs thousand)*	3	3	3	3	3
5. Total conversion cost (3 × 4) *(Rs thousand)*	60	30	15	12	6
6. Average lot size *(Rs lakh)*	0.75	1.5	3	3.75	7.5
7. Interest cost (6 × 0.05) *(Rs)*	3,750	7,500	15,000	18,750	37,500
8. Total cost (5 + 7) *(Rs)*	63,750	37,500	30,000	30,750	42,500

The optimal cash conversion size is Rs 6 lakh.

Working Notes

1. Number of conversion during the planning period =

$$\frac{\text{Total cash requirement (Rs 30 lakh)}}{\text{Cash conversion lot/size}}$$

2. Average cash balance = Cash conversion size/2.
3. Interest income foregone = Average cash balance × interest rate for the cash planning period; interest rate = annual yield/4.
4. Cost of cash conversion = Number of conversions × cost per conversion.
5. Total cost of converting and holding cash = Interest income foregone + Cost of cash conversion.

Example 11.2

The management of Popular Traders anticipates Rs 15 lakh in cash outlays (demand) during the next year. The recent experience has been that it costs Rs 30 to convert marketable securities to cash and *vice versa*. The marketable securities currently earns 8 per cent annual return. Find the total cost of managing cash according to Banmol model.

Solution

$$\text{Economic/optimal conversion size/lot} = \frac{\sqrt{2 \times \text{Rs}\,30 \times \text{Rs}\,15{,}00{,}000}}{0.08} = \text{Rs } 33{,}541$$

Number of conversions = Rs 15,00,000 ÷ Rs 33,541 = 45
Average cash balance = Rs 16,770.50 (Rs 33,541 ÷ 2)
Total cost = (Rs 30 × 45) + (0.08 × Rs 16,770.50) = Rs 2,692

Miller-Orr Model[6] The objective of cash management, according to Miller-Orr (MO), is to determine the optimum cash balance level which minimises the cost of cash management. Symbolically,

Miller-Orr model is a model that provides for cost-efficient transactional balances and assumes uncertain cash flows and determines an upper limit and return point for cash balances

$$C = \frac{bE\,(N)}{t} + iE\,(M) \qquad \textbf{(11.5)}$$

where b = the fixed cost per conversion, $E(M)$ = the expected average daily cash balance, $E(N)$ = the expected number of conversions, t = the number of days in the period, i = the lost opportunity costs, and C = total cash management costs

The MO Model is, in fact, an attempt to make the Baumol Model more realistic as regards the pattern of cash flows. As against the assumption of uniform and certain levels of cash balances in the Baumol Model, the MO Model assumes that *cash balances randomly* fluctuate between an upper bound (h) and a lower bound (O). When the cash balances hit the upper bound, the firm has too much cash and should buy enough marketable securities to bring the cash balances back to the optimal bound (z). When the cash balances hit zero, the financial manager must return them to the optimum bound (z) by selling/converting securities into cash. According to the MO Model, as in Baumol model, the optimal cash balance (z) can be expressed symbolically as

$$z = \sqrt{\frac{3br^2}{4i}} \qquad \textbf{(11.6)}$$

where r^2 = the variance of the daily changes in cash balances.

Thus, as in Baumol Model, there are economies of scale in cash management and the two basic costs of conversion and lost interest that have to be minimised.

MO Model also specifies the optimum upper boundary (h) as three times the optimal cash balance level such that

$$h = 3z \quad \textbf{(11.7)}$$

Further, the financial manager could consider the use of less liquid, potentially more profitable securities as investments for the cash balances in excess of h.

Example 11.3

Assuming for Popular Traders in Example 11.2 that variance of daily net cash flows is estimated to be Rs 27,000, show the cash balances as per Miller-Orr model.

Solution

$$\text{Return point} = \frac{\sqrt{3 \times \text{Rs}\,30 \times \text{Rs}\,27{,}000}}{4 \times 0.000222^{@}} = \text{Rs}\ 1{,}399$$

@daily portfolio return = (8% ÷ 360 days)

upper limit = 3 × Rs 1,399 = Rs 4,197

The cash balance of Popular Traders would be allowed to vary between Re 0 (zero) and Rs 4,197. When the upper limit is reached, Rs 2,798 (Rs 4,197 – Rs 1,399) is converted from cash to marketable securities that will earn interest. When the cash balance falls to zero, Rs 1,399 (Rs 1,399 – Re 0) is converted from marketable securities into cash.

Orgler's model is a model that provides for integration of cash management with production and other aspects of the firm.

Orgler's Model[7] According to this model, an optimal cash management strategy can be determined through the use of a multiple linear programming model. The construction of the model comprises three sections: **(1)** selection of the appropriate planning horizon, **(2)** selection of the appropriate decision variables and **(3)** formulation of the cash management strategy itself. The advantage of linear programming model is that it enables coordination of the optimal cash management strategy with the other operations of the firm such as production and with less restrictions on working capital balances.

The model basically uses one year *planning horizon* with twelve monthly periods because of its simplicity. It has four basic sets of *decisions variables* which influence cash management of a firm and which must be incorporated into the linear programming model of the firm. These are: **(i)** payment schedule, **(ii)** short-term financing, **(iii)** purchase and sale of marketable securities and **(iv)** cash balance itself.

The formulation of the model requires that the financial managers first specify an objective function and then specify a set of constraints.

Orgler's objective function is to 'minimise the horizon value of the net revenues from the cash budget over the entire planning period'. Using the assumption that all revenues generated are immediately re-invested and that any cost is immediately financed, the objective function represents the value of the net income from the cash budget at the horizon 'by adding the net returns over the planning period'. Thus, the objective function recognises each operation of the firm that generates cash inflows or cash outflows as adding or subtracting profit opportunities for the firm from its cash management operations. In the objective function, decision variables which cause inflows, such as payments on receivables, have positive co-efficient, while decision variables which generate cash outflows, such as interest on short-term borrowings have negative co-efficients. The purchase of marketable securities would, for example, produce revenue and thus have a positive co-efficient while the sale of those securities would incur conversion costs and have a negative co-efficient.

The constraints of the model could be **(i)** institutional or **(ii)** policy-constraints. The institutional constraints are those imposed by external factors, that is, bank-required compensating balance. Policy constraints are imposed on cash management by the firm itself. For instance,

the financial manager may be prohibited from selling securities before maturity. Either constraint can occur in the model during one monthly period or over several or all the months in the one year planning horizon.

An example of the linear programming model is as follows:
Objective function:

$$\text{Maximise profit} = a_1x_1 + a_2x_2 \quad \textbf{(11.8)}$$

Subject to:

$$b_1x_1 \leq \text{production}$$
$$b_2x_2 \leq \text{constraints} \quad \textbf{(11.9)}$$
$$C_1x_1 + C_2x_2 \leq \text{Cash available constraint} \quad \textbf{(11.10)}$$
$$a_1x_1 + a_2x_2 > \text{Current assets requirement constraint} \quad \textbf{(11.11)}$$
$$x_i \geq O_i = 1,\ n \text{ non-negativity constraint} \quad \textbf{(11.12)}$$

A very important feature of the model is that it allows the financial managers to integrate cash management with production and other aspects of the firm.

Cash Budget: Management Tool

Cash budget is a statement of the inflows and outflows of cash that is used to estimate its short-tern requirements.

A firm is well advised to hold adequate cash balances but should avoid *excessive* balances. The firm has, therefore, to assess its need for cash properly. The cash budget is probably the most important tool in cash management. It is a device to help a firm to plan and control the use of cash. It is a statement showing the estimated cash inflows and cash outflows over the planning horizon. In other words, the net cash position (surplus or deficiency) of a firm as it moves from one budgeting subperiod to another is highlighted by the cash budget.

The various purposes of cash budgets are: **(i)** to coordinate the timings of cash needs. It identifies the period(s) when there might either be a shortage of cash or an abnormally large cash requirement; **(ii)** it pinpoints the period(s) when there is likely to be excess cash; **(iii)** it enables a firm which has sufficient cash to take advantage of cash discounts on its accounts payable, to pay obligations when due, to formulate dividend policy, to plan financing of capital expansion and to help unify the production schedule during the year so that the firm can smooth out costly seasonal fluctuations;[8] finally, **(iv)** it helps to arrange needed funds on the most favourable terms and prevents the accumulation of excess funds. With adequate time to study his needs, the finance manager can select the best alternative. In contrast, a firm which does not budget its cash requirements, may suddenly find itself short of funds. With pressing needs and little time to explore alternative avenues of financing, the management would be forced to accept the best terms offered in a difficult situation. 'These terms will not be as favourable, since the lack of planning indicates to the lender, that there is an organisational deficiency. The firm, therefore, represents a higher risk.'[9]

Elements/Preparation of Cash Budget Thus, the principal aim of the cash budget, as a tool to predict cash flows over a given period of time, is to ascertain whether at any point of time there is likely to be an excess or shortage of cash. The preparation of a cash budget involves various steps. These may be described as the elements of the cash budgeting system.

The *first* element of a cash budget is the selection of the period of time to be covered by

the budget. It is referred to as the **planning horizon**. The planning horizon means the *time span* and the sub-periods within that time span over which the cash flows are to be projected. There is no fixed rule. The coverage of a cash budget will differ from firm to firm depending upon its nature and the degree of accuracy with which the estimates can be made. As a general rule, the period selected should be neither too long nor too short. If it is too long, it is likely that the estimates will be inaccurate. If, on the other hand, the time span is too small, many important events which lie just beyond the period cannot be accounted for and the work associated with the preparation of the budget becomes excessive.

The planning horizon of a cash budget should be determined in the light of the circumstances and requirements of a particular case. For instance, if the flows are expected to be stable and dependable, such a firm may prepare a cash budget covering a long period, say, a year and divide it into quarterly intervals. In the case of a firm whose flows are uncertain, a quarterly budget, divided into monthly intervals, may be appropriate. Where flows are affected by seasonal variations, monthly budgets, sub-divided on a weekly or even a daily basis, may be necessary. If the flows are subject to extreme fluctuations, even a daily budget may be called for. The idea behind subdividing the budgeting period into smaller intervals is to highlight the movement of cash from one subperiod to another. The sub-division will provide information on the fluctuations in the cash reservoir level during the time span covered by the budget.

Operating cashflows are cashflows generated by the operations of the firm.

Financial cashflows are cashflows generated by the financial activties of the firm.

The *second* element of the cash budget is the selection of the factors that have a bearing on cash flows. The items included in the cash budget are only cash items; non-cash items such as depreciation and amortisation are excluded.[10] The factors that generate cash flows are generally divided, for purposes of the construction of cash budget, into two broad categories: **(a)** operating, and **(b)** financial. This two-fold classification of cash budget items is based on their *nature*. While the former category includes cash flows generated by the operations of the firms and are known as **operating cash flows**, the latter consists of **financial cash flows**.

Operating Cash Flows The main operating factors/items which generate cash outflows and inflows over the time span of a cash budget are tabulated in Exhibit 11.1.

EXHIBIT 11.1 Operating Cash Flow Items

Inflows/Cash Receipts	*Outflows/Disbursements*
1. Cash sales	1. Accounts payable/Payable payments
2. Collection of accounts receivable	2. Purchase of raw materials
3. Disposal of fixed assets	3. Wages and salary (payroll)
	4. Factory expenses
	5. Administrative and selling expenses
	6. Maintenance expenses
	7. Purchase of fixed assets

Among the operating factors affecting cash flows, are the collection of accounts receivable (inflow) and accounts payable (outflows). The terms of credit and the speed with which the cus-

tomers pay would determine the lag between the creation of the accounts receivable and their collection. Also, discounts and allowances for early payments, returns from customers and bad debts affect cash inflows. Similarly, in the case of accounts payable relating to credit purchase, cash outflows are affected by the purchase terms.

Cash receipts implies all cash inflows in a given financial period.

Cash disbursements implies all cash outflows during a given financial period.

The calculation of the collection on credit sales and payments on credit purchases, is generally done in the form of a statement known as the *worksheet*.[11] The results are subsequently incorporated in the cash budget. We illustrate in Example 11.4 how the credit policy of a firm and the purchase terms affect cash flows.

Example 11.4

A firm sells goods on credit and allows a cash discount for payments made within 20 days. If the discount is not availed of, the buyer must pay the full amount in 40 days. However, the firm finds that some of its customers delay payments up to 90 days. The experience has been that on 20 per cent of sales, payment is made during the month in which the sale is made, on 70 per cent of the sales payment is made during the second month after sale and on 10 per cent of sales payment is made during the third month.

The raw materials and other supplies required for production amount to 70 per cent of sales and are bought in the month before the firm expects to sell its finished products. Its purchase terms allow the firm to delay payment on its purchases for one month.

The credit sales of the firm are:

(Rs lakh)

May	10	August	30	November	20
June	10	September	40	December	10
July	20	October	20	January	10

Prepare a worksheet, showing the anticipated cash inflows on account of collection of receivables and disbursement of payables.

Solution

The expected cash inflows through collection of receivables and the anticipated outflows on account of accounts payable are presented in Table 11.2 in the form of a worksheet.

TABLE 11.2 Work-Sheet

(Rs lakh)

	May	*June*	*July*	*Aug.*	*Sept.*	*Oct.*	*Nov.*	*Dec.*	*Jan.*
1. Credit sales	10	10	20	30	40	20	20	10	10
2. Collections:									
During month of sale (20%)	2	2	4	6	8	4	4	2	2
During the first month after sale (70%)	—	7	7	14	21	28	14	14	7
During second month after sale (10%)	—	—	1	1	2	3	4	2	2
Total collections	2	9	12	21	31	35	22	18	11
3. Credit purchases (70% of next month's sale)	7	14	21	28	14	14	7	7	7
Payment (one month lag)	—	7	14	21	28	14	14	7	7
Total payments	—	7	14	21	28	14	14	7	7

Financial Cash Flows The major financial factors/items affecting the generation of cash flows are depicted in Exhibit 11.2.

EXHIBIT 11.2 Financial Cash Flow Items

Cash Inflows/Receipts	*Cash Outflows/Payments*
1. Loans/Borrowings	1. Income-tax/Tax payments
2. Sales of securities	2. Redemption of loan
3. Interest received	3. Repurchase of shares
4. Dividend received	4. Interest paid
5. Rent received	5. Dividends paid
6. Refund of tax	
7. Issue of new shares and securities	

Preparation of Cash Budget After the time span of the cash budget has been decided and pertinent operating and financial factors have been identified, the final step is the construction of the cash budget. The preparation of a cash budget is illustrated in Examples 11.5 and 11.6.

Example 11.5

A firm adopts a six-monthly time span, subdivided into monthly intervals for its cash budget.

(A) The following information is available in respect of its operations: *(Rs lakh)*

Particulars	*Months*					
	1	*2*	*3*	*4*	*5*	*6*
1. Sales	40	50	60	60	60	60
2. Purchases	1	1.50	2	2	2	1
3. Direct labour	6	7	8	8	8	6
4. Manufacturing overheads	13	13.50	14	14	14	13
5. Administrative expenses	2	2	2	2	2	2
6. Distribution expenses	2	3	4	4	4	2
7. Raw materials (30 days credit)	14	15	16	16	16	15

(B) Assume the following financial flows during the period:

(a) *Inflows*:
1. Interest received in month 1 and month 6, Rs 1 lakh each;
2. Dividend received during months 3 and 6, Rs 2 lakh each;
3. Sales of shares in month 6, Rs 160 lakh.

(b) *Outflows:*
1. Interest paid during month 1, Rs 0.4 lakh;
2. Dividends paid during months 1 and 4, Rs 2 lakh each;
3. Instalment payment on machine in month 6, Rs 20 lakh;
4. Repayment of loan in month 6, Rs.80 lakhs.

(c) Assume that 10 per cent of each month's sales are for cash; the balance 90 per cent are on credit. The terms and credit experience of the firm are:
1. No cash discount;
2. 1 per cent of credit sales is returned by the customers;
3. 1 per cent of total accounts receivable is bad debt;
4. 50 per cent of all accounts that are going to pay, do so within 30 days;
5. 100 per cent of all accounts that are going to pay, do so within 60 days.

Using the above information prepare a cash budget.

Solution The cash budget is constructed in Table 11.3.

TABLE 11.3 Cash Budget for Six Months

(Rs lakh)

Particulars	*Months*					
	1	*2*	*3*	*4*	*5*	*6*
(A) Cash inflows:						
1. Cash sales (10% of total)	4.00	5.00	6.00	6.00	6.00	6.00
2. Receivables collection	—	17.64	39.68	48.50	52.92	52.92
3. Interest received	1.00	—	—	—	—	1.00
4. Dividends received	—	—	2.00	—	—	2.00
5. Sale of shares	—	—	—	—	—	160.00
Total (A)	5.00	22.64	47.68	54.50	58.92	221.92
(B) Cash outflows:						
1. Purchases	1.00	1.50	2.00	2.00	2.00	1.00
2. Labour	6.00	7.00	8.00	8.00	8.00	6.00
3. Manufacturing overheads	13.00	13.50	14.00	14.00	14.00	13.00
4. Administrative expenses	2.00	2.00	2.00	2.00	2.00	2.00
5. Distribution charges	2.00	3.00	4.00	4.00	4.00	2.00
6. Raw materials (30 days credit)	—	14.00	15.00	16.00	16.00	16.00
7. Interest paid	0.40	—	—	—	—	—
8. Dividend paid	2.00	—	—	2.00	—	—
9. Instalment of machine	—	—	—	—	—	20.00
10. Repayment of loan	—	—	—	—	—	80.00
Total (B)	26.40	41.00	45.00	48.00	46.00	140.00
(C) Net Receipt or (Payment) (*A* – *B*)	(21.40)	(18.36)	2.68	6.50	12.92	81.92

It can be seen from Table 11.3 that the cash budget helps to reconcile the need for cash with the financing arrangement. For instance, in the first two months, the cash receipts fall below the disbursements and the firm obviously needs temporary financing which it will be able to pay in the subsequent months. In month 6, it has, in fact, excess cash for which temporary investment will have to be made until the funds can be employed in business.

Example 11.6

The following information is available in respect of a firm:

(A) Balance Sheet as on March 31

Liabilities	*Amount*	*Assets*		*Amount*
Accrued salaries	Rs 500	Cash		Rs 3,000
Other liabilities	2,500	Inventory*		8,000
Capital	65,000	Other assets	Rs 70,000	
		Less: Depreciation	13,000	57,000
	68,000			68,000

*Consists of Rs 2,000 minimum inventory plus Rs 6,000 of inventory scheduled to be sold next month.

(B)	**Sales Forecast**		
April	Rs 10,000	July	Rs 50,000
May	20,000	August	40,000
June	30,000	September	20,000
		October	5,000

(C)	**Salary Expenses Budget**		
April	Rs 1,500	July	Rs 4,000
May	2,000	August	3,000
June	2,500	September	2,000

(D) The firm is expected to operate on the following lines:

- Other expenses approximate 12 per cent of sales (paid in the same month).
- Sales will be 80 per cent cash and 20 per cent credit. The all credit sales will be collected in the following month and no bad debts are expected.
- All inventory purchases will be paid for during the month in which they are made.
- A basic inventory of Rs 2,000 (at cost) will be maintained. The firm will follow a policy of purchasing additional inventory each month to cover the following month's sale.
- A minimum cash balance of Rs 3,000 will be maintained.
- New orders for equipment amounting to Rs 20,000 scheduled for May 1 delivery and Rs 10,000 for June 1 delivery have been made. Payment will be made at the time of delivery.
- Accrued salaries and other liabilities will remain unchanged.
- Gross profit margin is 40 per cent of sales.

Prepare a cash budget for 6 months (April to September). Borrowings are made in thousands of rupees. Ignore interest.

Solution

TABLE 11.4 Cash Budget (Amount in '000 rupees)

Particular	*April*	*May*	*June*	*July*	*Aug.*	*Sept.*
(A) Cash inflows:						
1. Cash sales (0.80)	8	16	24	40	32	16
2. Accounts receivable collections (0.2)	—	2	4	6	10	8
Total	8	18	28	46	42	24
(B) Cash outflows:						
1. Inventory	12	18	30	24	12	3
2. Salary	1.5	2	2.5	4	3	2
3. Expenses	1.2	2.4	3.6	6	4.8	2.4
4. Equipment	—	20	10	—	—	—
Total	14.7	42.4	46.1	34	19.8	7.4
(C) Net monthly cash gain or loss by end of month ($A - B$)	(6.7)	(24.4)	(18.1)	12	22.2	16.6
Cumulative cash gain or loss by end of month	(6.7)	(31.1)	(49.2)	(37.2)	(15)	1.6
Cumulative borrowing (month-end)	7	32	50	38	15	—

SECTION 5 CASH MANAGEMENT: BASIC STRATEGIES

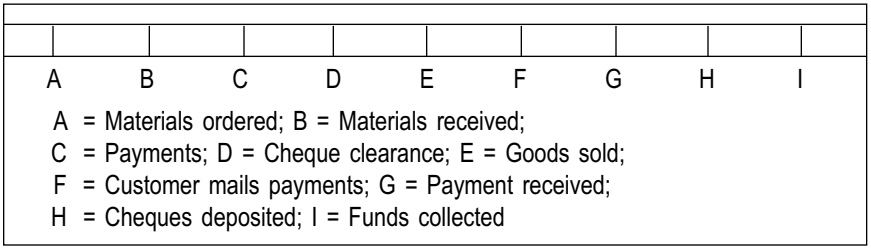
The cash budget, as a cash management tool, would throw light on the net cash position of a firm. After knowing the cash position, the management should work out the basic strategies

to be employed to manage its cash. The present section attempts to outline the basic strategies of cash management.

The broad cash management strategies are essentially related to the cash turnover process, that is, the cash cycle together with the cash turnover. The **cash cycle** refers[12] to the process by which cash is used to purchase materials from which are produced goods, which are then sold to customers, who later pay the bills. The firm receives cash from customers and the cycle repeats itself. The **cash turnover** means the number of times cash is used during each year.[13] The cash cycle involves several steps along the way as funds flow from the firm's accounts, as shown in Exhibit 11.3.

Cash cycle is the amount of time cash is tied up between payment for production inputs and receipt of payment from the sale of the resulting finished product; calculated as average age of inventory plus average collection period minus average accounts payable period.

EXHIBIT 11.3 Details of Cash Cycle



Cash turnover is the number of times cash is used during the year; calculated by dividing number of days in a year by the cash cycle.

In addressing the issue of cash management strategies, we are concerned with the time periods involved in stages B, C, D, and F, G, H, I. A firm has no control over the time involved between stages A and B. The lag between D and E is determined by the production process and inventory policy. The time period between stages E and F is determined by credit terms and the payments policy of customers.

The cash cycle and cash turnover are illustrated in Example 11.7.

Example 11.7

A firm which purchases raw materials on credit is required by the credit terms to make payments within 30 days. On its side, the firm allows its credit buyers to pay within 60 days. Its experience has been that it takes, on an average, 35 days to pay its accounts payable and 70 days to collect its accounts receivable. Moreover, 85 days elapse between the purchase of raw materials and the sale of finished goods, that is to say, the average age of inventory is 85 days. What is the firm's cash cycle? Also, estimate the cash turnover.

Solution

The cash cycle of the firm can be calculated by finding the average number of days that elapse between the cash outflows associated with paying accounts payable and the cash inflows associated with collecting accounts receivable:

(i) Cash cycle = 85 days + 70 days – 35 days = 120 days

(ii) Cash turnover = the assumed number of days in a year divided by the cash cycle = 365/120 = 3

Minimum Operating Cash

The higher the cash turnover, the less is the cash a firm requires. A firm should, therefore, try to maximise the cash turnover. But it must maintain a **minimum amount of operating**

Minimum operating cash is the level of opening cash balance at which a firm would meet all obligations and is computed by dividing total annual outlays by the cash turnover.

cash balance so that it does not run out of cash. The minimum level of operating cash is determined by dividing the total operating annual outlays by the cash turnover rate. If, for example, the total operating annual outlay of a firm is Rs 240 lakh, its minimum cash requirement is Rs 80 lakh (i.e. Rs 240 lakh ÷ 3). The operational implication of the minimum operating cash requirement is that if the firm has opening cash balance of Rs 80 lakh, it would be able to meet its obligations when they become due. In other words, it would not have to borrow anything. But the minimum operating cash involves a cost in terms of the earnings foregone from investing it temporarily, that is to say, there is an opportunity cost. Assuming 10 per cent return on a riskless investment (or retirement of a debt carrying 10 per cent interest), the cost of the minimum cash balance of Rs 80 lakh works out to Rs 8 lakh.

Cash management strategies are intended to minimise the operating cash balance requirement. The basic strategies that can be employed to do the needful are as follows:[14]

(a) Stretching Accounts Payable,
(b) Efficient Inventory-Production Management,
(c) Speedy Collection of Accounts Receivable, and
(d) Combined Cash Management Strategies.

We spell out the implications of these strategies to the minimum cash balance and the associated cost with the underlying assumption that a firm should adopt such cash management strate-gies as will lead to the minimising of the operating cash requirement. In other words, efficient cash management implies minimum cash balances consistent with the need to pay bills when they become due.

Stretching Accounts Payable

One basic strategy of efficient cash management is to stretch the accounts payable. In other words, a firm should pay its accounts payable as late as possible without damaging its credit standing. It should, however, take advantage of the cash discount available on prompt payment.

If the firm, in our Example 11.7, can stretch its accounts payable from the current level of 35 days to 45 days, its cash cycle will be 110 days (i.e. reduced by 10 days from the original 120 days). The reduction in the cash cycle by 10 days as a result of the stretching of the accounts payable by 10 days will increase the cash turnover from 3 (initially) to 3.27 (360 ÷ 110). This will lead to a decrease in the minimum cash requirement from Rs 80 lakh to Rs 73.40 lakh (Rs 240 lakh ÷ 3.27). That is, the requirement has been reduced by Rs 6.60 lakh. Assuming a 10 per cent rate of interest, there will be a saving in cost to the firm to the extent of Rs 0.66 lakh.

Efficient Inventory-Production Management

Another strategy is to increase the inventory turnover, avoiding stock-outs, that is, shortage of stock. This can be done in the following ways:

1. *Increasing the raw materials turnover* by using more efficient inventory control techniques.

2. *Decreasing the production cycle* through better production planning, scheduling and control techniques; it will lead to an increase in the work-in-progress inventory turnover.
3. *Increasing the finished goods turnover* through better forecasting of demand and a better planning of production.

Assume that the firm in Example 11.7 is able to reduce the average age of its inventory from 85 to 70, that is, by 15 days. As a result, the cash cycle will decline by 15 days from 120 days to 105 days. The cash turnover will increase to 3.43 (360 ÷ 105) from the original level of 3. The effect of an increase in the cash turnover will be to reduce the minimum cash requirement from Rs 80 lakh to Rs 70 lakh (Rs 240 lakh ÷ 3.43). The saving in cost on Rs 10 lakh will Re 1 lakh (Rs 10 lakh × 0.10). Thus, efficient inventory and production management causes a decline in the operating cash requirement and, hence, a saving in cash operating cost.

Speeding Collection of Accounts Receivable

Yet another strategy for efficient cash management is to collect accounts receivable as quickly as possible without losing future sales because of high-pressure collection techniques. The average collection period of receivables can be reduced by changes in **(i)** credit terms, **(ii)** credit standards, and **(iii)** collection policies. These are elaborated in the next chapter. In brief, **credit standards** represent the criteria for determining to whom credit should be extended. The collection policies determine the effort put forth to collect accounts receivable promptly.

If the firm in our Example 11.7 manages to reduce the average age of its accounts receivable from the current level of 70 days to 50 days, the cash cycle will be reduced to 100 days from 120 days (decline by 20 days). The cash turnover will increase in consequence to 3.60 (360 ÷ 100) from the original level of 3. The operating cash requirement will fall from Rs 80 lakh to approximately Rs 66.67 lakh (Rs 240 ÷ 3.60). The reduction in cash balance of about Rs 13.33 lakh will lead to a saving in cost amounting to Rs 1.33 lakh (0.10 × Rs 13.33 lakh). Thus, a reduction in the average collection period by 20 days, releases funds equivalent to Rs 13.33 lakh and leads to a saving in cash operating cost of Rs 1.33 lakh.

Combined Cash Management Strategies

We have shown the effect of individual strategies on the efficiency of cash management. Each one of them has a favourable effect on the operating cash requirement. We now illustrate their combined effect, as firms will be well advised to use a combination of these strategies.

Assume the firm in Example 11.7 simultaneously **(i)** increases the average accounts payable by 10 days; **(ii)** reduces the average age of inventory by 15 days; **(iii)** speeds up the collection of accounts receivable by 20 days. Now, the cash cycle will be 75 days (120 days–10 days–15 days–20 days); the cash turnover will increase to 4.8 (360 ÷ 75); the minimum operating cash requirement will go down to Rs 50 lakh, that is, a reduction of Rs 30 lakh; assuming a 10 per cent rate of interest, the saving in cash operating cost will be Rs 3 lakh.

The foregoing discussion clearly shows that the three basic strategies of cash management, related to **(1)** accounts payable, **(2)** inventory, and **(3)** accounts receivable, lead to a reduction in the cash balance. But, they imply certain problems for the management. *First*, if the accounts paya-ble are postponed too long, the credit standing of the firm may be adversely affected. *Secondly*, a low level of inventory may lead to a stoppage of production as sufficient

Stock-out implies shortage of enough stock to meet the demand for the product.

raw materials may not be available for uninterrupted production, or the firm may be short of enough stock to meet the demand for its product, that is, '**stock-out**'. *Finally*, restrictive credit standards, credit terms and collection policies may jeopardise sales. These implications should be constantly kept in view while working out cash management strategies.

SECTION 6 CASH MANAGEMENT TECHNIQUES/PROCESSES

The basic strategies of cash management have been outlined in the preceding section. It has been shown that the strategic aspects of efficient cash management are: **(i)** efficient inventory management, **(ii)** speedy collection of accounts receivable, and **(iii)** delaying payments on accounts payable. The main elements of an efficient management of inventory are discussed in some detail in Chapter 31. There are some specific techniques and processes for speedy collection of receivables from customers and slowing disbursements. We discuss them in the present section.

Speedy Cash Collections

In managing cash efficiently, the cash inflow process can be accelerated through systematic planning and refined techniques. There are two broad approaches to do this. In the first place, the customers should be encouraged to pay as quickly as possible. Secondly, the payment from customers should be converted into cash without any delay.

Prompt Payment by Customers One way to ensure prompt payment by customers is *prompt billing*. What the customer has to pay and the period of payment should be notified accurately and in advance. The use of mechanical devices for billing along with the enclosure of a self-addressed return envelope will speed up payment by customers. Another, and more important, technique to encourage prompt payment by customers, is the practice of offering cash discounts. The availability of discount implies considerable saving to the customers. To avail of the facility, the customers would be eager to make payment early.

Postal float is delay between the time when a payer mails a payment and the time when the payee receives it.

Lethargy/ processing float is the delay between the receipt of a cheque by the payee and its deposit in the account.

Early Conversion of Payments into Cash Once the customer makes the payment by writing a cheque in favour of the firm, the collection can be expedited by prompt encashment of the cheque. There is a lag between the time a cheque is prepared and mailed by the customer and the time the funds are included in the cash reservoir of the firm. This is represented by stages F to I in Exhibit 11.3. Within this time interval three steps are involved: **(a)** transit or mailing time, that is, the time taken by the post offices to transfer the cheque from the customers to the firm. This delay or lag is referred to as **postal float; (b)** time taken in processing the cheques within the firm before they are deposited in the banks, termed as **lethargy;** and **(c)** collection time within the bank, that is, the time taken by the bank in collecting the payment from the customer's bank. This is called **bank float.** The early conversion of payment into cash, as a technique to speed up collection of accounts receivable, is done to reduce the time lag between posting of the cheque by the customer and the realisation of money by the firm. The postal float, lethargy and bank float are collectively referred to

as **deposit float**. The term deposit float is defined as *the sum of cheques written by customers that are not yet usable by the firm.*[15]

Bank/clearing float is the delay between the deposit of a cheque by the payee and the actual availability of funds.

Deposit float is the funds despatched by a payer that are not yet in a form that can be spent/used by the payee.

The collection of accounts receivable can be considerably accelerated, by reducing transit, processing and collection time. An important cash management technique is reduction in deposit float. This is possible if a firm adopts a policy of **decentralised collections**. We discuss below some of the important processes that ensure decentralised collection so as to reduce **(i)** the amount of time that elapses between the mailing of a payment by a customer, and **(ii)** the point the funds become available to the firm for use. The principal methods of establishing a decentralised collection network are **(a)** Concentration Banking, and **(b)** Lock-box System.

Concentration Banking In this system of decentralised collection of accounts receivable, large firms which have a large number of branches at different places, select some of the strategically located branches as collection centres for receiving payment from customers. Instead of all the payments being collected at the head office of the firm, the cheques for a certain geographical area are collected at a specified local collection centre. Under this arrangement, the customers are required to send their payments (cheques) to the collection centre covering the area in which they live and these are deposited in the local account of the concerned collection centre, after meeting local expenses, if any. Funds beyond a predetermined minimum are transferred daily to a *central* or *disbursing* or *concentration* bank or account. A concentration bank is one with which the firm has a major account–usually a disbursement account.[16] Hence, this arrangement is referred to as concentration banking.

Concentration banking is a collection procedure in which payments are made to regionally dispersed collection centres, then deposited in local banks for quick clearing; reduces float by shortening the postal and bank float.

Concentration banking, as a system of decentralised billing and multiple collection points, is a useful technique to expedite the collection of accounts receivable. It reduces the time needed in the collection process by reducing the *mailing* time. Since the collection centres are near the customers, the time involved in sending the bill to the customer is reduced. Moreover, the time-lag between the despatch of the cheque by the customer and its receipt by the firm is also reduced. Mailing time is saved both in respect of sending the bill to the customers as well as in the receipt of payment. The second reason why deposit float is reduced by concentration banking is that the banks of the firm as well as the customers may be in close proximity. Thus, the arrangement of multiple collection centres with concentration banking results in a saving of time in both mailing and clearance of customer payments and leads to a reduction in the operating cash requirements. Another advantage is that *concentration* permits the firm to 'store' its cash more efficiently.[17] This is so mainly because by pooling funds for disbursement in a single account, the aggregate requirement for cash balance is lower than it would be if balances are maintained at each branch office.

Lock-Box System The concentration banking arrangement is instrumental in reducing the time involved in mailing and collection. But with this system of collection of accounts receivable, *processing* for purpose of internal accounting is involved, that is, some time elapses before a cheque is deposited by the local collection centre in its account. The lock-box system takes care of this kind of problem, apart from effecting economy in mailing and clearance times.

Lock-box system is a collection procedure in which payers send their payments/cheques to a nearby post box that is emptied by the firm's bank several times and the bank deposits the cheque in the firm's account; reduces float by shortening the lethargy as well as postal and bank floats.

Under this arrangement, firms hire a post office lock-box at important collection centres. The customers are required to remit payments to the post office lock-box. The local banks of the firm, at the respective places, are authorised to open the box and pick up the remittances (cheques) received from the customers. Usually, the authorised banks pick up the cheques several times a day and deposit them in the firm's accounts. After crediting the account of the firm, the banks send a deposit slip alongwith the list of payments and other enclosures, if any, to the firm by way of proof and record of the collection.

Thus, the **lock-box system** is like concentration banking in that the collection is decentralised and is done at the branch level. But they differ in one very important respect. While the customer sends the cheques, under the concentration banking arrangement, to the collection centres, he sends them to a post office box under the lock-box system. The cheques are directly received by the bank which empties the box and not from the firm or its local branch.

In a way, the lock-box arrangement is an improvement over the concentration banking system. Its superiority arises from the fact that one step in the collection process is eliminated with the use of lock-box: the receipt and deposit of cheques by the firm. In other words, the processing time within the firm before depositing a cheque in the bank is eliminated. Also,some extra saving in mailing timing is provided by the lock-box system as the cheques received in the post office box are not delivered either by the post office or the firm itself to the bank; rather, the bank itself picks them up at the post office.

Thus, the lock-box system, as a method of collection of receivables, has a two-fold advantage: **(i)** the bank performs the clerical task of handling the remittances prior to deposits, services which the bank may be able to perform at lower cost; **(ii)** the process of collection through the banking system begins immediately upon the receipt of the cheque/remittance and does not have to wait until the firm completes its processing for internal accounting purposes. In terms of the steps involved in the cash cycle, as shown in Exhibit 11.3, GH and HI would take place simultaneously. As a result, the time-lag between payment by a customer and the availability of funds to the firm for use would be reduced and, thereby, the collection of receivables would be accelerated.

Although the use of concentration banking and lock-box systems accelerate the collection of receivables, they involve a cost. While in the case of the former, the cost is in terms of the maintenance of multiple collection centres, compensation to the bank for services represents the cost associated with the latter. The justification for the use or otherwise of these special cash management techniques would be based on a comparison of the cost with the return generated on the released funds.[18] If the income exceeds the cost, the system is profitable and should be used; otherwise, not. For this reason, these techniques can be pressed into service only by large firms which receive a large number of cheques from a wide geographical area.

Example 11.8

A firm uses a continuous billing system that results in an average daily receipt of Rs 40,00,000. It is contemplating the institution of concentration banking, instead of the current system of centralised billing and collection. It is estimated that such a system would reduce the collection period of accounts receivable by 2 days.

Concentration banking would cost Rs 75,000 annually and 8 per cent can be earned by the firm on its investments. It is also found that a lock-box system could reduce its overall collection time by four days and could cost annually Rs 1,20,000.

(i) How much cash would be released with the concentration banking system?

(ii) How much money can be saved due to reduction in the collection period by 2 days? Should the firm institute the concentration banking system?

(iii) How much cash would be freed by lock-box system?

(iv) Between concentration banking and lock-box system, which is better?

Solution

(i) Cash released by the concentration banking system = Rs 40,00,000 × 2 days = Rs 80,00,000

(ii) Saving = 0.08 × Rs 80,00,000 = Rs 6,40,000.
The firm should institute the concentration banking system. It costs only Rs 75,000 while the savings expected are Rs 6,40,000.

(iii) Cash released by the lock-box system = Rs 40,00,000 × 4 days = Rs 1,60,00,000

(iv) Saving in lock-box system: 0.08 × Rs 1,60,00,000 = Rs 12,80,000
Lock-box system is better. Its net savings Rs 11,60,000 (Rs 12,80,000 – Rs 1,20,000) are higher than that of concentration banking.

Slowing Disbursements

Apart from speedy collection of accounts receivable, the operating cash requirement can be redu-ced by slow disbursements of accounts payable. In fact, slow disbursements represent a source of funds requiring no interest payments. There are several techniques to delay payment of accounts payable, namely, **(i)** avoidance of early payments; **(ii)** centralised disbursements; **(iii)** floats; and **(iv)** accruals.

Avoidance of Early Payments One way to delay payments is to avoid early payments. According to the terms of credit, a firm is required to make a payment within a stipulated period. It entitles a firm to cash discounts. If, however, payments are delayed beyond the due date, the credit standing may be adversely affected so that the firms would find it difficult to secure trade credit later. But if the firm pays its accounts payable before the due date it has no special advantage. Thus, a firm would be well advised not to make payments early, that is, before the due date.

Centralised Disbursements Another method to slow down disbursements is to have centralised disbursements. All the payments should be made by the head office from a centralised disbursement account. Such an arrangement would enable a firm to delay payments and conserve cash for several reasons. Firstly, it involves increase in the *transit* time. The remittance from the head office to the customers in distant places would involve more mailing time than a decentralised payment by the local branch. The second reason for reduction in operating cash requirement is that since the firm has a centralised bank account, a relatively smaller total cash balance will be needed. In the case of a decentralised arrangement, a minimum cash balance will have to be maintained at each branch which will add to a large operating cash balance. Finally, schedules can be tightly controlled and disbursements made exactly on the right day.

Float A very important technique of slow disbursements is float. The term float refers to the amount of money tied up in cheques that have been written, but have yet to be collected and encashed. Alternatively, float represents the difference between the bank balance and book

Cheque-kiting is a method of consciously anticipating the resulting float or delay associated with the payment process using it to keep funds in an interest-earning form for as long as possible.

balance of cash of a firm. The difference between the balance as shown by the firm's record and the actual bank balance is due to *transit* and processing delays. There is a time-lag between the issue of a cheque by the firm and its presentation to its bank by the customer's bank for payment. The implication is that although the cheque has been issued, cash would be required later when the cheque is presented for encashment. Therefore, a firm can send remittances although it does not have cash in its bank at the time of issuance of the cheque. Meanwhile, funds can be arranged to make payment when the cheque is presented for collection after a few days. Float used in this sense is called as **cheque kiting**.[19] There are two ways of doing it: **(a)** paying from a distant bank, **(b)** scientific cheque-cashing analysis.

Cheque encashment analysis is a way to play the float by depositing a certain proportion of a payroll payment in the firm's account on several successive days following the actual issue of cheques.

Paying From a Distant Bank The firm may issue a cheque on banks away from the creditor's bank. This would involve relatively longer transit time for the creditor's bank to get payment and, thus, enable the firm to use its funds longer.

Cheque-encashment Analysis Another way to make use of float is to analyse, on the basis of past experience, the time-lag in the issue of cheques and their encashment. For instance, cheques issued to pay wages and salary may not be encashed immediately; it may be spread over a few days, say, 25 per cent on one day, 50 per cent on the second day and the balance on the third day. It would mean that the firm should keep in the bank not the entire amount of a payroll but only a fraction represented by the actual withdrawal each day. This strategy would enable the firm to save operating cash.

Accruals Finally, a potential tool for stretching accounts payable is accruals which are defined as current liabilities that represent a service or goods received by a firm but not yet paid for. For instance, payroll, that is, remuneration to employees who render service in advance and receive payment later. In a way, they extend credit to the firm for a period at the end of which they are paid, say, a week or a month. The longer the period after which payment is made, the greater is the amount of free financing consequently and the smaller is the amount of cash balances required. Thus, less frequent payrolls, that is, weekly as compared to monthly, are an important source of accrual. They can be manipulated to slow down disbursements. Other examples of accrual are rent to lessors and taxes to government. But these can be utilised only to a limited extent as there are legal constraints beyond which such payments cannot be extended.

SECTION 7 MARKETABLE SECURITIES

This section presents a brief description of the marketable securities. Attention is focussed on the meaning and characteristics of marketable securities, the general selection criterion and the basic types of such securities.

Meaning and Characteristics

Once the optimum level of cash balance of a firm has been determined, the residual of its

liquid assets is invested in marketable securities. Such securities are short-term investment instruments to obtain a return on temporarily idle funds. In other words, they are securities which can be converted into cash in a short period of time, typically a few days. The basic characteristics of marketable securities affect the degree of their marketability/liquidity. To be liquid, a security must have two basic characteristics: a ready market and safety of principal. Ready marketability minimises the amount of time required to convert a security into cash. A ready market should have both **breadth** in the sense of a large number of participants scattered over a wide geographical area as well as **depth** as determined by its ability to absorb the purchase/sale of large amounts of securities.

Breadth of market is a characteristic of a ready market determined by the number of participants (buyers) in the market.

Depth of market is a characteristic of a ready market, determined by its ability to absorb the purchase/sale of a large amount of a particular securities.

The second determinant of liquidity is that there should be little or no loss in the value of a marketable security over time. Only those securities that can be easily converted into cash without any reduction in the principal amount qualify for short-term investments. A firm would be better off leaving the balances in cash if the alternative were to risk a significant reduction in principal.

Selection Criterion

A major decision confronting the financial managers involves the determination of the mix of cash and marketable securities. Some of the quantitative models for determining the optimum amounts of marketable securities to hold in certain circumstances have been outlined in an earlier section. In general, the choice of the mix is based on a trade-off between the opportunity to earn a return on idle funds (cash) during the holding period, and the brokerage costs associated with the purchase and sale of marketable securities. For example, take the case of a firm paying Rs 350 as brokerage costs to purchase and sell Rs 45,000 worth of marketable securities, yielding an annual return of 8 per cent and held for one month. The interest earned on the securities works out at Rs 300 ($1/12 \times .08 \times$ Rs 45,000). Since this amount is less than the cost of the transaction (Rs 350), it is not advisable for the firm to make the investments. This trade-off between interest returns and brokerage costs is a key factor in determining what proportion of liquid assets should be held in the form of marketable securities.

There are three motives for maintaining liquidity (cash as well as marketable securities) and, therefore, for holding marketable securities: transaction motive, safety/precautionary motive and speculative motive. Each motive is based on the premise that a firm should attempt to earn a return on temporarily idle funds. The type of marketable security purchased will depend on the motive for the purchase. An assessment of certain criteria can provide the financial manager with a useful framework for selecting a proper marketable securities mix. These considerations include evaluation of **(i)** financial risk, **(ii)** interest rate risk, **(iii)** taxability, **(iv)** liquidity, and **(v)** yield among different financial assets.

Default risk is the uncertainty of expected return attributable to possible change in financial capacity of issuer of security to make future payments.

Financial/Default Risk It refers to the uncertainty of expected returns from a security attributable to possible changes in the financial capacity of the *security-issuer* to make future payments to the *security-owner*. If the chance of default on the terms of the investment is high (low), then the financial risk is said to be high (low). As the marketable securities portfolio is designed to provide a return on funds that would be otherwise tied up in idle cash held for transaction or precautionary purposes, the financial

Interest rate risk is the uncertainty associated with expected return attributable to change in interest rate.

manager will not usually be willing to assume such financial/default risk in the hope of greater return within the makeup of the portfolio.

Interest Rate Risk The uncertainty that is associated with the expected returns from a financial instrument attributable to changes in interest rate is known as **interest rate risk**. Of particular con-cern to the corporate financial manager is the price volatility associated with instruments that have long, as opposed to short, terms to maturity.

If prevailing interest rates rise compared with the date of purchase, the market price of the securities will fall to bring their yield to maturity in line with what financial managers could obtain by buying a new issue of a given instrument, for instance, treasury bills. The longer the maturity of the instrument, the larger will be the fall in prices. To hedge against the price volatility caused by interest rate risk, the market securities portfolio will tend to be composed of instruments that mature over short periods.

Taxability Another factor affecting observed difference in market yields is the differential impact of taxes. Securities, income on which is tax-exempt, sell in the market at lower yields to maturity than other securities of the same maturity. A differential impact on yields arises also because interest income is taxed at the ordinary tax rate while capital gains are taxed at a lower rate. As a result, fixed-interest securities that sell at a discount because of low coupon rate in relation to the prevailing yields are attractive to taxable investors. The reason is that part of the yield to maturity is a capital gain. Owing to the desirability of discount on low-interest fixed-income securities, their yield to maturity tends to be lower than the yield on comparable securities with higher coupon rates. The greater the discount, the greater is the capital gains attraction and the lower is its yield relative to what it would be if the coupon rate were such that the security was sold at par.

Liquidity is the ability to transform a security into cash.

Liquidity With reference to marketable securities portfolio, **liquidity** refers to the ability to transform a security into cash. Should an unforeseen event require that a significant amount of cash be immediately available, a sizeable portion of the portfolio might have to be sold. The financial manager will want the cash *quickly* and will not want to accept a large price reduction in order to convert the securities. Thus, in the formulation of preferences for the inclusion of particular instruments in the portfolio, consideration will be given to **(i)** the time period needed to sell the security and **(ii)** the likelihood that the security can be sold at or near its prevailing market price. The latter element, here, means that 'thin' markets, where relatively few transactions take place or where trades are accomplished only with large price changes between transaction, should be avoided.

Yield The final selection criterion is the yields that are available on the different financial assets suitable for inclusion in the marketable/near-cash portfolio. All the four factors listed above, *financial risk, interest rate risk, liquidity* and *taxability*, influence the available yields on financial instruments. Therefore, the yield criterion involves a weighing of the risks and benefits inherent in these factors. If a given risk is assumed, such as lack of liquidity, then a higher yield may be expected on the instrument lacking the liquidity characteristics.

In brief, the finance manager must focus on the risk-return trade-offs associated with the four factors on yield through his analysis. Coming to grips with these trade-offs will enable the finance mananger to determine the proper marketable securities mix for his firm.

Marketable Security Alternatives

We describe below briefly the more prominent marketable/near-cash securities available for investment. Our concern is with money market instruments.

Treasury Bills These are obligations of the government. They are sold on a discount basis. The investor does not receive an actual interest payment. The return is the difference between the purchase price and the face (par) value of the bill.

Treasury bills are Indian government obligations issued on auction basis having maturities of 91-days and 364-days and virtually no risk.

The **treasury bills** are issued only in *bearer* form. They are purchased, therefore, without the investors' name upon them. This attribute makes them easily transferable from one investor to another. A very active secondary market exists for these bills. The secondary market for bills not only makes them highly liquid but also allows purchase of bills with very short maturities. As the bills have the full financial backing of the government, they are, for all practical purposes, risk-free. The negligible financial risk and the high degree of liquidity makes their yield lower than those on the other marketable securities. Due to their virtually risk-free nature and because of active secondary market for them, treasury bills are one of the most popular marketable securities even though the yield on them is lower.

Negotiable certificates of deposits are negotiable instruments representing specific cash deposits in banks having varying maturities and yields based on size, maturity and prevailing money market conditions.

Negotiable Certificates of Deposit (CDs) These are marketable receipts for funds that have been deposited in a bank for a fixed period of time. The deposited funds earn a fixed rate of interest. The denomination and maturities are tailored to the investors' need. The **CDs** are offered by banks on a basis different from treasury bills, that is, they are not sold at a discount. Rather, when the certificates mature, the owner receives the full amount deposited plus the earned interest. A secondary market exists for the CDs. While CDs may be issued in either registered or bearer form, the latter facilitates transactions in the secondary market and, thus, is the most common. The default risk is that of the bank failure, a possibility that is low in most cases.

Commercial papers is a short-term, unsecured promissory note issued by a firm that has high credit rating/ standing.

Commercial Paper It refers to short-term unsecured promissory note sold by large business firms to raise cash. As they are unsecured, the issuing side of the market is dominated by large companies which typically maintain sound credit ratings. **Commercial papers** (CPs) can be sold either directly or through dealers. Companies with high credit rating can sell directly to investors. The denominations in which they can be bought vary over a wide range. They can be purchased similarly with varying maturities. These papers are *generally* sold on discount basis in bearer form although at times commercial papers can be issued carrying interest and made payable to the order of the investor. For all practical purposes, there is no active trading in secondary market for commercial paper although direct sellers of CPs often repurchase it on request. This feature distinguishes CPs from all of the previously discussed short-term investment vehicles. When, there-fore, a financial manager evaluates these for possible inclusion in marketable securities portfolio, he should plan to hold it to maturity. Owing to its lack of marketability, CPs provide a yield advantage over other near-cash assets of comparable maturity.

Banker's acceptances are short-term, low-risk marketable securities arising from bank guarantees of business transactions.

Bankers' Acceptances These are drafts (order to pay) drawn on a specific bank by an exporter in order to obtain payment for goods he has shipped to a customer who maintains an account with that specific bank. They can also be used in financing domestic trade. The draft guarantees payment by the accepting bank at a specific point of time. The seller who holds such acceptance may sell it at a discount to get immediate funds. Thus, the acceptance becomes a marketable security. Since acceptances are used to finance the acquisition of goods by one party, the document is not 'issued' in specialised denominations; its size/denomination is determined by the cost of goods being purchased. They serve a wide range of maturities and are sold on a discount basis, payable to the bearer. A secondary market for the acceptances of large banks does exist. Owing to their greater financial risk and lesser liquidity, acceptances provide investors a yield advantage over treasury bills of like maturity. In fact, the acceptances of major banks are a very safe investment, making the yield advantage over treasury bills worth looking for marketable securities portfolio.

Repurchase (Repo) Agreements These are legal contracts that involve the actual sale of securities by a borrower to the lender with a commitment on the part of the former to repurchase the securities at the current price plus a stated interest charge. The securities involved are government securities and other money market instruments. The borrower is either a financial institution or a security dealer.

Repurchase agreement is an agreement whereby a bank sells securities and agrees to buy them back at a specific price and time.

There are two major reasons why a firm with excess cash prefers to buy **repurchase agreements** rather than a marketable security. First, the original maturities of the instrument being sold can, in effect, be adjusted to suit the particular needs of the investing firm. Therefore, funds available for a very short period, that is, one/two days can be employed to earn a return. Closely related to the first is the second reason, namely, since the contract price of the securities that make up the arrangement is fixed for the duration of the transaction, the firm buying the repurchase agreement is protected against market fluctuations throughout the contract period. This makes it a sound alternative investment for funds that are surplus for only short periods.

Units The units of mutual funds offer a reasonably convenient alternative avenue for investing surplus liquidity as **(i)** there is a very active secondary market for them, **(ii)** the income from units is tax-exempt up to a specified amount and, **(iii)** the units appreciate in a fairly predictable manner.

Intercorporate Deposits Intercorporate deposits, that is, short-term deposits with other companies is a fairly attractive form of investment of short-term funds in terms of rate of return which currently ranges between 12 and 15 per cent. However, apart from the fact that one month's time is required to convert them into cash, intercorporate deposits suffer from high degree of risk.

Bills Discounting Surplus funds may be deployed to purchase/discount bills. Bills of exchange are drawn by seller (drawer) on the buyer (drawee) for the value of goods delivered to him. During the pendency of the bill, if the seller is in need of funds, he may get it discounted.

On maturity, the bill should be presented to the drawee for payment. A bill of exchange is a self-liquidating instrument. Bill discounting is superior to intercorporate deposits for investing surplus funds. While parking surplus funds in bills discounting, it should be ensured that the bills are trade bills arising out of genuine commercial transaction and, as far as possible, they should be backed by letter of credit/acceptance by banks to ensure absolute safety of funds.

Money market mutual funds are professionally managed portfolios of popular marketable securities having instant liquidity, competitive yield and low transaction costs.

Money Market Mutual Funds/Liquid Funds are professionally managed portfolios of marketable securities. They provide instant liquidity. Due to high liquidity, competitive yields and low transactions, these funds have achieved significant growth in size and popularity in recent years.

Summary

- Cash management is one of the key areas of working capital management. There are four motives for holding cash: **(i)** transaction motive, **(ii)** precautionary motive, **(iii)** speculative motive, and **(iv)** compensating motive. The transaction motive refers to the holding of cash to meet anticipated obligations whose time is not perfectly synchronised with cash receipts. The cash balances held in reserve for random and unforeseen fluctuations in cash flows are called precautionary balances. The speculative motive indicates the desire of a firm to take advantage of opportunities which present themselves at unexpected moments and which are typically outside the normal course of business. The compensating motive means keeping the bank balance sufficient to earn a return equal to the cost of free services provided by the banks.
- The basic objectives of cash management are to reconcile two mutually contradictory and conflicting tasks: to meet the payment schedule and to minimise funds committed to cash balances.
- The factors that determine the required cash balances are: **(i)** synchronisation of cash flows, **(ii)** the cost associated with a shortfall in the firm's cash needs, **(iii)** excess cash balance cost, **(iv)** cost associated with establishing an operating cash management staff and activities, and **(v)** the impact of uncertainties on cash management strategy.

  There are two approaches to derive an optimal cash balance: **(i)** minimising cash cost models and **(ii)** cash budget. The important models are: **(1)** Baumol Model, **(2)** Miller-Orr Model and **(3)** Orgler's Model.
- The focus of Baumol model is to minimise the total cost associated with cash management comprising total conversion costs (that is, costs incurred each time marketable securities are converted into cash) and the opportunity cost of keeping idle cash balances which otherwise could have been invested in marketable securities.
- The objective of Miller-Orr Model is to determine the optimum cash balance level which minimises the cost of cash management.
- Orgler's model requires the use of multiple linear programming to determine an optimal cash management strategy. An important feature of this model is that it allows the financial mana-gers to integrate cash management with production, current assets requirement and other aspects of the corporate.
- Cash budget is probably the most important tool in cash management. It is a device to help a firm to plan and control the use of cash. The cash position of a firm as it moves from one period to another period is highlighted by the cash budget. A cash budget has normally three parts, namely, cash collections, cash payments and cash balances. The major sources of cash receipts

and payments are operating and financial. The operating sources are repetitive in nature, while the financial sources are non-recurring.

- The cash management strategies are intended to minimise the operating cash balance requirement. The basic strategies that can be employed are **(i)** stretching accounts payable without affecting the credit of the firm, **(ii)** efficient inventory management and **(iii)** speedy collections of accounts receivable. Some of the specific techniques and processes for speedy collection of receivables from customers are ensuring prompt payment for customers and early payment/ conversion into cash. Concentration banking and lock-box system deserve specific mention as principal methods of establishing a decentralised collection network. The techniques to delay payments of accounts payable include avoidance of early payment, centralised disbursements and float.
- Concentration banking, as a system of decentralised billing and multiple collection points, is a useful technique to expedite the collection of accounts receivable by reducing the mailing time. The mailing time is saved both in respect of sending the bill to the customers as well as in the receipt of payment.
- Under the lock-box system, firms hire a post office lock-box at important collection centers where the customers remit payments. The local banks are authorized to open the box and pick up the remittances (cheques) received from the customers. As a result, there is some extra saving in mailing time compared to concentration banking.
- The financial evaluation of concentration banking and lock-box system would be based on the incremental analysis by comparing the cost of operations and benefits in terms of interest earnings on the early release of funds.
- Marketable securities are an outlet for surplus cash as liquid security/assets. To be liquid a security must have two basic characteristics, that is, a ready market and safety of principal.
- The selection criteria for marketable securities include the evaluation of financial risk, interest-rate risk, liquidity, taxability and yield among different financial assets. The prominent marketable securities available for investment are: treasury bills, negotiable certificates of deposits, commercial paper, bankers' acceptance, units of mutual funds, intercorporate deposits, interbank call money, commercial bills under the bill market scheme and short-term deposits.

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17. Solomon, E and JJ Pringle, *op. cit.,* p 181.
18. Cf. Van Horne, *op. cit.*, p 425.
19. Cf. Gitman, *op. cit.,* p 180.

Practical Problems

P.11.1 The following information is available in respect of a trading firm:

(i) On an average, debtors are collected after 45 days; inventories have an average holding period of 75 days and creditors payment period on an average is 30 days.
(ii) The firm spends a total of Rs 120 lakh annually at a constant rate.
(iii) It can earn 10 per cent on investments.

From the above information, compute: **(a)** the cash cycle and cash turnover, **(b)** minimum amounts of cash to be maintained to meet payments as they become due, **(c)** savings by reducing the average inventory holding period by 30 days.

Solution

(a) Cash cycle = 45 days + 75 days – 30 days = 90 days (3 months)
Cash turnover = 12 months (360 days)/3 months (90 days) = 4.
(b) Minimum operating cash = Total operating annual outlay/cash turnover, that is, Rs 120 lakh/4 = Rs 30 lakh.
(c) Cash cycle = 45 days + 45 days – 30 days = 60 days (2 months)
Cash turnover = 12 months (360 days)/2 months (60 days) = 6.
Minimum operating cash = Rs 120 lakh/6 = Rs 20 lakh
Reduction in investments = Rs 30 lakh – Rs 20 lakh = Rs 10 lakh
Savings = 0.10 × Rs 10 lakh = Rs 1 lakh.

P.11.2 A firm has been offered a cash management service by a bank for Rs 1,00,000 per year. It is estimated that such a service would not only eliminate 'excess' cash on deposits (Rs 8,00,000) but also reduce its administration and other costs to the tune of Rs 5,000 per month. Assuming the cost of capital of 15 per cent, is it worthwhile for the firm to engage the cash management service?

Solution

Benefits (annual):	
Savings in interest (Rs 8,00,000 × 0.15)	Rs 1,20,000
Reduction in administration and other costs (Rs 5,000 × 12)	60,000
Total	1,80,000
Less: Cost (annual):	
Bank service charges	1,00,000
Net annual benefits	80,000

Recommendation It is worthwhile to engage the bank services.

P.11.3 Royal Industries feels a lock-box system can shorten its accounts receivable collection period by 3 days. Credit sales are estimated at Rs 365 lakh per year, billed on a continuous basis. The firm's opportunity cost of funds is 15 per cent. The cost of lock box system is Rs 50,000.

(a) Will you advise 'Royal' to go for lock-box system?

(b) Will your answer be different if accounts receivable collection period is reduced by 5 days?

Solution

(a)	Cash released by lock-box system (Rs 365 lakh/365 days = Rs 1 lakh × 3 days)	Rs 3,00,000
	Savings (Rs 3 lakh × 0.15)	45,000
	Less: Cost of lock-box system	50,000
	Net loss	(5,000)

The firm is advised not to go for the lock-box system.

(b)	Cash released: Rs 1 lakh × 5 days	Rs 5,00,000
	Savings (Rs 5 lakh × 0.15)	75,000
	Less: Cost of lock-box system	50,000
	Net savings	25,000

Recommendation The firm should go for the lock box system.

P.11.4 Sagar Industries sells its products through widely dispersed distributors in Northern India. It currently takes on an average 8 days for cash receipt cheques to become available to the firm from the day they are mailed. The firm is contemplating the institution of concentration banking to reduce this period. It is estimated that such a system would reduce the collection period of accounts receivable by 3 days. The daily cheque receipts currently average Rs 10,00,000.

The concentration banking would cost Rs 1,50,000 annually and the cost of funds is 15 per cent.

(a) Advise Sagar whether it should introduce concentration banking system.

(b) Will your answer be different, if it is estimated that a lock-box system can reduce the collection time by 4 days and its annual cost would be Rs 2,00,000?

Solution

(a)	Cash released by concentration banking system (Rs 10 lakh × 3 = Rs 30 lakh)	
	Savings (Rs 30 lakh × 0.15)	Rs 4,50,000
	Less: Costs	1,50,000
	Net savings	3,00,000

The firm should introduce concentration banking system.

(b)	Cash released by lock-box system (Rs 10 lakh × 4 = Rs 40 lakh)	
	Savings (Rs 40 lakh × 0.15)	6,00,000
	Less: Costs	2,00,000
	Net savings	4,00,000

The lock box system is better.

P.11.5 The following results are expected by XYZ Ltd by quarters next year, in thousands of rupees.

Particulars	*Quarter*			
	1	*2*	*3*	*4*
Sales	7,500	10,500	18,000	10,500
Cash payments:				
Production costs	7,000	10,000	8,000	8,500
Selling, administrative and other costs	1,000	2,000	2,900	1,600
Purchases of plant and other fixed assets	100	1,100	2,100	2,100

The debtors at the end of a quarter are one-third of sales for the quarter. The opening balance of debtors is Rs 30,00,000. Cash on hand at the beginning of the year is Rs 6,50,000 and the desired minimum balance is Rs 5,00,000. Borrowings are made at the beginning of quarters in which the need will occur in multiplies of Rs 10,000 and are repaid at the end of quarters. Interest charges may be ignored. You are required to prepare:

(a) a cash budget by quarters for the year; and

(b) state the amount of loan outstanding at the end of the year.

Solution

(a) Cash budget next year (quarter-wise)

(thousands of rupees)

Particulars	*Quarter*				
	1	*2*	*3*	*4*	*Total*
(A) Cash inflows:					
Collection from debtors					
(i) From prior quarter (1/3 of sales)	3,000	2,500	3,500	6,000	15,000
(ii) From current quarter (2/3 of sales)	5,000	7,000	12,000	7,000	31,000
Total	8,000	9,500	15,500	13,000	46,000
(B) Cash outflows:					
Production costs	7,000	10,000	8,000	8,500	33,500
Selling, administrative and other costs	1,000	2,000	2,900	1,600	7,500
Plant and other fixed assets purchased	100	1,100	2,100	2,100	5,400
Total	8,100	13,100	13,000	12,200	46,400
(C) Surplus/(deficiency)	(100)	(3,600)	2,500	800	(400)
Beginning balance	650	550	500	500	650
Ending balance (indicated)	550	(3,050)	3,000	1,300	250
Borrowings required (deficiency + minimum cash required)		3,550			3,550
(Repayments) made (balance – minimum cash required)			(2,500)	(800)	(3,300)
Ending balance (actually now estimated)	550	500	500	500	500

(b) Loan outstanding = Rs 35,50,000 – Rs 33,00,000 = Rs 2,50,000.

P.11.6 From the following information, prepare cash budget of a business firm for the month of April.

(a) The firm makes 20 per cent cash sales. Credit sales are collected 40, 30 and 25 per cent in the month of sales, month after and second month after sales, respectively. The remaining 5 per cent becomes bad debts.

(b) The firm has a policy of buying enough goods each month to maintain its inventory at two and one-half times the following month's budgeted sales.

(c) The firm is entitled to 2 per cent discount on all its purchases if bills are paid within 15 days and the firm avails of all such discounts. Monthly purchases are made in two equal lots on fortnightly basis.

(d) Cost of goods sold, without considering the 2 per cent discount, is 50 per cent of selling prices. The firm records inventory net of discount.

(e) Other data is:

Sales	
January (actual)	Rs 1,00,000
February (actual)	1,20,000
March (actual)	1,50,000
April (budgeted)	1,70,000
May (budgeted)	1,40,000

Inventory on March 31, Rs 2,25,400.
Cash on March 31, Rs 30,000.
Gross purchases in March, Rs 1,00,000.
Selling, general and administrative expenses budgeted for April, Rs 45,000 (includes Rs 10,000 depreciation).

Solution

Cash budget for the month of April

Particulars		*Amount*
(a) Cash inflows		
Balance in the beginning April I		Rs 30,000
Collection from sales		
Cash sales (0.20 × Rs 1,70,000)		34,000
Collection from debtors:		
For February sales	Rs (0.25 × Rs 96,000)	24,000
For March sales	(0.30 × 1,20,000)	36,000
For April sales	(0.40 × 1,36,000)	54,400
Total		1,78,400
(b) Cash outflows		
Payment for purchases		
March (Rs 1,00,000 × 0.98 × 1/2)		49,000
April (Rs 29,400 × 1/2) (see purchase budget)		14,700
Selling, general and administrative expenses (Rs 45,000 – Rs 10,000)		35,000
Total		98,700
(c) Budgeted cash balance [end of April (a – b)]		79,700

Working Notes

Purchase budget (April)	*Gross*	*Net*
Desired ending inventory—gross (Rs 1,40,000 × 0.50 × 2.5)	Rs 1,75,000	Rs 1,71,500
Add: Cost of sales in April—gross (Rs 1,70,000 × 0.50)	85,000	83,300
Total requirements	2,60,000	2,54,800
Less: Beginning inventory—gross (Rs 2,25,400 × 100/98)	2,30,000	2,25,400
Required purchases	30,000	29,400

Mini Case

11.C.1 The following is the balance sheet of Amar Industries Limited as on March 31 of the current year (amount in lakh of rupees)

Liabilities	*Amount*	*Assets*		*Amount*
Capital and reserves	1,650	Fixed assets at cost	1300	
12% Debentures	900	*Less:* Depreciation	(400)	900
Creditors for purchases	600	Sundry debtors	700	
Creditors for expenses	70	Stocks and stores	1,200	
Provision for bonus	30	Loans and advances	500	
Provision for tax	100	Cash and bank balances	100	
Proposed dividends	50			
	3,400			3,400

Projected P & L A/c for the first 4 months (April-July) of the next year shows the following

(Rs in lakhs)

Particulars	*April*	*May*	*June*	*July*
Sales	800	800	900	900
Excise duty recoveries	80	80	90	90
	880	880	990	990
Materials:				
Opening stock	1,200	1,200	1,260	1,320
Add: Purchases	600	660	720	720
Less: Closing stock	(1,200)	(1,260)	(1,320)	(1,320)
Cost of materials used	600	600	660	720
Expenses	180	180	200	200
Excise duty	80	84	88	92
	860	864	948	1,012
Profit (loss)	20	16	42	(22)

The following are the other relevant additional information:

(i) 10 per cent of sales are for cash and the balance on 30 days' credit.

(ii) Creditors for purchases are paid in 30 days.

(iii) Expenses include:

- **(a)** Interest payable at the end of each quarter;
- **(b)** Depreciation of Rs 10 lakh per month.
- **(c)** Provision for bonus to workmen, Rs 5 lakh per month, payable only in October.
- **(d)** One-half of rest of the expenses payable in the following month.

(iv) Rs 200 lakh of debentures are redeemable on June 30.

(v) Provision for taxation includes Rs 20 lakh of surplus provision carried forward from earlier year besides the balance for the current year payable before June 30.

(vi) Annual general meeting is to be held on May 31.

(vii) Overdraft is permissible; however, interest on overdraft may be ignored.

You are required to prepare cash budget for the months of April to July (on a monthly basis) for the next year.

Solution

Cash budget of Amar Industries Ltd from April to July *(Amount in lakh of rupees)*

Particulars	*April*	*May*	*June*	*July*
Gross sales (including excise duty)	880	880	990	990
Credit sales (90 per cent)	792	792	891	891
Credit purchases	600	660	720	720
Cash inflows:				
Cash sales	88	88	99	99
Collection from debtors: in the month following sales	700	792	792	891
Total	788	880	891	990
Cash outflows:				
Payment to creditors (in the month following purchases)	600	600	660	720
Interest (0.12 × Rs 900 lakh × 1/4)	—	—	27	—
Excise duty (assumed to be paid in the same month)	80	84	88	92
Expenses (working note 1)	148	156	166	177
Redemption of debentures	—	—	200	—
Tax (assumed to be paid in June)	—	—	80	—
Dividends (assumed to be paid in July)	—	—	—	50
Total	828	840	1,221	1,039
Surplus (deficiency)	(40)	40	(330)	(49)
Beginning balance	100	60	100	(230)
Closing balance (overdraft)	60	100	(230)	(279)

Working Notes

Payment for expenses *(Amount in lakh of rupees)*

	April	*May*	*June*	*July*
Total expenses	180	180	200	200
Less: Interest on debentures	9	9	9	7
Less: Depreciation	10	10	10	10
Less: Provision for bonus	5	5	5	5
Net expenses (for a month)	156	156	176	178
50 per cent payable in the same month	78	78	88	89
50 per cent of the previous month	70	78	78	88
	148	156	166	177

Review Questions

RQ.11.1 Indicate whether the following statements are true or false.

(i) Cash, in a narrow sense, implies currency and bank balances only.

(ii) Cash, in broad sense, includes marketable securities and time deposits in banks.

(iii) Transaction, precautionary and speculative are three motives for holding cash.

(iv) Speculative motive cash balance serves to provide a cushion to meet unexpected contingencies.

(v) To meet the payment schedule and to minimize funds committed to cash balance are two basic objectives of cash management.

(vi) Costs caused due to inadequate cash are referred to as short costs.

(vii) Baumol model takes into account all motives of holding cash.

(viii) Miller-Orr model assumes that cash balances randomly fluctuate between an upper bound and lower bound.

(ix) Orgler's model is based on the use of a simple linear programming model.

(x) Cash budget is based on operating cash flows.

(xi) The higher the period of cash cycle, the higher is cash turnover.

(xii) Time taken by the bank in collecting payment from the customer's bank is referred to as deposit float.

(xiii) Investment in marketable securities is intended to obtain a return on temporarily idle cash.

[Answers: (i) False (ii) True (iii) False (iv) False (v) True (vi) True (vii) False (viii) True (ix) False (x) False (xi) False (xii) False (xiii) True]

RQ.11.2 What are the principal motives for holding cash?

RQ.11.3 What are the objectives of cash management?

RQ.11.4 Briefly explain the factors that determine the cash needs of a firm. Give examples to illustrate the short, long and pro-curement costs.

RQ.11.5 Discuss the utility of cash budget as a tool of cash management. What are the steps involved in the construction of a cash budget.

RQ.11.6 What are the basic strategies of efficient cash management? Illustrate with suitable examples the effect of these on the operating cash requirements of a firm.

RQ.11.7 What is the significance of speedy receivables collection? In this context briefly explain concentration banking and lock-box system.

RQ.11.8 What specific strategies can be adopted to slow disbursements of accounts payable?

RQ.11.9 Explain and contrast deposit float and payment float.

RQ.11.10 What purpose do the following models serve? • Banmol model, • Miller-orr model, and • Orgler's model.

RQ.11.11 Breifly describe similarities and differences among cash management models.

Examination Questions

Theory Questions

11.1 Explain Baumol's model of cash management. (*Delhi University, 2007, 2008, 2011*)

11.2 Explain, in brief, the non-synchronisation of cash flows and 'short costs' as factors in determining the cash needs of a firm. (*Delhi University, 2010*)

11.3 Write short note on cash budget. (*Pune University, 2010*)

11.4 "Proper "management of float can reduce the cash requirements of a business entity." Comment. (*Delhi University, 2007*)

11.5 Write a short note on 'concentration banking' and 'lock-box system' to speed-up recovery from debtors. (*Delhi University, 2006*)

11.6 Explain the techniques that you would adopt for controlling inflow of cash. (*Delhi University, 2006*)

11.7 Explain the short costs in relation to cash flow management. (*Delhi University, 2006*)

11.8 State how the operating cycle period can be reduced. (*Calcutta University, 2006*)

11.9 What is cash operating cycle? *(Mumbai University, November 2003)*

11.10 Enumerate the motives for holding cash. *(Bharatiyar University, April 2003)*

11.11 Explain in brief the operating cycle of a manufacturing firm. *(Delhi University, 2003)*

11.12 (a) Explain briefly the concept of cash management.
(b) What are (i) collection float and (ii) disbursement float? *(Delhi University, 2002)*

11.13 What are the motives for holding cash? *(Mumbai University, November 2002)*

11.14 Choose the best answer

1. It is prudent for a firm to finance its current asset with
   (a) Long-term finance only.
   (b) Short-term finance only.
   (c) Partly with long-term finance and partly with short-term finance.
   (d) None of the above.
2. Maintaining cash balance to meet unexpected cash needs is called
   (a) Transaction motive.
   (b) Precautionary motive.
   (c) Speculative motive.
   (d) Compensation motive. *(Bharatiyar University, April 2001)*
3. Concentration banking is a system of
   (a) Centralising collection of accounts receivable
   (b) Decentralising collection of accounts receivable
   (c) Centralising collection of accounts receivable and accounts payable.
   (d) None of the above. *(Bharatiyar University, April 2003)*

11.15 "The need for maintaining cash balance arises from the non-synchronisation of the inflows and outflows of cash." Elucidate the statement. Also point out the role of short costs in determining the cash needs. *(Delhi University, 2001)*

11.16 What are the objectives of cash management? *(Bharatiyar University, April 2001)*

11.17 Explain management of cash. *(Bharatiyar University, November 2001)*

11.18 What are the objectives of cash management? (*Bangalore University*)

11.19 Mention the significance of cash management. (*Bangalore University*)

11.20 What is cash planning? (*Bangalore University*)

Numerical Questions

11.1 The following sales forecasts for the first five months of the next financial year of Max and Associates are available:

April	Rs 40,000
May	45,000
June	55,000
July	60,000
August	50,000

Other data are as follows:

(i) Debtors' and creditors' balances at the beginning of the year are Rs 30,000 and Rs 14,000 respectively. The balances of other relevant assets and liabilities are:

Cash balance	Rs 7,500
Stock	51,000
Accrued sales commission	3,500

(ii) 40 per cent sales are on cash basis. Credit sales are collected in the month following sale.

(iii) Cost of sale is 60 per cent of sales.

(iv) The only other variable cost is a 5% commission to sales agents. The sales commission is paid in month after it is earned.

(v) Inventory/stock is kept equal to sales requirements for the next two months' budgeted sales.

(vi) Trade creditors are paid in the following month after purchases.

(vii) Fixed costs are Rs 5,000 month, including Rs 2,000 depreciation. Prepare a cash budget for the first three months of the next financial year. (*Delhi University, 2009*)

Solution

Cash budget for 3 months (January-March)

Particulars	*Month*		
	April	*May*	*June*
(A) Cash inflows:			
Cash sales (40% of total sales)	Rs 16,000	Rs 18,000	Rs 22,000
Collection from debtors (one month after sales)	30,000	24,000	27,000
Total	46,000	42,000	49,000
(B) Cash outflows:			
Paid to trade creditors for purchases (see working note on purchase budget)	14,000	33,000	36,000
Sales commission (5 per cent of prior months' sales)	3,500	2,000	2,250
Fixed costs (Rs 5,000 – Rs 2,000 depreciation)	3,000	3,000	3,000
Total	20,500	38,000	41,250
(C) Surplus/(deficiency) (*A*) – (*B*)	25,500	4,000	7,750
Beginning balance	7,500	33,000	37,000
Ending balance (indicated)	33,000	37,000	44,750

Working Notes

Purchase budget

Desired ending inventory (at cost price)	Rs 60,000	Rs 69,000	Rs 66,000
Plus cost of goods sold (current month)	24,000	27,000	33,000
Total requirements	84,000	96,000	99,000
Less: Beginning inventory	51,000	60,000	69,000
Purchases	33,000	36,000	30,000

11.2 Prepare a cash budget for July-December from the following information:

(i) The estimated sales, expense, etc. are as follows: (Rs lakhs)

	June	*July*	*Aug.*	*Sep.*	*Oct.*	*Nov.*	*Dec.*
Sales	35	40	40	50	50	60	65
Purchases	14	16	17	20	20	25	28
Wages and salaries	12	14	14	18	18	20	22
Misc. expenses	5	6	6	6	7	7	7
Interest received	2	—	—	2	—	—	2
Sales of shares	—	—	20	—	—	—	—

(ii) 20 per cent of the sales are on cash and the balance on credit.

(iii) 2 per cent debts are uncollectible; 50 per cent of the total accounts receivable are collected in the month of the sales and the rest during next month.

(iv) The time-lag in payment of misc. expenses and purchase is one month. Wages and salaries are paid fortnightly with a time-lag of 15 days. (*Delhi University, 2007*)

Solution

Cash budget for the month of July-December (amount in Rs lakh)

Particulars	*July*	*Aug.*	*Sep.*	*Oct.*	*Nov.*	*Dec.*
(a) Cash inflows:						
Cash sales	8.00	8.00	10.00	10.00	12.00	13.00
Collection from debtors[@]	29.44	31.36	35.36	39.20	43.20	49.04
Interest received	—	—	2.00	—	—	—
Sale of shares	—	20.0	—	—	—	—
Total	37.44	59.36	47.36	49.20	55.20	64.09
(b) Cash outflows:						
Payment to suppliers (1 month time-lag)	14.00	16.00	17.00	20.00	20.00	25.00
Miscellaneous expense	5.00	6.00	6.00	6.00	7.00	7.00
Wages and salaries:						
Paid for previous month (50%)	6.00	7.00	7.00	9.00	9.00	10.00
Paid for current month (50%)	7.00	7.00	9.00	9.00	10.00	11.00
Total	32.00	36.00	39.00	44.00	46.00	53.00
Increase in cash balance	5.44	23.36	8.36	5.20	9.20	11.04

[@]Collection from debtors (amount in Rs lakh)

Particulars	*July*	*Aug.*	*Sep.*	*Oct.*	*Nov.*	*Dec.*
Total sales	40	40	50	50	60	65
Less cash sales (20%)	8	8	10	10	12	13
Credit sales	32	32	40	40	48	52
Collection (month of sales)	16	16	20	20	24	26
Bad debts (2% of credit sales)	0.64	0.64	0.80	0.80	0.96	1.04
Collection (month following sales)	13.44[*]	15.36	15.36	19.20	19.20	23.04
Total collection	29.44	31.36	35.36	39.20	43.20	49.04

[*]June's credit sales, Rs 28,00,000 – Collections in June, Rs 14,00,000 – Rs 56,000, Bad debts = Rs 13,44,000 collected in July

Chapter

12

Receivables Management

Learning Objectives

1. Review the specific costs and benefits which are relevant to determining the objectives of receivables management
2. Understand how to measure the key variables and use them to evaluate quantitatively the effects of either relaxing or tightening a firm's credit standards
3. Describe the key aspects of credit selection: obtaining credit information and analysing credit information
4. Review the three basic components of a firm's credit terms, the effects of changes in each of them on key variables and profits and the procedure for evaluating the quantitative effects of the proposed changes
5. Explain the key features of collection policy, the basic tradeoffs and the popular collection techniques

INTRODUCTION

In the preceding Chapter, which was devoted to an in-depth examination of one of the most important components of current assets, that is, cash, it was observed that a basic strategy to reduce the operating cash requirement of a firm is to accelerate the collection of receivables so as to reduce the average collection period. The receivables represent an important component of the current assets of a firm. The purpose of the present Chapter is to analyse the important dimensions of the efficient management of receivables within the framework of a firm's objectives of value maximisation. The Section 1 of this Chapter discusses the objectives of receivables management. This is followed by an in-depth analysis of the three crucial aspects of management of receivables. The Section 2 of the Chapter examines the first aspect, that is, credit policies, which have two dimensions: **(i)** credit standard defined as the criteria to determine to whom credit should be extended; and **(ii)** credit analysis. This Section evaluates policies regarding both these aspects. The second major part of receivables management is 'credit terms' comprising **(i)** cash discount, **(ii)** cash discount period, and **(iii)** credit period.

This is extensively spelt out in Section 3 of the Chapter. The next Section of the Chapter is concerned with the third major component of receivables management, collection policies, that is, the types and degree of effort made to collect receivables from customers. Finally, the last Section summarises the main points.

SECTION I OBJECTIVES

The term receivables is defined as 'debt owed to the firm by customers arising from sale of goods or services in the ordinary course of business'.[1] When a firm makes an ordinary sale of goods or services and does not receive payment, the firm grants trade credit and creates accounts receivable which could be collected in the future. Receivables management is also called *trade credit management*. Thus, accounts receivable represent an extension of credit to customers, allowing them a reasonable period of time in which to pay for the goods received.

The sale of goods on credit is an essential part of the modern competitive economic systems. In fact, credit sales and, therefore, receivables, are treated as a marketing tool to aid the sale of goods. The credit sales are generally made on open account in the sense that there are no formal acknowledgements of debt obligations through a financial instrument. As a marketing tool, they are intended to promote sales and thereby profits. However, extension of credit involves risk and cost. Management should weigh the benefits as well as cost to determine the goal of receivables management. The objective of receivables management is 'to promote sales and profits *until* that point is reached where the return on investment in further funding receivables is less than the cost of funds raised to finance that additional credit (i.e. cost of capital)'.[2] The specific costs and benefits which are relevant to the determination of the objectives of receivables management are examined below.

Costs

The major categories of costs associated with the extension of credit and accounts receivable are: **(i)** collection cost, **(ii)** capital cost, **(iii)** delinquency cost, and **(iv)** default cost.

Collection Cost **Collection costs** are administrative costs incurred in collecting the receivables from the customers to whom credit sales have been made. Included in this category of costs are: **(a)** additional expenses on the creation and maintenance of a credit department with staff, accounting records, stationery, postage and other related items; **(b)** expenses involved in acquiring credit information either through outside specialist agencies or by the staff of the firm itself. These expenses would not be incurred if the firm does not sell on credit.

Collection cost is the administrative cost incurred in collecting receivables.

Capital Cost The increased level of accounts receivable is an investment in assets. They have to be financed thereby involving a cost. There is a time-lag between the sale of goods to, and payment by, the customers. Meanwhile, the firm has to pay employees and suppliers of raw materials, thereby implying that the firm should arrange for additional funds to meet its own obligations while waiting for payment from its customers. The **cost on the use of additional capital** to support credit sales, which alternatively could be profitably employed elsewhere, is, therefore, a part of the cost of extending credit or receivables.

Capital cost is the cost on the use of additional capital to support credit sales which alternatively could have been employed elsewhere.

Delinquency Cost This cost arises out of the failure of the customers to meet their obligations when payment on credit sales become due after the expiry of the credit period. Such costs are called **delinquency costs**. The important components of this cost are: **(i)** blocking-up of funds for an extended period, **(ii)** cost associated with steps that have to be initiated to collect the overdues, such as, reminders and other collection efforts, legal charges, where necessary, and so on.

Delinquency cost is cost arising out of failure of customers to pay on due date.

Default Cost Finally, the firm may not be able to recover the overdues because of the inability of the customers. Such debts are treated as bad debts and have to be written off as they cannot be realised. Such costs are known as **default costs** associated with credit sales and accounts receivable.

Default costs are the over dues that cannot be recovered.

Benefits

Apart from the costs, another factor that has a bearing on accounts receivable management is the *benefit* emanating from credit sales. The *benefits* are *the increased sales* and *anticipated profits* because of a more liberal policy. When firms extend trade credit, that is, invest in receivables, they intend to increase the sales. The impact of a liberal trade credit policy is likely to take two forms. First, it is oriented to sales expansion. In other words, a firm may grant trade credit either to increase sales to existing customers or attract new customers. This motive for investment in receivables is growth-oriented. Secondly, the firm may extend credit to protect its current sales against emerging competition. Here, the motive is sales-retention. As a result of increased sales, the profits of the firm will increase.

From the above discussion, it is clear that investments in receivables involve both benefits and costs. The extension of trade credit has a major impact on sales, costs and profitability. Other things being equal, a relatively liberal policy and, therefore, higher investments in receivables, will produce larger sales. However, costs will be higher with liberal policies than with more stringent measures. Therefore, accounts receivable management should aim at a trade-off between profit (benefit) and risk (cost). That is to say, *the decision to commit funds to receivables (or the decision to grant credit) will be based on a comparison of the benefits and costs involved, while determining the optimum level of receivables.* **The costs and benefits to be compared are marginal costs and benefits**. The firm should only consider the incremental (additional) benefits and costs that result from a change in the receivables or trade credit policy.[3]

While it is true that general economic conditions and industry practices have a strong impact on the level of receivables, a firm's investments in this type of current assets is also greatly affected by its internal policy. A firm has little or no control over environmental factors, such as economic conditions and industry practices. But it can improve its profitability through a properly conceived trade credit policy or receivables management.

SECTION 2 CREDIT POLICIES

In the preceding discussions it has been clearly shown that the firm's objective with respect to receivables management is not merely to collect receivables quickly, but attention should also be given to the benefit-cost trade-off involved in the various areas of accounts receivable management. The first decision area is credit policies.

The **credit policy** of a firm provides the framework to determine **(a)** whether or not to extend credit to a customer and **(b)** how much credit to extend. The credit policy decision of a firm has two broad dimensions: **(i)** Credit standards and **(ii)** Credit analysis. A firm has to establish and use *standards* in making credit decisions, develop appropriate sources of credit information and methods of credit analysis. We illustrate below how these two aspects are relevant to the accounts receivable management of a firm.

Credit policy is the determination of credit standards and credit analysis.

Credit Standards

The term '**credit standards**' represents the basic criteria for the extension of credit to customers. The quantitative basis of establishing credit standards are factors such as credit ratings, credit references, average payments period and certain financial ratios.[4] Since we are interested in illustrating the trade-off between benefit and cost to the firm as a whole, we do not consider here these individual components of credit standards. To illustrate the effect, we have divided the overall standards into **(a)** tight or restrictive, and **(b)** liberal or non-restrictive. That is to say, *our aim is to show what happens to the trade-off when standards are relaxed or, alternatively, tightened.* The trade-off with reference to credit standards covers **(i)** the collection cost, **(ii)** the average collection period/cost of investment in accounts receivable, **(iii)** level of bad debt losses, and **(iv)** level of sales. These factors should be considered while deciding whether to relax credit standards or not. If standards are relaxed, it means more credit will be extended while if standards are tightened, less credit will be extended. The implications of the four factors are elaborated below.

Credit standards are basic criteria/ minimum requirement for extending credit to a customer.

Collection Costs The implications of relaxed credit standards are **(i)** more credit, **(ii)** a large credit department to service accounts receivable and related matters, **(iii)** increase in collection costs. The effect of tightening of credit standards will be exactly the opposite. These costs are likely to be semi-variable. This is because up-to a certain point the existing staff will be able to carry on the increased workload, but beyond that, additional staff would be required. These are assumed to be included in the variable cost per unit and need not be separately identified.

Investments in Receivables or the Average Collection Period The investment in accounts receivable involves a capital cost as funds have to be arranged by the firm to finance them till customers make payments. Moreover, the higher the average accounts receivable, the higher is the capital or carrying cost. A change in the credit standards–relaxation or tightening–leads to a change in the level of accounts receivable either through a change in **(a)** sales, or **(b)** collections.

A relaxation in credit standards, as already stated, implies an increase in sales which, in turn, would lead to higher average accounts receivable. Further, relaxed standards would mean that credit is extended liberally so that it is available to even less *creditworthy* customers who will take a longer period to pay overdues. The extension of trade credit to slow-paying customers would result in a higher level of accounts receivable.

In contrast, a tightening of credit standards would signify **(i)** a decrease in sales and lower average accounts receivable, and **(ii)** an extension of credit limited to more creditworthy customers who can promptly pay their bills and, thus, a lower average level of accounts receivable.

Thus, a change in sales and change in collection period together with a relaxation in standards would produce a higher carrying costs, while changes in sales and collection period result in lower costs when credit standards are tightened. These basic reactions also occur when changes in credit terms or collection procedures are made. We have discussed these in the subsequent sections of this chapter.

Bad Debt Expenses Another factor which is expected to be affected by changes in the credit standards is bad debt (default) expenses. They can be expected to increase with relaxation in credit standards and decrease if credit standards become more restrictive.

Sales Volume Changing credit standards can also be expected to change the volume of sales. As standards are relaxed, sales are expected to increase; conversely, a tightening is expected to cause a decline in sales.

The basic changes and effects on profits arising from a relaxation of credit standards are summarised in Exhibit 12.1. If the credit standards are tightened, the opposite effects, as shown in the brackets, would follow.

EXHIBIT 12.1 Effect of Relaxation of Standards

Item	*Direction of Change (Increase = I Decrease = D)*	*Effect on Profits (Positive + Negative –)*
1. Sales Volume	I(D)	+(–)
2. Average Collection Period	I(D)	–(+)
3. Bad Debt	I(D)	–(+)

The effect of alternative credit standards is illustrated in Example 12.1.

Example 12.1

A firm is currently selling a product @ Rs 10 per unit. The most recent annual sales (all credit) were 30,000 units. The variable cost per unit is Rs .6 and the average cost per unit, given a sales volume of 30,000 units, is Rs 8. The total fixed cost is Rs 60,000. The average collection period may be assumed to be 30 days.

The firm is contemplating a relaxation of credit standards that is expected to result in a 15 per cent increase in units sales; the average collection period would increase to 45 days with no change in bad debt expenses. It is also expected that increased sales will result in additional net working capital to the extent of Rs 10,000. The increase in collection expenses may be assumed to be negligible. The required return on investment is 15 per cent.

Should the firm relax the credit standard?

Solution

The decision to put the proposed relaxation in the credit standards into effect should be based on a comparison of **(i)** additional profits on sales and **(ii)** cost of the incremental investments in receivables. If the former exceeds the latter, the proposal should be implemented, otherwise not.

Profit on Incremental Sales This can be computed in two ways: **(i)** long approach, and **(ii)** short-cut-method.

Long Approach According to this approach, the costs and profits on both the present and the proposed sales level are calculated and the difference in profit at the two levels will be the incremental profit. This is shown in Table 12.1.

TABLE 12.1 Long Method to Calculate Marginal Profits

(A) Proposed Plan:		
1. Sales revenue (34,500 × units Rs 10)		Rs 3,45,000
2. *Less:* Costs:		
(a) Variable (34,500 × Rs 6)	Rs 2,07,000	
(b) Fixed	60,000	2,67,000
3. Profits from sales **(i)**		78,000
(B) Current Plan:		
1. Sales revenue (30,000 × units Rs 10)		3,00,000
2. *Less:* Costs:		
(a) Variable (30,000 × Rs 6)	1,80,000	
(b) Fixed	60,000	2,40,000
3. Profits from sales **(ii)**		60,000
(C) Marginal profits with new plan (I – II):		18,000

Short-Cut Method The profits on sales will increase by an amount equal to the product of the additional units sold and additional profit per unit. Since the 30,000 units representing the current level of sales absorb all the fixed costs, any additional units sold will cost only the variable cost per unit. The marginal profit per unit will be equal to the difference between the sales price per unit (Rs 10) and the variable cost per unit (Rs 6). The marginal profit/contribution margin per unit would, therefore, be Rs 4. The total additional (marginal) profits from incremental sales will be Rs 18,000 (Rs 4,500 × Rs 4).

Cost of Marginal/Incremental Investment in Receivables The second variable relevant to the decision to relax credit standards is the cost of marginal investment in accounts receivable. This cost can be computed by finding the difference between the cost of carrying receivables before and after the proposed relaxation in credit standards. It can be calculated as follows:

(i) Turnover of accounts receivable:

$$\text{Proposed plan} = \frac{\text{Number of days in the year}}{\text{Average collection period}} = \frac{360}{45} = 8$$

$$\text{Present plan} = \frac{360}{30} = 12$$

(ii) Total cost of sales:

Present plan = Number of units × cost per unit = 30,000 × Rs 8 = Rs 2,40,000

Proposed plan = (30,000 × Rs 8) + (4,500 × Rs 6) = Rs 2,67,000

(iii) Average investment in accounts receivable:

Present plan = Rs 2,40,000/12 = Rs 20,000

Proposed plan = Rs 2,67,000/8 = Rs 33,375

(iv) The cost of marginal investments in accounts receivable: This is the difference between the average investments in accounts receivable under **(i)** the proposed plan and **(ii)** under the present plan. It is calculated as follows:

Average investments with proposed plan	Rs 33,375
Less average investment with present plan	20,000
Marginal investments	13,375

Marginal investments represent the amount of additional funds required to finance incremental accounts receivable if the proposal to relax the credit standards is implemented. The additional cost of Rs 13,375 is the cost of marginal investment in accounts receivable.

$$\text{Given 15 per cent as required return on the investments, the cost} = \frac{\text{Rs } 13{,}375 \times 15}{100} = \text{Rs } 2{,}006.25$$

This is an opportunity cost in that the firm would earn this amount from alternative uses if the funds are not tied up in additional accounts receivable.

(v) Cost of working capital: Rs 10,000 × 0.15 = Rs 1,500.

In the above illustration, since the additional profits on increased sales as a result of relaxed credit standards (Rs 18,000) is considerably more than the cost of incremental investments in accounts receivable (Rs 2,006.25) and working capital (Rs 1,500), the firm should relax its credit standards. Such an action would lead to an overall increase in the profits of the firm by Rs 14,493.75 (Rs 18,000 – Rs 2,006.25 – Rs 1,500).

The effect of tightening credit standards would be just the opposite and can be illustrated on the above lines.

Credit Analysis

Besides establishing credit standards, a firm should develop procedures for evaluating credit applicants. The second aspect of credit policies of a firm is **credit analysis** and investigation. Two basic steps are involved in the credit investigation process: **(a)** obtaining credit information, and **(b)** analysis of credit information. It is on the basis of credit analysis that the decisions to grant credit to a customer as well as the quantum of credit would be taken.

Credit analysis involves obtaining credit information and evaluation of credit applicants.

Obtaining Credit Information The first step in credit analysis is obtaining credit information on which to base the evaluation of a customer. The sources of information, broadly speaking, are **(i)** internal, and **(ii)** external.

Internal Usually, firms require their customers to fill various forms and documents giving details about financial operations. They are also required to furnish trade references with whom the firms can have contacts to judge the suitability of the customer for credit. This type of information is obtained from internal sources of credit information. Another internal source of credit information is derived from the records of the firms contemplating an extension of credit. It is likely that a particular customer/applicant may have enjoyed credit facility in the past. In that case, the firm would have information on the behaviour of the applicant(s) in terms of the historical payment pattern. This type of information may not be adequate and may, therefore, have to be supplemented by information from other sources.

External The availability of information from external sources to assess the credit-worthiness of customers depends upon the development of institutional facilities and industry practices. In India, the external sources of credit information are not as developed as in the industrially advanced countries of the world. Depending upon the availability, the following external sources may be employed to collect information.

Financial Statements One external source of credit information is the published financial statements, that is, the balance sheet and the profit and loss account. The financial statements contain very useful information. They throw light on an applicant's financial viability, liquidity, profitability and debt capacity. Although the financial statements do not directly reveal the past payment record of the applicant, they are very helpful in assessing the overall financial position of a firm, which significantly determines its credit standing.

Bank References Another useful source of credit information is the bank of the firm which is contemplating the extension of credit. The *modus operandi* here is that the firm's banker collects the necessary information from the applicant's banks. Alternatively, the applicant may be required to ask his banker to provide the necessary information either directly to the firm or to its bank.

Trade References These refer to the collection of information from firms with whom the applicant has dealings and who on the basis of their experience would vouch for the applicant.

Credit Bureau Reports Finally, specialist *credit bureau* reports from organisations specialising in supplying credit information can also be utilised.

Analysis of Credit Information Once the credit information has been collected from different sources, it should be analysed to determine the credit worthiness of the applicant. Although there are no established procedures to analyse the information, the firm should devise one to suit its needs. The analysis should cover two aspects: **(i)** quantitative, and **(ii)** qualitative.

Quantitative The assessment of the quantitative aspects is based on the factual information available from the financial statements, the past records of the firm, and so on. The first step involved in this type of assessment is to prepare an *Aging Schedule* of the accounts payable of the applicant as well as calculate the average age of the accounts payable. This exercise will give an insight into the past payment pattern of the customer. Another step in analysing the credit information is through a ratio analysis of the liquidity, profitability and debt capacity of the applicant. These ratios should be compared with the industry average. Moreover, trend analysis over a period of time would reveal the financial strength of the customer.

Qualitative The quantitative assessment should be supplemented by a qualitative/subjective interpretation of the applicant's creditworthiness. The subjective judgement would cover aspects rela-ting to the quality of management. Here, the references from other suppliers, bank references and specialist bureau reports would form the basis for the conclusions to be drawn. In the ultimate analysis, therefore, the decision whether to extend credit to the applicant and what amount to extend will depend upon the subjective interpretation of his credit standing.

SECTION 3 CREDIT TERMS

Credit terms specify the repayment terms required of credit customers/ receivables.

The second decision area in accounts receivable management is the credit terms. After the credit standards have been established and the creditworthiness of the customers has been assessed, the management of a firm must determine the terms and conditions on which trade credit will be made available. The stipulations under which goods are sold on credit are referred to as **credit terms**. These relate to the repayment of the amount under the credit sale. Thus, credit terms specify the repayment terms of receivables.

Credit terms have three components: **(a) credit period**, in terms of the duration of time for which trade credit is extended–during this period the overdue amount must be paid by the customer; **(b) cash discount**, if any, which the customer can take advantage of, that is, the overdue amount will be reduced by this amount; and **(c) cash discount period**, which refers to the duration during which the discount can be availed of. These terms are usually written in abbreviations, for instance, '2/10 net 30'. The three numerals are explained below:

Credit period is the time for which trade credit is extended to customer in the case of credit sales.

Cash discount is the incentive to customer to make early payment of sum due.

Cash discount period is the duration of the period during which discount can be availed of.

- 2 signifies the rate of cash discount (2 per cent), which will be available to the customers if they pay the overdue within the stipulated time;
- 10 represents the time duration (10 days) within which a customer must pay to be entitled to the discount;
- 30 means the maximum period for which credit is available and the amount must be paid in any case before the expiry of 30 days.

In other words, the abbreviation 2/10 net 30 means that the customer is entitled to 2 per cent cash discount (discount rate) if he pays within 10 days (discount period) after the beginning of the credit period (30 days). If, however, he does not want to take advantage of the discount, he may pay within 30 days. If the payment is not made within a maximum period of 30 days, the customer would be deemed to have defaulted.

The credit terms, like the credit standards, affect the profitability as well as the cost of a firm. A firm should determine the credit terms on the basis of cost-benefit trade-off. We illustrate below how the three components of credit terms, namely, rate of discount, period of discount and the credit period, affect the trade-off. It should be noted *that our focus in analysing the credit terms is from the view point of suppliers of trade credit and not the recipients for whom it is a source of financing.*[5]

Cash Discount

The cash discount has implications for the sales volume, average collection period/average investment in receivables, bad debt expenses and profit per unit. In taking a decision regarding the grant of cash discount, the management has to see what happens to these factors if it initiates increase, or decrease in the discount rate. The changes in the discount rate would have both positive and negative effects. The implications of increasing or initiating cash discount are as follows:

1. The sales volume will increase. The grant of discount implies reduced prices. If the demand for the products is elastic, reduction in prices will result in higher sales volume.
2. Since the customers, to take advantage of the discount, would like to pay within the discount period, the average collection period would be reduced. The reduction in the collection period would lead to a reduction in the investment in receivables as also the cost. The decrease in the average collection period would also cause a fall in bad debt expenses. As a result, profits would increase.
3. The discount would have a negative effect on the profits. This is because the decrease in prices would affect the profit margin per unit of sale.

The effects of increase in the cash discount are summarised in Table 12.2. The effect of decrease in cash discount will be exactly opposite.

TABLE 12.2 Effects of Increase in Cash Discounts

Item	*Direction of Change (I = Increase D = Decrease)*	*Effect on Profits (Positive+ or Negative–)*
Sales Volume	I	+
Average Collection Period	D	+
Bad Debt Expenses	D	+
Profit Per Unit	D	–

The cash discount decision is illustrated in Example 12.2.

Example 12.2

Assume that the firm in our Example 12.1 is contemplating to allow 2 per cent discount for payment within 10 days after a credit purchase. It is expected that if discounts are offered, sales will increase by 15 per cent and the average collection period will drop to 15 days. Assume bad debt expenses will not be affected; return on investment expected by the firm is 15 per cent; 60 per cent of the total sales will be on discount. Should the firm implement the proposal?

Solution

(i) Profit on sales: The profit on sale = sale of additional units multiplied by the difference between the sales price and the variable cost per unit = 4,500 (Rs 10 – Rs 6) = 4,500 × Rs 4 = Rs 18,000

(ii) Saving on average collection period: This saving is what would have been earned on the reduced invest-ments in accounts receivable as a result of the cash discount.

$$\text{Average investment in accounts receivable} = \frac{\text{Cost of sales}}{\text{Receivables turnover}}$$

(a) Present plan (without discount) $= \dfrac{(30{,}000 \times \text{Rs } 8)}{12 \text{ (i.e. } 360/30)} = \text{Rs } 20{,}000$

(b) Proposed plan (with discount) $= \dfrac{(30{,}000 \times \text{Rs } 8) + (4{,}500 \times \text{Rs } 6)}{24 \text{ (i.e. } 360/15)} = \dfrac{\text{Rs } 2{,}67{,}000}{24} = \text{Rs } 11{,}125$

Thus, if cash discount is allowed, the average investments in receivables will decline by Rs 8,875 (i.e. Rs 20,000 – Rs 11,125). Given a 15 per cent rate of return, the firm could earn Rs 1,331.25 on Rs 8,875. Thus, the saving resulting from a drop in the average collection period is Rs 1,331.25.

(iii) The total benefits associated with the cash discount

Profit on additional sale	Rs 18,000.00
Saving in cost	1,331.25
Total	19,331.25

(iv) Cash discount: The cost involved in the cash discount on credit sales, that is, 2 per cent of credit sales = 0.02 × Rs 2,07,000 (i.e. 0.60 × Rs 3,45,000) = Rs 4,140

Thus, against a cost of Rs 4,140, the benefit from initiating cash discount is Rs 19,331.25; that is, there is a net gain of Rs 15,191.25 (Rs 19,331.25 – Rs 4,140). The firm should, therefore, implement the proposal to allow 2 per cent cash discount for payment within 10 days of the credit purchase by the customers.

A similar type of analysis can be made to illustrate the effect of either reduction or elimination of cash discount.

Credit Period

The second component of credit terms is the credit period. The expected effect of an increase in the credit period is summarised in Table 12.3.

TABLE 12.3 Effect of Increase in Credit Period

Item	*Direction of Change (I = Increase D = Decrease)*	*Effect on Profits (Positive or Negative)*
Sales Volume	I	+
Average Collection Period	I	–
Bad Debt Expenses	I	–

A reduction in the credit period is likely to have an opposite effect. The credit period decision is illustrated in Example 12.3.

Example 12.3

Suppose, a firm is contemplating an increase in the credit period from 30 to 60 days. The average collection period which is at present 45 days is expected to increase to 75 days. It is also likely that the bad debt expenses will increase from the current level of 1 per cent to 3 per cent of sales. Total credit sales are expected to increase from the level of 30,000 units to 34,500 units. The present average cost per unit is Rs 8, the variable cost and sales per unit is Rs 6 and Rs 10 per unit respectively. Assume the firm expects a rate of return of 15 per cent.

Should the firm extend the credit period?

Solution

(i) Profit on additional sales: = (Rs 4 × 4,500) = Rs 18,000

(ii) Cost of additional investments in receivables: = Average investments with the proposed credit period less average investments in receivables with the present credit period:

$$\text{Proposed plan} = \frac{\text{Cost of sales}}{\text{Turnover of receivables}} = \frac{(\text{Rs } 8 \times 30{,}000) + (\text{Rs } 6 \times 4{,}500)}{360 \div 75} = \text{Rs } 55{,}625$$

$$\text{Present plan} = \frac{(\text{Rs } 8 \times 30{,}000)}{360 \div 45} = \text{Rs } 30{,}000$$

Additional investment in accounts receivable = Rs 55,625 – Rs 30,000 = Rs 25,625

Cost of additional investment at 15 per cent = 0.15 × Rs 25,625 = Rs 3,843.75.

(iii) Additional bad debt expenses: This is the difference between the bad debt expenses with the proposed and present credit periods.

Bad debt with proposed credit period = 0.03 × Rs 3,45,000 = Rs 10,350

Bad debt with present credit period = 0.01 × Rs 3,00,000 = Rs 3,000

Additional bad debt expense = (Rs 10,350 – Rs 3,000) = Rs 7,350

Thus, the incremental cost associated with the extension of the credit period is Rs 11,193.75 (Rs 3,843.75 + Rs 7,350). As against this, the benefits are Rs 18,000. There is, therefore, a net gain of Rs 6,806.25, that is, (Rs 18,000 – Rs 11,193.75). The firm would be well-advised to extend the credit period from 30 to 60 days.

TABLE 12.4 Effect of Relaxation of Credit Period to Two Months

Particulars	*Amount*
Incremental sales revenue (4,500 × Rs 10)	Rs 45,000
Less: incremental variable costs (4,500 × Rs 6)	27,000
Incremental contribution	18,000
Less: incremental cost of additional investment in debtors	3,843.75
Less: increase in bad debts	7,350.00
Incremental profit	6,806.25

The effect of a decrease in the credit period can be similarly analysed.

Cost of Additional Investment in Debtors

There are two approaches to determine the cost of additional investment in debtors: **(1)** Total cost (FC + VC) and **(2)** Variable costs only. The rationale for the total cost is that the firm needs to finance total cost, whether it is fixed or variable as far as credit sales/investment in debtors is concerned. Its investments are not limited to VC only. The variable cost approach contends that the existing fixed costs are sunk costs and they are to be incurred by the corporate irrespective of the production/sales volume. Therefore, they are irrelevant costs as they are not additional out-of-pocket costs, as far as, additional investment in debtors is concerned. Therefore, the average investment in debtors in present as well as proposed plans should be computed dividing the total variable costs of sales by debtors turnover.[6]

The concept of additional investment in debtors, based on variable cost approach, is explained, based on the data contained in Example 12.3, below.

Average investment in debtors = Total VC/Debtors turnover
Present plan: (Rs 6 × 30,000 units = Rs 1,80,000) ÷ 8 = Rs 22,500
Proposed plan: (Rs 6 × 34,500 units = Rs 2,07,000) ÷ 4.8 = Rs 43,125
Additional investment: (Rs 43,125 − Rs 22,500) = Rs 20,625
Cost of additional investment (Rs 20,625 × 0.15) = Rs 3,093.75
Incremental profit (Rs 3,843.75 − Rs 3,093.75) = Rs 750 (Total = Rs 7,556.25)

The marginal/additional investment in debtors based on VC approach would obviously be lower than the total cost (TC) approach, leading to less financial cost. This, in turn, would result in higher incremental profits (or lower loss) in the VC approach compared to the total cost approach.

Cost of Additional Investment in Cash and Inventories (Net of Additional Creditors)

Liberal credit terms, in general, lead to additional sales which, in turn, would require higher level of production. To support this higher level of operations, the corporates would evidently require additional working capital in terms of higher level of safety stocks of cash and inventories of all types, besides increased investments in debtors (**explained earlier**). Assuming the requirement net of additional accounts payable is positive, this also needs to be financed. In operational terms, there is need to take into account financial cost of such additional investments to evaluate true profitability of the proposed relaxation in credit terms.

Continuing with Examples 12.3, assume additional net working capital (duly adjusted for increased creditors), besides debtors, is Rs 4,000; the cost of Rs 4,000 at 15 per cent is Rs 600. As a result of this additional cost, profits would decrease by Rs 600 to Rs 6,206.26 (total cost approach) and to Rs 6,956.25 (variable cost approach.)

SECTION 4 COLLECTION POLICIES

Collection policy involves procedures for collecting accounts receivables when they are due.

The third area involved in the accounts receivable management is collection policies. They refer to the procedures followed to collect accounts receivable when, after the expiry of the credit period, they become due. These policies cover two aspects: **(i)** degree of effort to collect the overdues, and **(ii)** type of collection efforts.

Degree of Collection Effort

To illustrate the effect of the collection effort, the credit policies of a firm may be categorised into **(i)** strict/light, and **(ii)** lenient. The collection policy would be tight if very rigorous procedures are followed. A tight collection policy has implications which involve benefits as well costs. The management has to consider a trade-off between them. Likewise, a lenient collection effort also affects the cost-benefit trade-off. The effect of tightening the collection is discussed below.

In the first place, the bad debt expenses (default cost) would decline. Moreover, the average collection period will be reduced. As a result of these two effects, the firm will benefit and its profits will increase. But, there would be a negative effects also. A very rigorous collection strategy would involve increased collection costs. Yet another negative effect may be in the form of a decline in the volume of sales. This may be because some customers may not like the pressure and intense efforts initiated by the firm, and may switch to other firms. These effects are tabulated in Table 12.5.

TABLE 12.5 Basic Trade-off from Tight Collection Effort

Item	*Direction of Change (I = Increase D = Decrease)*	*Effect on Profits [Positive (+) or Negative (–)]*
Bad Debt Expenses	D	+
Average Collection Period	D	+
Sales Volume	D	–
Collection Expenditure	I	–

The effect of the lenient policy will be just the opposite. We illustrate the basic trade-off in Example 12.4.

Example 12.4

A firm is contemplating stricter collection policies. The following details are available:

1. At present, the firm is selling 36,000 units on credit at a price of Rs 32 each; the variable cost per unit is Rs 25 while the average cost per unit is Rs 29; average collection period is 58 days; and collection expenses amount to Rs 10,000; bad debts are 3 per cent.

2. If the collection procedures are tightened, additional collection charges amounting to Rs 20,000 would be required, bad debts will be 1 per cent; the collection period will be 40 days; sales volume is likely to decline by 500 units.

Assuming a 20 per cent rate of return on investments, what would be your recommendation? Should the firm implement the decision?

Solution

(i) Bad debt expenses:

Present plan: (0.03 × Rs 11,52,000)	Rs 34,560
Proposed plan: (0.01 × Rs 11,36,000)	11,360
Savings in bad debt expenses	23,200

(ii) Average collection period/average investment in receivables:

$$\text{Present plan} = \frac{36{,}000 \times \text{Rs } 29}{360 \div 58} = 1{,}68{,}200 \textbf{ (a)}$$

$$\text{Proposed plan} = \frac{(36{,}000 \times \text{Rs } 29) - (500 \times \text{Rs } 25)}{360 \div 40} = 1{,}14{,}611 \textbf{ (b)}$$

Savings in average investments (a – b) 53,589

Assuming a 20 per cent return, the firm will be able to earn Rs 10,718 on this saving.

(iii) Sales volume: Since the sales volume will decline by 500 units, there would be a loss of Rs 3,500 (500 × Rs 7).

(iv) Additional collection charges = Rs 20,000.

Thus, the total benefits from a tightening of the collection policy will be Rs 33,918 (Rs 23,200 + Rs 10,718) and the total cost will be Rs 23,500 (Rs 3,500 + Rs 20,000). Therefore, there would be a net gain of Rs 10,418 (Rs 33,918 – Rs 23,500). The firm should, therefore, implement the proposed strategy.

Example 12.5

Super Sports, dealing in sports goods, has an annual sale of Rs 50 lakh and currently extending 30 days' credit to the dealers. It is felt that sales can pick up considerably if the dealers are willing to carry increased stocks, but the dealers have difficulty in financing their inventory. The firm is, therefore, considering shifts in credit policy. The following information is available:

The average collection period now is 30 days.
Variable costs, 80 per cent of sales.
Fixed costs, Rs 6 lakh per annum
Required (pre-tax) return on investment: 20 per cent

Credit policy	*Average collection period (days)*	*Annual sales (Rs lakh)*
A	45	56
B	60	60
C	75	62
D	90	63

Determine which policy the company should adopt.

Solution

Evaluation of Proposed Credit Policies *(Amount in Rupees lakh)*

Particulars	*Present*	*Proposed (number of days)*			
	(30)	*A(45)*	*B(60)*	*C(75)*	*D(90)*
(a) Sales revenue	50	56	60	62	63
Less: Variable costs (80% of sales)	40	44.8	48	49.6	50.4

(*Contd.*)

(*Contd.*)

Total contribution	10	11.2	12	12.4	12.6
Less: Fixed costs	6	6	6	6	6
Profit	4	5.2	6	6.4	6.6
Increase in profits due to increase in total contribution (20% of sales) compared to present profits	—	1.2	2	2.4	2.6
(b) Investment in debtors:					
Total cost (VC + FC)	46	50.8	54	55.6	56.4
Debtors turnover (DT) (360 days collection period)	12	8	6	4.8	4
Average investment (total cost ÷ DT)	3.83	6.35	9	11.58	14.10
Additional investment compared to present level	—	2.52	5.17	7.75	10.27
Cost of additional investment	—	0.50	1.03	1.55	2.05
(c) Incremental profit (a – b)	—	0.70	0.97	0.85	0.55

Policy B (average collection period 60 days) should be adopted as it yields maximum profit.

Example 12.6

XYZ Corporation is considering relaxing its present credit policy and is in the process of evaluating two alternative policies. Currently, the firm has annual credit sales of Rs 50 lakh and accounts receivable turnover ratio of 4 times a year. The current level of loss due to bad debts is Rs 1,50,000. The firm is required to give a return of 25 per cent on the investment in new accounts receivable. The company's variable costs are 70 per cent of the selling price. Given the following information, which is a better option?

Particulars	*Present policy*	*Policy option I*	*Policy option II*
Annual credit sales	Rs 50,00,000	Rs 60,00,000	Rs 67,50,000
Accounts receivable turnover ratio	4	3	2.4
Bad debt losses	1,50,000	3,00,000	4,50,000

Solution

Relative Suitability of Policy Options

Particulars	*Present policy*	*Policy option I*	*Policy option II*
Sales revenue	Rs 50,00,000	Rs 60,00,000	Rs 67,50,000
Less: Variable cost (70%)	35,00,000	42,00,000	47,25,000
Contribution margin (manufacturing)	15,00,000	18,00,000	20,25,000
Less: Other relevant costs:			
Bad debt losses	1,50,000	3,00,000	4,50,000
Investment cost (see working notes)	2,18,750	3,50,000	4,92,187.50
Contribution margin (final)	11,31,250	11,50,000	10,82,812.50

Recommendation The firm is advised to adopt policy option I (extend credit terms to 4 months).

Working Notes

Strictly speaking, investment in accounts receivable should be determined with reference to total cost of goods sold on credit. However, fixed costs are not given. It is assumed that there are no fixed costs and investment in debtors/receivables is determined with reference to variable costs only.

$$\text{Present policy: } \frac{\text{Rs } 35,00,000}{4} = \text{Rs } 8,75,000 \times 0.25 = \text{Rs } 2,18,750$$

$$\text{Policy option I: } \frac{\text{Rs } 42,00,000}{3} = \text{Rs } 14,00,000 \times 0.25 = \text{Rs } 3,50,000$$

$$\text{Policy option II: } \frac{\text{Rs } 47,25,000}{2.4} = \text{Rs } 19,68,750 \times 0.25 = \text{Rs } 4,92,187.5$$

Type of Collection Efforts

The second aspect of collection policies relates to the steps that should be taken to collect overdues from the customers. A well-established collection policy should have clear-cut guidelines as to the sequence of collection efforts. After the credit period is over and payment remains due, the firm should initiate measures to collect them. The effort should in the beginning be polite, but, with the passage of time, it should gradually become strict. The steps usually taken are **(i)** letters, including reminders, to expedite payment; **(ii)** telephone calls for personal contact; **(iii)** personal visits; **(iv)** help of collection agencies; and finally, **(v)** legal action. The firm should take recourse to very stringent measures, like legal action, only after all other avenues have been fully exhausted. They not only involve a cost but also affect the relationship with the customers. The aim should be to collect as early as possible; genuine difficulties of the customers should be given due consideration.

Summary

- When a firm sells goods and services on credit, it creates accounts receivable/debtors which would be collected in future. Accounts receivable, repesent an extension of credit to customers, allowing them a reasonable period of time, in which to pay for the goods/services purchased by them. In fact, credit sales and, therefore, receivables are considered as a marketing tool to promote sales and thereby profits.
- The extension of credit involves risk and cost. The objective of receivables management, therefore, is to have a trade-off between the benefits and costs associated with the extension of credit. The benefits are increased sales and anticipated increased profits/incremental con-tribution. The major costs are collection costs, capital costs, delinquency costs and default costs. The firm should consider only the incremental benefits and costs that result from a change in the receivables or trade credit policy.
- The management of receivables involves crucial decision in three areas: **(i)** credit policies, **(ii)** credit terms and **(iii)** collection policies.
- The credit policy of a firm provides the framework to determine whether or not to extend credit to a customer and how much credit to extend. The two broad dimensions of credit policy decision of a firm are credit standards and credit analysis.
- Credit standards represent the basic criterion for the extension of credit to customers. These can be either tight/restrictive or liberal/non-restrictive. The trade-off with reference to credit standards cover: **(i)** collection cost, **(ii)** cost of investment in debtors, **(iii)** bad debts and **(iv)** level of sales profit/contribution. The credit analysis component of credit policies includes obtaining credit information from different sources and its analysis.
- In case, the standards are relaxed, it implies credit for a longer period will be extended. More credit results in increase in sales. The benefits of incremental sales are to be weighed against incremental collection costs, interest costs due to additional investment in debtors, delinquency cost and bad debts.
- When standards are tightened, it implies less period of credit extended to customers. It would result in decrease in sales. The contribution foregone due to decrease in sales is to be com-pared with savings due to the lower collection costs, interest costs and bad debt losses.

- Credit terms specify the repayment terms. The credit terms have three components: **(i)** credit period, **(ii)** cash discount and **(iii)** cash discount period. The credit terms should be determined on the basis of cost-benefit trade-off in these three components.
- Collection policies refer to the procedure followed to collect the receipts when they become due. The collection policies may be classified into **(i)** strict and **(ii)** liberal. The effects of tightening the collection policy would be: **(i)** decline in debts, **(ii)** decline in collection period resulting lower interest costs, **(iii)** increase in collection costs and **(iv)** decline in sales. The effects of a lenient policy would be exactly the opposite.
- The framework of analysis of all the three decision areas in receivables management is to secure a trade-off between the costs and benefits of the measurable effects on the sales vol-ume, capital cost due to change in investment in debtors, collection costs, bad debts and so on. The firm should select an alternative which has potentials of more benefits than the cost.

References

1. Joy, O M, *Introduction to Financial Management*, Irwin, Homewood Ill., 1992, p 456.
2. Bolten, S E, *Managerial Finance*, Houghton, Mifflin Co., Boston, 1991, p 446.
3. Cf. Joy, *op. cit.*, p 458.
4. *Ibid*., pp 462-64.
5. For a prenetrating description of the implications of credit terms from the point of recipients (accounts payable) refer to Gitman, L J, *Principles of Managerial Finance*, Harper and Row, New York, 1993, Chapter 17; also Joy, O M, *op. cit.*, Chapter 19; and Bolten, SE, *Managerial Finance*, Houghton Mifflin Co., Boston, 1991, Chapter 12.
6. Gitman, L.J., *Op.cit.*, 2006, p.643. Also refer to Van Horne, J.C., *Op.cit.*, 2002, p.470. There are merits of each approach.

Practical Problems

P.12.1 H Ltd has at present annual sales level of Rs 10,000 units at Rs 300 per unit. The variable cost is Rs 200 per unit and fixed cost amount to Rs 3,00,000 per annum. The present credit period allowed by the company is 1 month. The company is considering a proposal to increase the credit period to 2 months and 3 months and has made the following estimates:

	Existing	*Proposed*	
Credit period (month)	1	2	3
Increase in sales (per cent)	—	15	30
Bad debts (per cent)	1	3	5

There will be increase in fixed cost by Rs 50,000 on account of increase in sales beyond 25 per cent of present level. The company plans a pre-tax return of 20 per cent on investment in receivables.

You are required to calculate the most paying credit policy for the company.

Solution

Decision-making (liberalisation of credit period to 2 months or 3 months)

Particulars	*1 month*	*2 months*	*3 months*
Sales (units)	10,000	11,500	13,000
Sale revenue	Rs 30,00,000	Rs 34,50,000	Rs 39,00,000

(*Contd.*)

(*Contd.*)

Less: Variable costs	20,00,000	23,00,000	26,00,000
Total contribution	10,00,000	11,50,000	13,00,000
Less: Other costs:			
Fixed costs	3,00,000	3,00,000	3,50,000
Bad debts	30,000	1,03,500	1,95,000
Investment cost (*see working notes*)	38,333	86,667	1,47,500
Profit	6,31,667	6,59,833	6,07,500

Recommendation The firm is advised to adopt policy of extending credit of 2 months as it yields maximum profit.

Working Notes

	Existing	*2 months*	*3 months*
Investment in debtors (VC + FC)/Debtors turnover	(Rs 23,00,000) / 12	(Rs 26,00,000) / 6	(Rs 29,50,000) / 4
	= Rs 1,91,667	= Rs 4,33,333	= Rs 7,37,500
Cost of investment (Investment in debtors × 0.20)	38,333	86,667	1,47,500

P.12.2 Golden Syntex has annual sales of Rs 24,00,000. The selling price per unit is Rs 10 and the variable cost is 70 per cent of the selling price. The required rate of return on investment is 20 per cent, average cost, Rs 9 per unit; annual collection expenditure, Rs 50,000 and percentage of default, 3 per cent; credit terms, 2 months. Golden Syntex is considering the change in credit policy by following Programme A or Programme B.

	Programme	
	A	*B*
Average collection period (months)	1.5	1
Annual collection expenditure (Rs)	75,000	1,50,000
Percentage of default (%)	2	1

Determine which collection programme should Golden Syntex follow?

Solution

Financial evaluation of proposed programmes (A or B) relating to credit policy

Particulars	*Existing*	*Programme A*	*Programme B*
Cost of operation:			
Annual collection expenditure	Rs 50,000	Rs 75,000	Rs 1,50,000
Losses due to default/bad debts (on sales of Rs 24,00,000)	72,000	48,000	24,000
Cost of investment in debtors (see working note 1)	72,000	54,000	36,000
Total	1,94,000	1,77,000	2,10,000

Recommendation Golden Syntex is advised to adopt Programme A as its entails minimum cost of operation.

Working Notes

Cost of investment in debtors

Particulars	*Existing*	*Programme A*	*Programme B*
(a) Investment in debtors [(2,40,000 units × Rs 7) + (2,40,000 × Rs 2)]	(Rs 21.6 lakh) / 6 = Rs 3,60,000	(Rs 21.6 lakh) / 8 = Rs 2,70,000	(Rs 21.6 lakh) / 12 = Rs1,80,000
(b) Required rate of return (%)	20	20	20
(c) Cost of investment in debtors(a × b)	72,000	54,000	36,000

P.12.3 Sagar company currently makes all sales on credit and offers no cash discount. It is considering a 2 per cent cash discount for payment within 10 days. The firm's current average collection period is 60 days, sales are 2,00,000 units, selling price is Rs 30 per unit, variable cost per unit is Rs 20 and average cost per unit is Rs 25 at the current sales volume.

It is expected that the change in credit terms will result in increase in sales to 2,25,000 units and the average collection period will fall to 45 days. However, due to increased sales, increased working capital required will be Rs 1,00,000 (it does not take into account the effect on debtors). Assuming that 50 per cent of the total sales will be on cash discount and 20 per cent is the required return on investment, should the proposed discount be offered?

Solution

Effect of extending cash discount to customers

Particulars	*Amount*
Increased sales revenue (25,000 × Rs 30)	Rs 7,50,000
Less: Variable costs (25,000 × Rs 20)	5,00,000
Incremental contribution	2,50,000
Add: Savings in cost due to decrease in investment in debtors (see working note 1)	29,167
Less: Cost of additional working capital required (Rs 1,00,000 × 0.20)	(20,000)
Less: Cost involved in cash discount (0.02 × 2,25,000 units × Rs 30 × 0.5)	(67,500)
Profit	1,91,667

It is advised that the firm should offer cash discount to its customers.

Working Notes

1. Savings due to decrease in average collection period:

$$\text{Present investment in debtors (without cash discount)} = \frac{2,00,000 \times \text{Rs } 25}{6\ (360 \text{ days}/60)} = \text{Rs } 8,33,333$$

$$\text{Expected investment in debtors (with cash discount)} = \frac{2,00,000 \times \text{Rs } 25 + 25,000 \times \text{Rs } 20}{8\ (360 \text{ days}/45)}$$

$$= \text{Rs } 6,87,500$$

Decrease in investment in debtors = Rs 8,33,333 – Rs 6,87,500 = Rs 1,45,833

Savings in cost = Rs 1,45,833 × 0.20 = Rs 29,167

P.12.4 Easy Limited specialises in the manufacture of a computer component. The component is currently sold for Rs 1,000 and its variable cost is Rs 800. For the current year ended December 31, the company sold on an average 400 components per month.

At present, the company grants one month's credit to its customers. It is thinking of extending the same to two months on account of which the following are expected:

Increase in sales, 25 per cent
Increase in stock, Rs 2,00,000
Increase in creditors, Rs 1,00,000

You are required to advise the company on whether or not to extend credit terms if **(a)** all customers avail of the extended credit period of two months and **(b)** existing customers do not avail of the credit terms but only the new customers avail of the same. Assume the entire increase in sales is attributable to the new customers.

The company expects a minimum return of 40 per cent on the investments.

Solution

(a) **Effect of relaxation of credit period to two months**

Particulars	*Amount*
Incremental sales revenue (100 components × 12 × Rs 1,000)	Rs 12,00,000
Less: Increased variable costs (Rs 12,00,000 × 0.80)	9,60,000
Incremental contribution	2,40,000
Less: Cost of additional working capital required (see working note 1)	2,32,000
Incremental profit	8,000

Working Note 1

(i)	Present investment in debtors: $\frac{400 \times 12 \times \text{Rs } 800}{12 \text{ (Debtors turnover ratio)}}$	Rs 3,20,000
(ii)	Proposed investment in debtors: $\frac{500 \times 12 \times \text{Rs } 800}{6 \text{ (Debtors turnover ratio)}}$	8,00,000
(iii)	Additional investment in debtors	4,80,000
	Add: Increase in stock	2,00,000
	Less: Increase in creditors	1,00,000
	Additional working capital required	5,80,000
(iv)	Minimum return expected on additional working capital (Rs 5,80,000 × 0.40)	2,32,000

(b) **Effect of relaxation of credit period to two months**

Particulars	*Amount*
Incremental contribution (as per **(a)** above	Rs 2,40,000
Less: Cost of additional working capital (see working note 2)	1,04,000
Incremental profit	1,36,000

Working Note 2

(i)	Additional investment in debtors (100 × 12 × Rs 800/6)	Rs 1,60,000
	Add: Increase in stock	2,00,000
	Less: Increase in creditors	1,00,000
	Additional working capital required	2,60,000
(ii)	Minimum return expected on additional working capital (Rs 2,60,000 × 0.40)	1,04,000

P.12.5 Star Limited, manufacturers of colour TV sets, are considering the liberalisation of existing credit terms to three of their large customers. The credit period and likely quantity of TV sets that will be lifted by the customers are as follows:

Credit period (days)	*Quantity lifted*		
	A	*B*	*C*
0	1,000	1,000	—
30	1,000	1,500	—
60	1,000	2,000	1,000
90	1,000	2,500	1,500

The selling price per TV set is Rs 9,000. The expected contribution is 20 per cent of the selling price. The cost of carrying debtors averages 20 per cent per annum.

You are required:

(a) To determine the credit period to be allowed to each customer (assume 360 days in a year for calculation purposes).

(b) What other problems the company might face in allowing the credit period as determined in **(a)** above?

Solution

(a) In case of customer A, liberalisation of credit period does not affect sales. No credit should be allowed to him.

Effect of extending credit period to customer B and C

(Amount in lakhs of rupees)

Particulars	*Customer B (days)*				*Customer C (days)*	
	0	30	60	90	60	90
Sales 90	135	180	225	90	135	
Less: Variable costs (0.80)	72	108	144	180	72	108
Contribution (0.20)	18	27	36	45	18	27
Less: Cost of investments in debtors (at VC)	—	1.8	4.8	9.0	2.4	5.4
$\left(\frac{\text{Total VC}}{\text{Debtors turnover}}\right) \times 0.20$	—	$\left(\frac{108}{360/30}\right)$	$\left(\frac{144}{360/60}\right)$	$\left(\frac{180}{360/90}\right)$	$\left(\frac{72}{360/60}\right)$	$\left(\frac{108}{360/90}\right)$
Profit	18	25.2	31.2	36	15.6	21.6

Profits are maximum when credit period is 90 days to both customers.

(b) When customer A comes to know of 90 days credit extended to customer B and C, he will either seek similar credit period or press for cash discount.

Customer B will seek either higher credit period or trade discount for buying more than Customer C.

P.12.6 In order to increase sales from the normal level of Rs 2.4 lakh per annum, the marketing manager submits a proposal for liberalising credit policy as under: Normal sales, Rs 2.4 lakh, Normal credit period, 30 days

Proposed increase in credit period beyond normal 30 days	*Increase in normal sales*
15	Rs 12,000
30	18,000
45	21,000
60	24,000

The contribution to volume/profit-volume ratio is 33.33 per cent. The company expects a pre-tax return of 20 per cent on investment. Evaluate the above 4 alternatives and advise the management (assume 360 days a year).

Solution

Effect of extending credit period to customers

(Amount in lakh of rupees)

Particulars	*Credit period (days)*				
	30	*45*	*60*	*75*	*90*
Sales	2.4	2.52	2.58	2.61	2.64
Variable costs (2/3)	1.6	1.68	1.72	1.74	1.76
Contribution (1/3)	0.8	0.84	0.86	0.87	0.88
Less: Cost of investment in debtors at variable costs (as data related to fixed cost is not given)	0.027	0.042	0.057	0.0725	0.088
(Total VC/Debtors turnover) × 0.20	$\left(\frac{1.6}{12}\right)$	$\left(\frac{1.68}{8}\right)$	$\left(\frac{1.72}{6}\right)$	$\left(\frac{1.74}{4.8}\right)$	$\left(\frac{1.76}{4}\right)$
Profit	0.773	0.798	0.803	0.7975	0.792

Recommendation The company is advised to extend credit for 60 days.

P.12.7 Radiance garments Ltd. manufactures readymade garments and sells them on credit basis through a network of dealers. Its present sale is Rs 60 lakh per annum with 20 days credit period. The company is contemplating an increase in the credit period with a view to increasing sales. Present variable costs are 70 per cent of sales and the total fixed costs Rs 8 lakh per annum. The company expects pre-tax return on investment @ 25 per cent. Some other details are given as under:

Proposed credit policy	*Average collection period (days)*	*Expected annual sales (Rs lakh)*
I	30	65
II	40	70
III	50	74
IV	60	75

Required: Which credit policy should the company adopt? Present your answer in a tabular form. Assume 360-day a year. Calculations should be made upto two digits after decimal.

Solution

Evaluation of proposed credit policies *(Amount in Rs lakh)*

Particulars	*Present*	*Proposed (number of days)*			
	(20)	*I (30)*	*II (40)*	*III (50)*	*IV (60)*
(a) Sales revenue	60	65	70	74	75
Less: Variable costs (VC)	42	45.5	49	51.8	52.5
Total contribution	18	19.5	21	22.2	22.5
Less: Fixed costs (FC)	8	8	8	8	8
Profit	10	11.5	13	14.2	14.5
Increase in profit due to increase in total contribution compared to present profit	—	1.5	3	4.2	4.5
(b) Investment in debtors/receivables:					
Total costs (VC + FC)	50	53.5	57	59.8	60.5
Debtors turnover ratio (DT) (360 ÷ Average collection period)	18	12	9	7.2	6

(*Contd.*)

(*Contd.*)

Average investment in debtors (Total cost ÷ DT)	2.78	4.46	6.33	8.3	10.08
Additional investment compared to present level	—	1.68	3.55	5.52	7.30
Cost of additional investment @ 25%	—	0.42	0.89	1.38	1.83
(c) Incremental profit [**(a)** – **(b)**]	—	1.08	2.11	2.82	2.67

Recommendation Policy III (average collection period 60 days) is recommended as it yields maximum profit.

Mini Case

12.C.1 (Credit Policy) Khoobsurat Industries Ltd is a major player in the soap and detergent business. It has a market share of 25 per cent which is almost twice as much as that of the next competitor. The current sales of Khoobsurat amount to Rs 1,400 crore. Its bad debts are in the range of 1 per cent. The company has a P/V ratio of 45 per cent. The policy of Khoobsurat is to extend to all its customers a credit of 30 days. The existing fixed costs are Rs 120 crore which are unaffected by changes in sales.

Khoobsurat Industries is facing severe competition both from multinational and regional players. The CEO of the company, Sushant Sachdeva, has asked Amit Gupta, the chief marketing manager, to submit proposals to meet the challenge from the competitors. Amit Gupta has, after a detailed survey and discussion, proposed three options for the consideration of the CEO:

Option 1: Increase the credit period to 60 days. In that case, the sales are likely to increase by 20 per cent. But bad debts would go up to 2 per cent and an additional investment of Rs 20 crore will be required in working capital (without taking into account the effect of debtors).

Option 2: Offer a credit term, 2/10 net 30. In this case, sales are expected to increase by 10 per cent. Fifty per cent of the debtors are likely to avail of the discount. There would be no change in bad debts.

Option 3: Offer both extended credit to 60 days and cash discount of 2 per cent (2/10 net 30). An increase of 25 per cent in sales could be expected and cash discount could be availed of by 30 per cent of the customers. But bad debts will increase to 2 per cent and the additional investment in working capital of Rs 20 crore will be required (without taking into account the effect of debtors).

The CEO of Khoobsurat Industries desires the CFO to carry out a financial evaluation of the above alternative proposals and suggest the course of action to be taken. The required rate of return of Khoobsurat is 20 per cent.

Solution

Financial Evaluation of Credit Proposal (Rs crore)

	Option 1	*Option 2*	*Option 3*
Incremental sales	(Rs 1,400 × .20) 280	(1,400 × 0.10) 140	(1,400 × 0.25) 350
Less incremental variable cost	(280 × 0.55) 154	(140 × 0.55) 77	(350 × 0.55) 192.5
Incremental contribution	(280 × 0.45) 126	(140 × 0.45) 63	(350 × 0.45) 157.5
Less other relevant costs:			
Bad debts	19.6[a]	1.4[c]	21[d]
Cost of investment in working capital (20 × 0.20)	4	—	4
Cost of investment in debtors	19.97[b]	—	12.2[e]
Cash discount	—	15.4	10.5
Add savings on account of reduction in debtors	—	4.1[f]	
Incremental profit	82.43	50.3	109.8

[a](Rs 1,680 crore × 0.02) − (Rs 1,400 crore × 0.01) = Rs 19.6 crore

[b] Proposed investment in debtors [(Rs 1,680 crore × 0.55) + Rs 120 crore] ÷ 6
(Debtors turnover, 360 days ÷ 60 days = 6 days) = Rs 174 crore

Present investment in debtors [(Rs 1,400 crore × 0.55) + Rs 120 crore] ÷ 12 (360 ÷ 30)	74.2 crore
Incremental investment in debtors	99.8
Cost of incremental investment in debtors (Rs 99.8 crore × 0.20)	19.97

[c] (Rs 1,540 crore × 0.01) − (Rs 1,400 crore × 0.01) = 1.4 crore

[d] (Rs 1,750 × 0.20) − (Rs 1,400 crore × 0.01) = 21 crore

[e] Proposed investment in debtors [(Rs 1,750 crore × 0.55) × Rs 120 crore)

÷ 8 (360 days ÷ 45 days)	135.3
Present investment in debtors	74.2
Incremental investment in debtors	61.1
Cost of incremental investment in debtors (Rs 61.1 crore × 0.20)	12.2

[f]Debtors turnover = 360 days/[(0.5 × 10 days) + (0.5 × 30 days) = 20 days] = 18

Proposed investment in debtors [(Rs 1,540 crore × 0.55) + Rs 120 crore) ÷ 18 = Rs 53.7 crore

Decrease in investment in debtors (Rs 74.2 crore − Rs 53.7 crore) = Rs 20.5 crore

Savings on account of reduction in debtors (Rs 20.5 crore × 0.2) = Rs 4.1 crore

Recommendation Option 3 which combines extended credit period and cash discount would result in the maximum incremental profit. The CEO may consider the proposed policy change due to its beneficial effect.

Review Questions

RQ.12.1 Indicate whether the following statements are true or false.

(i) Default costs are caused due to failure of customers to pay on time.

(ii) Financial costs to support credit-sales are referred to as collection costs.

(iii) Credit standards represent minimum requirements for extending credit to a customer.

(iv) Financial costs of investment in debtors are determined with reference to selling price at which credit sales are made.

(v) It is always in the interest of a business firm to pursue tight credit standards as they yield lower collection costs and bad debts.

(vi) Business firms should not opt for relaxation of credit standards as they cause increase in collection costs, amount of bad debts and financial costs.

(vii) The credit term '3/10 net 30' implies that the debtor would be entitled for cash discount of 3 per cent if payment is made within 10 days, 2 per cent if it is made within 20 days and 1 per cent if it is made in 30 days.

(viii) The credit term '2/10 net 30' implies that the customer is entitled to 2 per cent cash discount only when he pays within 10 days after the beginning of credit period.

(ix) Financial costs of investment in debtors are determined with reference to cash cost of sales.

(x) The financial framework of analysis of various decision areas in receivable management should factor all measurable costs and benefits.

[Answers: (i) False (ii) False (iii) True (iv) False (v) False (vi) False (vii) False (viii) True (ix) True (x) True]

RQ.12.2 What are credit standards? What key variables should be considered in evaluating possible changes in credit standards?

RQ.12.3 What is meant by credit terms? What are the expected effects of **(a)** a decrease in the cash discount, and **(b)** a decrease in the credit period?

RQ.12.4 What are collection policies? How can they be evaluated?

RQ.12.5 Explain the objectives of receivables management.

Examination Questions

Theory Questions

12.1 What are the costs and benefits associated with a liberal credit policy? (*Delhi University, 2011*)

12.2 Discuss the consequences of lengthening and shortening of the credit policy by the firm. (*Delhi University, 2010*)

12.3 What is credit policy? Explain the role of credit terms in credit policy. (*Delhi University, 2008*)

12.4 Explain in brief how effectiveness of credit control of a firm can be assessed. *(Calcutta University, 2004)*

12.5 What is the role of credit terms and credit standards in the credit policy of a firm? *(Periyar University, Oct./Nov. 2004)*

12.6 As a credit controller what steps would you take to grant credit to prospective customers? *(Calcutta University, 2003)*

12.7 Discuss the consequences of lengthening and shortening of the credit period by a firm. *(Delhi University, 2002)*

12.8 Explain briefly the following:

(i) Credit policies; *(Delhi University, 2001)*

(ii) The costs and benefits associated with a change in credit policy *(Delhi University, 2003)*

12.9 Explain in detail the steps involved in credit analysis. *(Mumbai University, November 2001)*

12.10 What are the various costs of maintaining debtors of a firm? Explain them in brief. *(Calcutta University, 2001)*

12.11 What factors would you take into consideration in granting credit? Explain. *(Calcutta University, 2001)*

12.12(a) Mention the costs and benefits of credit extension.

(b) Explain

(i) Credit policies and

(ii) Credit terms

(c) Choose the best answer

"2/10, net 30" means

(a) 20 per cent cash discount if paid within 30 days.

(b) 2 per cent cash discount if paid within 30 days.

(c) 2 per cent cash discount if paid within 10 days.

(d) 20 per cent trade discount. *(Bharatiyar University, April 2001)*

12.13 State the objectives of granting credit to customers. *(Calcutta University, 2000)*

12.14 Whether the following statement is correct or false? Give briefly reasons for your answer: Extending credit to all customers results in decrease in sales, investment in debtors, and bad-debt loses. *(Delhi University, 1998)*

12.15 What do you mean by receivables management? (*Bangalore University*)

Numerical Questions

12.1 The management of Akruti Ltd. is considering to change its present credit policy. The details of the options are given below: (in Rs `000)

Credit Policy	*Present*	*A*	*B*	*C*
Sale	50	56	60	62
VC (80% of sale)	40	44.8	48	49.6
Fixed cost	6	6	6	6
Average collection period (days)	30	45	60	75

Firm's rate of investment is 20%. Assuming 360 days in a year, advise which of the options is the best. (*Delhi University, 2011*)

Solution

Evaluation of proposed credit policies (*A*, *B* and *C*)

Particulars	*Present*	*A*	*B*	*C*
Sales revenue	Rs 50,000	Rs 56,000	Rs 60,000	Rs 62,000
Less costs:				
Variable costs (80%)	40,000	44,800	48,000	49,600
Fixed costs	6,000	6,000	6,000	6,000
Cost of investment in debtors[@]	767	1,270	1,800	2,317
Profit	3,233	3,930	4,200	4,083
Incremental profit (loss)		697	967	850

Recommendation: Credit policy *B* (extending credit period to 2 months) is the best option for the company as it yields maximum profit.

[@]Cost of investment in debtors:

Present : Rs 46,000 × 1/12 × 0.2 = Rs 767

A : Rs 50,800 × 1/8 × 0.2 = 1,270

B : Rs 54,000 × 1/6 × 0.2 = 1,800

C : Rs 55,600 × 1/4.8 × 0.2 = 2,317

12.2 A company is currently engaged in the business of manufacturing a computer component. The computer component is currently sold for Rs 1,000 and its variable cost is Rs 800. For the year ended 31-03-2010, the company sold on an average 500 components per month.

Presently company grants one month credit to its customers. The company is thinking of extending the credit to two months on account of which the following is expected: Increase in sales, 25 per cent; Increase in stock, Rs 2,00,000; and Increase in creditors, Rs 1,00,000.

You are required to advise the company whether or not to extend the credit terms, if all customers avail the credit period of two months. Company expects a minimum return of 40% on investment. (*Delhi University, 2010*)

Solution

Incremental analysis whether to extend credit terms

Incremental sales revenue (1,500 units × Rs 1,000)		Rs 15,00,000
Less incremental costs:		
Variable cost (1,500 units × Rs 800)	Rs 12,00,000	
Cost of additional investment in debtors (Rs 6,00,000[1] × 40%)	2,40,000	
Cost of additional investment in other components of net working capital (Rs 2,00,000 – Rs 1,00,000) × 40%	40,000	14,80,000
Incremental profit		20,000

Recommendation: The company is advised to extend (relax) credit terms to 2 months as it yields additional profit of Rs 20,000.

Working Note:

(1) Investment in debtors (with 2 months credit)

(7,500 units × Rs 800 × 2/12)	Rs 10,00,000
Less current investment (with 1 month credit) (6,000 units × Rs 800 × 1/12)	4,00,000
Increase in investment in debtors	6,00,000

12.3 M/s. *XYZ* Ltd. has total turnover of Rs 75 lacs (proportion of cash sale is 1:2). Its variable cost is 60% of credit sales and annual fixed cost related to credit sales is Rs 10 lakh p.a. Company's management plans to relax credit policy of 1 month to either 2 month or 3 months. The following information is available:

Particulars	*Present policy*	*Proposed option I*	*Proposed option II*
Average age of debtors	1 month	2 months	3 months
Increase of sales (credit)	—	20%	30%
% of Bad debts	1%	2.5%	5%

Companies required rate of return is 20% on investment before tax. Evaluate the proposal and suggest the better course of action. (*Pune University, 2010*)

Solution

Evaluation of proposed credit policies

Particulars	*Present*	*Proposal I*	*Proposal II*
Annual credit sales	Rs 50,00,000	Rs 60,00,000	Rs 65,00,000
Less costs:			
Variable costs (60% of credit sales)	30,00,000	36,00,000	39,00,000
Fixed costs	10,00,000	10,00,000	10,00,000
Bad debts (% of credit sales)	50,000	1,50,000	3,25,000
Cost of investment in debtors[@]	66,667	1,53,333	2,45,000
Profit	8,83,333	10,96,667	10,30,000
Incremental profit (loss)	—	2,13,334	1,46,667

Recommendation: Proposal I (extending credit period to 2 months) is the best course of action for the company's management as it yields maximum profit.

[@]Cost of (required return on) investment in debtors:

Present : (Rs 40,00,000 × 1/2 × 0.2) = Rs 66,667
Proposal I : (Rs 46,00,000 × 2/12 × 0.2) = 1,53,333
Proposal II : (Rs 49,00,000 × 3/12 × 0.2) = 2,45,000

12.4 *H* Ltd. has at present a sales level of 10,000 units @ Rs 300 per unit. The variable cost is Rs 200 per unit and fixed cost amounts to Rs 3,00,000 per annum. At present, the company allows one month's credit to its customers. Company is considering extending the credit period to 2 months or 3 months. It has arrived at the following estimates:

	Existing	*Proposal I*	*Proposal II*
Credit period (month)	1	2	3
Increase in sales (per cent)	—	15	30
Bad debts (per cent of sales)	1	3	5

There will be an increase in fixed cost by Rs 50,000 if sales increase beyond 25%. Company wants a return of 20% on its investment in receivables. Find out the best course of action for the company. (*Delhi University, 2007*)

Solution

Evaluation of proposed credit policies

Particulars	*Present*	*Proposal I*	*Proposal II*
Sales revenue	Rs 30,00,000	Rs 34,50,000	Rs 39,00,000
Less costs:			
Variable costs	20,00,000	23,00,000	26,00,000
Fixed costs	3,00,000	3,00,000	3,50,000
Bad debts	30,000	1,03,500	1,95,000
Cost of investment in debtors[@]	38,333	86,667	1,47,500
Profit	6,31,667	6,59,833	6,07,500
Incremental profit (loss)	—	28,166	(24,167)

Recommendation: Proposal I (extending credit period to 2 months) is the best course of action for the company as it yields maximum profits.

[@]Cost of investment in debtors

Present : Rs 23,00,000 × 1/12 × 0.2 = Rs 38,333
Proposal I : Rs 26,00,000 × 2/12 × 0.2 = 86,667
Proposal II : Rs 29,50,000 × 3/12 × 0.2 = 1,47,500

12.5 *A* Ltd. has current sales of Rs 6,00,000 per annum. To push up sales, *A* Ltd is considering a more liberal credit policy as one of the strategies. The current average collection period of the company is 30 days. Proposed increases in collection period and their impact on sale and default rate (on total sales) are given below:

Credit policy	*Increase in collection period (days)*	*Increase in sales*	*Default rate (%)*
I	15	Rs 25,000	0.5
II	30	60,000	1.0
III	40	70,000	2.0

A Ltd is selling its products at Rs 10 each. Average cost per unit at the current level is Rs 8 and variable cost per unit is Rs 6. If *A* Ltd requires a rate of return of 20 per cent on its investments, which credit policy do you recommend and why? Assume 360 days in a year.

(*Delhi University, 2007*)

Solution

Evaluation of proposed credit policies

Particulars	*Present*	*I*	*II*	*III*
Sales revenue	Rs 6,00,000	Rs 6,25,000	Rs 6,60,000	Rs 6,70,000
Less costs:				
Variable cost (60%)	3,60,000	3,75,000	3,96,000	4,02,000
Fixed cost (60,000 units × Rs 2)	1,20,000	1,20,000	1,20,000	1,20,000
Default costs/Bad debts	—	3,125	6,600	13,400
Cost of investment in debtors[@]	8,000	12,375	17,200	20,300
Profit	1,12,000	1,14,500	1,20,200	1,14,300
Incremental profit	—	2,500	8,200	2,300

Recommendation: Proposed credit policy (II) is recommended as it yields maximum profit.

[@]Cost of investment in debtors

Present : (Rs 4,80,000 × 1/12 × 0.2) = Rs 8,000
Proposal I : (Rs 4,95,000 × 1.5/12 × 0.2) = 12,375
Proposal II : (Rs 5,16,000 × 2/12 × 0.2) = 17,200
Proposal III : (Rs 5,22,000 × 70/360 × 0.2) = 20,300

12.6 *XYZ* Corporation is considering relaxing its present credit policy and is in the process of evaluating two proposed policies. Currently, the firm has annual credit sales of Rs 50 lakh and accounts receivable turnover ratio of 4 times a year. The current level of loss due to bad debts is Rs 1,50,000. The firm is required to give a return of 25% on the investment in account receivables. The company's variable costs are 70% of the selling price. Given the following information, which is the better option?

	Present policy	*Policy option*	
		I	*II*
Annual credit sale (Rs)	50,00,000	60,00,000	67,50,000
Turnover ratio (times)	4	3	2.4
Bad debts losses (Rs)	1,50,000	3,00,000	4,50,000

(*Pune University, 2006*)

Solution

Evaluation of proposed credit policies

Particulars	*Present*	*Proposal I*	*Proposal II*
Annual credit sales	Rs 50,00,000	Rs 60,00,000	Rs 67,50,000
Less costs:			
Variable costs (70% of credit sales)	35,00,000	42,00,000	47,25,000
Bad debts	1,50,000	3,00,000	4,50,000
Cost of investment in debtors[@]	2,18,750	5,00,000	7,03,125
Profit	11,31,250	10,00,000	8,71,875
Incremental profit (loss)	—	(1,31,250)	(2,59,3750)

Recommendation: The company should not relax its present credit policy (of extending credit period of 3 months) as proposal policy options (I and II) lead to lower profits.

[@]Cost of (required return on) investment in debtors:

Present : (Rs 35,00,000[*] ×1/4 × 0.25) = Rs 2,18,750
Proposal I : (Rs 60,00,000 × 1/3 × 0.25) = 5,00,000
Proposal II : (Rs 67,50,000 × ½.4 × 0.25) = 7,03,125

(Note: In absence of information regarding fixed costs, investments in debtors have been taken at variable costs only).

12.7 Surabhi Co. Ltd. currently provides 36 days of credit to its customers. The present level of sales is Rs 50 crores. The firm's cost of capital is 10% and the ratio of variable costs to sales is 0.80. The company is considering to extend its credit period to 72 days. Such an extension is likely to push sales by Rs 5 crore. The bad debt proportion on additional sales would be 8%. The company is under 40% tax bracket. Should the credit period be extended? (*Delhi University, 2005*)

Solution

Incremental analysis whether to extend credit period to 72 days

Incremental sales revenue		Rs 5,00,00,000
Less incremental costs:		
Variable costs (Rs 5 crore × 0.8))	Rs 4,00,00,000	
Bad debt (Rs 5 crore × 0.08)	40,00,000	
Cost of additional investment in debtors[@]	48,00,000	4,88,00,000
Increase in profit		12,00,000
Less taxes (40%)		4,80,000
Increase in after-tax profit		7,20,000

Recommendation: As there is increase in after-tax profit, the company is advised to extend credit period to 72 days.

[@]Cost of additional investment in debtors:

Present investment: (Rs 50 crore × 0.8 × 36/360 × 0.1) = Rs 40 lakh

Investment in proposed policy: (Rs 55 crore × 0.8 × 72/360 × 0.1) = 88 lakh. Additional cost: Rs 88 lakh – Rs 40 lakh = Rs 44 lakh.

Chapter

13

Inventory Management

Learning Objectives

1. Discuss the tradeoffs between costs and benefits associated with the level of inventory
2. Describe the common techniques for managing inventory—ABC system, the basic economic order quantity (EOQ) model, the recorder point and the safety stock

INTRODUCTION

The preceding two Chapters have discussed the basic strategies and considerations in managing two individual current assets, namely, cash and receivables. The third major current asset is inven-tory. The term inventory refers to the stockpile of the products a firm is offering for sale and the components that make up the product.[1] In other words, inventory is composed of assets that will be sold in future in the normal course of business operations. The assets which firms store as inventory in anticipation of need are **(i)** raw materials, **(ii)** work-in-process (semi-finished goods) and **(iii)** finished goods. The raw material inventory contains items that are purchased by the firm from others and are converted into finished goods through the manufacturing (production) process. They are an important input of the final product. The work-in-process inventory consists of items currently being used in the production process. They are normally semi-finished goods that are at various stages of production in a multi-stage production process. Finished goods represents final or completed products which are available for sale. The inventory of such goods consists of items that have been produced but are yet to be sold.

Inventory, as a current asset, differs from other current assets because only financial managers are not involved. Rather, all the functional areas, finance, marketing, production, and purchasing, are involved. *The views concerning the appropriate level of inventory would differ among the different functional areas.*[2] *The job of the financial manager is to reconcile the conflicting viewpoints of the various functional areas regarding the appropriate inventory levels in order to fulfil the overall objective of maximising the owner's wealth.* Thus, inventory

management, like the management of other current assets, should be related to the overall objective of the firm. It is in this context that the present chapter is devoted to the main elements of inventory management from the viewpoint of financial managers. The objectives of inventory management are explained in some detail in Section 1. Section 2 is concerned with inventory management techniques. Attention is given here to basic concepts relevant to the management and control of inventory. The aspects covered are: **(i)** determination of the type of control required, **(ii)** the basic econo-mic order quantity, **(iii)** the reorder point, and **(iv)** safety stocks. As a matter of fact, the inven-tory management techniques are a part of production management. But a familiarity with them is of great help to the financial managers in planning and budgeting inventory, hence, they are explained here. The chapter concludes with the main points.

SECTION 1 OBJECTIVES

The basic responsibility of the financial manager is to make sure the firm's cash flows are managed efficiently. Efficient management of inventory should ultimately result in the maximisation of the owner's wealth. It was indicated in Chapter 29 that in order to minimise cash requirements, inven-tory should be turned over as quickly as possible, avoiding stock-outs that might result in closing down the production line or lead to a loss of sales. It implies that while the management should try to pursue the financial objective of turning inventory as quickly as possible, it should at the same time ensure sufficient inventories to satisfy production and sales demands. In other words, the financial manager has to reconcile these two conflicting requirements. Stated differently, the objective of inventory management consists of two counterbalancing parts: **(i)** to minimise investments in inventory, and **(ii)** to meet a demand for the product by efficiently organising the production and sales operations. These two conflicting objectives of inventory management can also be expressed in terms of cost and benefit associated with inventory. That the firm should minimise investment in inventory implies that maintaining inventory involves costs, such that the smaller the inventory, the lower is the cost to the firm. But inventories also provide benefits to the extent that they facilitate the smooth functioning of the firm: the larger the inventory, the better it is from this viewpoint. Obviously, the financial managers should aim at a level of inventory which will reconcile these conflicting elements. That is to say, an optimum level of inventory should be determined on the basis of the trade-off between costs and benefits associated with the levels of inventory.

Costs of Holding Inventory

One operating objective of inventory management is to minimise cost. Excluding the cost of merchandise, the costs associated with inventory fall into two basic categories: **(i)** Ordering or Acquisition or Set-up costs, and **(ii)** Carrying costs. These costs are an important element of the optimum level of inventory decisions.

Ordering cost is the fixed cost of placing and receiving an inventory order.

Ordering Costs This category of costs is associated with the acquisition or ordering of inventory. Firms have to place orders with suppliers to replenish inventory of raw materials. The expenses involved are referred to as **ordering costs**. Apart from placing orders outside, the various pro-duction departments have to acquire materials from the stores. Any

expenditure involved here is also a part of the ordering cost. Included in the ordering costs are costs involved in **(i)** preparing a purchase order or requisition form and **(ii)** receiving, inspecting, and recording the goods received to ensure both quantity and quality. The cost of acquiring materials consists of clerical costs and costs of stationery. It is, therefore, called a *set-up cost*. They are generally fixed *per order placed*, irrespective of the amount of the order. The larger the orders placed, or the more frequent the acquisition of inventory made, the higher are such costs. From a different perspective, the larger the inventory, the fewer are the acquisitions and the smaller/lower are the order costs. The acquisition costs are inversely related to the size of inventory: they decline with the level of inventory. Thus, such costs can be minimised by placing fewer orders for a larger amount. But acquisition of a large quantity would increase the cost associated with the maintenance of inventory, that is, carrying costs.

Carrying costs are the variable costs per unit of holding an item in inventory for a specified time period.

Carrying Costs The second broad category of costs associated with inventory are the **carrying costs**. They are involved in maintaining or carrying inventory. The cost of holding inventory may be divided into two categories:

1. Those that Arise Due to the Storing of Inventory The main components of this category of carrying costs are **(i)** storage cost, that is, tax, depreciation, insurance, maintenance of the building, utilities and janitorial services; **(ii)** insurance of inventory against fire and theft; **(iii)** deterioration in inventory because of pilferage, fire, technical obsolescence, style obsolescence and price decline; **(iv)** serving costs, such as, labour for handling inventory, clerical and accounting costs.

2. The Opportunity Cost of Funds This consists of expenses in raising funds (interest on capital) to finance the acquisition of inventory. If funds were not locked up in inventory, they would have earned a return. This is the opportunity cost of funds or the financial cost component of the cost.

The carrying costs and the inventory size are positively related and move in the same direction. If the level of inventory increases, the carrying costs also increase and *vice-versa*.

Total cost is the sum of the ordering costs and carrying costs of inventory.

The sum of the order and carrying costs represents the **total cost** of inventory. This is compared with the benefits arising out of inventory to determine the optimum level of inventory.

Benefits of Holding Inventory

The second element in the optimum inventory decision deals with the benefits associated with holding inventory. The major benefits of holding inventory are the basic functions of inventory. In other words, inventories perform certain basic functions which are of crucial importance in the firm's production and marketing strategies.

The basic function of inventories is to act as a buffer to decouple or uncouple the various activities of a firm so that all do not have to be pursued at exactly the same rate[3]. The key activities are **(1)** purchasing, **(2)** production, and **(3)** selling. The term *uncoupling* means that these interrelated activities of a firm can be carried on independently. Without inventories, purchasing and production would be completely controlled by the sales schedules. If the sales of a firm increases, these two would also increase and *vice-versa*. In other words,

purchase and production functions would depend upon the level of sales. It is, of course, true that in the long run, the purchasing and production activities are and, in fact, should be tied to the sales activity of a firm. But, if in the short term they are rigidly related, the three key activities cannot be carried out efficiently. Inventories permit short-term relaxation so that each activity may be pursued efficiently. Stated differently, *inventories enable firms in the short run to produce at a rate greater than purchase of raw materials and vice-versa, or to sell at a rate greater than production and vice-versa.*

Since inventory enables uncoupling of the key activities of a firm, each of them can be operated at the most efficient rate. This has several beneficial effects on the firm's operations. In other words, three types of inventory, raw materials, work-in-process and finished goods, perform certain useful functions. Alternatively, rigid tying (coupling) of purchase and production to sales schedules is undesirable in the short run as it will deprive the firms of certain benefits. The effect of uncoupling (maintaining inventory) are as follows.

Benefits in Purchasing If the purchasing of raw materials and other goods is not tied to production/sales, that is, a firm can purchase independently to ensure the most efficient pur-chase, several advantages would become available. In the first place, a firm can purchase larger quantities than is warranted by usage in production or the sales level. This will enable it to avail of discounts that are available on bulk purchases. Moreover, it will lower the ordering cost as fewer acquisitions would be made. There will, thus, be a significant saving in the costs. Second, firms can purchase goods before anticipated or announced price increases. This will lead to a decline in the cost of production. Inventory, thus, serves as a hedge against price increases as well as shortages of raw materials. This is a highly desirable inventory strategy.

Benefits in Production Finished goods inventory serves to uncouple production and sale. This enables production at a rate different from that of sales. That is, production can be carried on at a rate higher or lower than the sales rate. This would be of special advantage to firms with seasonal sales pattern. In their case, the sales rate will be higher than the production rate during a part of the year (peak season) and lower during the off-season. The choice before the firm is either to produce at a level to meet the actual demand, that is, higher production during peak season and lower (or nil) production during off-season, or, produce continuously throughout the year and build up inventory which will be sold during the period of seasonal demand. The former involves discontinuity in the production schedule while the latter ensures level production. The level production is more economical as it allows the firm to reduce the cost of discontinuities in the production process. This is possible because excess production is kept as inventory to meet future demands. Thus, inventory helps a firm to coordinate its production scheduling so as to avoid disruptions and the accompanying expenses.[4] In brief, since inventory permits *least cost* production scheduling, production can be carried on more efficiently.

Benefits in Work-in-Process The inventory of work-in-process performs two functions. In the first place, it is necessary because production processes are not instantaneous. The amount of such inventory depends upon technology and the efficiency of production. The larger the steps involved in the production process, the larger the work-in-process inventory and *vice-versa.* By shortening the production time, efficiency of the production process can be improved and the size of this type of inventory reduced. In a multi-stage production process, the work-in-process inventory serves a second purpose also. It uncouples the various stages of production so that all of them do not have to be performed at the same rate. The stages involving higher

set-up costs may be most efficiently performed in batches with a work-in-process inventory accumulated during a production run.[5]

Benefits in Sales The maintenance of inventory also helps a firm to enhance its sales efforts. For one thing, if there are no inventories of finished goods, the level of sales will depend upon the level of current production. A firm will not be able to meet demand instantaneously. There will be a lag depending upon the production process. If the firm has inventory, actual sales will not have to depend on lengthy manufacturing processes. Thus, inventory serves to bridge the gap between current production and actual sales. A related aspect is that inventory serves as a competitive marketing tool to meet customer demands. A basic requirement in a firm's competitive position is its ability *vis-a-vis* its competitors to supply goods rapidly. If it is not able to do so, the customers are likely to switch to suppliers who can supply goods at short notice. Inventory, thus, ensures a continued patronage of customers. Moreover, in the case of firms having a seasonal pattern of sales, there should be a substantial finished goods inventory prior to the peak sales season. Failure to do so may mean loss of sales during the peak season.

To summarise the preceding discussion relating to the objective of inventory management, the two main aspects pertain to the minimisation of investment in inventory, on the one hand, and the need to ensure that there is enough inventory to meet demand such that production and sales operations are smooth. They are often in conflict with each other. By holding less inventory, cost can be minimised, but there is a risk that the operations will be disturbed as the emerging demands cannot be met. On the other hand, by holding a large inventory, the chances of disruption of operations are reduced, but, the cost will increase. The appropriate level of inventory should be determined in terms of a trade-off between the benefits and costs associated with maintaining inventory.

SECTION 2 TECHNIQUES

In the preceding section the objectives of inventory management have been outlined. The financial managers should aim at an optimum level of inventory on the basis of the trade-off between cost and benefit to maximise the owner's wealth. Many sophisticated mathematical techniques are available to handle inventory management problems. But they are more appropriately a part of production management and lie outside the scope of this book. Nevertheless, they involve in-built financial costs. The financial managers should, therefore, be familiar with them. We have discussed in this section some simple production-oriented methods of inventory control to indicate a broad framework for managing inventories efficiently in conformity with the goal of wealth-maximisation. The major problem—areas that comprise the heart of inventory control[5] are **(i)** the *classification problem* to determine the type of control required, **(ii)** the *order quantity problem*, **(iii)** *the order point problem*, and **(iv)** *safety stocks*.

A B C system is an inventory management technique that divides inventory into three categories of descending importance based on the rupee investment in each.

Classification Problem: A B C System

The first step in the inventory control process is classification of different types of inventories to determine the type and degree of control required for each. The **A B C** system is a widely-used classification technique to identify various items of inventory for purposes of inventory control. This

technique is based on the assumption that a firm should not exercise the same degree of control on all items of inventory. It should rather keep a more rigorous control on items that are **(i)** the most costly, and/or **(ii)** the slowest-turning, while items that are less expensive should be given less control effort.

On the basis of the cost involved, the various inventory items are, according to this system, categorised into three classes: **(i)** A **(ii)** B and **(iii)** C. The items included in group A involve the largest investment. Therefore, inventory control should be the most rigorous and intensive and the most sophisticated inventory control techniques should be applied to these items. The C group consists of items of inventory which involve relatively small investments although the number of items is fairly large. These items deserve minimum attention. The B group stands midway. It deserves less attention than A but more than C. It can be controlled by employing less sophisticated techniques.

The task of inventory management is to properly classify all the inventory items into one of these three groups/categories. The typical breakdown of inventory items is as shown in Table 13.1[7].

TABLE 13.1 Inventory Breakdown between Number of Items and Inventory Value

Group	*Number of items (per cent)*	*Inventory value (per cent)*
A	15	70
B	30	20
C	55	10
Total	100	100

Some points stand out from Table 13.1. While group A is the least important in terms of the number of items, it is by far the most important in terms of the investments involved. With only 15 per cent of the number, it accounts for as much as 70 per cent of the total value of inventory. The firm should direct most of its inventory control efforts to the items included in this group. The items comprising B group account for 20 per cent of the investments in inventory. They deserve less attention than A, but more than C, which involves only 10 per cent of the total value although number-wise its share is as high as 55 per cent. The A B C analysis is illustrated in Example 13.1.

Example 13.1

A firm has 7 different items in its inventory. The average number of each of these items held, alongwith their units costs, is listed below. The firm wishes to introduce an A B C inventory system. Suggest a breakdown of the items into A, B, and C classifications.

Item number	*Average number of units in inventory*	*Average cost per unit*
1	20,000	Rs 60.80
2	10,000	102.40
3	32,000	11.00
4	28,000	10.28
5	60,000	3.40
6	30,000	3.00
7	20,000	1.3

Solution

The A B C analysis is presented in Table 13.2.

TABLE 13.2 ABC Analysis

Item (1)	*Units* (2)	*Per cent of total* (3)		*Unit cost* (4)	*Total cost* (5)	*Per cent of total* (6)	
1	20,000	10	15	Rs 60.80	Rs 12,16,000	38.00	70
2	10,000	5		102.40	10,24,000	32.00	
3	32,000	16	30	11.00	3,52,000	11.00	20
4	28,000	14		10.28	2,88,000	9.00	
5	60,000	30	55	3.40	2,04,000	6.38	10
6	30,000	15		3.00	90,000	2.80	
7	20,000	10		1.30	26,000	0.82	
Total	2,00,000	100			32,00,000	100.00	

The A B C system of classification should, however, be used with caution. For example, an item of inventory may be very inexpensive. Under the A B C system it would be classified into C category. But it may be very critical to the production process and may not be easily available. It deserves the special attention of management. But in terms of the A B C framework, it would be included in the category which requires the least attention. This is a limitation of the A B C analysis.

Order Quantity Problem: Economic Order Quantity (EOQ) Model

After various inventory items are classified on the basis of the A B C analysis, the management becomes aware of the type of control that would be appropriate for each of the three categories of the inventory items. The A group of items warrants the maximum attention and the most rigorous control. A key inventory problem particularly in respect of the Group A items relates to the determination of the size or quantity in which inventory will be acquired. In other words, while purchasing raw materials or finished goods, the questions to be addressed are[8]: *How much inventory should be bought in one lot under one order on each replenishment? Should the quantity to be purchased be large or small? Or, should the requirement of materials during a given period of time (say, six months or one year) be acquired in one lot or should it be acquired in instalments or in several small lots?* Such inventory problems are called order quantity problems.

The determination of the appropriate quantity to be purchased in each lot to replenish stock as a solution to the order quantity problem necessitates resolution of conflicting goals. Buying in large quantities implies a higher average inventory level which will assure **(i)** smooth production/sale operations, and **(ii)** lower ordering or set-up costs. But it will involve higher carrying costs. On the other hand, small orders would reduce the carrying cost of inventory by reducing the average inventory level but the ordering costs would increase as there is a likelihood of interruption in the operations due to stock-outs. A firm should place neither too large nor too small orders. On the basis of a trade-off between benefits derived from the availability of inventory and the cost of carrying that level of inventory, the appropriate or optimum level of the order to be placed should be determined. The optimum level of

Economic order quantity (EOQ) model is the inventory management technique for determining optimum order quantity which is the one that minimises the total of its order and carrying costs; it balances fixed ordering costs against variable ordering costs.

inventory is popularly referred to as the **economic order quantity** (EOQ). It is also known as the *economic lot size*. The economic order quantity may be defined as *that level of inventory order that minimises the total cost associated with inventory management*. As explained in the earlier section dealing with the objectives of inventory management, the costs associated with inventories are (i) ordering costs, and (ii) carrying costs. Stated with reference to cost perspectives, EOQ refers to *the level of inventory at which the total cost of inventory comprising acquisition/ ordering/set-up costs and carrying cost is minimal.*

For analysing the EOQ, as an inventory management technique, several sophisticated mathematical models are available.[9] These are, however, outside the scope of this book. We illustrate here the analysis of EOQ on the basis of simple non-mathematical approach. Nevertheless, the main ele-ments of the order quantity problem are covered by the analytical method followed here.

Assumptions The EOQ model, as the technique to determine the economic order quantity, illus-trated by us, is based on three restrictive assumptions:

1. The firm knows with certainty the annual usage (consumption) of a particular item of inventory.
2. The rate at which the firm uses inventory is steady over time.
3. The orders placed to replenish inventory stocks are received at exactly that point in time when inventories reach zero.

In addition, it may also be assumed that ordering and carrying costs are constant over the range of possible inventory levels being considered.

Approaches The EOQ model can be illustrated by **(i)** the long analytical approach or trial and error approach, and **(ii)** the short cut or simple mathematical approach.

Trial and Error (Analytical) Approach Given the total requirements of inventory during a given period of time depending upon the inventory planning horizon, a firm has different alternatives to purchase its inventories. For instance, it can buy its entire requirements in one single lot at the beginning of the inventory planning period. Alternatively, the inventories may be procured in small lots periodically, say, weekly, monthly, quarterly, six-monthly and so on. If the purchases are made in one lot, the average inventory holdings would be relatively large whereas it would be relatively small when the acquisition of inventory is in small lots: the smaller the lot, the lower is the average inventory and *vice-versa*. High average inventory would involve high carrying costs. On the other hand, low inventory holdings are associated with high ordering cost. The trial and error or long analytical approach for the determination of EOQ uses different permutations and combinations of lots of inventory purchases so as to find out the least ordering and carrying cost combination. In other words, according to this approach, the carrying and acquisition costs for different sizes of orders to purchase inventories are computed and the order size with the lowest total cost (ordering plus carrying) of inventory is the economic order quantity. The mechanics of the computation of EOQ with the analytical approach is illustrated in Example 13.2.

Example 13.2

A firm's inventory planning period is one year. Its inventory requirement for this period is 1,600 units. Assume that its acquisition costs are Rs 50 per order. The carrying costs are expected to be Re 1 per unit per year for an item.

The firm can procure inventories in various lots as follows: **(i)** 1,600 units, **(ii)** 800 units, **(iii)** 400 units, **(iv)** 200 units, and **(v)** 100 units. Which of these order quantities is the economic order quantity?

Solution

The calculations of the inventory costs for different order quantities are shown in Table 13.3.

TABLE 13.3 Inventory Cost for Different Order Quantities

1. Size of order (units)	1,600	800	400	200	100
2. Number of orders	1	2	4	8	16
3. Cost per order (Rs)	50	50	50	50	50
4. Total ordering cost (2 × 3) (Rs)	50	100	200	400	800
5. Carrying cost per unit (Rs)	1	1	1	1	1
6. Average inventory (units)	800	400	200	100	50
7. Total carrying cost (5 × 6) (Rs)	800	400	200	100	50
8. Total cost (4 + 7) (Rs)	850	500	400	500	850

It can be seen from Table 13.3 that the carrying and ordering costs taken together are the lowest for the order size of 400 units. This, therefore, is the economic order quantity.

Working Notes

(i) Number of orders = Total inventory requirement/order size

(ii) Average inventory = Order size/2

The calculation of EOQ is further developed in Example 13.3.

Example 13.3

The following details are available in respect of a firm:

1. Inventory requirement per year, 6,000 units
2. Cost per unit (other than carrying and ordering costs), Rs 5
3. Carrying costs per item for one year, Re 1
4. Cost of placing each order, Rs 60
5. Alternative order sizes: (units) 6,000, 3,000, 2,000, 1,200, 1,000, 600 and 200.

Determine the economic order quantity.

Solution

The EOQ is determined in Table 13.4.

TABLE 13.4 Determination of Economic Order Quantity

1. Cost of items purchased each year (*Rs*)	30,000	30,000	30,000	30,000	30,000	30,000	30,000
2. Order size (*units*)	6,000	3,000	2,000	1,200	1,000	600	200
3. Number of orders	1	2	3	5	6	10	30
4. Average inventory (*units*)	3,000	1,500	1,000	600	500	300	100
5. Total carrying costs (*Rs*)	3,000	1,500	1,000	600	500	300	100
6. Total ordering costs (*Rs*)	60	120	180	300	360	600	1,800
7. Total cost (carrying plus ordering cost) (*Rs*)	3,060	1,620	1,180	900	860	900	1,900
8. Total cost (*Rs*)	33,060	31,620	31,180	30,900	30,860	30,900	31,900

Clearly, the EOQ is 1,000 units.

Working Notes

(i) Number of orders = Demand per year/order size
(ii) Average inventory = Order size/2
(iii) Total carrying cost = Average inventory × Carrying cost per unit
(iv) Total ordering cost = Number of orders × Cost per order
(v) Total cost = Cost of items purchased + Total carrying and ordering costs

Mathematical (Short cut) Approach The economic order quantity can, using a short-cut method, be calculated by the following equation:

$$EOQ = \sqrt{\frac{2AB}{C}} \qquad \textbf{(13.1)}$$

where A = Annual usage of inventory (units),
B = Buying cost per oder, and
C = Carrying cost per unit

Example 13.4

Using the facts in Example 13.2, find out the EOQ by applying the short-cut mathematical approach.

Solution

$$EOQ = \sqrt{\frac{2 \times 1{,}600 \times 50}{1}} = 400 \text{ units}$$

Limitations While using the EOQ model, it should be noted that it suffers from shortcomings which are mainly due to the restrictive nature of the assumptions on which it is based. The important limitations are explained below.

The assumption of a constant consumption/usage and the instantaneous replenishment of inventories are of doubtful validity. As discussed subsequently, deliveries from suppliers may be slower than expected for reasons beyond control. It is also possible that there may be an unusual and unexpected demand for stocks. To meet such contingencies, firms have to keep additional inventories which are known as *safety* stocks.

Another weakness of the EOQ model is that the assumption of a *known annual demand* for inventories is open to question. There is likelihood of a discrepancy between the actual and the expected demand, leading to a wrong estimate of the economic order quantity.

In addition, there are some computational problems involved. For instance, Equation 13.1 may give the EOQ in fractions, say, 232.5 units. A more difficult situation may occur when the number of orders to be placed may turn out to be a fraction.

Order Point Problem

The EOQ technique determines the size of an order to acquire inventory so as to minimise the carrying as well as the ordering costs. In other words, the EOQ provides an answer to the question: how much inventory should be ordered in one lot? Another important question pertaining to efficient inventory management is: when should the order to procure inventory be placed? This aspect of inventory management is covered under the reorder point problem.

The reorder point is stated in terms of the level of inventory at which an order should be placed for replenishing the current stock of inventory. In other words, **reorder point** may be

defined as the level of inventory when fresh order should be placed with the suppliers for procuring additional inventory equal to the economic order quantity. Although some sophisticated reorder point formula are available, they are outside the scope of this book. We have, therefore, used a simple formula to calculate the reorder point. It is based on the following assumptions: **(i)** constant daily usage of inventory, and **(ii)** fixed lead time. In other words, the formula assumes conditions of certainty.

Reorder point is the point at which to order inventory expressed equationally as: lead time in days × daily usage.

The reorder point = Lead time in days × average daily usage of inventory **(13.2)**

The term **lead time** refers to the time normally taken in receiving the delivery after placing orders with the suppliers. It covers the time-span from the point when a decision to place the order for the procurement of inventory is made to the actual receipt of the inventory by the firm. Another way of saying it is that the lead time consists of the number of days required by the suppliers to receive and process the order as well as the number of days during which the goods will be in transit from the supplier. The lead time may also be called as the procurement time of inventory.

Lead time is time normally taken in receiving delivery after placing orders with suppliers.

The average usage means the quantity of inventory consumed daily. *We can, therefore, define reorder point as the inventory level which should be equal to the consumption during the lead time.*

The average consumption (daily usage) of inventory of a firm is 5,000 units. The number of days required to receive the delivery of inventory after placing order (lead i.e. processing and transit time) is 15 days. The reorder point = 5,000 units × 15 days = 75,000 units. The implication is that the firm should place an order for replenishing the stock of inventory as soon as the level reaches 75,000 units. The size of the order would obviously be equal to the EOQ.

Safety Stock

The economic order quantity and the reorder point, as inventory management techniques, have been explained, to keep the discussion simple, on the assumption of *certainty conditions*. That is to say, we had assumed **(i)** constant/fixed usage/requirement of inventory, and **(ii)** instantaneous replenishment of inventory. The assumptions are, however, of questionable validity in actual situations, that is, under conditions of uncertainty. For instance, the demand for inventory is likely to fluctuate from time to time. In particular, at certain points of time the demand may exceed the anticipated level. In other words, a discrepancy between the assumed (anticipated/expected) and actual usage rate of inventory is likely to occur in practice. Similarly, the receipt of inventory from the suppliers may be delayed beyond the expected lead time. The delay may arise from strikes, floods, transportation and other bottlenecks. Thus, a firm would come across situations in which the actual usage of inventory is higher than the anticipated level and/or the delivery of the inventory from the suppliers is delayed.

The effect of increased and/or slower delivery would be a shortage of inventory. That is, the firm would face a stock-out situation. This, in turn, as explained in detail below, would disrupt the production schedule and alienate the customers. The firm would, therefore, be well-advised to keep a sufficient safety margin by having additional inventory to guard against

Safety stock implies extra inventories that can be drawn down when actual lead time and/or usage rates are greater than expected.

stock-out situations. Such stocks are called **safety stocks**. This would act as a buffer or cushion against a possible shortage of inventory caused either by increased usage or delayed delivery of inventory. The safety stock may, then, be defined as the *minimum additional inventory to serve as a safety margin or buffer or cushion to meet an unanticipated increase in usage resulting from an unusually high demand and or an uncontrollable late receipt of incoming inventory.*

How can a financial manager determine the safety stock? What is his responsibility? The safety stock involves two types of costs: **(i)** stock-out, and **(ii)** carrying costs. The job of the financial manager is to determine the appropriate level of safety stock on the basis of a trade-off between these two types of conflicting costs.

The term *stock-out costs* refers to the cost associated with the shortage (stock-out) of inventory. It is, in fact, an opportunity cost in the sense that due to the shortage of inventory the firm would be deprived of certain benefits. The denial of those benefits which would otherwise be available to the firm are the stock-out costs. The first, and the most obvious, of these cots is the loss of profit which the firm could have earned from increased sales if there was no shortage of inventory. Another category of stock-out costs is the damage to the relationship with the customers.[10] Owing to shortage of inventory, the firm would not be able to meet the customer's requirements and the latter may turn to the firm's competitors. It should, of course, be clearly understood that this type of cost cannot be easily and precisely quantified. Last, the shortage of inventory may disrupt the production schedule of the firm. The production process would grind to a halt involving idle time.

The carrying costs, as already explained in the earlier part of this chapter, are the costs associated with the maintenance of inventory. Since the firm is required to maintain additional inventory, in excess of the normal usage, additional carrying costs are involved.

The stock-out and the carrying costs are counterbalancing. The larger the safety stock, the larger would be the carrying costs and *vice-versa*. Conversely, the larger is the safety stock, the smaller would be the stock-out costs. In other words, if the firm minimises the carrying costs, the stock-out costs are likely to rise; on the other hand, an attempt to minimise the stock-out costs implies increased carrying costs. The object of the financial managers should be to have the lowest total cost (i.e. carrying cost plus stock-out cost). The safety stock with the minimum carrying and stock-out costs is the economic (appropriate) level which financial managers should aim at. In brief, the appropriate level of safety stock is determined by the trade-off between the stock-out and the carrying costs. We illustrate in Example 13.5, using a simple method,[11] the determination of the optimum (least-cost) safety stock.

Example 13.5

The experience of a firm being out of stock is summarised below:

(a) *Stock-out (number of units)*	*Number of times*
500	1 (1)
400	2 (2)
250	3 (3)
100	4 (4)
50	10 (10)
0	80 (80)
Total	100 (100)

Figures in brackets represents percentage of time the firm has been out of stock.

(b) Assume that the stock-out costs are Rs 40 per unit.
(c) The carrying cost of inventory per unit is Rs 20.
Determine the optimum level of stock-out inventory.

Solution

TABLE 13.5 Computation of Expected Stock-out Costs

Safety stock level (units)	*Stock-out (units)*	*Stock-out costs (Rs 40 per unit)*	*Probability of stock-out*	*Expected stock-out cost at this level*	*Total expected stock-out cost*
(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
500	0	0	0	0	0
400	100	Rs 4,000	0.01	Rs 40	Rs 40
250	250	10,000	0.01	100	
	150	6,000	0.02	120	220
100	400	16,000	0.01	160	
	300	12,000	0.02	240	
	150	6,000	0.03	180	580
50	450	18,000	0.01	180	
	350	14,000	0.02	280	
	200	8,000	0.03	240	
	50	2,000	0.04	80	780
0	500	20,000	0.01	200	
	400	16,000	0.02	320	
	250	10,000	0.03	300	
	100	4,000	0.04	160	
	50	2,000	0.10	200	1,180

Working Notes

(i) The determination of the optimum safety stock involves dealing with *uncertain* demand. The first step, therefore, is to estimate the probability of being out of stock as well as the size of stock-out in terms of the shortage of inventory at different levels of safety stock.

Size of stock-out (units) The shortage of inventory at different levels of safety stock can be computed as follows:

(a) The firm's experience has been that it has been short of inventory by 500 units only once in 100 times. If, therefore, the level of safety stock is 500 units, it will never be short of inventory. It means that with 500 units of safety stock, the size of stock-out would be zero.
(b) When the firm has a safety stock of 400 units, it could be short by 100 units.
(c) Further, with 250 units of safety stock, the firm could be short by 250 units if the actual demand turns out to be 500 units greater than expected; 150 units short if the demand turn out to be 400 units greater than expected. Thus, the size of stock-out could be 250 units or 150 units depending upon the level of actual demand.
(d) It should be obvious that the size of stock-out increases with a decrease in the level of safety stock. The size of the stock-out for safety stock levels of 100 units, 50 units and 0 units can be computed on the lines of step (c).

The stock-out size at different safety stock levels is computed in column (2) of Table 13.5.

Probability of Stock-out The probability of stock-out at different levels of safety stock can be computed as follows:

(a) If the safety stock of the firm is 500 units, there is no chance of the firm being out of stock. The probability of stock-out is, therefore, zero.

(b) When the safety stock is 400 units, there is 1 per cent chance that the firm will be short of inventory. The probability of stock-out is, therefore, 0.01.

(c) The probability of stock-out for other levels of safety stock is similarly computed in column (4) of Table 13.5.

(ii) After the determination of the size and probability of stock-out, the next step is the calculation of the stock-out cost. The expected stock-out cost can be found out by multiplying the stock-out cost and the probability of stock-out.

When the stock-out is expected to be 100 units (safety stock being 400 units), the stock-out cost would be 100 × Rs 40 = Rs 4,000. But the probability of stock-out of this size is only 0.01. Therefore, the expected cost stock-out would be Rs 4,000 × 0.01 = Rs 40. For other levels of safety stock, the expected stock-out cost can be similarly computed (column 5 of Table 13.5).

(iii) The next step is to compute the total expected stock-out costs (column 6 of Table 13.5).

(iv) Then, the carrying costs should be calculated. The carrying costs are equal to the safety stock multiplied by the carrying costs per unit. (Table 13.6 column 3).

TABLE 13.6 Computation of Total Safety Stock Costs

Safety stock level (units) (1)	*Expected stock-out costs** (2)	*Carrying costs (Rs 20 per unit)* (3)	*Total safety stock cost* (4) (2 + 3)
0	Rs 1,180	0	Rs 1,180
50	780	Rs 1,000	1,780
100	580	2,000	2,580
250	220	5,000	5,220
400	40	8,000	8,040
500	0	10,000	10,000

*from Table 13.5 column 6.

(v) Finally, the carrying costs and the expected stock-out costs at each safety stock level should be added (Table 13.6, column 4). The optimum safety stock would be that level of inventory at which total of these two costs is the lowest.

Thus, the optimum safety stock is zero units.

Summary

- Inventory refers to the stockpile of the products a firm would sell in future in the normal course of business operations and the components that make up the product. The firm stores three types of inventories, namely, raw materials, work-in-process/semi-finished goods and finished good.
- The management of inventory is different from the management of other current assets in that virtually all the functional areas are involved. The job of the finance manager is to reconcile the conflicting viewpoints of the various functional areas regarding the appropriate inventory levels.
- The objectives of inventory management consists of two counterbalancing parts: **(i)** to minimise investments in inventory and **(ii)** to meet the demand for products by efficiently organising the production and sales operations. In operational terms, the goal of inventory management is to have a trade-off between these two conflicting objectives which can be expressed in terms of costs and benefits associated with different levels of inventory.
- The costs of holding inventory are ordering costs and carrying costs. While ordering costs are associated with the acquisition or ordering of inventory, carrying costs arise due to the storing of inventory. The major benefits of holding inventory are in the area of purchasing, production and sales. The total cost of inventory are to be compared with the total benefits arising out of inventory to determine its optimum level.
- There are four decision areas in inventory management: **(i)** classification problem, **(ii)** order quantity problem, **(iii)** order point problem and **(iv)** safety stock.
- The ABC system is a widely-used classification technique to identify various items of inventory for purposes of inventory control. On the basis of the cost involved, the various items are classified into three categories: **(i)** A, consisting of items with the large investment, **(ii)** C, with relatively small investments but fairly large number of items and **(iii)** B, which stands mid-way between category A and C. Category A needs the most rigorous control, C requires minimum attention and B deserves less attention than A but more than C.
- The order quantity problem relates to the determination of the quantity of inventory which should be ordered. The economic order quantity (EOQ) is that level of inventory order which minimises the total cost associated with inventory management. Symbolically, EOQ = $\sqrt{2AB/C}$.
- The re-order point is that level of inventory when a fresh order should be placed with suppliers to procure additional inventory equal to the EOQ. It is that inventory level which is equal to the consumption during the lead time plus safety stock.
- Safety stocks are the minimum additional inventory which serve as a safety margin to meet an unanticipated increase in usage resulting from an unusually high demand and/or an uncontrollable late receipt of incoming inventory.

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Practical Problems

P.13.1 The following details are available in respect of a firm:

Annual requirement of inventory, 40,000 units
Cost per unit (other than carrying and ordering cost), Rs 16
Carrying costs are likely to be 15 per cent per year
Cost of placing order, Rs 480 per order

Determine the economic order quantity.

Solution $\text{EOQ} = \sqrt{\frac{2AB}{C}} = \sqrt{\frac{2 \times 40{,}000 \times \text{Rs } 480}{\text{Rs } 2.40}} = 4{,}000 \text{ units}$

C = Rs 16 × 0.15 = Rs 2.40

P.13.2 Economic Enterprises require 90,000 units of certain items annually. The cost per unit is Rs 3. The cost per purchase order is Rs 300 and the inventory carrying cost is Rs 6 per unit per year.

(a) What is the EOQ?

(b) What should the firm do if the suppliers offer discounts as detailed below:

Order quantity	*Discount*
4,500 – 5,999	2 per cent
6,000 and above	3

Solution

(a) EOQ $= \sqrt{\frac{2AB}{C}} = \sqrt{\frac{2 \times 90{,}000 \times \text{Rs } 300}{\text{Rs } 6}} = 3{,}000 \text{ units}$

(b) Determination of optimal order quantity

1. Order size (units)	3,000	4,500	6,000
2. Average inventory (units)	1,500	2,250	3,000
3. Annual requirements (units)	90,000	90,000	90,000
4. Number of orders	30	20	15
5. Price per unit (Rs)	3	2.94[a]	2.91[b]
6. Cost of purchase (Rs)	2,70,000	2,64,600	2,61,900
7. Carrying cost @ Rs 6 per unit (Rs)	9,000	13,500	18,000
8. Total ordering cost (Rs)	9,000	6,000	4,500
9. Total cost (6 + 7 + 8)	2,88,000	2,84,100	2,84,400

[a][(3) – (2%)]: [b][(3) – (3%)]

The total cost is minimum at the order size of 4,500 units and, therefore, the firm should place order for 4,500 units.

P.13.3 Two components, A and B are, used as follows:

Normal usage	:	50 units each per week
Minimum usage	:	25 units each per week
Maximum usage	:	75 units each per week
Re-order quantity	:	A: 300 units; B: 500 units
Re-order period	:	A: 4 to 6 weeks; B: 2 to 4 weeks

Calculate for each component:

(a) Reorder level
(b) Minimum level
(c) Maximum level
(d) Average stock level.

Solution

(a) Reorder level = (maximum usage × maximum delivery time)
A = 75 × 6 weeks = 450 units
B = 75 × 4 weeks = 300 units

(b) Minimum level = Reorder level – (normal usage × average delivery time in weeks)
A = 450 units – (50 units × 5 weeks) = 200 units
B = 300 units – (50 units × 3 weeks) = 150 units

(c) Maximum level = Reorder level – (minimum usage × minimum delivery time) + reorder quantity
A = 450 units – (25 × 4) + 300 units = 650 units
B = 300 units – (25 × 2) + 500 units = 750 units

(d) Average stock level = minimum level $+\left(\frac{\text{Reorder quantity}}{2}\right)$

A = $200 + \frac{300}{2}$ = 350 units

B = $150 + \frac{500}{2}$ = 400 units

P.13.4 Good Luck Company estimates its carrying cost at 15 per cent and its ordering cost at Rs 9 per order. The estimated annual requirement is 38,000 units at a price of Rs 4 per unit. What is the most economical number of units to order and how often will an order need to be placed?

Solution

(i) $\textbf{EOQ} = \sqrt{\frac{2AB}{C}} = \sqrt{\frac{2 \times 38{,}000 \times \text{Rs } 9}{0.6}} = 1{,}068.$

(ii) Time after which an order is to be placed is given by the following formula (in days):

$$= \frac{\text{EOQ}}{\text{Per day consumption (annual usage } \div \text{ 365 days)}} = \frac{1{,}068}{104.11\,(38{,}000 \div 365 \text{ days})} = 10 \text{ days}$$

Working Notes

$$\text{Total carrying cost} = 38{,}000 \text{ units} \times \text{Rs } 4 \times \frac{15}{100} = \text{Rs } 22{,}800$$

$$\text{Carrying cost per unit} = \frac{\text{Rs } 22{,}800}{38{,}000} = \text{Re } 0.60$$

P.13.5 A manufacturer buys casting equipment from outside suppliers @ Rs 30 per unit. Total annual needs are 800 units. The following further data are available:

Annual return on investment, 10 per cent
Rent, insurance, taxes per unit per year, Re 1
Cost of placing an order, Rs 100

Determine the economic order quantity.

Solution

$$\textbf{EOQ} = \sqrt{\frac{2AB}{C}} = \sqrt{\frac{2 \times 800 \times 100}{4}} = 200 \text{ units}$$

$$\text{Total interest cost} = \frac{800 \times \text{Rs } 30 \times 10}{100} = \text{Rs } 2{,}400$$

$$\text{Interest cost per unit} = \frac{\text{Rs } 2{,}400}{800} = \text{Rs } 3$$

Rs 3 + other carrying costs (rent, insurance, taxes) per unit that is, Re 1 per unit.

Carrying cost per unit = Rs 4.

P.13.6 The Peekay Company has been buying a given item in lots of 1.200 units which is a six months' supply, the cost per units is Rs 12, order cost is Rs 8 per order, and carrying cost is 25 per cent. You are required to calculate the savings per year by buying in economical lot quantities.

Solution

$$\textbf{EOQ} = \sqrt{\frac{2AB}{C}} = \sqrt{\frac{2 \times 2{,}400 \times 8}{3}} = 114 \text{ units}$$

$$\text{Total carrying cost} = \frac{2{,}400 \times \text{Rs } 12 \times 25}{100} = \text{Rs } 7{,}200$$

Carrying cost per unit (C) = Rs 7,200 ÷ 2,400 units = Rs 3

Savings due to EOQ

Particulars	*Present*	*With EOQ*
1. Size of order (units)	1,200	114
2. Number of orders	2	22
3. Cost per order (Rs)	8	8
4. Total ordering cost (2 × 3) (Rs)	16	176
5. Carrying cost per unit (Rs)	3	3
6. Average inventory (units)	600	57
7. Total carrying cost (5 × 6) (Rs)	1,800	171
8. Total cost (4 + 7) (Rs)	1,816	347
Differential costs (savings) (Rs)	1,469	

P.13.7 The Ganges Pump Company uses about 75,000 valves per year and the usage is fairly constant at 6,250 per month. The valve costs Rs 1.50 per unit when bought in quantities and the carrying cost is estimated to be 20 per cent of average inventory investment on an annual basis. The cost to place an

order and process the delivery is Rs 18. It takes 45 days to receive delivery from the date of an order and a safety stock of 3,250 valves is desired.

You are required to determine:

(a) The most economical order quantity and frequency of orders.

(b) The order point.

(c) The most economical order quantity if the valves cost Rs 4.50 each instead of Rs 1.50 each.

Solution

(a) EOQ $= \sqrt{\frac{2AB}{C}} = \sqrt{\frac{2 \times 75,000 \times 18}{0.3}} = 3,000$ units

Working Notes

(a) (i)**Total carrying cost** $= \frac{75,000 \times \text{Rs } 1.50 \times 20}{100} = \text{Rs } 22,500$

(ii) **Carrying cost per unit** $= \frac{\text{Rs } 22,500}{75,000} = 0.30$

(b) Order point = (Lead Time × Normal usage during lead time) + Safety stock (1.5 months × 6,250 units per month) + 3,250 units = 12,625 units.

(c) EOQ when cost per valve is Rs 4.50:

$$\textbf{EOQ} = \sqrt{\frac{2AB}{C}} = \sqrt{\frac{2 \times 75,000 \times 18}{0.90}} = 1,733 \text{ units}$$

$$\text{Total carrying cost} = \frac{75,000 \times \text{Rs } 4.50 \times 20}{100} = \text{Rs } 67,500$$

$$\text{Carrying cost per unit} = \frac{\text{Rs } 67,500}{75,000} = 0.90$$

P.13.8 Precision Engineering Factory consumes 50,000 units of a component per year. The ordering, receiving and handling costs are Rs 3 per order while the trucking costs are Rs 12 per order. Further details are as follows: deterioration and obsolescence cost Rs 0.004 per unit per year; interest cost Re 0.06 per unit per year; storage cost Rs 1,000 per year for 50,000 units. Calculate the economic order quality.

Solution

EOQ $= \sqrt{\frac{2AB}{C}} = \sqrt{\frac{2 \times 50,000 \times 15}{0.084}} = 4,226$

Carrying cost per unit:

Interest cost	Re 0.060
Deterioration and obsolescence cost	0.004
Storage cost $\left(\frac{\text{Rs } 1,000}{50,000}\right)$	0.020
Total	0.084

P.13.9 A customer has been ordering 5,000 special design metal columns at the rate of 1,000 per order during the past year. The production cost is Rs 12 a unit – Rs 8 for materials and labour and Rs 4 for overheads (fixed cost). It costs Rs 1,500 to set up for one run of 1,000 columns, and inventory carrying cost is 20 per cent. Since this customer may buy at least 5,000 columns this year, the company would like to avoid making five different production runs. Find the most economic production run.

Solution

Economic production run is given by the formula of EOQ in which B is setting up costs for one production run in place of buying cost per order. Accordingly, economic production run

$$= \sqrt{\frac{2 \times 5{,}000 \times \text{Rs } 1{,}500}{\text{Rs } 2.40}} = 2{,}500$$

P.13.10 Royal Industries manufactures plastic lunch boxes in a moulding process. On an annual basis, the industry manufactures 1,000 plastic lunch boxes at a cost of Rs 4 per unit. The industry's differential costs of carrying the item in the finished goods inventory are 20 per cent of the inventory value per year and the set-up costs per production run is Rs 200. What is the optimum production-run?

Solution The optimum production run is = $\sqrt{\frac{2AB}{C}}$, B = set-up costs per production run

$$= \sqrt{\frac{2 \times 1{,}000 \times 200}{\text{Re } 0.80}} = 707 \text{ units.}$$

P.13.11 M/s Tubes Ltd are the manufacturers of picture tubes for T.V. The following are the details of the operation during the current year.

Average monthly market demand (tubes)	2,000
Ordering cost (per order)	Rs 100
Inventory carrying cost (per cent per annum)	20
Cost of tubes (per tube)	500
Normal usage (tubes per week)	100
Minimum usage (tubes per week)	50
Maximum usage (tubes per week)	200
Lead time to supply (weeks)	6-8

Compute from the above:

1. Economic order quantity. If the supplier is willing to supply quarterly 1,500 units at a discount of 5 per cent, is it worth accepting?
2. Maximum level of stock
3. Minimum level of stock
4. Reorder level

Solution

1. **Economic order quantity**

Annual demand (A) = Normal usage per week × 52 weeks = 100 tubes × 52 = 5,200 tubes.
Ordering cost per order (B) = Rs 100 per order
Inventory carrying cost per unit per annum (C) = Rs 500 × 0.20 = Rs 100 per unit per annum

$$\text{EOQ} = \sqrt{2\,AB/C} = \sqrt{(2 \times 5{,}200 \text{ units} \times \text{Rs } 100) \div \text{Rs } 100} = 102 \text{ tubes}$$

If supplier is willing to supply 1,500 units at a discount of 5 per cent:
Total cost (When order size is 1,500 units) = Cost of 5,200 units + Ordering cost + Carrying cost

$$= [5{,}200 \times (500 \times 0.95)] + \left[(5{,}200/1{,}500) \times \text{Rs } 100) + \left(\frac{1}{2} \times 1{,}500 \times 0.20 \times 475\right)\right]$$

= Rs 24,70,000 + Rs 346.67 + Rs 71,250 = Rs 25,41,596.67

Total cost (when order size is 102 units) = (5,200 × 500) + (5,200/102 × Rs 100)
+ (1/2 × 102 × 0.20 × 500)
= Rs 26,00,000 + Rs 5,098.03 + Rs 5,100 = Rs 26,10,198.03

Since the total cost under quarterly supply of 1,500 units with 5 per cent discount is lower than when order size is 102 units, the offer should be accepted. While accepting this offer, consideration of capital blocked on order size of 1,500 units per quarter has been ignored.

2. **Maximum level of stock** = Reorder level + Reorder quantity
   – (Minimum usage × Minimum reorder period)
   = 1,600 units + 102 units – (50 units × 6 weeks) = 1,402 units
3. **Minimum level of stock** = Reorder level – (Normal usage × Average reorder period)
   = 1,600 units – (100 units × 7 weeks) = 900 units
4. **Reorder level** = Maximum consumption × Maximum reorder period
   = 200 units × 8 weeks = 1,600 units.

P.13.12 Shriram Enterprises manufactures a special product "Zed." The following particulars were collected for the current year.

Monthly demand of Zed, 1000 units
Cost of placing an order, Rs 100
Annual carrying cost per unit, Rs 15
Normal usage, 50 units per week
Maximum usage, 75 units per week
Minimum usage, 25 units per week
Reorder period, 4 to 6 weeks

Compute from the above: **(a)** Reorder quantity, **(b)** Reorder level, **(c)** Minimum level, **(d)** Maximum level, and **(e)** Average stock level.

Solution

(a) Reorder quantity/EOQ = $\sqrt{2\,AB/C} = \sqrt{2 \times 2,600^{*} \times \text{Rs } 100/\text{Rs } 15}$ = 187 units

*Annual demand for input unit of (1,000 × 12) 12,000 Zed = 52 weeks × Normal usage of inputs per week (52 × 50 units) = 2,600 units

(b) Reorder level = (Maximum usage × Maximum delivery time) = (75 units × 6 weeks) = 450 units

(c) Minimum level = Reorder level – (Normal usage × Average delivery time in weeks)
= 450 units – (50 units × 5 weeks) = 200 units

(d) Maximum level = Reorder level – (Minimum usage × Minimum delivery time) + Reorder quantity
= 450 units – (25 units × 4 weeks) + 187 units = 537 units.

(e) Average stock level = (Minimum level + Maximum level)/2 = (200 units + 537 units)/2 = 369 units

P.13.13 The purchase department of an organisation has received an offer of quantity discounts on its order of materials as under:

Price per tonne	*Tonnes*
Rs 1,400	Less than 500
1,380	500 and less than 1,000
1,360	1,000 and less than 2,000
1,340	2,000 and less than 3,000
1,320	3,000 and above

The annual requirement of the material is 5,000 tonnes. The delivery cost per order is Rs 1,200 and the annual stock holding cost is estimated at 20 per cent of the average inventory.

The purchase department wants you to consider the following purchase options and advise which among them will be the most economical order quantity, presenting the information in a tabular form:

The purchase quantity options to be considered are: 400 tonnes, 500 tonnes, 1,000 tonnes, 2,000 tonnes, and 3,000 tonnes

Solution

Determination of economic order quantity (EOQ)

1.	Annual requirements (tonnes)	5,000	5,000	5,000	5,000	5,000
2.	Order size (tonnes)	400	500	1,000	2,000	3,000
3.	Number of orders (1 ÷ 2)*	12.5	10	5	2.5	1.67
4.	Price per tonne (Rs)	1,400	1,380	1,360	1,340	1,320
5.	Cost of inventory (1 × 4) Rs lakh	70	69	68	67	66
6.	Ordering cost (Rs) (No. of orders × Rs 1,200)	15,000	12,000	6,000	3,000	2,004
7.	Average inventory (tonnes)	200	250	500	1,000	1,500
8.	Average inventory (Rs lakh)	2.8	3.45	6.8	13.4	19.8
9.	Carrying cost (0.20 × Average inventory) (Rs lakh)	0.56	0.69	1.36	2.68	3.96
10.	Total cost (5 + 6 + 9) (Rs lakh)	70.71	69.81	69.42	69.71	69.98

*Number of orders can be in fraction figure as per going concern concept.

Recommendation The purchase department is advised to have order size of 1,000 tonnes as at this order size total cost is minimum.

Review Questions

RQ.13.1 Fill in the following blanks:

(i) Finance manager is to _____ of the various functional areas regarding the appropriate inventory levels.

(ii) _____ is fixed cost of placing and receiving an order for acquisition of inventory.

(iii) Costs of holding inventory are referred to as _____.

(iv) _____ is a widely-used classification technique to identify various items of inventory for purposes of inventory control.

(v) While category _____ items warrant the most rigorous control, category _____ items minimum attention.

(vi) _____ is the level of inventory at which total cost of inventory consisting of acquisition/ordering and carrying cost is minimal.

(vii) _____ is the level of inventory at which fresh order for procuring additional inventory is placed.

(viii) _____ refers to the time normally taken in receiving the inventory supplies after placing orders with suppliers.

(ix) _____ is the amount of inventory that needs to be maintained to meet unforeseen situations, say, unanticipated increase in daily usage and increase in lead time.

(x) In EOQ, average inventory is determined dividing _____.

[Answers: (i) Reconcile the conflicting consideration/viewpoints (ii) Ordering costs (iii) Carrying costs (iv) ABC system (v) A, C, (vi) Economic order quantity (vii) Reorder point (viii) Lead time (ix) Safety stock (x) order size/2]

RQ.13.2 What is inventory? Why do firms maintain inventory? What are the objectives of inventory management?

RQ.13.3 What purpose doe safety stock serve? What are the benefits and costs associated with safety stock?

RQ.13.4 What is the financial manager's role in management of inventory?

RQ.13.5 What is meant by the ABC inventory control system? On what key premise is this system based? What are its limitations?

RQ.13.6 Define economic order quantity (EOQ). How can it be computed? What are the limitations of the EOQ model?

Examination Questions

Theory Questions

13.1 Discuss *ABC* system of inventory management. (*Delhi University, 2011*)
13.2 What are the various costs which affect economic order quantity? (*Delhi University, 2007*)
13.3 Explain the assumption of the *EOR* model. (*Delhi University, 2007, 2005*)
13.4 Write short note on inventory management. (*Calcutta University, 2007*)
13.5 What is meant by inventory management? Why is it essential to a business concern? (*Bangalore University, 2006*)
13.6 What do you mean by stock-out? (*Delhi University, 2004*)
13.7 (a) Give the arguments to support the view that dividends are relevant.
(b) Define safety stock. How can safety stock be computed? (*Periyar University, Oct./Nov. 2004*)
13.8 Explain the objectives of inventory management. (*Gujarat University, March-April 2003*)
13.9 What is meant by economic order quantity? What are the various costs which affect economic order quantity? (*Bharatiyar University, April 2001*)
13.10 What assumptions underlie the basic EOQ model? (*Delhi University, 1997*)
13.11 Explain the need for holding inventories. *Bangalore University*)
13.12 What is inventory management? (*Bangalore University*)
13.13 What are consequences of holding excess inventory? (*Bangalore University*)

Numerical Questions

13.1 A firm purchases 2000 units of a particular item per year at a unit cost of Rs 20. The ordering cost is Rs 50 per order and the inventory carrying cost is 25%.
(i) Determine the optimal order quantity and the minimum quantity including purchase cost.
(ii) If a 3% discount is offered by the supplier for purchases in a lot of 1000 or more, should the firm accept the offer? (*Delhi University, 2009*)

Solution

(i) *EOQ*/Optimal order quantity

$$= \sqrt{\frac{2AB}{C}} = \sqrt{\frac{2 \times 2{,}000 \times \text{Rs } 50}{\text{Rs } 5}} = \sqrt{40{,}000} = 200 \text{ units}$$

C = (2,000 units × Rs 20) × 0.25 = Rs 10,000/2,000 units = Rs 5

Minimum total cost when optimal order quantity is 200 units

Particulars	*Amount*
1 Annual usage (units)	2,000
2 Size of order (units)	200
3 Number of orders (1 ÷ 2)	10
4 Cost per order	Rs 50
5 Total ordering cost	Rs 500
6 Carrying cost per unit	Rs 5
7 Average inventory (200/2) in units	100
8 Total carrying cost (6 × 7)	Rs 500
9 Purchase cost (2,000 units × Rs 20)	40,000
10 Total cost (5 + 8 + 9)	41,000

(ii) Determination of total cost when purchases are made in a lot of 1,000

1 Number of orders (2,000/1,000)	2
2 Cost per order	Rs 50
3 Total ordering cost (1 × 2)	100
4 Average inventory 1,000/2 (units)	500
5 Carrying cost per unit[@]	Rs 4.85
6 Total carrying cost	2,425
7 Purchase costs (2,000 × Rs 19.40)	38,800
8 Total cost (3 + 6 + 7)	Rs 41,325

[@](Rs 2,000 × Rs 19.40) × 0.25 = Rs 9,700/2,000 units = Rs 4.85

Recommendation: Since the total cost is higher (when purchases are made in lot of 1000), the firm should not accept the offer.

13.2 *ABC* Ltd. purchases 9,000 units of spare parts for its annual requirement, ordering one month usage at a time. Each spare part costs Rs 20. The ordering cost per order is Rs 15 and the carrying charges are 15% of unit cost. Do you think, it is a correct policy? If not, suggest a more economical purchase policy for the company. Also find out the total annual cost of inventory ordering and carrying.

(*Delhi University, 2008*)

Solution

(i) $EOQ = \sqrt{\frac{2AB}{C}} = \sqrt{\frac{2 \times 9{,}000 \text{ units} \times \text{Rs } 15}{\text{Rs } 3}} = \sqrt{9{,}000} = 300 \text{ units}$

C = Rs 20 × 0.15 = Rs 3

Statement showing total cost to be incurred under current practice and *EOR* basis.

Particulars	*Current practice*	*EOA basis*
1 Annual usage (units)	9,000	9,000
2 Size of order	750	300
3 Number of orders (1 ÷ 2)	12	30
4 Cost per order	Rs 15	Rs 15
5 Total ordering cost (3 × 4)	180	450
6 Carrying cost per unit	Rs 3	Rs 3
7 Average inventory (size or order/2)	375	150
8 Total carrying cost (6 × 7)	1,125	450
9 Total cost (5 + 8)	1,305	900

Suggestion: It would be more economical to place order (as suggested by *EOQ*) 30 times in a year or after 12 days.

13.3 Calculate EOQ from the following information. A limited sells 2,25,000 units of a wrist watch per annum. The unit cost per watch is Rs. 1,000. The cost of placing an order is Rs. 500 and carrying cost is 10 percent. Also find out number of orders to be placed per year.

(Gujarat University, March 2003)

Solution

Calculation of EOQ:

$$\text{EOQ} = \sqrt{\frac{2AB}{C}} = \sqrt{\frac{2 \times 2{,}25{,}000 \times \text{Rs. } 500}{\text{Rs. } 100}} \sqrt{22{,}50{,}000} = 1{,}500 \text{ units}$$

Carrying cost = (Rs. 1,000 × 10/100) = Rs. 100

Number of orders = Demand per year/Order size = 2,25,000/1,500 units = 150

PART 5

FINANCING DECISION

The second major area in financial management is the financing/capital structure decision. The financing decision involves the choice of an appropriate mix of different sources of financing, namely, owners' funds and outsider/lenders' funds. The selection of the capital structure will obviously depend on the bearing that it has on the firm's objective of maximisation of shareholders' wealth. A financing mix which will lead to maximisation of shareholders' wealth as reflected in the market price of shares is termed as an **optimum capital structure**. This Part of the book is devoted to a comprehensive discussion of the important dimensions of the financing decision of a firm. Chapter 14 discusses operating, financial and combined leverage as a setting to the in-depth analysis of the relationship between the composition of the source of financing and the value of the firm. The theoretical relationship between capital structure and the valuation of a firm is examined in Chapter 15. The appropriateness of a capital structure will vary from firm to firm and, therefore, an optimum capital structure should be designed in the light of facts and circumstances of each firm. The factors having a bearing on designing a suitable capital structure are outlined in Chapter 16. Finally, Chapter 17 presents an overview of sources of long-term finance.

Chapter

14

Operating, Financial and Combined Leverage

Learning Objectives

1. Understand the concepts, measurement and behaviour of operating, financial and combined leverage and the relationship between them
2. Discuss the EBIT-EPS approach to compare alternative capital structures using both algebraic determination and graphic presentation
3. Explain the relationship between total leverage and total risk of a firm

INTRODUCTION

The purpose of this Chapter is to set forth a framework for the financing decision of a firm. It discusses the principles and types of leverage. As mentioned earlier, a firm can make use of different sources of financing whose costs are different. These sources may be, for purposes of exposition, classified into those which carry a fixed rate of return and those on which the returns vary. The fixed returns on some sources of finance have implications for those who are entitled to a variable return. Thus, since debt involves the payment of a stated rate of interest, the return to the ordinary shareholders is affected by the magnitude of debt in the capital structure of a firm.

Leverage is the employment of an asset/source of finance for which firm pays fixed cost/fixed return.

The employment of an asset or source of funds for which the firm has to pay a fixed cost or fixed return may be termed as **leverage**. Consequently, the earnings available to the shareholders as also the risk are affected. If earnings less the variable costs exceed the fixed cost, or earnings before interest and taxes exceed the fixed return requirement, the leverage is called favourable. When they do not, the result is unfavourable leverage.

There are two types of leverage—'operating' and 'financial'. The leverage associated with investment (asset acquisition) activities is referred to as **operating leverage**, while leverage associated with financing activities is called **financial leverage**.[1] While we are basically concerned with financial leverage for purposes of the financing decision of a firm, the discussion

of operating leverage is to serve as a background to the understanding of financial leverage because the two types of leverage are closely related.

Operating leverage is determined by the relationship between the firm's sales revenues and its earnings before interest and taxes (EBIT). The earnings before interest and taxes are also generally called as **operating profits**. Financial leverage represents the relationship between the firm's earnings before interest and taxes (operating profits) and the earnings available for ordinary shareholders. The operating profits (EBIT) are, thus, used as the pivotal point in defining operating and financial leverage. In a way, operating and financial leverage represent two stages in the process of determining the earnings available to the equity shareholders and, hence, their discussion in this chapter. Apart from the elaboration of the return-risk implications, their combined effect has also been discussed. Section 1 of the Chapter discusses the operating leverage while financial leverage is covered in Section 2. The combined leverage is illustrated in Section 3 and major points are summarised in Section 4.

SECTION 1 OPERATING LEVERAGE

Operating leverage results from the existence of fixed operating expenses in the firm's income stream. The operating costs of a firm fall into three categories: **(i)** fixed costs which may be defined as those which do not vary with sales volume; they are a function of time and are typically contractual; they must be paid regardless of the amount of revenues available; **(ii)** variable costs which vary directly with the sales volume; and **(iii)** semi-variable or semi-fixed costs are those which are partly fixed and partly variable. They are fixed over a certain range of sales volume and increase to higher levels for higher sales volumes. Since the last category of costs can be broken down into fixed and variable components, the costs of a firm, in operational terms, can be divided into **(a)** fixed, and **(b)** variable.

Operating leverage is caused due to fixed operating expenses in a firm.

The operating leverage may be defined as the *firm's ability to use fixed operating costs to magnify the effects of changes in sales on its earnings before interest and taxes*. Operating leverage occurs any time a firm has fixed costs that must be met regardless of volume. We employ assets with fixed cost in the hope that volume will produce revenues more than sufficient to cover all fixed and variable costs. In other words, with fixed costs, the percentage change in profits accompanying a change in volume is greater than the percentage change in volume. This occurrence is known as operating leverage. Consider Example 14.1.

Example 14.1

A firm sells products for Rs 100 per unit, has variable operating costs of Rs 50 per unit and fixed operating costs of Rs 50,000 per year. Show the various levels of EBIT that would result from sale of (i) 1,000 units (ii) 2,000 units and (iii) 3,000 units.

Solution

If sales level of 2,000 units are used as a base for comparison, the operating leverage is illustrated in Table 14.1

TABLE 14.1 EBIT for Various Sales Levels

	Case 2	*Base*	*Case 1*
	−50%		*+50%*
1. Sales in units	1,000	2,000	3,000
2. Sales revenue	Rs 1,00,000	Rs 2,00,000	Rs 3,00,000

(*Contd.*)

(*Contd.*)

3. *Less:* Variable operating cost	50,000	1,00,000	1,50,000
4. Contribution	50,000	1,00,000	1,50,000
5. *Less:* Fixed operating cost	50,000	50,000	50,000
6. EBIT	Zero	50,000	1,00,000
	−100%		+100%

From the results contained in Table 14.1, certain generalisations follow:

(i) Case 1: A 50 per cent increase in sales (from 2,000 to 3,000 units) results in a 100 per cent increase in EBIT (from Rs 50,000 to Rs 1,00,000).

(ii) Case 2: A 50 per cent decrease in sales (from 2,000 to 1,000 units) results in a 100 per cent decrease in EBIT (from Rs 50,000 to zero).

Example 14.2

A firm sells its products for Rs 50 per unit, has variable operating costs of Rs 30 per unit and fixed operating costs of Rs 5,000 per year. Its current level of sales is 300 units. Determine the degree of operationg leverage. What will happen to EBIT if sales change: **(a)** rise to 350 units, and **(b)** decrease to 250 units?

Solution

The EBIT for various sales levels is computed in Table 14.2.

TABLE 14.2 EBIT at Various Sales Levels

	Case 2	*Base*	*Case 1*
	−16.7%		*+16.7%*
1. Sales in units	250	300	350
2. Sales revenue	Rs 12,500	Rs 15,000	Rs 17,500
3. *Less:* Variable cost	7,500	9,000	10,500
4. Contribution	5,000	6,000	7,000
5. *Less:* Fixed operating cost	5,000	5,000	5,000
6. EBIT	Zero	1,000	2,000
	−100%		+100%

Interpretation In case 2, 16.7 per cent decrease in sales volume (from 300 units to 250 units) leads to 100 per cent decline in the EBIT (from Rs 1,000 to zero). On the other hand, a 16.7 per cent increase in the sales level in case 1 (from 300 units to 350 units) results in 100 per cent increase in EBIT (from Rs 1,000 to Rs 2,000).

The two illustrations (Tables 14.1 and 14.2) clearly show that when a firm has fixed operating costs, an increase in sales volume results in a more than proportionate increase in EBIT. Similarly, a decrease in the level of sales has an exactly opposite effect. This is operating leverage; the former being favourable leverage, while the latter is unfavourable. Leverage, thus, works in both directions.

Alternative Definition of Operating Leverage

Operating leverage can also be defined and illustrated in another way. This is a more precise measurement in terms of degree of operating leverage (DOL). The DOL measures in quantitative terms the extent or degree of operating leverage.

When proportionate change in EBIT as a result of a given change in sales is more than the proportionate change in sales, operating leverage exists. The greater the DOL, the higher is the operating leverage. Symbolically,

$$\text{DOL} = \frac{\text{Percentage change in EBIT}}{\text{Percentage change in sales}} > 1 \qquad \textbf{(14.1)}$$

$$\text{Alternatively, DOL} = \frac{\Delta \text{EBIT} \div \text{EBIT}}{\Delta Q \div Q}$$

$$\text{EBIT} = Q(S - V) - F, \ \Delta \text{ EBIT} = \Delta \ Q(S - V)$$

Where Q = Sales quantity in units,
S = Selling price per unit,
V = Variable cost per unit, and
F = Total fixed costs.

$$\text{DOL} = \frac{\Delta Q(S - V)}{Q(S - V) - F} \times \frac{Q}{\Delta Q} = \frac{Q(S - V)}{Q(S - V) - F} = \frac{\text{Total Contribution (at base level)}}{\text{EBIT (at base level)}} \qquad \textbf{(14.2)}$$

Applying Equations 14.1 and 14.2 to Example 14.1 we get,

$$\text{DOL} = \frac{+100\%}{+50\%} = 2 \text{ (Case 1)}, \quad \frac{-100\%}{-50\%} = 2 \text{ (Case 2)}$$

or = Rs 1,00,000/Rs 50,000 = 2

Similarly, in Example 14.2,

$$\text{DOL} = \frac{+100\%}{+16.7\%} = 6 \text{ (Case 1)}, \quad \frac{-100\%}{-16.7\%} = 6 \text{ (Case 2)}$$

or = Rs 6,000/Rs 1,000 = 6

Since the DOL exceeds 1 in both the illustrations, operating leverage exists. However, the degree of operating leverage is higher (3 times) in the case of the firm in Example 14.2 as compared to the firm in Example 14.1, the respective quotients being 6 and 2. The quotients mean that for every 1 per cent change in sales, there will be 6 per cent (Examples 14.2) and 2 per cent (Example 14.1) change in EBIT in the direction the sales change.

However, operating leverage exists only when there are fixed operating costs. If there are no fixed operating costs, there will be no operating leverage. Consider Example 14.3.

Example 14.3

Particulars	*Base Level*	*New Level*
1. Units sold	1,000	1,100
2. Sales price per unit	Rs 10	Rs 10
3. Variable cost per unit	6	6
4. Fixed operating cost	Nil	Nil

Solution

The relevant computations are given in Table 14.3.

TABLE 14.3 EBIT for Various Sales Volume

Particulars	*Base Level*	*New Level*
1. Sales revenues	Rs 10,000	Rs 11,000
2. *Less:* Variable costs	6,000	6,600
3. *Less:* Fixed costs	—	—
4. EBIT	4,000	4,400

Applying Equation 14.1, DOL = 1. Since the quotient is 1, there is no operating leverage.

Since operating leverage (magnifying the effects of a change in sales) can be favourable or unfavourable, higher levels of risk are attached to higher degrees of leverage. Since DOL depends on fixed operating costs, it logically follows that the larger the fixed operating cost, the higher is the firm's operating leverage and its operating risk. High operating leverage is good when revenues are rising and bad when they are falling. **Operating risk** is the risk of the firm not being able to cover its fixed operating costs. The larger the magnitude, the larger the volume of sales required to cover all fixed costs.

Operating risk is risk of not being able to cover fixed operating costs.

SECTION 2 FINANCIAL LEVERAGE

As already indicated, financial leverage relates to the financing activities of a firm. The sources from which funds can be raised by a firm, from the point of view of the cost/charges, can be categorised into **(i)** those which carry a fixed financial charge, and **(ii)** those which do not involve any fixed charge. The sources of funds in the first category consist of various types of long-term debt, including bonds, debentures, and preference shares. Long-term debts carry a fixed rate of interest which is a contractual obligation for the firm. Although the dividend on preference shares is not a contractual obligation, it is a fixed charge and must be paid before anything is paid to the ordinary shareholders. The equity shareholders are entitled to the remainder of the operating profits of the firm after all the prior obligations are met. We assume in the subsequent discussions that all preference dividends are paid in order to ascertain the operating profits available for distribution to ordinary shareholders.

Financial leverage results from the presence of fixed financial charges in the firm's income stream. These fixed charges do not vary with the earnings before interest and taxes (EBIT) or operating profits. They are to be paid regardless of the amount of EBIT available to pay them. After paying them, the operating profits (EBIT) belong to the ordinary shareholders. Financial leverage is concerned with the effects of changes in EBIT on the earnings available to equityholders. It is defined as the **ability of a firm to use fixed financial charges to magnify the effects of changes in EBIT on the earnings per share**[2]. In other words, financial leverage involves the use of funds obtained at a fixed cost in the hope of increasing the return to the shareholders.

Financial leverage is caused due to fixed financial costs (interest).

Favourable or positive leverage occurs when the firm earns more on the assets purchased with the funds, than the fixed cost of their use. Unfavourable or negative leverage occurs when the firm does not earn as much as the funds cost. Thus, financial leverage is based on the assumption that the firm is to earn more on the assets that are acquired by the use of funds on which a fixed rate of interest/dividend is to be paid. The difference between the earnings from the assets and the fixed cost on the use of the funds goes to the equity holders.

In a way, therefore, use of fixed-interest sources of funds provides increased return on equity investment without additional requirement of funds from the shareholders. Financial leverage is also, therefore, called as 'trading on equity'. However, in periods of persisting adversity when earnings are not adequate, the presence of fixed charges will imply that the shareholders will have to bear the burden. Thus, the leverage/trading on equity will operate in the opposite direction such that the earnings per share, instead of increasing, will actually fall as a result of the use of funds carrying fixed cost.

The financial leverage is illustrated in Example 14.4.

Example 14.4

The financial manager of the Hypothetical Ltd expects that its earnings before interest and taxes (EBIT) in the current year would amount to Rs 10,000. The firm has 5 per cent bonds aggregating Rs 40,000, while the 10 per cent preference shares amount to Rs 20,000. What would be the earnings per share (EPS)? Assuming the EBIT being (i) Rs 6,000, and (ii) Rs 14,000, how would the EPS be affected? The firm can be assumed to be in the 35 per cent tax bracket. The number of outstanding ordinary shares is 1,000.

Solution

TABLE 14.4 EPS for Various EBIT Levels

	Case 2	*Base*	*Case 1*
	–40%		*+40%*
EBIT	Rs 6,000	Rs 10,000	Rs 14,000
Less: Interest on bonds	2,000	2,000	2,000
Earnings before taxes (EBT)	4,000	8,000	12,000
Less: Taxes (35%)	1,400	2,800	4,200
Earning after taxes (EAT)	2,600	5,200	7,800
Less: Preference dividend	2,000	2,000	2,000
Earnings available for ordinary shareholders	600	3,200	5,800
Earnings per share (EPS)	0.6	3.2	5.8
	–81.25%		+81.25%

The interpretation of Table 14.4 is as follows:

Case 1: A 40 per cent increase in EBIT (from Rs 10,000 to Rs 14,000) results in 81.25 per cent increase in EPS (from Rs 3.2 to Rs 5.8).

Case 2: A 40 per cent decrease in EBIT (from Rs 10,000 to Rs 6,000) leads to 81.25 per cent decrease in EPS (from Rs 3.2 to Re 0.6).

Example 14.5

A company has Rs 1,00,000, 10% debentures and 5,000 equity shares outstanding. It is in the 35 per cent tax-bracket. Assuming three levels of EBIT (i) Rs 50,000, (ii) Rs 30,000, and (iii) Rs 70,000, calculate the change in EPS (base level of EBIT = Rs 50,000).

Solution

TABLE 14.5 EPS at Various EBIT Levels

	Case 2	*Base*	*Case 1*
	–40%		*+40%*
EBIT	Rs 30,000	Rs 50,000	Rs 70,000
Less: interest	10,000	10,000	10,000

(*Contd.*)

(*Contd.*)

Earnings before taxes	20,000	40,000	60,000
Less: Taxes	7,000	14,000	21,000
Earning after taxes	13,000	26,000	39,000
Earnings per share (EPS)	2.6	5.2	7.8
	−50%		+50%

Thus, a 40 per cent increase in EBIT in case 2 from the base level of EBIT has led to 50 per cent increase in EPS. And a decrease of 40 per cent in EBIT has decreased the EPS by 50 per cent.

The preceding examples show that the presence of fixed-interest sources funds leads to a more than proportionate change in EPS as a result of change in EBIT level. Whenever a firm has fixed cost in its capital structure, financial leverage is present. The greater the amount of fixed-interest sources of funds (and, therefore, the larger is the fixed-financial cost), the higher is the financial leverage. For instance, in Example 14.4, the amount of fixed financial cost is higher than in Example 14.5 owing to the preference dividend. As a result of this difference, the proportionate change in EPS was much higher (± 81.25 per cent) for Example 14.4 as compared to Example 14.5 (± 50 per cent) although the changes in EBIT in both cases are the same (± 40 per cent).

Alternative Definition of Financial Leverage

The procedure outlined above is merely indicative of the presence or absence of financial leverage. Financial leverage can be more precisely expressed in terms of the degree of financial leverage (DFL). The DFL can be calculated by Eq. (14.3)

$$\text{DFL} = \frac{\text{Percentage change in EPS}}{\text{Percentage change in EBIT}} > 1 \qquad \textbf{(14.3)}$$

Alternatively, $\text{DFL} = \dfrac{\Delta\,\text{EPS} \div \text{EPS}}{\Delta\,\text{EBIT} \div \text{EBIT}}$

$$\text{EPS} = \frac{[(\text{EBIT} - I)(1-t) - D_P}{N}$$

$$= \frac{[Q(S-V) - F - I](1-t) - D_P}{N}$$

Since, F, I and D_p are constants,

$$\Delta\text{EPS} = [\Delta\, Q(S - V)]\,(1 - t)]/N$$

$$\frac{\Delta\text{EPS}}{\text{EPS}} = \frac{[\Delta\, Q(S-V)](1-t)}{[Q(S-V) - F - I](1-t) - D_P}$$

Dividing numerator and denominator by $(1 - t)$

$$\frac{\Delta Q(S-V)}{[Q(S-V) - F - I] - D_P/(1-t)}$$

$$\text{DFL} = \frac{\Delta Q(S-V)}{[Q(S-V) - F - I] - D_P/(1-t)} \times \frac{Q(S-V) - F}{\Delta Q(S-V)}$$

$$= \frac{Q(S-V)-F}{[Q(S-V)-F-1]-D_P/(1-t)} = \frac{\text{EBIT}}{\text{EBIT}-I-D_P/(1-t)} \quad \textbf{(14.4)}$$

Applying Equations 14.3 to Case 1 and Case 2 in Examples 14.4 and 14.5,

(i) For Example 14.4: *Case 1* = $\frac{+81.25\%}{+40\%} = 2.03$, *Case 2* = $\frac{-81.25\%}{-40\%} = 2.03$

$$= \frac{\text{Rs } 10,000}{\text{Rs } 10,000 - \text{Rs } 2,000 - [\text{Rs } 2,000/(1-0.35)]} = 2.03$$

(ii) Example 14.5: *Case 1* = $\frac{+50\%}{+40\%} = 1.25$, *Case 2* = $\frac{-50\%}{-40\%} = 1.25$

$$= \frac{\text{Rs } 50,000}{\text{Rs } 50,000 - \text{Rs } 10,000} = 1.25$$

As a rule, when a percentage change in EPS resulting from a given percentage change in EBIT is greater than the percentage change in EBIT, financial leverage exists. In other words, financial leverage occurs when the quotient in Equation 14.3 is more than one.

In both the examples, the relevant quotient is larger than one. Therefore, financial leverage exists. But the degree of financial leverage is higher in Example 14.4 (2.03) than in Example 14.5 (1.25). The higher the quotient of percentage change in EPS due to percentage change in EBIT, the greater is the degree of financial leverage. The quotient of 2.03 implies that 1 per cent change in EBIT will cause 2.03 per cent change in EPS in the same direction (± increase/decrease) in which the EBIT changes. With 1.25 quotient the proportionate change in EPS as a result of 1 per cent change in EBIT will be comparatively less, that is, 1.25 per cent in either direction.

There will be, however, no financial leverage, if there is no fixed-charged financing. (Table 14.6).

TABLE 14.6 EPS at Various EBIT Levels

	Case 2 *−40%*	*Base*	*Case 1* *+40%*
EBIT	Rs 30,000	Rs 50,000	Rs 70,000
Less: Taxes (0.35)	10,500	17,500	24,500
Earnings available for equity-holders	19,500	32,500	45,500
Number of shares	10,000	10,000	10,000
EPS	1.95	3.25	4.55
	−40%		+40%

Degree of financial leverage (DFL): Applying Eq. (14.3)

(i) Case 1 = $\frac{+40\%}{+40\%} = 1$ **(ii)** Case 2 = $\frac{-40\%}{-40\%} = 1$

Thus, the quotient is 1. Its implication is that 1 per cent change in EBIT will result in 1 per cent change in EPS, that is, proportionate. There is, therefore, no magnification in the EPS.

Like operating leverage, higher levels of risks are attached to higher degrees of financial leverage also. High fixed financial costs increase the financial leverage and, thus, financial risk. The **financial risk** refers to the risk of the firm not being able to cover its fixed financial costs. With the increase in financial charges, the firm is also required to raise the level of EBIT necessary to meet financial charges. If the firm cannot cover these financial payments, it can be technically forced into liquidation. Therefore, the very existence of the business is at stake. Obviously, the financial manager should take into consideration all such factors while formulating the firm's financing plan in terms of the mix of various sources of long-term funds, viz. long-term debts, preference shares, equity funds including retained earnings. One of the objectives of planning an appropriate capital structure is to provide a high income for the equity owners, that is, to increase the EPS. To devise an appropriate capital structure or financing plan, the amount of EBIT under various financing plans should be related to EPS. Thus, one widely used means of examining the effect of leverage is to analyse the relationship between EBIT and EPS.

Financial risk is the risk of not being able to cover fixed financial costs by a firm.

EBIT-EPS Analysis

The **EBIT-EPS analysis**, as a method to study the effect of leverage, essentially involves the comparison of alternative methods of financing under various *assumptions* of EBIT. A firm has the choice to raise funds for financing its investment proposals from different sources in different proportions. For instance, it can **(i)** exclusively use equity capital **(ii)** exclusively use debt, **(iii)** exclusively use preference capital, **(iv)** use a combination of **(i)** and **(ii)** in different proportions; **(v)** a combination of **(i)**, **(ii)** and **(iii)** in different proportions, **(vi)** a combination of **(i)** and **(iii)** in different proportions, and so on. The choice of the combination of the various sources would be one which, *given the level of earnings before interest and taxes*, would ensure the largest EPS. Consider Example 14.6.

EBIT-EPS analysis involves comparison of alternative methods of financing at various levels of EBIT.

Example 14.6

Suppose a firm has a capital structure exclusively comprising of ordinary shares amounting to Rs 10,00,000. The firm now wishes to raise additional Rs 10,00,000 for expansion. The firm has four alternative financial plans:

(A) It can raise the entire amount in the form of equity capital.
(B) It can raise 50 per cent as equity capital and 50 per cent as 5% debentures.
(C) It can raise the entire amount as 6% debentures.
(D) It can raise 50 per cent as equity capital and 50 per cent as 5% preference capital.

Further assume that the existing EBIT are Rs 1,20,000, the tax rate is 35 per cent, outstanding ordinary shares 10,000 and the market price per share is Rs 100 under all the four alternatives.

Which financing plan should the firm select?

Solution

TABLE 14.7 EPS Under Various Financial Plans

Particulars	*Financing plans*			
	A	*B*	*C*	*D*
EBIT	Rs 1,20,000	Rs 1,20,000	Rs 1,20,000	Rs 1,20,000
Less: Interest	—	25,000	60,000	—
Earnings before taxes	1,20,000	95,000	60,000	1,20,000
Taxes	42,000	33,250	21,000	42,000
Earnings after taxes	78,000	61,750	39,000	78,000
Less: Preference dividend	—	—	—	25,000
Earnings available to ordinary shareholders	78,000	61,750	39,000	53,000
Number of shares	20,000	15,000	10,000	15,000
Earnings per share (EPS)	3.9	4.1	3.9	3.5

The calculations in Table 14.7 reveal that given a level of EBIT of Rs 1,20,000, the financing alternative B, which involves 50 per cent ordinary shares and 50 per cent debt, is the most favourable with respect to EPS. Another disclosure of the table is that although the proportion of ordinary shares in the total capitalisation under the financing plan D is also 50 per cent, that is, equal to plan B, EPS is considerably different (lowest). The difference in the plans B and D is due to the fact that interest on debt is tax-deductible while the dividend on preference shares is not. With 35 per cent income tax, the explicit cost of preference shares would be higher than the cost of debt.

Table 14.7 also indicates that the annual before-tax costs of the various financing plans are:

1. Financing Plan B	Rs 25,000
2. Financing Plan C	60,000
3. Financing Plan D (Rs 25000/1 – 0.35)	38,462

Financing plan A involves no cost as there is no fixed financial charge. That the financing plan involves a specific amount of cost, is another way of saying that an equal amount of earnings before interest and taxes is necessary to cover the fixed financial charges. Since preference dividend is not tax-deductible, we must divide the total dividends by one, minus the tax rate, in order to obtain the EBIT necessary to cover these dividends as a financial charge. Assuming a 35 per cent tax rate, preference dividend of Rs 25,000 can be paid on EBIT of Rs 38,462. The fixed financial charge would, therefore, be higher. Earnings per share would be zero for plans B, C and D for the EBIT level of Rs 25,000, Rs 60,000 and Rs 38,462 respectively. This level of EBIT may be termed as **financial break even (BEP)** level of earnings before interest and taxes because it represents the level of EBIT necessary for the firm to break even on its fixed financial charge. In other words, it is the level of EBIT at which the firm can satisfy all fixed financial charges (i.e. interest and preference dividend). EBIT less than this level will result in negative EPS. The financial break-even point can be determined by Eq. (14.5).

Financial BEP is the level of EBIT which is equal to firm's fixed financial costs.

$$\text{Financial break-even point} = I + \frac{D_P}{1-t} \qquad \textbf{(14.5)}$$

where I = Annual interest charges,
D_P = Preference dividend, and
t = Tax rate

Equation 14.5 gives before-tax earnings necessary to cover the firm's fixed financial obligations.

As fixed financial charges are added, the break-even point for zero EPS is increased by the amount of the additional fixed cost. Beyond the financial break-even point, increase in EPS is more than the proportionate increase in EBIT. This is illustrated in Table 14.8, which presents the EBIT-EPS relationship for the data in Example 14.6 under the various EBIT assumptions given in the box:

(i) Rs 80,000 (4 per cent return on total assets)
(ii) 1,00,000 (5 per cent return on total assets)
(iii) 1,30,000 (6.5 per cent return on total assets)
(iv) 1,60,000 (8 per cent return on total assets)
(v) 2,00,000 (10 per cent return on total assets)

TABLE 14.8 EBIT-EPS Analysis under Various EBIT Assumptions for the Four Financing Plans of Example 14.6

(i) EBIT = Rs 80,000 (4 per cent return on investments)

Particulars	*Financing Plans*			
	A	*B*	*C*	*D*
EBIT	80,000	80,000	80,000	80,000
Less: Interest	—	25,000	60,000	—
EBT	80,000	55,000	20,000	80,000
Less: Taxes	28,000	19,250	7,000	28,000
EAT	52,000	35,750	13,000	52,000
Less: Preference dividend	—	—	—	25,000
EAT for equity-holders	52,000	35,750	13,000	27,000
EPS	2.6	2.38	1.3	1.8

(ii) EBIT = Rs 1,00,000 (5 per cent return)

EBIT	1,00,000	1,00,000	1,00,000	1,00,000
Less: Interest	—	25,000	60,000	—
EBT	1,00,000	75,000	40,000	1,00,000
Less: Taxes	35,000	26,250	14,000	35,000
EAT	65,000	48,750	26,000	65,000
Less: Preference dividend	—	—	—	25,000
EAT for equity-holders	65,000	48,750	26,000	40,000
EPS	3.25	3.25	2.6	2.67

(*Contd.*)

(*Contd.*)

(iii) EBIT = Rs 1,30,000 (6.5 per cent return)				
EBIT	1,30,000	1,30,000	1,30,000	1,30,000
Less: Interest	—	25,000	60,000	—
EBT	1,30,000	1,05,000	70,000	1,30,000
Less: Taxes	45,500	36,750	24,500	45,500
EAT	84,500	68,250	45,500	84,500
Less: Preference dividend	—	—	—	25,000
EAT for equity-holders	84,500	68,250	45,500	59,500
EPS	4.22	4.55	4.55	3.97
(iv) EBIT = Rs 1,60,000 (8 per cent return)				
EBIT	1,60,000	1,60,000	1,60,000	1,60,000
Less: Interest	—	25,000	60,000	—
EBT	1,60,000	1,35,000	1,00,000	1,60,000
Less: Taxes	56,000	47,250	35,000	56,000
EAT	1,04,000	87,750	65,000	1,04,000
Less: Preference dividend	—	—	—	25,000
EAT for equity-holders	1,04,000	87,750	65,000	79,000
EPS	5.2	5.8	6.5	5.3
(v) EBIT = Rs 2,00,000 (10 per cent return)				
EBIT	2,00,000	2,00,000	2,00,000	2,00,000
Less: Interest	—	25,000	60,000	—
EBT	2,00,000	1,75,000	1,40,000	2,00,000
Less: Taxes	70,000	61,250	49,000	70,000
EAT	1,30,000	1,13,750	91,000	1,30,000
Less: Preference dividend	—	—	—	25,000
EAT for equity-holders	1,30,000	1,13,750	91,000	1,05,000
EPS	6.5	7.6	9.1	7

It can be seen from Table 14.8 that when the EBIT level exceeds the financial break-even level (Rs 25,000, Rs 60,000 and Rs 38,462 for financing alternatives, *B*, *C* and *D* respectively) EPS increases. The percentage increase in EPS is the greatest when EBIT is nearest the break-even point. Thus, in Plan *C*, an increase of 25 per cent in EBIT (from Rs 80,000 to Rs 1,00,000) results in a 100 per cent increase in EPS (from Re 1.3 to Rs 2.6), whereas the percentage increase in EPS is only 40 per cent (from Rs 6.5 to Rs 9.1) as a result of the change in EBIT at higher levels from Rs 1,60,000 to Rs 2,00,000 (i.e. 25 per cent increase).

We can also see from Tables 14.7 and 14.8 that the EPS for different financing plans at a given level of EBIT is equal. At EBIT levels above or below the given level, the EPS is higher or lower. Thus, for alternatives *A* and *C* at the EBIT level of Rs 1,20,000 (Table 14.7) the EPS is the same, that is, Rs 3.9. If EBIT is below this level, alternative *A* (ordinary shares) will provide higher EPS; above this level, the debt alternative (*C*) is better from the viewpoint of EPS.

Between preference share (*D*) and ordinary share (*A*) alternatives, the EPS is equal (Rs 5.2) at Rs 1,60,000 EBIT level. Above this level, alternative *D* will give better EPS; while below it, alternative *A* would provide higher EPS.

The earnings per share (EPS) in alternatives *A* and *B* are the same at EBIT level of Rs 1,00,000. Above this, *B* plan would lead to higher EPS; at levels lower than this, financing plan *A* would provide higher EPS.

The debt alternative (*B*) gives higher EPS for all levels of EBIT as compared to the preference share alternative (*D*).

Indifference Point

Indifference point is the EBIT level beyond which benefits of financial leverage accrue with respect to EPS.

The EBIT level at which the EPS is the same for two alternative financial plans is referred to as the **indifference point/level**. The indifference point may be defined as the *level of* EBIT *beyond which the benefits of financial leverage begin to operate with respect to earnings per share* (EPS). In operational terms, if the expected level is to exceed the indifference level of EBIT, the use of fixed-charge source of funds (debt) would be advantageous from the viewpoint of EPS, that is, financial leverage will be favourable and lead to an increase in the EPS available to the shareholders. The capital structure should include debt. If, however, the expected level of the EBIT is less than the indifference point, the advantage of EPS would be available from the use of equity capital.

The indifference point between two methods of financing can be obtained mathematically (algebraic approach) as well as graphically.

Algebraic Approach Mathematically, the indifference point can be obtained by using the following symbols:

X = earnings before interest and taxes (EBIT) at the indifference point
N_1 = number of equity shares outstanding if only equity shares are issued
N_2 = number of equity shares outstanding if both debentures and equity shares are issued
N_3 = number of equity shares outstanding if both preference and equity shares are issued
N_4 = number of equity shares outstanding if both preference shares and debentures are issued
I = the amount of interest on debentures
D_P = the amount of dividend on preference shares
t = corporate income tax rate
Dt = tax on payment of dividend

For a New Company The indifference point can be determined by using the following equations:

(i) Equity shares versus Debentures:

$$\frac{X(1-t)}{N_1} = \frac{(X-I)(1-t)}{N_2} \qquad \textbf{(14.6)}$$

(ii) (a) Equity shares versus Preference shares:

$$\frac{X(1-t)}{N_1} = \frac{X(1-t)-D_P}{N_3} \qquad \textbf{(14.7)}$$

(ii) (b) Equity shares versus Preference shares with tax on Preference dividend:

$$\frac{X(1-t)}{N_1} = \frac{X(1-t)-D_P(1+Dt)}{N_3} \qquad \textbf{(14.7A)}$$

(iii) Equity shares versus Preference shares and Debentures:

$$\frac{X(1-t)}{N_1} = \frac{(X-I)(1-t) - D_P}{N_4} \qquad \textbf{(14.8)}$$

For an Existing Company If the debentures are already outstanding, let us assume I_1 = interest paid on existing debt, and I_2 = interest payable on additional debt, then the indifference point would be determined by Equation (14.9).

$$\frac{(X-I_1)(1-t)}{N_1} = \frac{(X-I_1-I_2)(1-t)}{N_2} \qquad \textbf{(14.9)}$$

Example 14.7

The financial manager of a company has formulated various financial plans to finance Rs 30,00,000 required to implement various capital budgeting projects:

(i) Either equity capital of Rs 30,00,000 or Rs 15,00,000 10% debentures and Rs 15,00,000 equity;

(ii) Either equity capital of Rs 30,00,000 or 13% preference shares of Rs 10,00,000 and Rs 20,00,000 equity;

(iii) Either equity capital of Rs 30,00,000 or 13% preference capital of Rs 10,00,000, (subject to dividend tax of 10 per cent), Rs 10,00,000 10% debentures and Rs 10,00,000 equity; and

(iv) Either equity share capital of Rs 20,00,000 and 10% debentures of Rs 10,00,000 or 13% preference capital of Rs 10,00,000, 10% debentures of Rs 8,00,000 and Rs 12,00,000 equity.

You are required to determine the indifference point for each financial plan, assuming 35 per cent corporate tax rate and the face value of equity shares as Rs 100.

Solution

TABLE 14.9 Determination of Indifference Point

(i) $\dfrac{X(1-t)}{N_1} = \dfrac{(X-I)(1-t)}{N_2}$

Or $\dfrac{X(1-0.35)}{30,000} = \dfrac{(X - \text{Rs } 1,50,000)(1-0.35)}{15,000}$

Or $\dfrac{0.65X}{30,000} = \dfrac{0.65X - \text{Rs } 97,500}{15,000}$

Or $0.65X = 1.3X - \text{Rs } 1,95,000$

Or $-0.65X = -\text{ Rs } 1,95,000$

$X = \text{Rs } 1,95,000/0.65 = \text{Rs } 3,00,000$

Confirmation Table

Particulars	*Equity financing*	*Equity + debt financing*
EBIT	Rs 3,00,000	Rs 3,00,000
Less: Interest	—	1,50,000
Earning before taxes	3,00,000	1,50,000
Less: Taxes	1,05,000	52,500
Earnings for equity-holders	1,95,000	97,500
Number of equity shares	30,000	15,000
EPS	6.5	6.5

(ii) $\dfrac{X(1-t)}{N_1} = \dfrac{X(1-t)-D_P}{N_3}$

Or $\dfrac{X(1-0.35)}{30,000} = \dfrac{X(1-0.35)-\text{Rs } 1,30,000}{20,000}$

Or $\dfrac{0.65X}{30,000} = \dfrac{0.65X-\text{Rs } 1,30,000}{20,000}$

X = Rs 6,00,000

Confirmation Table

Particulars	*Equity financing*	*Equity + Preference financing*
EBIT	Rs 6,00,000	Rs 6,00,000
Less: Taxes	2,10,000	2,10,000
Earning after taxes	3,90,000	3,90,000
Less: Dividends on preference shares	—	1,30,000
Earnings for equity-holders	3,90,000	2,60,000
Number of equity shares	30,000	20,000
EPS	13	13

(iii) $\dfrac{X(1-t)}{N_1} = \dfrac{(X-I)(1-t)-D_P\ (1+Dt)}{N_4}$

Or $\dfrac{X(1-0.35)}{30,000} = \dfrac{(X-\text{Rs } 1,00,000)(1-0.35)-\text{Rs } 1,30,000\,(1+0.1)}{10,000}$

Or $\dfrac{0.65X}{30,000} = \dfrac{0.65X-\text{Rs } 65,000-\text{Rs } 1,43,000}{10,000}$

Or X = Rs 4,80,000

Confirmation Table

Particulars	*Equity financing*	*Equity + Preference + Debentures financing*
EBIT	Rs 4,80,000	Rs 4,80,000
Less: Interest	—	1,00,000
Earnings after interest	4,80,000	3,80,000
Less: Taxes	1,68,000	1,33,000
Earning after taxes	3,12,000	2,47,000
Less: Dividends including dividend tax on preference shares	—	1,43,000
Earnings available for equity holders	3,12,000	1,04,000
Number of equity shares	30,000	10,000
EPS	18.4	18.4

(iv) $\dfrac{(X-I)(1-t)}{N_2} = \dfrac{(X-I)(1-t)-D_P}{N_4}$

Or $\dfrac{(X-1,00,000)(1-0.35)}{20,000} = \dfrac{(X-80,000)(1-0.35)-1,30,000}{12,000}$

X = Rs 5,50,000

Confirmation Table

Particulars	*Equity financing*	*Equity + Debt + Preference financing*
EBIT	Rs 5,50,000	Rs 5,50,000
Less: Interest	1,00,000	80,000
Earnings before taxes	4,50,000	4,70,000
Less: Taxes	1,57,500	1,64,500
Earning after taxes	2,92,500	3,05,500
Less: Dividends on preference shares	—	1,30,000
Earnings for equity-holders	2,92,500	1,75,500
Number of equity shares	20,000	12,000
EPS	14.625	14.625

Graphic Approach The indifference point can also be determined graphically. Figures 14.1 and 14.2 portray the graphic representation of financial plans **(i)** and **(ii)** of Example 14.7. The horizontal X-axis represents EBIT while EPS is represented on the Y-axis.

In order to graph the financial plan, two sets of EBIT-EPS coordinates are required. The EPS values associated with EBIT values of Rs 2,00,000 and Rs 6,00,000 are calculated and plotted on the graph paper under each financial plan in case of Figure 14.1. It may noted that 100 per cent equity financing plan starts from origin (O) because EPS would be zero if EBIT is zero. However, EBIT required to have the value of the EPS as zero is Rs 1,50,000, that is, the interest charges payable on 10% debentures of Rs 15,00,000. Therefore, the starting point of 50 per cent equity financing plan is away from the point of the origin (i.e. it starts from Rs 1.5 lakh). The point at which the two lines intersect is the **indifference point (IP)**. When we draw a perpendicular to the X-axis from the point of intersection, we have EBIT required for the IP. A line drawn from the point of intersection and joined with the Y-axis determines the EPS at the indifference point of EBIT.

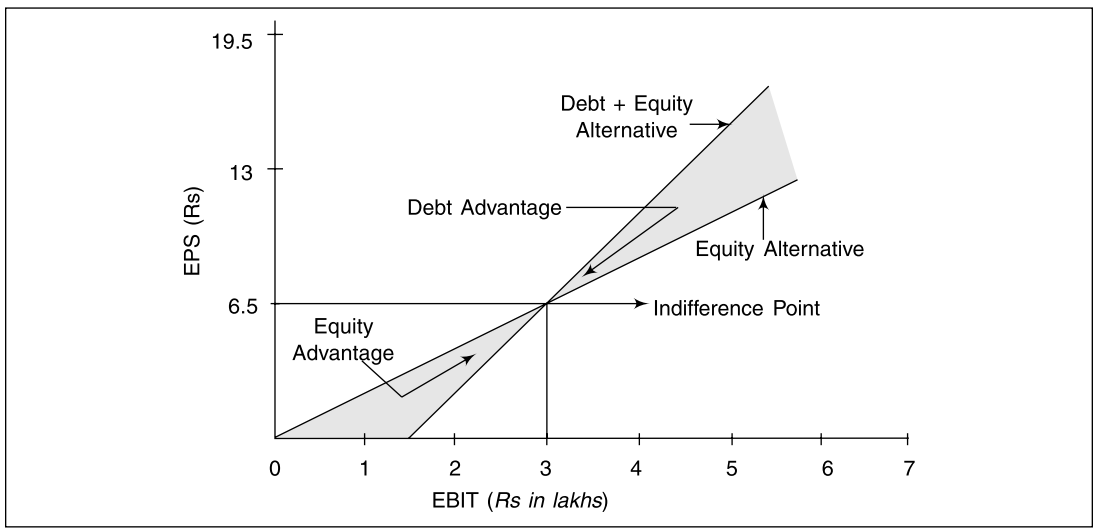

FIGURE 14.1 EBIT-EPS Analysis

An important point to be remembered in relation to the drawing of 33 per cent preference share financial plan (Fig. 14.2), is that EPS would not be zero if the firm's EBIT is Rs 1,30,000, because dividend payable on preference share is not tax-deductible. The firm must earn so much more than Rs 1,30,000 that it is left with Rs 1,30,000 after paying taxes. This amount can be calculated dividing Rs 1,30,000 by $(1 - t)$. The required amount is Rs 2,00,000 [Rs 1,30,000) ÷ (1 – 0.35)]. Thus, the starting point of preference share financial plan would be Rs 2 lakh.

The indifference points of Figs. 14.1 and 14.2 correspond to what we have determined through the algebraic approach. But the utility of the EBIT-EPS chart lies in its being more informative regarding the EBIT-EPS relationship. It gives a bird's eye view of EPS at various levels of EBIT. The EPS value at the estimated level of EBIT can be promptly ascertained. Moreover, it more easily explains why an equity financing plan is better than other plans requiring debenture and/or preference shares for the EBIT level below the IP. For instance, Fig. 14.2 indicates that for all EBIT levels below Rs 6 lakh, the EPS under equity alternative is greater than 33 per cent preference share financing plan and for all EBIT levels above Rs 6 lakh, the EPS is greater under 33 per cent financing plan than 100 per cent equity financing. The IP can be compared with the most likely level of EBIT. If the likely level of EBIT is more than the IP, the use of fixed cost financing plan may be recommended, otherwise equity plan would be more suitable. To sum up, **the greater the likely level of EBIT than the indifference point, the stronger is the case for using levered financial plans to maximise the EPS. Conversely, the lower the likely level of EBIT in relation to the indifference point, the more useful the unlevered financial plan would be** from the view point of EPS. In other words, financial leverage will be favourable and shareholders will get higher EPS if the return on total investment is more than the fixed cost (interest and preference dividend). If the return is less than the fixed financial charge, the EPS will decline with the use of debt and the leverage will be unfavourable. The financial leverage will have no effect on EPS in case the return on investment is exactly equal to the fixed financial costs.

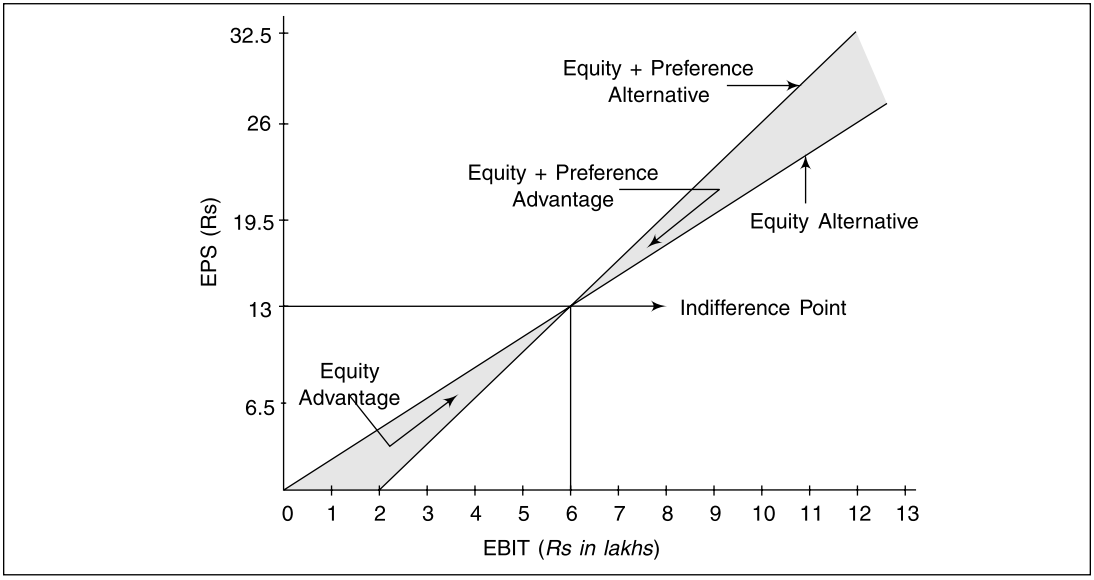

FIGURE 14.2 EBIT-EPS Analysis

The indifference point may be computed in another way using market value as the basis. Since the operational objective of financial management is the maximisation of share prices, the market price of shares of a firm with two different financial plans should be identical. Thus, on the basis of level of EBIT which ensures identical market price for alternative financial plans, the indifference point can be symbolically computed by Equation 14.10.

$$P/E_1\left[\frac{X(1-t)}{N_1}\right] = P/E_2\left[\frac{(X-I)(1-t)-D_P}{N_2}\right] \qquad \textbf{(14.10)}$$

where PE_1 = P/E ratio of unlevered plan and P/E_2 = P/E ratio of levered plan.

Example 14.8

Determine the indifference point at which market price of equity shares of a corporate firm will be the same from the following data:

1. Funds required, Rs 50,000.
2. Existing number of equity shares outstanding, 5,000 @ Rs 10 per share.
3. Existing 10% debt, Rs 20,000
4. Funds required can be raised either by (a) issue of 2,000 equity shares, netting Rs 25 per share or (b) new 15 per cent debt.
5. The P/E ratio will be 7 times in equity alternative and 6 times in debt alternative.
6. Corporate tax rate, 35 per cent.

Solution

$$P/E_1\left[\frac{(x-I_1)(1-t)}{N_1}\right] = P/E_2\left[\frac{(x-I_1-I_2)(1-t)}{N_2}\right]$$

or $$7\left[\frac{(x-\text{Rs } 2{,}000)\,0.65}{7{,}000}\right] = 6\left[\frac{(x-\text{Rs } 9{,}500)\,0.65}{5{,}000}\right]$$

or $$\frac{0.65x-\text{Rs } 1{,}300}{7{,}000} = \frac{0.65x-\text{Rs } 6{,}175}{5{,}000}$$

or $$5(4.55x-\text{Rs } 9{,}100) = 7(3.9x\times\text{Rs } 37{,}050)$$

or $$4.55x = \text{Rs } 2{,}13{,}850, \text{ i.e. } x = \text{Rs } 47{,}000$$

Confirmation Table

Particulars	*15% Debt issue*	*Equity issue*
EBIT	Rs 47,000	Rs 47,000
Less: Interest	9,500	2,000
Earning before taxes	37,500	45,000
Less: Taxes	13,125	15,750
Earning after taxes	24,375	29,250
Number of equity shares	5,000	7,000
Earnings per share	4.875	4.18
P/E ratio (times)	6	7
Market price of the share	29.25	29.25

Measures of Financial Leverages

Financial leverage measures the degree of the use of debt and other fixed-cost sources of fund to finance the assets the firm has acquired. As shown above, the use of debt has a magnifying

effect on the earnings per share. It can be said that the higher the proportion of debt in the capital structure, the higher is the financial leverage and *vice-versa*. Broadly speaking, financial leverage can be measured in two ways: **(i)** stock terms, and **(ii)** flow terms.

Stock Terms It can be measured either by **(a)** a simple ratio of debt to equity, or **(b)** by the ratio of long-term debt plus preference share to total capitalisation. Each of these measures indicates the relative proportion of the funds to the total funds of the firm on which it is to pay fixed financial charges.

Flow Terms The financial leverage can be measured either by **(a)** the ratio of EBIT to interest payments or **(b)** the ratio of cash flows to interest payment, popularly called the **debt service capacity/coverage**. These coverage ratios are useful to the suppliers of the funds as they assess the degree of risk associated with lending to the firm.

In general, the higher the 'stock' ratios and the lower the 'flow' ratios, the greater is the risk and *vice-versa*.

SECTION 3 COMBINED LEVERAGE: TOTAL RISK

Combined leverage is the product of operating leverage and financial leverage.

Total risk is the risk associated with combined leverage.

The operating leverage has its effects on operating risk and is measured by the percentage change in EBIT due to percentage change in sales. The financial leverage has its effects on financial risk and is measured by the percentage change in EPS due to percentage change in EBIT. Since both these leverages are closely concerned with ascertaining the ability to cover fixed charges (fixed-operating costs in the case of operating leverage and fixed-financial costs in the case of financial leverage), if they are combined, the result is total leverage and the risk associated with **combined leverage** is known as **total risk**. Symbolically, Degree of combined leverage (DCL)

$$\text{DCL} = \text{DOL} \times \text{DFL} \qquad \textbf{(14.11)}$$

Substituting the values of DOL and DFL, we have:

$$\text{DCL} = \frac{\%\text{ change in EBIT}}{\%\text{ change in sales}} \times \frac{\%\text{ change in EPS}}{\%\text{ change in EBIT}} = \frac{\%\text{ change in EPS}}{\%\text{ change in sales}} \qquad \textbf{(14.12)}$$

or

$$\text{DCL} = \frac{\text{Contribution}}{\text{EBIT}} \times \frac{\text{EBIT}}{\text{EBIT} - I} = \frac{\text{Contribution}}{\text{EBIT} - I} \qquad \textbf{(14.13)}$$

Thus, the DCL measures the percentage change in EPS due to percentage change in sales. If the degree of operating leverage of a firm is 6 and its financial leverage is 2.5, the combined leverage of this firm would be 15(6 x 2.5). That is, 1 per cent change in sales would bring about 15 per cent change in EPS in the direction of the change in sales. The combined leverage can work in either direction. It will be favourable if sales increase and unfavourable when sales decrease because changes in sales will result in more than proportionate returns in the form of EPS.

The usefulness of DCL lies in the fact that it indicates the effect that sales changes will have on EPS. Its potential is also great in the area of choosing financial plans for new investments. If, for example, a firm begins to invest heavily in more risky assets than usual, the operating leverage will obviously increase. If it does not change its financing policy, that is, the capital structure remains constant, there would be no change in its financial leverage. As a result, the combined leverages would increase causing an increase in its total risk. The firm, in order to

keep its risk constant, may like to lower its financial leverage. This could be done if the new investments are financed with more equity than the firm has used in the past. This would lower the financial leverage and compensate for the increased operating leverage caused by investment in more risky investments. If the operating leverage has decreased due to low fixed costs, the firm can afford to have a more levered financial plan to keep the total risk constant at the same time having the same prospects of magnifying effects on EPS due to change in sales.

Summary

- Leverage refers to the use of an asset or source of funds which involves fixed costs or fixed returns. As a result, the earnings available to the shareholders/owners are affected as also their risk. There are three types of leverage, namely, operating, financial and combined.
- Leverage associated with asset acquisition or investment activities is referred to as the operating leverage. It refers to the firm's ability to use fixed operating costs to magnify the effect of changes in sales on its operating profits (EBIT) and results in more than a proportionate change (±) in EBIT with change in the sales revenue.
- Degree of operating leverage (DOL) is computed in two ways: **(i)** Percentage change in EBIT/ Percentage change in sales and **(ii)** (Sales – Variable costs)/EBIT.
- The operating leverage is favourable when increase in sales volume has a positive magnifying effect on EBIT. It is unfavourable when a decrease in sales volume has a negative magnifying effect on EBIT. Therefore, high DOL is good when sales revenues are rising and bad when they are falling.
- The DOL is a measure of the business/operating risk of the firm. Operating risk is the risk of the firm not being able to cover its fixed operating costs. The larger is the magnitude of such costs, the larger is the volume of sales required to recover them. Thus, the DOL depends on fixed operating costs.
- Financial leverage is related to the financing activities of a firm. It results from the presence of fixed financial charges (such as interest on debt and dividend on preference shares). Since such financial expenses do not vary with the operating profits, financial leverage is concerned with the effect of changes in EBIT on the earnings available to equity-holders. It is defined as the ability of a firm to use fixed financial charges to magnify the effect of changes in EBIT on the earnings per share (EPS).
- The degree of financial leverage (DFL) can be computed in the following ways:
  (i) DFL = Percentage change in EPS/Percentage change in EBIT.
  (ii) DFL = EBIT/(EBIT – I), when debt is used.
  (iii) DFL = EBIT/[EBIT – I – $D_p/(1 - t)$], when debt as well as preference capital is used.
  (iv) DFL = EBIT/[EBIT – I – $(D_p + D_t)/(1 - t)$], when dividends paid on preference share capital are subject to dividend tax.
- Financial leverage involves the use of funds obtained at a fixed cost in the hope of increasing the return to the equity-holders. When a firm earns more on the assets purchased with the funds than the fixed cost of their use, the financial leverage is favourable. Unfavourable leverage occurs when the firm does not earn as much as the funds cost.
- High fixed financial costs increase the financial leverage and, thus, financial risk. The financial risk refers to the risk of the firm not being able to cover its fixed financial costs. In case of default, the firm can be technically forced into liquidation. The larger is the amount of fixed financial costs, the larger is EBIT required to recover them. Thus, the DFL depends on fixed financial costs.

- To devise an appropriate capital structure, the amount of EBIT under various financing plans should be related to EPS. The EBIT-EPS analysis is a widely-used method of examining the effect of financial leverage/use of debt. A financial alternative that ensures the largest EPS is preferred, given the level of EBIT.
- Financial break-even point (BEP) represents a point at which before-tax earnings are equal to the firm's fixed financial obligations. Symbolically, it is computed as follows: $[I + D_p + D_t)/(1 - t)]$. In other words, at financial BEP, EPS is zero.
- The EBIT level at which the EPS is the same for two alternative financial plans is known as the indifference point/level. Beyond the indifference level of EBIT, the benefits of financial leverage begin to operate with respect to EPS.
- The indifference point (IP) can be determined by using the following equations:

  (a) For a new company

  (i) $\frac{X(1-t)}{N_1} = \frac{(X-I)(1-t)}{N_2}$ (Equity versus Debentures)

  (ii) $\frac{X(1-t)}{N_1} = \frac{X(1-t) - D_p(1+D_t)}{N_3}$ (Equity versus Preference shares)

  (iii) $\frac{X(1-t)}{N_1} = \frac{(X-I)(1-t) - D_p(1+D_t)}{N_4}$ (Equity versus Preference shares and Debentures)

  (b) For an existing company (having existing debt)

  $$\frac{(X-I_1)(1-t)}{N_1} = \frac{(X-I_1-I_2)(1-t) - D_p(1+D_t)}{N_4}$$ (Equity versus Preference shares and Debentures)

- The indifference point can also be determined graphically. In order to graph the financial plan, two sets of EBIT-EPS coordinates are required for each financial plan. The point at which the two lines intersect is the IP.
- The greater is the likely level of EBIT than the IP, the stronger is the case for using levered plan (debt) to maximise the EPS. Conversely, the lower is the likely level of EBIT in relation to IP, the unlevered (equity) plan would be more useful from the perspective of EPS.
- The IP can be computed using market value (instead of EPS) as the basis. Under this method, the IP is that level of EBIT at which market price of the share (MPS) is the same for two alternative financial plans. Symbolically,

  $$P/E_1\left[\frac{X(1-t)}{N_1}\right] = P/E_2\left[\frac{(X-I)(1-t) - D_p(1+D_t)}{N_4}\right]$$

  (Equity versus preference shares and debentures)
- Combined leverage (DCL) is the product of operating and financial leverage. It indicates the effect that changes in sales will have on EPS. Symbolically, it can be computed by the following methods:
  (i) DCL = DOL × DFL
  (ii) DCL = Percentage change in EPS/Percentage change in sales
  (iii) DCL = (Sales – Variable costs)/(EBIT – *I*)
- Combined leverage is a measure of the total risk of the firm. To keep the risk within manageable limits, a firm which has high degree of operating leverage should have low financial leverage and *vice-versa*.

References

1. Joy, PM, *Introduction to Financial Management*, Irwin Homewood Ill., p 226.
2. Gitman, LJ, *Principles of Managerial Finance,* Harper & Row, New York, 1997, p 84.

Practical Problems

P.14.1 Calculate the operating leverage for each of the four firms, A, B, C and D from the following price and cost data. What conclusions can you draw with respect to levels of fixed cost and the degree of operating leverage result? Explain. Assume number of units sold is 5,000.

Particulars	*Firms*			
	A	*B*	*C*	*D*
Sale price per unit	Rs 20	Rs 32	Rs 50	Rs 70
Variable cost per unit	6	16	20	50
Fixed operating cost	80,000	40,000	2,00,000	Nil

*S*olution

Particulars	*Firms*			
	A	*B*	*C*	*D*
Sales (units)	5,000	5,000	5,000	5,000
Sales revenue (Units × price)	Rs 1,00,000	Rs 1,60,000	Rs 2,50,000	Rs 3,50,000
Less: Variable cost (Units × VC per unit)	30,000	80,000	1,00,000	2,50,000
Less: Fixed operating costs	80,000	40,000	2,00,000	Nil
EBIT	(10,000)	40,000	(50,000)	1,00,000

$$\text{DOL} = \frac{\text{Current sales (S)} - \text{Variable costs (VC)}}{\text{Current EBIT}}$$

$$\text{DOL}_{(A)} = \frac{\text{Rs } 1,00,000 - \text{Rs } 30,000}{\text{Rs } 10,000} = 7$$

$$\text{DOL}_{(B)} = \frac{\text{Rs } 1,60,000 - \text{Rs } 80,000}{\text{Rs } 40,000} = 2$$

$$\text{DOL}_{(C)} = \frac{\text{Rs } 2,50,000 - \text{Rs } 1,00,000}{\text{Rs } 50,000} = 3$$

$$\text{DOL}_{(D)} = \frac{\text{Rs } 3,50,000 - \text{Rs } 2,50,000}{\text{Rs } 1,00,000} = 1$$

The operating leverage exists only when there are fixed costs. In the case of firm D, there is no magnified effect on the EBIT due to change in sales. A 20 per cent increase in sales has resulted in a 20 per cent increase in EBIT. In the case of other firms, operating leverage exists. It is maximum in firm A, followed by firm C and minimum in firm B. The interpretation of DOL of 7 is that 1 per cent change in sales results in 7 per cent change in EBIT level in the direction of the change of sales level of firm A.

P.14.2 A firm's sales, variable costs and fixed cost amount to Rs 75,00,000, Rs 42,00,000 and Rs 6,00,000 respectively. It has borrowed Rs 45,00,000 at 9 per cent and its equity capital totals Rs 55,00,000.

(a) What is the firm's ROI?
(b) Does it have favourable financial leverage?
(c) If the firm belongs to an industry whose asset turnover is 3, does it have a high or low asset leverage?
(d) What are the operating, financial and combined leverages of the firm?
(e) If the sales drop to Rs 50,00,000, what will the new EBIT be?
(f) At what level will the EBT of the firm equal to zero?

Solution

(a) ROI = EBIT/Investment
EBIT = Sales – VC – FC = Rs 75 lakh – Rs 45 lakh – Rs 6 lakh = Rs 27 lakh.
ROI = Rs 27 lakh/Rs 100 lakh = 27 per cent.

(b) Yes, the firm has favourable financial leverage as its ROI is higher than the interest on debt.

(c) Asset turnover = Sales/Total assets or Total investments. = Rs 75 lakh/Rs 100 lakh = 0.75 It is lower than the industry average.

(d) $$\text{Operating leveage} = \frac{\text{Sales} - \text{Variable costs}}{\text{EBIT}} = \frac{\text{Rs 75 lakh} - \text{Rs 42 lakh}}{\text{Rs 27 lakh}} = 1.22$$

$$\text{Financial leverage} = \frac{\text{EBIT}}{\text{EBIT} - \text{Interest}} = \frac{\text{Rs 27 lakh}}{(\text{Rs 27 lakh} - \text{Rs 4.05 lakh})} = 1.18$$

$$\text{Combined leverage} = \frac{\text{Sales} - \text{VC}}{\text{EBIT} - \text{Interest}} = \frac{\text{Rs 33 lakhs}}{\text{Rs 22,95,000}} = 1.44$$

Alternatively = OL × FL = 1.22 × 1.18 = 1.44

(e) EBIT at sales level of Rs 50 lakh

Sales revenue	Rs 50,00,000
Less: Variable costs (50 lakh ´ 0.56)	28,00,000
Less: Fixed costs	6,00,000
EBIT	16,00,000

(f) Zero EBT implies break-even sales (BESR) = FC/CV ratio, CV ratio = Rs 33 lakhs/Rs 75 lakhs = 44 per cent
BESR = (Rs 6 lakh + Rs 4.05 lakh)/0.44 = Rs 22,84,091.

Confirmation table

Sales revenue	Rs 22,84,091
Less: VC (0.56)	12,79,091
Less: FC (operating)	6,00,000
Less: Interest (additional fixed cost)	4,05,000
EBT	ZERO

P.14.3 The selected financial data for A, B and C companies for the current year ended March 31 are as follows:

Particulars	*A*	*B*	*C*
Variable expenses as a percentage of sales	66.67	75	50
Interest expenses (Rs)	200	300	1,000
Degree of operating leverage	5	6	2
Degree of financial leverage	3	4	2
Income-tax rate	0.35	0.35	0.35

(a) Prepare income statements for A, B, and C companies.
(b) Comment on the financial position and structure of these companies.

Solution

(a) Income statement of companies A, B and C for the current year, ended March 31

Particulars	*A*	*B*	*C*
Sales	Rs 4,500	Rs 9,600	Rs 24,000
Less: Variable costs	3,000	7,200	12,000
Less: Fixed costs (Sales – VC – EBIT)	1,200	2,000	10,000
EBIT	300	400	2,000
Less: Interest	200	300	1,000
Earnings before taxes	100	100	1,000
Less: Taxes	35	35	350
EAT (Net income)	65	65	650

Working Notes

(a) The preparation of the income statement requires data for **(i)** sales revenue, **(ii)** variable costs and **(iii)** fixed costs.

Company A:

$$\text{DFL} = 3,\ \text{DFL} = \frac{\text{EBIT}}{\text{EBIT} - I}$$

$$3 = \frac{\text{EBIT}}{\text{EBIT} - \text{Rs } 200}$$

$$\text{EBIT} = \text{Rs } 300$$

$$\text{DOL} = \frac{\text{Sales} - \text{Variable costs (V)}}{\text{EBIT}}$$

$$5 = \frac{S - 0.667\,S}{\text{Rs } 300} \quad \text{where } S = \text{sales} = \text{Rs } 4{,}500$$

$$\text{VC} = 0.667 \times \text{Rs } 4{,}500 = \text{Rs } 3{,}000$$

Company B:

$$4 = \frac{\text{EBIT}}{\text{EBIT} - \text{Rs } 300}$$

$$\text{EBIT} = \text{Rs } 400$$

$$6 = \frac{S - 0.75\,S}{\text{Rs } 400} = \text{Rs } 9{,}600$$

$$VC = 0.75 \times \text{Rs } 9{,}600 = \text{Rs } 7{,}200$$

Company C:

$$2 = \frac{\text{EBIT}}{\text{EBIT} - \text{Rs } 1{,}000}$$

$$\text{EBIT} = \text{Rs } 2{,}000$$

$$6 = \frac{S - 0.50\,S}{\text{Rs } 2{,}000} = \text{Rs } 24{,}000$$

$$VC = 0.50 - \text{Rs } 24{,}000 = \text{Rs } 12{,}000$$

(b) The financial position of company *C* can be regarded better than other companies: **(i)** It has the least financial risk as it is has minimum degree of financial leverage. It is true that there will be

a more magnified impact on EPS of *A* and *B* due to change in EBIT, but, their EBIT level due to low sales is very low. **(ii)** From the point of view of DCL, company *C* is better placed. The degree of combined leverage is maximum in company *B* (24); for company *A* (15) and for company *C* it is 4. The total risk (business plus financial) of company *C* is the lowest. **(iii)** The ability of the company *C* to meet interest liability is better. The EBIT/interest ratios for the three companies are:

C, 2.0 (Rs 2,000 ÷ Rs 1,000)
B, 1.5 (Rs 300 ÷ Rs 200)
A, 1.33 (Rs 400 ÷ Rs 300)

P.14.4 Calculate (a) the operating leverage, (b) financial leverage and (c) combined leverage from the following data under situations I and II and financial plans, *A* and *B*.
Installed capacity, 4,000 units
Actual production and sales, 75 per cent of the capacity
Selling price, Rs 30 per unit
Variable cost, Rs 15 per unit

Fixed cost:
Under situation I, Rs 15,000
Under situation II, 20,000

Capital structure:

Particulars	*Financial plan*	
	A	*B*
Equity	Rs 10,000	Rs 15,000
Debt (0.20 interest)	10,000	5,000
	20,000	20,000

Solution

(a) Determination of operating leverage

Particulars	*Situations*	
	I	*II*
Sales	Rs 90,000	Rs 90,000
Less: Variable costs	45,000	45,000
Contribution	45,000	45,000
Less: Fixed costs	15,000	20,000
EBIT	30,000	25,000
Operating leverage $\left(\frac{\text{Contribution}}{\text{EBIT}}\right)$	1.5	1.8

(b) Determination of financial leverage

Particulars	*Situation I*		*Situation II*	
	Financial plans		*Financial plans*	
	A	*B*	*A*	*B*
EBIT	Rs 30,000	Rs 30,000	Rs 25,000	Rs 25,000
Less: Interest on debt	2,000	1,000	2,000	1,000
EBT	28,000	29,000	23,000	24,000
Financial leverage (EBIT/EBT)	1.07	1.03	1.09	1.04

(c) Determination of combined leverage

Particulars	*Financial plans*	
	A	*B*
Situation I	1.5 × 1.07 = 1.61	1.5 × 1.03 = 1.54
Situation II	1.8 × 1.09 = 1.96	1.8 × 1.04 = 1.87

P.14.5 The capital structure of the Progressive Corporation Ltd consists of an ordinary share capital of Rs 10,00,000 (shares of Rs 100 par value) and Rs 10,00,000 of 10% debentures. The unit sales increased by 20 per cent from 1,00,000 units to 1,20,000 units, the selling price is Rs 10 per unit, variable costs amount to Rs 6 per unit and fixed expenses amount to Rs 2,00,000. The income tax rate is assumed to be 35 per cent.

(a) You are required to calculate the following:

(i) The percentage increase in earnings per share.

(ii) The degree of financial leverage at 1,00,000 units and 1,20,000 units.

(iii) The degree of operating leverage at 1,00,000 units and 1,20,000 units.

(b) Comment on the behaviour of operating and financial leverage in relation to increase of production from 1,00,000 to 1,20,000 units.

Solution

(a) **Determination of earnings per share (EPS)**

Sales level (units)	1,00,000	1,20,000
Sales revenue	Rs 10,00,000	Rs 12,00,000
Less: Variable costs	6,00,000	7,20,000
Less: Fixed costs	2,00,000	2,00,000
EBIT	2,00,000	2,80,000
Less: Interest	1,00,000	1,00,000
Earnings after interest	1,00,000	1,80,000
Less: Taxes	35,000	63,000
EAT	65,000	1,17,000
Number of equity shares	10,000	10,000
EPS (EAT ÷ N)	6.5	11.7

(i) Percentage increase per share $= \dfrac{\Delta EPS}{EPS} \times 100 = \dfrac{Rs\ 5.2}{Rs\ 6.5} \times 100 = 80$ per cent

(ii) DFL (at 1,00,000 units) $= \dfrac{Rs\ 2,00,000}{Rs\ 1,00,000} = 2.0$

(at 1,20,000 units) $= \dfrac{Rs\ 2,80,000}{Rs\ 1,80,000} = 1.56$

(iii) DOL (at 1,00,000 units) $= \dfrac{Rs\ 4,00,000}{Rs\ 2,00,000} = 2.0$

(at 1,20,000 units) $= \dfrac{Rs\ 4,80,000}{Rs\ 2,80,000} = 1.71$

(b) As a result of increase in production and sales from 1,00,000 units to 1,20,000 units, EPS has gone up by 80 per cent. Moreover, there has been a decrease in both types of leverages–operating as well as financial–reflecting a decline in the total risk of the company.

P.14.6 Exel Limited is considering three financing plans. The key information is as follows:

(a) Total funds to be raised, Rs 2,00,000.

(b) Financing plans

Plans	*Equity (%)*	*Debt (%)*	*Preference (%)*
A	100	—	—
B	50	50	—
C	50	—	50

(c) Cost of debt 8 per cent; cost of preference shares 8 per cent

(d) Tax rate, 35 per cent

(e) Equity shares of the face value of Rs 10 each will be issued at a premium of Rs 10 per share.

(f) Expected EBIT, Rs 80,000.

Determine for each plan:

(i) earnings per share (EPS) and financial break-even point.

(ii) indicate if any of the plans dominate, and compute the EBIT range among the plans for indifference.

Solution

(i) Determination of EPS under plans A, B and C

EBIT	Rs 80,000	Rs 80,000	Rs 80,000
Less: Interest	—	8,000	—
EBT	80,000	72,000	80,000
Less: Taxes (0.35)	28,000	25,200	28,000
EAT	52,000	46,800	52,000
Less: Dividend on preference shares	—	—	8,000
Earnings for equity-holders	52,000	46,800	44,000
÷ number of shares	10,000	5,000	5,000
EPS	5.2	9.36	8.8

Financial BEP for plans, *A*, *B* and *C*

Plan A = Zero

Plan B = Rs 8,000 (Rs 1,00,000 × 0.08)

Plan C $= \dfrac{D_P}{(1-t)} = \dfrac{\text{Rs } 8,000}{0.65}$ = Rs 12,308

(ii) Indifference point among financial plans

(a) A and B:

$$\frac{X(1-t)}{N_1} \quad \frac{(X-I)(1-t)}{N_1} = \frac{X(1-t)-D_P}{N_2}; \quad \frac{0.65(X-\text{Rs } 8,000)}{5,000}$$

X = Rs 10,400/0.65 = Rs 16,000.

(b) B and C:

$$\frac{(X-I)(1-t)}{N_1} = \frac{X(1-t)-D_P}{N_2}; \quad \frac{0.65(X-\text{Rs } 8,000)}{5,000} = \frac{0.65X-\text{Rs } 8,000}{5,000}$$

or $0.65X$ – Rs 5,200 = $0.65X$ – Rs 8,000

or $0.65X - 0.65X$ = Rs 5,200 – Rs 8,000

Thus, indifference point between plans B and C is indeterminate.

(c) A and C:

$$\frac{X(1-t)}{N_1} = \frac{X(1-t)-D_P}{N_2}; \frac{0.65X}{10,000} = \frac{0.65X - \text{Rs } 8,000}{5,000}$$

or $0.65X = 13X - \text{Rs } 16,000$ or $X = \text{Rs } 16,000/0.65$ i.e. Rs 24,615

Domination of plan: Plan *B* dominates plan *C* as the financial BEP of plan *B* is lower.

P.14.7 Skyline Software Ltd has appointed you as its finance manager. The comapny wants to implement a project for which Rs 30 lakh is required to be raised from the market as a means of financing the projet. The following financing plans and options are at hand: (Number in thousands)

Particulars	*Plan A*	*Plan B*	*Plan C*
Option 1:			
Equity shares	30	30	30
Option 2:			
Equity shares	15	20	10
12% Preference shares	Nil	10	10
10% Non-convertible debentures	15	Nil	10

Assuming corporate tax to be 35 per cent and the face value of all the shares and debentures to be Rs 100 each, calculate the indifference points and earnings per share (EPS) for each of the financing plans. Which plan should be accepted by the company?

Solution

Determination of indifference point under plans A, B, C

Plan A:

$$\frac{X(1-t)}{N_1} = \frac{(X-I)(1-t)}{N_2}; \frac{X(1-0.35)}{30,000} = \frac{(X - \text{Rs } 1.5 \text{ lakh})\,0.65}{15,000}$$

OR $X - 0.35X = 2(0.65X - \text{Rs } 97,500)$;

$X - 0.35X = 1.3X - \text{Rs } 1,95,000$

OR $0.65X = \text{Rs } 1,95,000$ or $X = \text{Rs } 1,95,000/0.65 = \text{Rs } 3,00,000$

Plan B:

$$\frac{X(1-0.35)}{30,000} = \frac{X(1-0.35) - \text{Rs } 1,20,000}{20,000}$$

OR $$\frac{0.65X}{30,000} = \frac{0.65X - \text{Rs } 1,20,000}{20,000};$$

$2(0.65X) = 3(0.65X - \text{Rs } 1,20,000)$

$1.3X = 1.95X - \text{Rs } 3,60,000$

OR $X = \text{Rs } 3,60,000/0.65 = \text{Rs } 5,53,846$

Plan C:

$$\frac{X(1-t)}{N_1} = \frac{(X-I)(1-t)-D_P}{N_2}; \frac{0.65X}{30,000} = \frac{(X - \text{Rs } 1 \text{ lakh})\,0.65 - \text{Rs } 1.2 \text{ lakh}}{10,000}$$

OR $$\frac{0.65X}{30,000} = \frac{0.65X - \text{Rs } 65,000 - \text{Rs } 1,20,000;}{10,000}$$

OR $$\frac{0.65X}{30,000} = \frac{0.65X - \text{Rs } 1,85,000}{10,000}$$

X = Rs 5,55,000/1.3 = Rs 4,26,923

Determination of EPS under plans *A*, *B* and *C* for options 1 and 2

Particulars	*Plan A*		*Plan B*		*Plan C*	
	1	*2*	*1*	*2*	*1*	*2*
EBIT	Rs 3,00,000	Rs 3,00,000	Rs 5,53,846	Rs 5,53,846	Rs 4,26,923	Rs 4,26,923
Less: Interest	—	1,50,000	—	—	—	1,00,000
EBT	3,00,000	1,50,000	5,53,846	5,53,846	4,26,923	3,26,923
Less: Taxes	1,05,000	52,500	1,93,846	1,93,846	1,49,423	1,14,423
EAT	1,95,000	97,500	3,60,000	3,60,000	2,77,500	2,12,500
Less: Dividend on preference shares	—	—	—	1,20,000	—	1,20,000
Earnings available for equity-holders	1,95,000	97,500	3,60,000	2,40,000	2,77,500	92,500
Number of equity shares (N)	+30,000	+ 15,000	+30,000	+20,000	+30,000	+10,000
EPS	6.5	6.5	12	12	9.25	9.25

P.14.8 The Well Established Company's most recent balance sheet is as follows:

Liabilities	*Amount*	*Assets*	*Amount*
Equity capital (Rs 10 per share)	Rs 60,000	Net fixed assets	Rs 1,50,000
10% Long-term debt	80,000	Current assets	50,000
Retained earnings	20,000		
Current liabilities	40,000		
	2,00,000		2,00,000

The company's total assets turnover ratio is 3, its fixed operating costs are Rs 1,00,000 and the variable operating costs ratio is 40 per cent. The income tax rate is 35 per cent.

(a) Calculate all the three types of leverages.

(b) Determine the likely level of EBIT if EPS is (i) Re 1, (ii) Rs 3, and (iii) Zero.

Solution

Income statement

Sales	Rs 6,00,000
Less: Variable costs	2,40,000
Less: Fixed costs	1,00,000
EBIT	2,60,000
Less: Interest	8,000
Earnings before interest	2,52,000
Less: Taxes	88,200
Earnings after taxes	1,63,800

(a) DOL $= \dfrac{\text{Rs } 6,00,000 - 2,40,000}{\text{Rs } 2,60,000} = 1.38$

$$\text{DFL} = \frac{\text{Rs } 2{,}60{,}000}{\text{Rs } 2{,}52{,}000} = 1.03$$

$$\text{DCL} = 1.38 \times 1.03 = 1.42$$

(b) (i) $$\text{EPS} = \frac{(\text{EBIT} - I)(1 - t)}{N}$$

$$\text{Re } 1 = \frac{(\text{EBIT} - \text{Rs } 8{,}000)(1 - 0.35)}{6{,}000}$$

$$\text{Rs } 6{,}000 = 0.65\ \text{EBIT} - \text{Rs } 5{,}200$$

$$\text{EBIT} = \text{Rs } 17{,}231$$

(ii) $$\text{Rs } 3 = \frac{(\text{EBIT} - \text{Rs } 8{,}000) \times 0.65}{6{,}000}$$

$$\text{EBIT} = \text{Rs } 35{,}692$$

(iii) $$0(\text{Zero}) = \frac{(\text{EBIT} - \text{Rs } 8{,}000) \times 0.65}{6{,}000}$$

$$\text{EBIT} = \text{Rs } 8{,}000$$

Confirmation table

EBIT	Rs 8,000	Rs 17,231	Rs 35,692
Less: Interest	8,000	8,000	8,000
Earnings after interest	Nil	9,231	27,692
Less: Taxes	Nil	3,231	9,692
Net income (NI)	Nil	6,000	18,000
Number of shares (N)	6,000	6,000	6,000
EPS (NI + N)	Zero	1	3

Working Notes

$$\text{Total assets turnover ratio} = 3 = \frac{\text{Sales}}{\text{Rs } 2{,}00{,}000}$$

$$\text{Sales} = \text{Rs } 6{,}00{,}000$$

P.14.9 A company has 20,000 equity shares of Rs 50 each outstanding. The following is the income statement relating to the previous year as well as four proforma statements reflecting different assumptions regarding a new project. The new project is expected to cost Rs 5,00,000 in each case.

Proforma

Particulars	*Actual (previous year)*	*Sell 10,000 equity shares*		*Sell 10% debentures*	
		Optimistic	*Pessimistic*	*Optimistic*	*Pessimistic*
		Rs 12,00,000	*Rs 9,00,000*	*Rs 12,00,000*	*Rs 9,00,000*
Sales	Rs 8,00,000				
Variable expenses	2,40,000				
	5,60,000				
Fixed costs	3,00,000				
EBIT	2,60,000				
Interest	Nil				
Earning after interest	2,60,000				
Taxes	91,000				
EAT	1,69,000				
EPS	8.45				

Assuming variable cost as per cent of sales remains constant and additional fixed cost with new project is likely to be Rs 1,00,000, complete the tabulation. Which plan would you recommend to finance the new project?

Solution

Completion of table *(Amount in Rs thousand)*

Particulars		*Proforma*			
	Actual	*Sell 10,000 equity shares*		*Sell 10% debentures*	
	(Previous year)	*Optimistic*	*Pessimistic*	*Optimistic*	*Pessimistic*
Sales	800	1,200	900	1,200	900
Variable costs	240	360	270	360	270
	560	840	630	840	630
Fixed costs	300	400	400	400	400
EBIT	260	440	230	440	230
Interest	Nil	Nil	Nil	50	50
Earnings after interest	260	440	230	390	180
Taxes	91	154	80.5	136.5	63
EAT	169	286	149.5	253.5	117
EPS (Rs)	8.45	9.53	4.98	12.67	5.85

The debt form of financing would be recommended to finance the new project as the EPS is more under debt form of financing than equity, in both optimistic and pessimistic situations.

Assumption: The company can sell its equity shares at Rs 50 each without incurring any floatation costs.

P.14.10 Consider the following information for Strong Ltd: *(Rs in lakh)*

EBIT	1,120
EBT	320
Fixed cost	700

Calculate the percentage of change in EPS, if sales increase by 5 per cent.

Solution

Degree of combined leverage (DCL) = (Degree of operating leverage × Degree of financial leverage)

$$= \frac{\text{Percentage change in EBIT}}{\text{Percentage change in sales}} \times \frac{\text{Percentage change in EPS}}{\text{Percentage change in EBIT}}$$

$$\text{DCL} = \frac{\text{Percentage change in EPS}}{\text{Percentage change in sales}}$$

Alternatively, DCL can be determined as

$$\text{DCL} = \left(\frac{\text{Sales} - \text{Variable costs}^*}{\text{EBIT}} \times \frac{\text{EBIT}}{\text{EBT}} \right)$$

*Sales – VC i.e., Contribution = EBIT + Fixed costs = Rs 1,120 lakh + Rs 700 lakh = Rs 1,820 lakh

DCL = (Contribution/EBT) i.e. (Rs 1,820 lakh/Rs 320 lakh) = 5.6875

5.6875 = Percentage change in EPS/Percentage increase in sales

Percentage change in EPS = Percentage increase in sales × 5.6875 = 5% × 5.6875 = 28.4375 per cent 5 per cent increase in sales will cause 28.4375 per cent increase in EPS.

Mini Case

14.C.1 AMR Paints (Operating, Financial and Combined Leverage) AMR Paints Ltd is a leading manufacturer of decorative and industrial paints in India. The income statement (Exhibit 1) and the balance sheet (Exhibit 2) for the current year are given. Its sales next year are estimated to be 25 per cent higher on account of increase in demand for paints from the housing and commercial real estate sectors. The variable costs as percentage to sale are likely to remain constant. An increase of 12.5 per cent is estimated in fixed costs.

AMR Paints is planning to launch two new brands of luxury emulsions—Supercoat and Luxurycoat. The Supercoat paint would generate an additional Rs 600 crore sales and require an extra Rs 400 crore investment involving installation of manufacturing and packaging machinery. While the additional fixed costs requirement would be Rs 150 crore, variable cost to sales ratio would not change. For manufacturing the Luxurycoat paint the additional investment requirement and sales generated would amount to Rs 600 crore and Rs 800 crore respectively. The variable cost ratio would remain constant but the fixed cost are expected to increase by Rs 240 crore. The AMR has four alternative financing plans to choose from (Exhibit 3). Its current debt-equity ratio is 5:1.

AMR Paints has hired Mustafa Hakimuddin as a financial consultant to carry out the following tasks:

(1) What would its operating, financial and total leverages be next year without the new proposal?

(2) Assuming that the AMR paints finances the projects using financing plan (A), determine the three leverages for the two projects individually. Which new brand is better?

(3) Which financing option should AMR choose to if only Supercoat is to be manufactured?

(4) Calculate the financial breakeven points of each plan.

EXHIBIT 1 Income Statement, Current Year and Market Data (Rs crore)

Sales	Rs 5,000
Variable costs (0.50)	2,500
Contribution	2,500
Fixed costs	1,000
EBIT	1,500
Interest	500
EBT	1,000
Tax (0.35)	350
EAT	650
Shares outstanding	10
EPS (Rs)	65
P/E ratio	20
Market price per share (MPS) (Rs)	1,300

EXHIBIT 2 Balance Sheet As at March 31, Current Year (Rs crore)

Liabilities		*Assets*		
Equity capital	Rs 100	Fixed assets		Rs 5,850
Reserve and Surpluses	900	Current assets:		
10% Debt	5,000	Inventory	Rs 550	
Current liabilities	950	Receivables	300	
		Cash	250	1,100
	6,950			6,950

EXHIBIT 3 Financing Options/Plans (Rs crore)

Plans	*Debentures*		*Equity Shares*		*Preference Shares*		*P/E*
	Coupon rate	*Amount*	*Number (Crore)*	*Face value*	*Rate*	*Amount*	
(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*
A	0.12	Rs 1,000	—	—	—	—	14
B	—	—	100	Rs 10	—	—	30
C	0.11	400	60	10	—	—	20
D	—	—	70	10	0.11	Rs 300	28

Solution

(1) Determination of Leverage (Without New Proposal)

Degree of operating leverage (DOL) = $\left[\frac{\text{Sales} - \text{VC}}{\text{EBIT}}\right]$	= 1.56
Degree of financial leverage (DFL) = EBIT/(EBIT – I)	= 1.33
Degree of combined leverage (DCL) = [DOL × DFL]	= 2.07

Working Note

Income statement (Rs crore)

Project sales (Rs 5,000 + 0.25)	Rs 6,250
Variable costs (50%)	3,125
Contribution	3,125
Fixed costs (Rs 1,000 + 0.125)	1,125
EBIT	2,000
Interest	500
EBT	1,500
Taxes (0.35)	525
EAT	975
EPS	97.5
P/E	20
MPS	1,950

(2) Determination of Leverage

	Supercoat	*Luxurycoat*
DOL	2	2.5
DFL	1.47	1.82
DCL	2.94	4.55
ROCE (Return on capital employed)	0.375	0.267

Comment: Supercoat is a superior alternative as its leverages are lower and the ROCE is higher.

Working Notes

Income Statement (Rs crore)

	Supercoat	*Luxurycoat*
Sales	Rs 600	Rs 800
Variable costs (0.50)	300	400
Contribution	300	400
Fixed costs	150	240
EBIT	150	160
Interest	48	72
EBT	102	88
Tax	35.7	30.8
EAT	66.3	57.2

(3) Determination of Leverages

Particulars	*Financing Plans*			
	A	*B*	*C*	*D*
DOL	1.59	1.59	1.59	1.59
DFL	1.34	1.30	1.32	1.32
DCL	2.13	2.07	2.10	2.10
Outstanding shares (crore)	10.00	50.00	34.00	38.00
EPS (Rs)	104.13	21.45	31.21	27.88
P/E ratio	14	30	20	28
MPS (Rs)	1,457.82	643.50	624.22	780.64

Comment: Plan A is preferable as it has the highest MPS.

Working Notes

Income Statement (Rs crore)

Particulars	*Plans*			
	A	*B*	*C*	*D*
Projected sales	Rs 6,850	Rs 6,850	Rs 6,850	Rs 6,850
Variable costs	3,425	3,425	3,425	3,425
Contribution	3,425	3,425	3,425	3,425
Fixed costs	1,275	1,275	1,275	1,275
EBIT	2,150	2,150	2,150	2,150
Interest	548	500	517.6	500
EBT	1,602	1,650	1,632.4	1,650
Tax	560.7	577.5	571.4	577.5
EAT	1,041.3	1,072.5	1,061.0	1,072.5
Preference dividend	—	—	—	13.2
Earning available for shareholders	1,041.3	1,072.5	1,061.0	1,059.3

(4) Financial Break-even Point
= (I + D/PD) ÷ (1 − t)

Plan	A = Rs	548.0	crore (Interest)
	B	500.0	(Interest)
	C	517.6	(Interest)
	D	520.30	[Rs 500 + (Rs 13.2/0.65)]

Review Questions

RQ.14.1 Indicate whether the following statements are true or false.

(i) The degree of operating leverage is a measure of financial risk.

(ii) The degree of financial leverage is a measure of business risk.

(iii) The EBIT level at which the EPS is the same for two alternative financial plans is known as the financial break-even point.

(iv) At financial break-even point, EPS is zero.

(v) The greater the projected level of EBIT than the indifference point, the stronger is the case for the use of equity.

(vi) The combined leverage is the summation of the degree of operating leverage and financial leverage.

(vii) The combined leverage is a measure of total risk of the firm.

(viii) High fixed operating costs increase the financial leverage.

(ix) The larger the amount of fixed financial costs, the larger is the EBIT required to recover them.

(x) There exists inverse relationship between fixed costs and leverage.

(xi) Financial BEP is a summation of interest payable on debt and dividend on preference shares.

[Answers: (i) False (ii) False (iii) False (iv) True (v) False (vi) False (vii) True (viii) False (ix) True (x) False (xi) False]

RQ.14.2 What is meant by the term 'leverage'? What are its types? With what type of risk is each leverage generally associated? Why is increasing leverage also indicative of increasing risk? State the situation when there is neither a financial risk nor business risk.

RQ.14.3 A financial analyst is interested in ascertaining business risk of two similar firms. If all operating data for the two firms were the same, save the following differences, which firm would have greater amount of business risk in each instance?

(a) Firm X has a higher sales level than Firm Y, **(b)** Firm X has a higher EBIT level, and **(c)** Firm Y has a lower variable cost ratio.

RQ.14.4 What is combined leverage? What does it measure? What would be the changes in the degree of combined leverage, assuming other things being equal, in each of the following situations?

(a) The fixed costs increase, **(b)** The EBIT level increases, **(c)** The sale price decreases, and **(d)** The variable cost decreases.

RQ.14.5 Why must the finance manager keep in mind the degree of financial leverage in evaluating various financing plans? When does financial leverage become favourable?

RQ.14.6 What is the 'indifference point' and why is it so called? What is its usefulness?

RQ.14.7 What is an indifference point in the EBIT-EPS analysis? How would you compute it?

RQ.14.8 Explain the significance of operating and financial leverage analysis for a financial executive in corporate profit and financial structure planning.

Examination Questions

Theory Questions

14.1 What does the 'degree of combined leverage' measure? What should be the changes in the degree of combined leverage, assuming other things being equal, in each of the following situations: **(i)** the fixed cost increases and **(ii)** the sale price decreases? (*Delhi University, 2010*)

14.2 Differentiate between financial leverage and operating leverage. (*Pune University, 2010*)

14.3 What is operating leverage? (*Madras University, 2010*)

14.4 Explain indifference point in EBIT-EPS analysis. How is it measured? (*Calcutta University, 2010*).

14.5 Write short note on relationship between margin of safety and degree of operating leverage. (*Calcutta University, 2010*)

14.6 The purpose of measuring operating leverage is different from that of financial leverage. Explain. (*Delhi University, 2009*)

14.7 Write short note on EBIT-EPS analysis. (*Calcutta University, 2007, 2009*)

14.8 What do you understand by operating or business risk and financial risk of a firm? How would you measure them? (*Calcutta University, 2009*)

14.9 What are the components of total risk of a firm? State the combination of operating and financial leverages that will provide **(i)** low risk situation, **(ii)** high risk situation and **(iii)** an ideal situation. (*Calcutta University, 2009*)

14.10 What is 'indifference point'? Explain it in relation to EBIT-EPS analysis. (*Calcutta University, 2008*)

14.11 Distinguished between operating leverage and financial leverage. How can the two leverages be measured? (*Delhi University, 2007*)

14.12 What is meant by financial break-even point? (*Delhi University, 2007*)

14.13 What do you understand by operating leverage? How would you measure it? (*Calcutta University, 2007*)

14.14 Explain the relation among fixed cost, risk and leverage. (*Calcutta University, 2006*)

14.15 What is **(a)** EPS and **(b)** financial leverage? *Bangalore University, 2006*)

14.16 Distinguish between operating leverage and financial leverage. (*Bangalore University, 2006*)

14.17 How are business risk and financial risk measured? (*Delhi University, 2008, 2005*)

14.18 Why must the finance manager keep in mind the degree of financial leverage in evaluating various financing plans? When does financial leverage become favourable? *(Delhi University, 2004)*

14.19 'Operating leverage and financial leverage are the two sides of the same coin and should be given due weightage in planning the risk profile of a firm'. Do you agree? Critically examine the statement. *(Calcutta University, 2004)*

14.20 Explain the significance and limitations of trading on equity. *(Gujarat University, March-April 2003)*

14.21 Explain the significance of degree of operating leverage (DOL) and margin of safety (M/S) to a firm and examine their relationship. *(Calcutta University, 2003)*

14.22 What is indifference point in EBIT-EPS analysis? How would you measure it? *(Calcutta University, 2002)*

14.23 Explain briefly the concept of financial leverage. *(Delhi University, 2001)*

14.24 Explain the concept of leverage ratio. What do they indicate? *(Mumbai University, November 2001)*

14.25 What factors contribute to the operating risk and financial risk of a firm? How would you measure them? *(Calcutta University, 2001)*

14.26 **(a)** What is meant by financial leverage?

(b) Examine:

(i) Operating leverage and

(ii) Financial leverage.

(c) Choose the best answer
A firm's financial leverage can
(a) Enhance its EPS when its EBIT is high.
(b) Reduce its EPS when its EBIT is high.
(c) Enhance its EPS when its EBIT is low.
(d) Stabilise its EPS when its EBIT is low. *(Bharatiyar University, April 2001)*

14.27 Explain briefly 'financial risk' and 'business risk'. *(Delhi University, 1998)*

14.28 Which of the following statements are correct and which are false? Give briefly reasons for your answers:

(1) 'Trading on equity' is resorted to with a view to decrease earnings per equity share. *(Delhi University, 1998)*

(2) Financial risk refers to variability in operating profit due to changes in sales. *(Delhi University, 2000)*

14.29 What is composite leverage? State the significance of combined leverage? (*Bangalore University*)

14.30 Explain the term 'leverage'. What are its types? (*Bangalore University*)

14.31 How do you calculate operating leverage and combined leverage. (*Bangalore University*)

14.32 Operating leverage shows the effect on residual net income on account of long-term funds bearing fixed changes. (True or False) (*Bangalore University*) (Answer 'False')

Numerical Questions

14.1 The capital structure of Radhika Ltd. consists of equity share capital of Rs 10,00,000 (the par value of one equity share is Rs 100) and Rs 10,00,000 of 10% debentures. The unit sales increased by 20 per cent from 1,00,000 units to 1,20,000 units, the selling price is Rs 10 per unit, variable costs amount to Rs 6 per unit and fixed expenses amount to Rs 2,00,000. The income tax rate is 35 per cent.

1. You are required to calculate: **(i)** The percentage increase in EPS, **(ii)** The degree of financial leverage at 1,00,000 and 1,20,000 units, and **(iii)** The degree of operating leverage at 1,00,000 and 1,20,000 units
2. Comment on the behaviour of operating and financial leverage in relation to increase in production from 1,00,000 to 1,20,000. (*Delhi University, 2011*)

Solution

Statement showing increase in EPS and DOL and DFL at 1,00,000 and 1,20,000 units of sales

Particulars	*1,00,000 units*	*1,20,000 units*
Selling price per unit	Rs 10	Rs 10
Variable cost per unit	6	6
Contribution per unit	4	4
Total contribution	4,00,000	4,80,000
Less fixed costs (operating)	2,00,000	2,00,000
EBIT	2,00,000	2,80,000
Less interest (10% 3 Rs 10 lakh)	1,00,000	1,00,000
EBT	1,00,000	1,80,000
Less taxes (35%)	35,000	63,000
EAT	65,000	1,17,000
Number of equity shares (N)	10,000	10,000
EPS (EAT/N)	Rs 6.5	Rs 11.70
DOL (Total contribution/EBIT)	2.0	1.71
DFL (EBIT/EBT)	2.0	1.56
Percentage increase in EPS (Rs 11.7 – Rs 6.5 – Rs 5.2/6.50)	—	80

Comment: Increase in production/sales from 1 lakh units to 1.2 lakh units has caused decrease in DOL as well as DFL.

14.2 The following information have been taken from the income statement of *X* Ltd.:

Fixed operating expenses	Rs 1,200
Fixed financial charges	600
Earning before tax	400

Calculate percentage of change in EPS, if sales increase by 10 per cent.

(*Calcutta University, 2010*)

Solution

Statement showing determination of DCL of *X* Ltd.

Earnings before tax (EBT)	Rs 400
Add fixed financial charges (interest)	600
Earnings before interest and taxes (EBIT)	1,000
Add fixed operating expenses	1,200
Contribution	2,200
DCL = Contribution/EBT: (Rs 2,200/Rs 400)	5.5

Alternatively, DOL = % change in EPS/% change in sales.

Percentage change in EPS = DOL 3 % change in sales = 5.5 × 10% = 55%

Sales increase of 10 per cent would result 55 per cent increase in EPS.

14.3 The Karnal Recreation Ltd. manufacturers a full line of lawn furniture. The average selling price of a finished unit is Rs 2,500 and variable cost is Rs 1,500 per unit. Fixed cost for the company is Rs 50,00,000 per year.

(i) What is the break-even point in units for the company?

(ii) Find the degree of operating leverage at the following production and sales levels: 4,000 units; 5,000 units; 6,000 units; 8,000 units.

(iii) Does the degree of operating leverage increase or decrease as the production and sales levels rise above the break-even point? What conclusion would you draw from such increase or decrease?

(iv) By what percentage the EBIT will increase if the company's sales should increase by 10% from the production and sales level of 8,000 units? (*Delhi University, 2010*)

Solution

(i) and **(ii)** Statement showing BEP and DOL at varying production and sales levels (amount in Rs lakh)

Particulars	*Sales (units)*			
	4,000	*5,000*	*6,000*	*8,000*
Sales revenue	Rs 100	Rs 125	Rs 150	Rs 200
Less variable costs	60	75	90	120
Total contribution (C)	40	50	60	80
Less fixed costs (FC)	50	50	50	50
EBIT	(–10)	0	10	30
BEP (TFC/CMPU@) in units: Rs 50 lakh/Rs 1,000 = 5,000 units				
DOL (C/EBIT)	–4	infinite	6	2.67

@ Rs 2,500 selling price – Rs 1,500 variable cost = Rs 1,000 is contribution margin per unit (CMPU)

(iii) At BEP, total operating fixed costs are fully recovered. Therefore, higher DOL are considered favourable beyond BEP; for instance, DOL 6 implies that 1% change in sales would course 6% change in EBIT.

(iv) DOL = Percentage change in EBIT/Percentage change in sales. Therefore, percentage change in EBIT = 1% × 2.67 = 2.67%.

14.4 Calculate the operating, financial and combined leverages from the following information: Sales, Rs 50,000; Variable cost, Rs 25,000; Interest, Rs 5,000, and Fixed cost, Rs 15,000.

(*Madras University, 2010*)

Solution

Statement showing determination of leverage

Particulars	*Amount*
Sales	Rs.50,000
Less variable cot	25,000
Contribution	25,000
Less fixed cost	15,000
EBIT	10,000
Less interest	5,000
EBT	5,000
DOL = (Contribution/EBIT): (Rs 25,000/Rs 10,000)	2.5
DFL = (EBIT/EBT): (Rs 10,000/Rs 5,000)	2.0
DCL = (DOL × DFL): (2.5 × 2.0)	5.0

14.5 The capital structure of Moon Ltd. is given below: (Rs lakh)

Equity share capital (Rs 10 each per share)	10
Retained earnings	6
10% preference share	4
	20

The firm has planned to undertake an expansion scheme of Rs 10,00,000 which can be financed **(i)** entirely by issue of equity shares of Rs 10 each; or **(ii)** by issue of 12% debentures of Rs 100 each at par. As a result of expansion, sales and operating fixed cost will increase by 60% and 75% respectively. The other relevant information are given below: Sales, Rs 50,00,000; Variable cost, 60%; Operating fixed cost, Rs 5,00,000, and Corporate tax, 40%. Calculate leverages and EPS before and after expansion and give your opinion for taking appropriate decision with respect to financing. (*Calcutta University, 2010*)

Solution

Statement showing determination of DOL, DFL,DCL, EPS under two proposed financial plans (before expansion and after expansion)

Particulars	*Before expansion*	*After expansion*	
		Equity plan	*12% Debt plan*
Sales	Rs 50,00,000	Rs 80,00,000	Rs 80,00,000
Less variable cost (60%)	30,00,000	48,00,000	48,00,000
Contribution	20,00,000	32,00,000	32,00,000
Less fixed operating costs	5,00,000	8,75,000	8,75,000
EBIT	15,00,000	23,25,000	23,25,000
Less interest on debentures	—	—	1,20,000
EBT	15,00,000	23,25,000	22,05,000
Less taxes (40%)	6,00,000	9,30,000	8,82,000
EAT	9,00,000	13,95,000	13,23,000
Less preference dividend (Dp)	40,000	40,000	40,000
Earnings available for equity-holders (EAEH)	8,60,000	13,55,000	12,83,000
Number of equity shares (N)	1,00,000	2,00,000	1,00,000
EPS (EAEH/N)	Rs 8.60	Rs 6.775	Rs 12.83
DOL; Contribution/EBIT	1.33	1.38	1.38
DFL: EBIT (EBT – Dp/1-t)	1.05	1.03	1.09
DCL: DOL × DFL)	1.40	1.42	1.50

Recommendation: The company is advised to go for debt plan as it yields maximum EPS. Though there is minor increase in DFL (from 1.03 to1.09), this increase is nominal. In practical terms, financial risk at 1.09 is very low; total risk (measured by DOL) is in very safe limits as DCL is 1.5 under debt plan.

14.6 The following data is available for *ABC* Ltd.:

Sales	Rs 5,00,000
Variable cost @ 40%	2,00,000
Contribution	3,00,000
Fixed cost	1,50,000
EBIT	1,50,000
Interest	25,000
EBT	1,25,000

(i) Using the concept of operating leverage, by what percentage will EBIT increase if there is 10% increase in sales?

(ii) Using concept of financial leverage, by what percentage will the taxable income increase if EBIT increase by 6%?

(iii) Using the concept of leverage by what percentage will be taxable income increase if the sales increase by 8%? Also, verify the results in view of the above figures.

(*Delhi University, 2009*)

Solution

Statement showing computation of DOL, DFL and DCL

Particulars	*Amount*
Sales revenue	Rs 5,00,000
Less variable costs (40%)	2,00,000
Total contribution	3,00,000
Less fixed cost (FC)	1,50,000
EBIT	1,50,000
Less interest	25,000
EBT	1,25,000
DOL = Total contribution/EBIT: (Rs 3,00,000/Rs 1,50,000)	2
DFL = EBIT/EBT: (Rs 1,50,000/Rs 1,25,000)	1.2
DCL = (Total contribution/EBT: (Rs 3,00,000/Rs 1,25,000)	2.4

(i) DOL = Percentage change in EBIT/Percentage change in sales = 2 × 10% = 20% in EBIT

Verification table:

Sales revenue (after 10% increase)	Rs 5,50,000
Less variable costs (40%)	2,20,000
Total contribution	3,30,000
Less fixed costs	1,50,000
EBIT	1,80,000
Percentage increase in EBIT (Rs 30,000/Rs 1,50,000)	20

(ii) DFL = Percentage change in EBT/Percentage change in EBIT = 1.2 × 6% = 7.2%

Verification table

EBIT (after 6% increase)	Rs 1,59,000
Less interest	25,000
EBT	1,34,000
Percentage increase in EBT (Rs 9,000/Rs 1,25,000)	7.2

(iii) DCL = Percentage change in EBT/Percentage change in sales = 2.4 × 8% = 19.2%

Verification table

Sales (after 8% increase)	Rs 5,40,000
Less variable costs (40%)	2,16,000
Total contribution	3,24,000
Less fixed cost	1,50,000
EBIT	1,74,000
Less interest	25,000
EBT	1,49,000
Percentage increase in EBT (Rs 24,000/Rs 1,25,000)	19.2

14.7 *RQ* Ltd. is planning an expansion programme which will require Rs 30 crores and can be funded through one of the three options: **(i)** Issue further equity shares of Rs 100 each at par; **(ii)** Raise a 15% loan; and **(iii)** Issue 12% preference shares.

The present paid-up capital is Rs 60 crore and the annual EBIT is Rs 12 crores. The tax rate may be taken as 50%. After the expansion plan is adopted, the EBIT is expected to be Rs 15 crore.

Calculate the EPS under all the three financing options indicating the alternative giving the highest return to the equity shareholders. Also, determine the indifference point between the equity share capital and the debt financing. (*Delhi University, 2009*)

Solution

(i) Determination of EPS under 3 financial plans

Particulars	*Financial plans*		
	Equity shares	*15% loan*	*12% Pref. shares*
EBIT	Rs 15,00,00,000	Rs 15,00,00,000	Rs 15,00,00,000
Less interest	—	4,50,00,000	—
EBT	15,00,00,000	10,50,00,000	15,00,00,000
Less taxes (50%)	7,50,00,000	5,25,00,000	7,50,00,000
EAT	7,50,00,000	5,25,00,000	7,50,00,000
Less preference dividend	—	—	3,60,00,000
EAEH(Earnings for equityholders)	7,50,00,000	5,25,00,000	3,90,00,000
Number of equity shares (present shares being 60 lakh), N	90,00,000	60,00,000	60,00,000
EPS (EAEH/N)	Rs 8.33	Rs 8.75	Rs 6.50

Recommendation: Alternative of raising funds through 15% loan is the best as it results the maximum EPS.

Determination of indifference point between equity and debt plans

$$= \frac{X(t-1)}{N_1} = \frac{(X-1)(1-t)}{N_2} \text{ where } X = \text{EBIT}$$

$$\frac{X(1-0.5)}{90,00,000} = \frac{(X - \text{Rs } 4,50,000)(1-0.5)}{60,00,000}$$

$$= \frac{0.5X}{90,00,000} = \frac{0.5X - \text{Rs } 2,25,000}{60,00,000}$$

Multiplying left hand equation by 2 and right by 3

X = 1.5X – Rs 6,75,000 = Rs 6,75,000/0.5 = Rs 13,50,000 (EBIT)

14.8 The project cost of *ABC* Ltd. is Rs 20,00,000. The annual operating profits of business are expected to be Rs 3,00,000. It is considering the possibility of issuing equity shares plus raising a debt of Rs 4,00,000, Rs 8,00,000 or Rs 12,00,000. The current market price is Rs 50 per share, which is expected to drop to Rs 40 per share if the market borrowings were to exceed Rs 8,50,000. Cost of borrowing is indicated below: Upto Rs 5,00,000, 10%, Between Rs 5,00,001, and Rs 10,00,000, 14%, and Between Rs 10,00,001 to Rs 15,00,000, 16%. Assuming a tax rate of 50%, work out the EPS and the scheme which would be best from the shareholders' point of view.

(*Punjab University, 2009*)

Solution

Determination of EPS under 3 financial plans

Particulars	*Financial plans*		
	Equity Rs 16 lakh + Debt Rs 4 lakh @ 10%	*Equity Rs 12 lakh + Debt Rs 8 lakh @ 14%*	*Equity Rs 8 lakh + Debt 12 lakh @ 16%*
EBIT	Rs 3,00,000	Rs 3,00,000	Rs 3,00,000
Less interest	40,000	1,12,000	1,92,000
Earnings before taxes	2,60,000	1,88,000	1,08,000
Less taxes (0.50)	1,30,000	94,000	54,000
Earnings after taxes (EAT)	1,30,000	94,000	54,000
Number of equity shares (N)	32,000	24,000	20,000
Earnings per share (EAEH/N), EPS	Rs 4.0625	3.917	2.7

Recommendation: The company should raise Rs16 lakh by issuing equity shares and Rs 4 lakh by 10% debt as it is the best option in terms of the maximum EPS.

14.9 Relevant information about three companies are given below:

	BIL	*PIL*	*MIL*
Annual production capacity (units)	1,00,000	1,50,000	2,50,000
Capacity utilisation and sales(%)	75	75	75
Unit selling price	Rs 40	Rs 50	Rs 50
Unit variable cost	15	15	20
Annual fixed cost	2,00,000	3,00,000	5,00,000
Equity capital (1,000 shares for each company)	5,00,000	7,00,000	10,00,000
10% Preference Capital	—	50,000	1,00,000
15% Debentures	1,00,000	2,00,000	3,00,000

Calculate operating leverage, financial leverage, combined leverage and EPS of these three companies and comment. (*Calcutta University, 2008*)

Solution

Statement showing computation of DOL, DFL, DCL and EPS of 3 companies

Particulars	*BIL*	*PIL*	*MIL*
Number of units sold (N)	75,000	1,12,500	1,87,500
Unit selling price (SP)	Rs 40	Rs 50	Rs 20
Unit variable cost (VC)	15	15	20
Unit contribution (SP – VC)	25	35	30
Total contribution (SP – VC) 3 N	Rs 18,75,000	39,37,500	56,25,000
Less operating fixed cost	2,00,000	3,00,000	5,00,000

(*Contd.*)

(*Contd.*)

EBIT	16,75,000	36,37,500	51,25,000
Less interest	15,000	30,000	45,000
EBT	16,60,000	36,07,500	50,80,000
Less taxes (35% assumed)	5,81,000	12,62,625	17,78,000
EAT	10,79,000	23,44,875	33,02,000
Less dividend on preference shares	—	5,000	10,000
Earnings available for equityholders (EAEH)	10,79,000 —	23,39,875 5.000	32,92,000 10,000
Number of equity shares (N)	1,000	1,000	1,000
EPS (EAEH/N)	Rs 1,079	Rs 2,398.75	Rs 3,292
DOL = Contribution/EBIT	1.12	1.08	1.10
DFL = EBIT/EBIT – I – (Dp/1 – *t*)	1.01	1.01	1.01
DCL (DOL 3 DFL)	1.13	1.09	1.11

Comments: All 3 firms have very low degree of business risk (measured by DOL), financial risk (measured by DFL) and total risk (measured by DCL).

14.10 Try Ltd. has a requirement of raising Rs 2,00,000 for which the following plans are suggested:

	Equity	*Debt*	*Preference shares*
Plan A	100%	—	—
Plan B	50%	50%	—
Plan C	50%	—	50%

The cost of debt and preference share is estimated to be 8% and the equity shares of face value of Rs 10 each will be issued at a premium of Rs 10 each. The expected EBIT of the firm is Rs 80,000 and the applicable tax rate is 50%. Find out, for each plan, the EPS, the financial break-even level and the indifference level of EBIT between Plans *A* and *B* and between Plans and *C*.

(*Delhi University, 2008*)

Solution

(i) Determination of EPS and financial BEP under 3 financial plans

Particulars	*Financial plans*		
	A (100% equity)	*B (50% equity + 50% debt)*	*C (50% equity + 50% preference capital)*
EBIT	Rs 80,000	Rs 80,000	Rs 80,000
Less interest at 8%	—	8,000	—
EBT	80,000	72,000	80,000
Less taxes (50%)	40,000	36,000	40,000
EAT	40,000	36,000	40,000
Less dividend on preference shares at 8%	—	—	8,000
EAEH (Earnings for equity holders)	40,000	36,000	32,000
Number of equity shares (N)	10,000	5,000	5,000
EPS (EAEH/N)	Rs 4	Rs 7.2	Rs 6.4
Financial BEP: 1 + (Dp/1 – *t*)	0	Rs 8,000	Rs 16,000

(ii) (a) Indifference point between Plans *A* and *B*

$$= \frac{X(1-t)}{N_1} = \frac{(X-1)(1-t)}{N_2}, \text{ where } X = \text{EBIT}$$

$$= \frac{X(0.5)}{10,000} = \frac{(X - \text{Rs } 8,000)0.5}{5,000} = \frac{0.5X}{10,000} = \frac{0.5X - \text{Rs } 4,000}{5,000}$$

Multiplying left hand equation by 1 and right by 2

$0.5X = X - \text{Rs } 8,000 = 0.5X = \text{Rs } 8,000$ or $X = \text{Rs } 8,000/0.5 = \text{Rs } 16,000$ (EBIT)

(b) Indifference point between plans *A* and *C*

$$\frac{X(1-t)}{N_2} = \frac{X(1-t) - \text{Dp}}{N_2}, \text{ where } X = \text{EBIT, Dp = Dividend on preference shares}$$

$$\frac{0.5X}{10,000} = \frac{0.5X - \text{Rs } 8,000}{5,000}$$

Multiplying left hand equation by 1 and right by 2

$0.5X = X - \text{Rs } 16,000 = 0.5X = \text{Rs } 16,000$ or $X = \text{Rs } 16,000/0.5 = \text{Rs } 32,000$ EBIT

14.11 The following data is available for *XYZ* Ltd.:

Sales	Rs 2,00,000
Variable cost @ 30%	60,000
Contribution	1,40,000
Fixed cost	1,00,000
EBIT	40,000
Interest	5,000
Profit before tax	35,000

Find out:

1. Using the concept of financial leverage, by what percentage will the taxable income increase if EBIT increases by 6%?
2. Using the concept of operating leverage, by what percentage will EBIT increase if thee is 10% increase in sales? and
3. Using the concept of leverage, by what percentage will the taxable income increase if the sales increase by 8%? (*Delhi University, 2008*)

Solution

Statement showing computation of DOL, DFL and DCL

Particulars	*Amount*
Sales	Rs 2,00,000
Less variable cots (30%)	60,000
Total contribution	1,40,000
Less fixed cost	1,00,000
EBIT	40,000
Less interest	5,000
EBT	35,000
DOL = Total contribution/EBIT: (Rs 1,40,000/Rs 40,000)	3.5
DFL = EBIT/EBT: (Rs 40,000/Rs 35,000)	1.142
DCL = Total contribution/EBIT: (Rs 1,40,000/Rs 35,000)	4.0

(i) DFL = Percentage change in EBT/Percentage change in EBIT = 1.142 × 6% = 6.857 per cent increase in taxable income.
Verification table

EBIT (after 6% increase)	Rs 42,000
Less interest	5,000
EBT	37,400
Percentage increase in EBT Rs 2,400/Rs 35,000	6.857%

(ii) DOL = percentage change in EBIT/Percentage change in sales
3.5 × 10% = 35% percentage increase in EBIT
Verification table

Sales (after 10% increase)	Rs 2,20,000
Less variable costs (30%)	66,000
Total contribution	1,54,000
Less fixed costs	1,00,000
EBIT	54,000
Percentage increase in EBIT = Rs 14,000/Rs 40,000	35%

(iii) DCL = Percentage increase in EBT/Percentage increase in sales
4.0 × 8% = 32% increase in taxable income.
Verification table

Sales (after 10% increase)	Rs 2,16,000
Variable costs (30%)	64,800
Contribution	1,51,200
Less fixed costs	1,00,000
EBIT	51,200
Less interest	5,000
EBT	46,200
Percentage increase in EBT = Rs 11,200/Rs 35,000	32%

14.12 Shree Ltd has equity shares capital of Rs 5,00,000 divided into shares of Rs 100 each. It wants to raise further Rs 3,00,000 for modernisation plans. The company plans the following financing schemes: **(a)** All equity shares (face value Rs 100 per share), **(b)** Rs1,00,000 in equity shares (face value Rs 100 per share) and Rs 2,00,000 in debt @ 10% p.a, and **(c)** All debt @ 10% p.a. The company is estimating an EBIT of Rs 2,00,000. The rate of corporate tax is 50%. Calculate the earning per share in each case. Give a comment as to which capital structure is suitable?

(*Pune University, 2008*)

Solution

Determination of EPS under 3 financial plans

Particulars	*Financial plans*		
	Equity	*Equity + Debt*	*10% Debt*
EBIT	Rs 2,00,000	Rs 2,00,000	Rs 2,00,000
Less interest	—	20,000	30,000
EBT	2,00,000	1,80,000	1,70,000
Less taxes (50%)	1,00,000	90,000	85,000
EAT	1,00,000	90,000	85,000
Number of equity shares (Existing 5,000 plus additional) N	8,000	6,000	5,000
EPS (EAT/N)	Rs 12.5	Rs 15	Rs 17

Recommendation: Debt plan is the most suitable plan as it has potentials of having maximum EPS (at Rs 17).

14.13 Siscon Ltd. has a capital structure comprising equity capital only. It has 1,00,000 equity shares of Rs 10 each. Now the company wants to raise additional Rs 2,50,000 for its expansion purpose. They have following alternatives to raise these funds. **(a)** Issue 25,000 equity shares of Rs 10 each, **(b)** Borrow a debt of Rs 2,50,000 at 10%, and **(c)** Issue 2,500, 10% preference shares of Rs 100 each. Show the workings when the EBIT is Rs 3,20,000 and taxation rate of 50%. Which is the best alternative on the basis of EPS valuation? (*Pune University, 2008*)

Solution

Computation of EPS under 3 financial plans

Particulars	*Financial plans*		
	Equity	*Debt*	*Preference*
EBIT	Rs 3,20,000	Rs 3,20,000	Rs 3,20,000
Less interest	—	25,000	—
EBT	3,20,000	2,95,000	3,20,000
Less taxes (50%)	1,60,000	1,47,500	1,60,000
EAT	1,60,000	1,47,500	1,60,000
Less preference dividend	—	—	25,000
Earnings available for equity holders (EAEH)	1,60,000	1,47,500	1,35,000
Number of equity shares (Exiting shares are 1 lakh), N	1,25,000	1,00,000	1,00,000
EPS (EAEH/N)	Rs 1.28	Rs 1.475	Rs 1.35

Recommendation: Debt financial plan is the best alternative as it has maximum EPS.

14.14 A company has sales of Rs 10 lakh, variable cost of Rs 7 lakh, fixed cost of Rs 2 lakh and debt of Rs 5 lakh at 10% rate of interest. What are the operating and financial leverage? (*Bangalore University, 2008*)

Solution

Statement showing determination of DOL and DFL

Particulars	*Amount*
Sales	Rs 10,00,000
Less variable cots	7,00,000
Contribution	3,00,000
Less fixed cost (operating)	2,00,000
EBIT	1,00,000
Less interest (Rs 5,00,000 × 0.10)	50,000
EBT	50,000
DOL = (Contribution/EBIT): Rs 3,00,000/Rs 1,00,000)	3
DFL = (EBIT/EBT): (Rs 100,000/Rs 50,000)	2

14.15 Compare two companies in terms of their operating, financial and combined leverages and interpret the results.

Particulars	*Firm A*	*Firm B*
Sales	Rs 20,00,000	Rs 30,00,000
Variable cost (% of sales)	40	30
Operating fixed cost	5,00,000	7,00,000
Interest	1,00,000	1,25,000

(*Bangalore University, 2008*)

Solution

Statement showing computation of leverage of firms *A* and *B*

Particulars	*A*	*B*
Sales revenue	Rs 20,00,000	Rs 30,00,000
Less variable costs	8,00,000	9,00,000
Contribution	12,00,000	21,00,000
Less operating fixed costs	5,00,000	7,00,000
EBIT	7,00,000	14,00,000
Less interest	1,00,000	1,25,000
EBT	6,00,000	12,75,000
DOL: (Contribution/EBIT)	1.71	1.5
DFL: (EBIT/EBT)	1.17	1.1
DCL: (DOL × DFL or Contribution/EBT)	2.00	1.65

Interpretation: Firm *A* has higher business, financial and total risk compared to Firm *B*.

14.16 A company needs Rs 6,00,000 for construction of a new plant. The following three financial plans are feasible:

(a) The company may issue 60,000 equity shares of Rs 10 each.

(b) The company may issue 30,000 equity shares of Rs 10 each and 3,000 debentures of Rs 100 each bearing 8% coupon rate of interest.

(c) The company may issue 30,000 equity shares of Rs 10 each and 3,000 preference shares of Rs 100 each bearing 8% rate of dividend.

The profit before interest and taxes (EBIT) is expected to be Rs 1,50,000, corporate tax rate is 50%. Calculate the earnings per share under the three plans. Which plan would you recommend?

(*Bangalore University*)

Solution

Determination of EPS under 3 financial plans

Particulars	*Financial plans*		
	Equity share	*Equity + debentures*	*Equity + preference*
EBIT/PBIT	Rs 1,50,000	Rs 1,50,000	Rs 1,50,000
Less interest	—	24,000	—
EBT	1,50,000	1,26,000	1,50,000
Less taxes (0.50)	75,000	63,000	75,000
EAT	75,000	63,000	75,000
Less preference dividend	—	—	24,000
Earnings available for equity holders	75,000	63,000	51,000
Divided by number of equity shares (N)	60,000	30,000	30,000
Earnings per share (EPS)	Rs 1.25	Rs 2.1	Rs 1.7

Recommendation: Levered plan (equity + debt) is recommended as it yields maximum EPS.

14.17 From the following information, compute sales: DOL, 2; DFL, 3; Interest, Rs 3,00,000 and contribution is 40% of sales. (*Calcutta University, 2007*)

Solution

The following steps (in chronological order) are required to determine sales:

1. DFL = EBIT/(EBIT – I)
3 = EBIT/(EBIT – Rs 3,00,000)
3 EBIT – Rs 9,00,000 = EBIT
EBIT = Rs 9,00,000/2 = Rs 4,50,000

2. DOL = Contribution/EBIT
2 = Contribution/Rs 4,50,000
Contribution = Rs 9,00,000

3. Given contribution as 40% of sales,
Sales = Rs 9,00,000/0.4 = Rs 22,50,000

14.18 The following information relates to two companies *P*. Ltd. and *Q* Ltd.

Particulars	*P Ltd. (Rs in lakh)*	*Q Ltd. (Rs in lakh)*
Sales	500	1000
Variable costs	200	300
Fixed costs	150	400

P Ltd had taken a loan of Rs 500 lakh and *Q* Ltd had taken a loan of Rs 1,000 lakh. Both the loans carried an interest @ 10% p.a. Calculate all the three Leverages. Comment on the relative risk position of them. (*Pune University, 2007*)

Solution

Statement showing computation of leverages of *P* Ltd and *Q* Ltd (Amount in Rs lakh)

Particulars	*P Ltd*	*Q Ltd*
Sales revenue	Rs 500	Rs 1,000
Less variable costs	200	300
Total contribution	300	700
Less fixed costs	150	400
EBIT	150	300
Less interest	50	100
EBT	100	200
DOL = Total contribution/EBIT	2:1	2.33:1
DFL = EBIT/EBT	1.5:1	1.5:1
DCL = DOL × DFL	3.0	3.5

Comment: *Q* Ltd is more risky than Firm *P* Ltd.

14.19 (a) Calculate financial BEP from the following:

Interest per annum	Rs 60,000
Preference dividend	45,000
Tax rate (%)	40

(b) *ABC* Ltd. has decided to set up a plant costing Rs 10,00,000. It is expected that the plant will generate operating profits at the rate of 20%. The following 4 plans have been short-listed to raise the required funds:

(i) Issue of 1,00,000 equity shares of Rs 10 each.

(ii) Issue of 12% preference share capital of Rs 3,00,000 and equity share capita of Rs 7,00,000 as in **(i)** above.

(iii) 10% debt of Rs 4,00,000 and equity share capital of Rs 6,00,000 as in (i) above.

(iv) Issue of 12% preference share capital of Rs 2,00,000, 10% Debt of Rs 3,00,000 and balance by issue of equity share capital as in **(i)** above.

Find out the EPS in all these situations, given that the tax rate applicable to company is 40%. Which options should be preferred by the company? (*Delhi University, 2007*)

Solution

(a) Financial BEP = I + Dp $(1 - t)$

= Rs 60,000 + (Rs 45,000/0.6) = Rs 60,000 + Rs 75,000 = Rs 1,35,000

(b) Determination of EPS under 4 proposed financial plans

Particulars	*1(E)*	*2 (E + P)*	*3 (E + D)*	*4 (E + P + D)*
EBIT(Rs10,00,000 × 20%)	Rs 2,00,000	Rs 2,00,000	Rs 2,00,000	Rs 2,00,000
Less interest @ 10%	—	—	40,000	30,000
EBT	2,00,000	2,00,000	1,60,000	1,70,000
Less taxes (40%)	80,000	80,000	64,000	68,000
EAT	1,20,000	1,20,000	96,000	1,02,000
Less 12% preference dividend	—	36,000	—	24,000
Earnings for equity-holders (EAEH)	1,20,000	84,000	96,000	78,000
Number of equity shares (N)	1,00,000	70,000	60,000	50,000
EPS = (EAEH/N)	Rs 1.20	Rs 1.20	Rs 1.60	Rs 1.56

Recommendation: Financial plan 3 is recommended as it yields maximum EPS of 1.60.

14.20 Consider the following information about *X* Ltd.

EBIT	Rs 12,00,000
EBT	3,00,000
Operating fixed cost	24,00,000
Preference dividend	60,000
Tax rate (%)	40

Calculate the degree of operating, financial and combined leverage. By what percentage, the operating profits would increase, if sales increase by 10%?

(*Delhi University, 2007*)

Solution

Statement showing computation of DOL, DFL and DCL

Particulars	
Total contribution (EBIT + Operating fixed cost)	Rs 36,00,000
Less fixed cost	24,00,000
EBIT	12,00,000
Less interest (EBIT − EBT Rs 3,00,000)	9,00,000
EBT	3,00,000
Less taxes (40%)	1,20,000
EAT	1,80,000
Less dividend paid to preference shareholders	60,000
Earnings available to equityholders (EAEHs)	1,20,000
DOL = Total contribution/EBIT": Rs 36 lakh/Rs 12 lakh	3
DFL = EBIT/[EBIT − I − Dp$(1 - t)$:	
= Rs 12 lakh/[Rs 12 lakh − Rs 9 lakh − Rs 60,000/0.6] = Rs 2 lakh	6
DCL = DOL × DFL : 3 × 6	18

DOL = Percentage change in EBIT/Percentage change in sales

3 × 10% = 30% increase in EBIT. Operating profits would increase by 30% when sales increases by 10%.

14.21 Consider the given information for *XYZ* Ltd.: (Rs lakhs)

Sale (variable cost 70% of sales)	8,000
EBIT	1,950
PBT	950
Tax rate (%)	40

Calculate different types of leverages. Calculate percentage change in earnings per share if sales increased by 5 per cent. (*Delhi University, 2007*)

Solution

Statement showing determination of DOL, DFL and DCL

Particulars	*Amount (Rs lakhs)*
Sales	8,000
Less variable costs (70% of sales)	5,600
Total contribution	2,400
Less fixed costs (Contribution – EBIT)	450
EBIT	1,950
Less interest (EBIT – EBT)	1,000
EBT	950
Less taxes (40%)	380
EAT	570
DOL = Contribution/EBIT: Rs 2,400/Rs 1,950	16/13
DFL = EBIT/EBT: Rs 1,950/Rs 950	39/19
DCL = Contribution/EBIT: Rs 2,400/Rs 950	48/19

Alternatively, DCL = Percentage change in EPS/Percentage change in sales = 48/19 × 5% = 12.632%. EPS would increase by 12.632 per cent if sales increase by 5%.

14.22 Super Star Ltd. has decided to change its capital structure. The firm currently has one crore fully paid up share. The share commands a price of Rs 50 in the market and is likely to remain the same even after proposed capital restructuring. The restructuring involves increasing the firm's exiting Rs 9 crore 10% debt to Rs 14 crore.

The proceeds will be used to retire the equity. The interest rate on debt is not expected to change as the debt investors do not perceive the firm to become more risky as a result of proposed dose of debt. Company is in 40% tax bracket. Calculate the minimum level of EBIT that the firm must earn so that EPS does not change. (*Delhi University, 2007*)

Solution

The question requires detrimental of indifference point. It is given by the following equation:

$$\frac{(X - I_1)(1 - t)}{N_1} = \frac{(X - I_2)(1 - t)}{N_2}$$

Where, X = EBIT, I_1, and I_2 = Varying interest amount.

$$= \frac{(X - \text{Rs } 90,00,000)\ 0.6}{1,00,00,000} = \frac{(X - \text{Rs } 1,40,00,000)(0.6)}{90,00,000}$$

$$= \frac{0.6X - \text{Rs } 54,00,000}{1,00,00,000} = \frac{0.6X - \text{Rs } 84,00,000}{90,00,000}$$

Multiplying left hand equation by 9 and right by 10

9 (0.6X – Rs 54,00,000) = 10 (0.6X – Rs 84,00,000)

5.4X – Rs 4,86,00,000 = 6X – Rs 8,40,00,000

$6X - 5.4X$ = Rs 8,40,00,000 − Rs 4,86,00,000
$0.6X$ = Rs 3,54,00,000 or X = Rs 3,54,00,000/0.6 = Rs 590 lakh
Verification table showing EPS at present and proposed capital structure (amount in Rs lakh)

Particulars	*Present*	*Proposed*
EBIT	Rs 590	Rs 590
Less interest	90	140
EBT	500	450
Less taxes (40%)	200	180
EAT	300	270
Number of equity shares (N)	100	90
EPS (EAT/N) in Rupees	Rs 3	Rs 3

14.23 *X* Ltd. has operating profit of Rs 8,60,000 and a fixed finance burden of Rs 60,000. The company is subject to income tax payment of Rs 2,00,000. The company has 3,00,000 shares of Rs 30,00,000 and 18% debentures of Rs 3,12,500. The market price of equity share is Rs 12. Find: **(i)** EPS **(ii)** Cost of equity **(iii)** Cost of debt (k_d). (*Delhi University, 2006*)

Solution

Statement showing computation of EPS, k_e and K_d

Particulars	*Amount*
EBIT	Rs 8,60,000
Less fixed financial costs/interest	60,000
EBT	8,00,000
Less taxes (Rs 2,00,000/Rs 8,00,000 = 0.25)	2,00,000
EAT/Earnings available for equityholders, EAEH	6,00,000
Number of equity shares (N)	3,00,000
EPS = EAT/N	Rs 2
Market price of share	12
Cost of equity, Net income approach (Rs 2/Rs 12)	16.67%
Cost of debt (k_d) = Rs 60,000 (1 − 0.25)/ Rs 3,12,500	14.4%*

*Based on coupon rate, k_d = 18% (1 − 0.25) = 13.5%

14.24 Calculate operating leverage and combined leverage from the following data:

Sales, 2,00,000 units @ Rs 50 per unit
Variable cost per unit Rs 18
Fixed charges Rs 25,00,000
Interest charges Rs 2,00,000

(*Bangalore University, 2006*)

Solution

Statement showing determination of DOL and DCL

Particulars	*Amount*
Selling price per unit	Rs 50
Less variable cost per unit	18
Contribution per unit	32
Total contribution (Rs 32 3 2 lakh units)	Rs 64,00,000
Less fixed costs	25,00,000

(*Contd.*)

(*Contd.*)

EBIT	39,00,000
Less interest (assumed to be fixed)	2,00,000
EBT	37,00,000
DOL = Total contribution/EBIT	1.64
DFL = EBIT/EBT	1.05
DCL = (DOL × DFL)	1.72
Alternatively, Total contribution/EBT (Rs 4 lakh/Rs 37 lakh)	1.72

14.25 A new project under consideration requires a capital outlay of Rs 600 lakh for which the funds can either be raised by the issue of equity shares of Rs 100 each or by the issue of equity shares of the value of Rs 400 lakh (of Rs 100 each) and by issue of 15% loan of Rs 200 lakh. Find out the indifference point of EBIT, given the tax rate of 50%. (*Bangalore University, 2006*)

Solution

Determination of indifference point: $\frac{X(1-t)}{N_1} = \frac{(X-1)(1-t)}{N_2}$, where X = EBIT

$$\frac{X(0.5)}{6,00,000} = \frac{(X - \text{Rs } 30,00,000)0.5}{4,00,000}$$

Multiplying left hand equation by 2 and right by 3

$X = 1.5X$ – Rs 45,00,000

Or $0.5X$ = Rs 45,00,000 or X = Rs 45 lakh/0.5 = Rs 90,00,000. The indifference point is Rs 90 lakh.

14.26 A firm has sales of Rs 5,00,000, variable cost of Rs 3,50,000, fixed cost of Rs 1,00,000 and debt of Rs 2,50,000 at 10% rate of interest. What is combined leverage? If the firm wants to double its EBIT, how much of a rise in sales would be needed on a percentage basis?

(*Calcutta University, 2006*)

Solution

(i) Statement showing determination of combined leverage

Particulars	*Amount*
Sales revenue	Rs 5,00,000
Less variable costs	3,50,000
Contribution	1,50,000
Less fixed cost	1,00,000
EBIT	50,000
Less interest (Rs 2,50,000 × 10%)	25,000
EBT	25,000
Combined leverage (Contribution/EBT): Rs 1,50,000/Rs 25,000)	6

(ii) Required increase in sales (on percentage basis)

DOL = % change in EBIT/% change in sales

Or DOL = Contribution/EBIT = Rs 1,50,000/Rs 50,000 = 3

DOL 3 implies that 1 per cent change in sales causes 3 per cent change in EBI. To achieve desired increase of 100% in EBIT, sales are to increase by 100/3 = 33.1/3 %.

Verification table

Sales (Rs 5,00,000 3 1331/3%)	Rs 6,66,667
Less variable costs (Rs 6,66,667 × 70%, VC/sales)	4,66,667
Contribution	2,00,000
Less fixed cost	1,00,000
EBIT	1,00,000

14.27 The existing capital structure of a company consists of equity share capital (of Rs 10 each) is of Rs 10 lakh. The company has an opportunity to enter into global markets but it calls for additional funds of Rs 15 lakh. Company's EBIT is Rs 8 lakh and income tax rate is 50%. Show your working in table form, by computing EPS under each of the following alternatives:

(i) To raise entire amount of additional funds by floating equity capital of Rs 10 each.

(ii) To raise 50% of amount by way of equity and balance by term loan, bearing 16% interest p.a.

(iii) To raise Rs 6 lakh from equity, Rs 6 lakh from 14% preference shares and balance by 13% debentures. (*Pune University, 2006*)

Solution

Determination of EPS under 3 financial plans

Particulars	*Financial plans*		
	Equity shares	*Equity + Debt*	*E+P+D*
EBIT	Rs 8,00,000	Rs 8,00,000	Rs 8,00,000
Less interest	—	1,20,000	39,000
EBT	8,00,000	6,80,000	7,61,000
Less taxes (0.50)	4,00,000	3,40,000	3,80,500
EAT	4,00,000	3,40,000	3,80,500
Less preference dividend	—	—	84,000
Earnings for equityholders (EAEH)	4,00,000	3,40,000	2,96,500
Number of equity shares (existing shares are one lakh) (N)	2,50,000	1,75,000	1,60,000
EPS (EAEH/N)	1.6	1.94	1.85

14.28 From the following data, calculate: **(i)** Operating, financial and combined leverage, **(ii)** Financial break-even point, and **(iii)** Percentage drop in sales to make the earnings per share zero.

Earnings before Interest and Taxes (EBIT)	Rs 20,00,000
Profit after tax (PAT)	9,60,000
Operating fixed cost	15,00,000
Tax rate (%)	40
Preference dividend	2,40,000

(*Delhi University, 2006*)

Solution

(i) and **(ii)** Statement showing computation of DOL, DFL, DCL and FBEP

Particulars	*Amount*
Contribution (EBIT + operating fixed costs)	Rs 35,00,000
Less operating fixed costs	15,00,000
EBIT	20,00,000
Less interest (EBIT – EBT)	4,00,000

(*Contd.*)

(*Contd.*)

EBT = (EAT/1 − *t*): (Rs 9,60,000/0.6)	16,00,000
Less taxes (Rs 16,00,000 × 0.40)	6,40,000
EAT/PAT	9,60,000
Less preference dividend (Dp)	2,40,000
Earnings available for equityholders (EAEH)	7,20,000
DOL = Contribution/EBIT: (Rs 35,00,000/Rs 20,00,000)	1.75
DFL = EBIT/(EBIT − *I* − Dp/1 − *t*)	
[Rs 20,00,000/(Rs 20,00,000 − Rs 4,00,000 − Rs 2,40,000/0.6)]	1.67
DCL = DOL 3 DFL: (1.75 × 1.67)	2.92
Financial BEP = *I* + Dp/(1 − *t*): (Rs 4,00,000 + Rs 4,00,000)	Rs 8,00,000

(iii) In order to make EPS zero, EAEH should be zero.It would be sum of the following:

Operating fixed cost	Rs 15,00,000
Interest payment	4,00,000
Preference dividend (adjusted for taxes)	4,00,000
Required contribution	23,00,000

Desired reduction in contribution:

Present contribution	Rs 35,00,000
Less required contribution	23,00,000
Reduction in contribution (desired)	12,00,000
Desired drop in sales would be equal to desired drop in contribution to make EPS zero: (Rs 12 lakh/Rs 35 lakh) (%)	34.29

14.29 From the following information of Trends Ltd., calculate the degree of operating leverage, financial leverage and combined leverage for each situations *A* and *B* under financial plans I, II and III. Also indicate which of the above plans is most risky and which one is least risky:

Production and sales (units)	1000
Selling price per unit	Rs 20
Valuable cost per unit	15
Fixed cost (operating)	
Situation – *A*	3,000
Situation – *B*	4,000
Capital structure:	

	Plan		
	I	II	III
Equity	Rs 7,000	Rs 5,000	Rs 3,000
10% Debt	3,000	5,000	7,000
	10,000	10,000	10,000

(*Calcutta University, 2006*)

Solution

Statement showing computation of DOL, DFL, and DCL in two varying situations (of fixed costs) under 3 financial plans

Particulars	*Situation A*			*Situation B*		
	Plan I	*II*	*III*	*Plan I*	*II*	*III*
Sales revenue	Rs 20,000	Rs 20,000	Rs 20,000	Rs 20,000	Rs 20,000	Rs 20,000
Less variable cost	15,000	15,000	15,000	15,000	15,000	15,000
Contribution	5,000	5,000	5,000	5,000	5,000	5,000
Less fixed cost	3,000	3,000	3,000	4,000	4,000	4,000
EBIT	2,000	2,000	2,000	1,000	1,000	1,000
Less interest (I)	300	500	700	300	500	700
EBT	1,700	1,500	1,300	700	500	300
DOL (Contribution/EBIT)	2.5	2.5	2.5	5.0	5.0	5.0
DFL (EBIT/EBT)	1.176	1.333	1.538	1.429	2.0	3.333
DCL (DOL × DFL)	2.94	3.332	3.845	7.145	10.0	16.665

Recommendation: Plan III using debt of Rs 7,000 is the most risky as it has DCL of 16.665. It implies 1% change in sales would cause 16.67% change in earnings for equity owners (when operating fixed costs are Rs 4,000). Plan I using debt of Rs 3,000 is the least risky as it has DCL of 2.94. It implies 1% change in sales would cause 2.94% change in earnings of equityholders (when fixed cots are Rs 3,000).

14.30 A firm has sales of Rs 75,00,000, variable cost of Rs 42,00,000 and fixed cost of Rs 6,00,000. It has a debt of Rs 45,00,000 at 9% and equity of Rs 55,00,000. **(i)** What is the firm's ROI?, **(ii)** Calculate OL, FL and CL. Are leverages favourable or unfavourable?, and **(iii)** At what level of EBIT and sales, EPS will be equal to zero? (*Delhi University, 2006*)

Solution

Statement showing determination of ROI, DOL, DFL and DCL.

Particulars	*Amount*
Sales	Rs 75,00,000
Less variable cost (56%)	42,00,000
Total contribution (c/v ratio 44%)	33,00,000
Less fixed cost	6,00,000
EBIT	27,00,000
Less interest	4,05,000
EBT	22,95,000
ROI = EBIT/Total capital employed	
(Rs 45 lakh debt + Rs 55 lakh equity): Rs 27 lakh/Rs 100 lakh (%)	27
DOL = Contribution/EBIT: Rs 33 lakh/Rs 27 lakh	11/9
DFL = –EBIT/EBT: Rs 27 lakh/Rs 22.95 lakh	20/17
DCL = DOL × DFL: 11/9 × 20/17	1.44

Leverages are favourable as ROI is higher than rate of interest (9%).

(iii) BESR (comprehensive) at which total operating fixed cost and fixed interest costs are fully recovered would indicate sales at which EPS will be zero and EBIT = interest. BESR (comprehensive) = (Rs 6,00,000 + Rs 4,05,000)/0.44 = Rs 22,84,091

Income statement showing EPS at sales of Rs 22,84,091

Sales	Rs 22,84,091
Less variable costs (56%)	12,79,091
Less fixed cost	6,00,000
EBIT	4,05,000
Less interest	4,05,000
EBT	0
Less taxes	0.
EAT	0
EPS	0

14.31. Arvind Textile Mill currently has 10,00,000 shares of equity outstanding with a market price of Rs 50 per share. It has also Rs 4 crore in 12% bonds. The company is considering a Rs 5 crore expansion programme that it can finance through: **(1)** All equity shares at Rs 40 per share or **(2)** Straight bonds at 15% interest or **(3)** Half equity shares at Rs 40 per share and half 15% bonds. You are required to do the following: **(i)** *F* or EBIT level of Rs 2,50,00,000 after the expansion programme, calculate the earnings per share for each of the alternative modes of financing. Assume a corporate tax rate of 50%; **(ii)** What are the indifference points between alternatives? **(iii)** What is your interpretation of the results? (*Delhi University, 2005*)

Solution

(i) Determination of EPS under 3 financing options

Particulars	*Financial options*		
	1 (E)	*2 (D)*	*3 (E + D)*
EBIT	Rs 2,50,00,000	Rs 2,50,00,000	Rs 2,50,00,000
Less interest (existing)	48,00,000	48,00,000	48,00,000
Less interest (additional)	—	75,00,000	37,50,000
EBT	2,02,00,000	1,27,00,000	1,64,50,000
Less taxes (50%)	1,01,00,000	63,50,000	82,25,000
EAT/Earnings for equity holders, EAEH	1,01,00,000	63,50,000	82,25,000
Number (N) of existing equity shares	10,00,000	10,00,000	10,00,000
Number of additional equity shares	12,50,000	—	6,25,000
EPS (EAEH/N)	Rs 4.49	Rs 6.35	Rs 5.06

(ii) Indifference point between plans 1 and 2

$$= \frac{(X - I_1)}{N_1} = \frac{(X - I_1 - I_2)(1 - t)}{N_2}$$

where, X = EBIT, I_1, and I_2 = existing and additional interest respectively.

$$= \frac{(X - \text{Rs } 48,00,000)0.5}{22,50,000} = \frac{(X - \text{Rs } 1,23,00,000)0.5}{10,00,000}$$

Multiplying left equation by 4 and right by 9.

4 (0.5X – Rs 24,00,000) = 9 (0.5X – Rs 61,50,000)

2X – Rs 96,00,000 = 4.5X – Rs 5,53,50,000

2.5X = Rs 4,57,50,000 or X = Rs 4,57,50,000/2.5 = Rs 1,83,00,000 (EBIT)

(iii) Indifference point between plans 1 and 3

$$= \frac{(X - I_1)(1-t)}{N_1} = \frac{(X - I_1 - I_3)(1-t)}{N_3}$$

$$= \frac{(X - \text{Rs } 48,00,000)0.5}{22,50,000} = \frac{(X - \text{Rs } 85,50,000)0.5}{16,25,000}$$

Multiplying left equation by 13 and right by 18
$13(0.5X - \text{Rs } 24,00,000) = 18(0.5X - \text{Rs } 42,75,000)$
$6.5X - \text{Rs } 3,12,00,000 = 9X - \text{Rs } 7,69,50,000$
$2.5X = \text{Rs } 4,57,50,000$ or $X = \text{Rs } 4,57,50,000/2.5 = \text{Rs } 1,83,00,000$ (EBIT)

(iv) Indifference point between plans 2 and 3

$$= \frac{(X - I_1 - I_2)}{N_1} = \frac{(X - I_1 - I_3)(1-t)}{N_2}$$

$$= \frac{(X - \text{Rs } 1,23,00,000)0.5}{10,00,000} = \frac{(X - \text{Rs } 85,50,000)(0.5)}{16,25,000}$$

Multiplying left equation by 13 and right by 8
$13(0.5X - \text{Rs } 61,50,000) = 8(0.5X - \text{Rs } 42,75,000)$
$6.5X - \text{Rs } 7,99,50,000 = 4X - \text{Rs } 3,42,00,000$
$2.5X = \text{Rs } 7,99,50,000 - \text{Rs } 3,42,00,000/2.5 = \text{Rs } 4,57,50,000$
$X = \text{Rs } 4,57,50,000/2.5 = \text{Rs } 1,83,00,000$

Interpretation: Indifference points are the same in all the options. Since EPS is maximum under option 2, the company is advised to raise funds through debt.

Chapter

15

Capital Structure, Cost of Capital and Valuation

Learning Objectives

1. Review the assumptions, definitions and symbols relating to capital structure theories
2. Explain the major capital structure theories—Net Income Approach, Net Operating Income Approach, Modigliani and Miller (MM) Approach and Traditional Approach—and evaluate them to explore the relationship between leverage and cost of capital from the standpoint of valuation

INTRODUCTION

The discussions in the preceding Chapter have shown that financial leverage has a magnifying effect on EPS, such that, for a given level of change in EBIT, there will be a more than proportionate change in the same direction in the EPS. But financial leverage also increases the financial risk, defined as the risk of possible insolvency arising out of inadequacy of available cash as well as the variability in the earnings available to the ordinary shareholders. Given the objective of the firm to maximise the value of the equity shares, the firm should select a financing-mix/capital structure/financial leverage which will help in achieving the objective of financial management. As a corollary, the **capital structure** should be examined from the viewpoint of its impact on the *value* of the firm. It can be legitimately expected that if the capital structure decision affects the total value of the firm, a firm should select such a financing-mix as will maximise the shareholders' wealth. Such a capital structure is referred to as the optimum capital structure. The **optimum capital structure** may be defined as the *capital structure or combination of debt and equity that leads to the maximum value of the firm.*

Capital structure is the proportion of debt and preference and equity shares on a firm's balance sheet.

Optimum capital structure is the capital structure at which the weighted averge cost of capital is minimum and thereby maximum value of the firm.

The importance of an appropriate capital structure is, thus, obvious. There is a viewpoint that strongly supports the close relationship between leverage and value of a firm. There is an equally strong body of opinion which believes that financing-mix or the combination of debt

and equity has no impact on the shareholders ' wealth and the decision on financial structure is irrelevant. In other words, there is nothing such as optimum capital structure.

In theory, capital structure can affect the value of a company by affecting either its expected earnings or the cost of capital, or both. While it is true that financing-mix cannot affect the total operating earnings of a firm, as they are determined by the investment decisions, it can affect the share of earnings belonging to the ordinary shareholders . The capital structure decision can influence the value of the firm through the earnings available to the shareholders . But the leverage can largely influence the value of the firm through the cost of capital. In exploring the relationship between leverage and value of a firm in this chapter we are concerned with the relationship between leverage and cost of capital from the standpoint of valuation. While Section 1 deals with the assumptions, definition and symbols relating to capital structure theories, the next four Sections of the Chapter explain the major capital structure theories, namely: **(i)** Net Income Approach, **(ii)** Net Operating Income Approach, **(iii)** Modigliani-Miller (MM) Approach, and **(iv)** Traditional Approach. The last Section summarises the main points.

SECTION I CAPITAL STRUCTURE THEORIES

Assumptions

1. There are only two sources of funds used by a firm: *perpetual riskless* debt and *ordinary* shares.
2. There are no corporate taxes. This assumption is removed later.
3. The dividend-payout ratio is 100. That is, the total earnings are paid out as dividend to the shareholders and there are no retained earnings.
4. The total assets are given and do not change. The investment decisions are, in other words, assumed to be constant.
5. The total financing remains constant. The firm can change its degree of leverage (capital structure) either by selling shares and use the proceeds to retire debentures or by raising more debt and reduce the equity capital.
6. The operating profits (EBIT) are not expected to grow.
7. All investors are assumed to have the same subjective probability distribution of the future expected EBIT for a given firm.
8. Business risk is constant over time and is assumed to be independent of its capital structure and financial risk.
9. Perpetual life of the firm.

Definitions and Symbols

In addition to the above assumptions, we shall make use of some symbols in our analysis of capital structure theories:

S = total market value of equity
B = total market value of debt
I = total interest payments
V = total market value of the firm ($V = S + B$)
NI = net income available to equity-holders .

We shall also make use of some basic definitions:

(1) Cost of debt (k_i) = $\frac{I}{B}$ **(15.1)**

$$\text{Value of debt } (B) = \frac{I}{k_i} \quad \textbf{(15.2)}$$

(2) $$\text{Cost of equity capital } (k_e) = \frac{D_1}{P_0} + g \quad \textbf{(15.3)}$$

where D_1 = net dividend; P_0 = current market price of shares and g is the expected growth rate. According to assumption (3), the percentage of retained earnings is zero. Since $g = br$, where r is the rate of return on equity shares and b is the retention rate, $g = 0$, the growth rate is zero. This is consistent with assumption (6). In operational terms $D_1 = E_1$, $g = 0$. Therefore,

$$k_e = \frac{E_1}{P_0} + g = \frac{E_1}{P_0} + 0 = \frac{E_1}{P_0} \quad \textbf{(15.4)}$$

where E_1 = earnings per share. Equation 15.4 is on a per share basis. Multiplying both the numerator and the denominator by the number of shares outstanding (N) and assuming there are no income taxes, we have

$$K_e = \frac{E_1 (\times) N}{P_0 (\times) N} = \frac{\text{EBIT} - I \text{ or } NI}{S}$$

Or
$$= \frac{\text{Net income available to equity holders}}{\text{Total market value of equity shares}} \quad \textbf{(15.5)}$$

Thus, k_e may be defined on either per share or total basis.

From Eqs. 15.4 and 15.5 follow the equations of determining the value of equity shares on per share basis and total basis.

(i) *Per share basis,* $P_0 = \frac{E_1}{k_e}$ **(15.6)**

(ii) *Total basis,* $S = P_0 N = \frac{\text{EBIT} - I}{k_e}$ **(15.7)**

(iii) *Overall cost of capital or weighted average cost of capital:*

$$K_0 = W_1 k_i + W_2 k_e \text{ (where } W_1 \text{ and } W_2 \text{ are relative weights)}$$

$$= (B/V)k_i + (S/V)k_e = \left[\frac{B}{B+S}\right]k_i + \left[\frac{S}{B+S}\right]k_e \quad \textbf{(15.8)}$$

or
$$k_0 = \frac{I + NI}{V} = \frac{\text{EBIT}}{V} \quad \textbf{(15.9)}$$

From Eq. 15.9 follows the equation of total value of the firm. Thus,

$$V = \frac{\text{EBIT}}{k_0} \quad \textbf{(15.10)}$$

Alternatively:
$$V = \frac{I}{k_i} + \frac{\text{EBIT} - I}{k_e} \quad \textbf{(15.11)}$$

Another useful way of measuring the cost of equity capital is as follows:

We know k_0 is the weighted average of the cost of equity and the cost of debt. Symbolically,

$$k_0 = \left[\frac{B}{B+S}\right]k_i + \left[\frac{S}{B+S}\right]k_e \quad \textbf{(15.8)}$$

$$= k_i\left(\frac{B}{V}\right) + k_e\left(\frac{S}{V}\right) \quad \textbf{(15.8.1)}$$

$$k_e = \frac{k_0 - k_i\,(B/V)}{S/V} \quad \textbf{(15.8.2)}$$

We know that $V = B + S$. Therefore, equity ratio, S/V can be expressed as:

$$\frac{S}{V} = \frac{S}{B+S} = 1 - \frac{B}{B+S} \quad \textbf{(15.8.3)}$$

Substituting the value of Eq. 15.8.3 in Eq. 15.8.2, we have

$$k_e = k_0 - k_i\left[\frac{B}{B+S}\right] \Big/ 1 - \frac{B}{B+S}$$

$$= \frac{k_0\,(B+S) - k_i B}{B+S} \Big/ \frac{B+S-B}{B+S} \quad \textbf{(15.8.4)}$$

Or

$$= \frac{k_0 B + k_0 S - k_i B}{B+S} \Big/ \frac{S}{B+S} \quad \textbf{(15.8.5)}$$

Simplifying Eq. 15.8.5, we have

$$k_e = \frac{k_0 B + k_0 S - k_i B}{S} \quad \textbf{(15.8.6)}$$

$$k_e = k_0 + (k_0 - k_i)\,B/S \quad \textbf{(15.12)}$$

While exploring the relationship between capital structure and value of the firm, our concern is with the cost of equity capital (k_e), cost of debt (k_i) and overall cost of capital (k_0) when the capital structure/leverage changes, as measured by the change in the relationship between total value of debt and debt to total of ordinary shares (B/S).

SECTION 2 NET INCOME APPROACH

According to the Net Income (NI) Approach, suggested by the Durand[1], the capital structure decision is relevant to the valuation of the firm. In other words, a change in the financial leverage will lead to a corresponding change in the overall cost of capital as well as the total value of the firm. If, therefore, the degree of financial leverage as measured by the ratio of debt to equity is increased, the weighted average cost of capital will decline, while the value of the firm as well as the market price of ordinary shares will increase. Convers ely, a decrease in the leverage will cause an increase in the overall cost of capital and a decline both in the value of the firm as well as the market price of equity shares.

The NI Approach to valuation is based on three assumptions: firs t, there are no taxes; second, that the cost of debt is less than the equity-capitalisation rate or the cost of equity; third, that the use of debt does not change the risk perception of investors . That the financial

risk perception of the investors does not change with the introduction of debt or change in leverage implies that due to change in leverage, there is no change in either the cost of debt or the cost of equity. The implication of the three assumptions underlying the NI Approach is that as the degree of leverage increases, the proportion of a cheaper source of funds, that is, debt in the capital structure increases. As a result, the weighted average cost of capital tends to decline, leading to an increase in the total value of the firm. Thus, with the cost of debt and cost of equity being constant, the increased use of debt (increase in leverage), will magnify the shareholder's earnings and, thereby, the market value of the ordinary shares.

The financial leverage is, according to the NI Approach, an important variable to the capital structure of a firm. With a judicious mixture of debt and equity, a firm can evolve an optimum capital structure which will be the one at which value of the firm is the highest and the overall cost of capital is the lowest. At that structure, the market price per share would be maximum.

If the firm uses no debt or if the financial leverage is zero, the overall cost of capital will be equal to the equity-capitalisation rate. The weighted average cost of capital will decline and will approach the cost of debt as the degree of leverage reaches one.

The NI Approach is illustrated in Example 15.1.

Example 15.1

A company's expected annual net operating income (EBIT) is Rs 50,000. The company has Rs 2,00,000, 10% debentures. The equity capitalisation rate (k_e) of the company is 12.5 per cent.

Solution

With no taxes, the value of the firm, according to the Net Income Approach is depicted in Table 15.1.

TABLE 15.1 Value of the Firm (Net Income Approach)

Net operating income (EBIT)	Rs 50,000
Less: Interest on debentures (I)	20,000
Earnings available to equity holders (NI)	30,000
Equity capitalisation rate (k_e)	0.125
Market value of equity (S) = NI/k_e	2,40,000
Market value of debt (B)	2,00,000
Total value of the firm ($S + B$) = V	4,40,000
Overall cost of capital = k_0 = EBIT/V (%)	11.36
Alternatively: $k_0 = k_i (B/V) + k_e(S/V)$ where k_i and k_e are cost of debt and cost of equity respectively, $= 0.10\left(\frac{\text{Rs } 2,00,000}{\text{Rs } 4,40,000}\right) + 0.125\left(\frac{\text{Rs } 2,40,000}{\text{Rs } 4,40,000}\right)$ (%)	11.36

Increase in Value

In order to examine the effect of a change in financing-mix on the firm's overall (weighted average) cost of capital and its total value, let us suppose that the firm has decided to raise the amount of debenture by Rs 1,00,000 and use the proceeds to retire the equity shares. The k_i and k_e would remain unaffected as per the assumptions of the NI Approach. In the new situation, the value of the firm is shown in Table 15.2.

TABLE 15.2 Value of the Firm (Net Income Approach)

Net operating income (EBIT)	Rs 50,000
Less: Interest on debentures (I)	30,000
Earnings available to equity holders (NI)	20,000
Equity capitalisation rate (k_e)	0.125
Market value of equity (S) = NI/k_e	1,60,000
Market value of debt (B)	3,00,000
Total value of the firm ($S + B$) = V	4,60,000
$k_0 = \left[\frac{\text{Rs } 50{,}000}{\text{Rs } 4{,}60{,}000}\right]$ Or $0.10\left[\frac{\text{Rs } 3{,}00{,}000}{\text{Rs } 4{,}60{,}000}\right] + 0.125\left[\frac{\text{Rs } 1{,}60{,}000}{\text{Rs } 4{,}60{,}000}\right]$	10.9 per cent

Thus, the use of additional debt has caused the total value of the firm to increase and the overall cost of capital to decrease.

Decrease in Value

If we decrease the amount of debentures in Example 15.1, the total value of the firm, according to the NI Approach, will decrease and the overall cost of capital will increase. Let us suppose that the amount of debt has been reduced by Rs 1,00,000 to Rs 1,00,000 and a fresh issue of equity shares is made to retire the debentures. Assuming other facts as given in Example 15.1, the value of the firm and the weighted average cost of capital are shown in Table 15.3.

TABLE 15.3 Value of the Firm (Net Income Approach)

Net operating income (EBIT)	Rs 50,000
Less: Interest on debentures (I)	10,000
Earnings available to equity holders (NI)	40,000
Equity capitalisation rate (k_e)	0.125
Market value of equity (S) = NI/k_e	3,20,000
Market value of debt (B)	1,00,000
Total value of the firm ($S + B$) = V	4,20,000
$k_0 = \frac{\text{Rs } 50{,}000}{\text{Rs } 4{,}20{,}000}$ Or $0.10\left[\frac{\text{Rs } 1{,}00{,}000}{\text{Rs } 4{,}20{,}000}\right] + 0.125\left[\frac{\text{Rs } 3{,}20{,}000}{\text{Rs } 4{,}20{,}000}\right]$ (%)	11.9

Thus, we find that the decrease in leverage has increased the overall cost of capital and has reduced the value of firm.

Market Price

Thus, according to the NI Approach, the firm can increase/decrease its total value (V) and lower/increase its overall cost of capital (k_0) as it increases/decreases the degree of leverage. As a result, the market price per share is affected. To illustrate, assume in Example 15.1 that the firm with Rs 2,00,000 debt has 2,400 equity shares outstanding. The market price per share works out to Rs 100 (Rs 2,40,000 ÷ 2,400). The firm issues Rs 1,00,000 additional debt and uses the proceeds of the debt to repurchase/retire Rs 1,00,000 worth of equity shares or 1,000 shares. It, then, has 1,400 shares outstanding. We have observed in Example 15.1 that the total market value of the equity after the change in the capital structure is Rs 1,60,000 (Table 15.2). Therefore, the market

price per share is Rs 114.28 (Rs 1,60,000 ÷ 1,400), as compared to the original price of Rs 100 per share. Likewise, when the firm employs less amount of debt, the market value per share declines. To continue with Example 15.1, the firm raises Rs 1,00,000 additional equity capital by issuing 1,000 equity shares of Rs 100 each and uses the proceeds to retire the debenture amounting to Rs 1,00,000. It would then have 3,400 shares (2,400 old + 1,000 new) outstanding. With this capital structure, we have seen in Example 15.1 that the total market value of equity shares is Rs 3,20,000 (Table 15.3). Therefore, the market price per share has declined to Rs 94.12 (Rs 3,20,000 ÷ 3,400) from Rs 100 before a change in the leverage.

We can graph the relationship between the various factors (k_e, k_i, k_0) with the degree of leverage (Fig. 15.1).

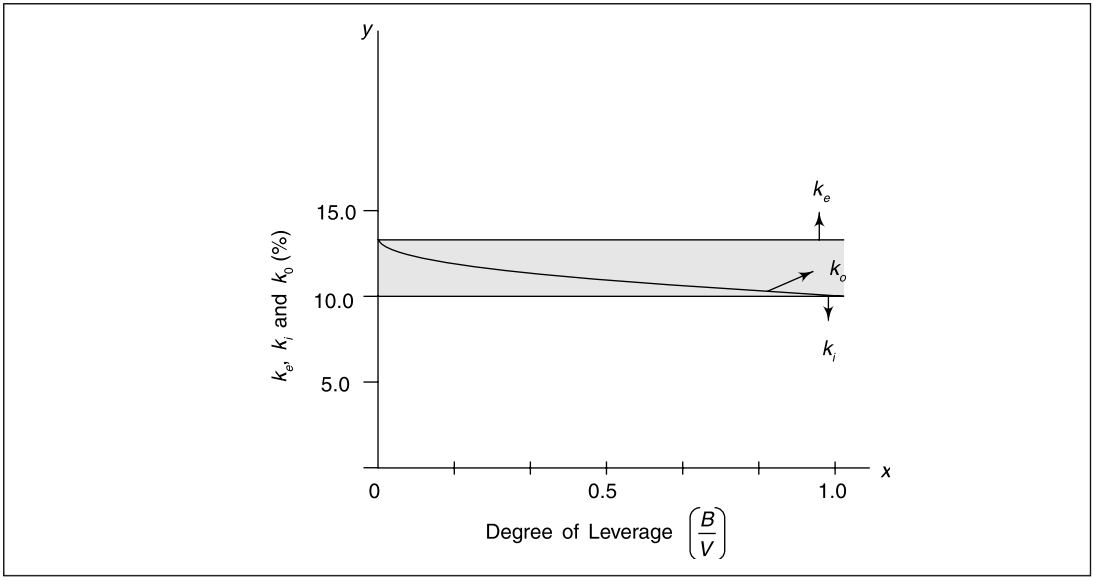

FIGURE 15.1 Leverage and Cost of Capital (NI Approach)

The degree of leverage (B/V) is plotted along the X-axis, while the percentage rates of k_i, k_e and k_0 are on the Y-axis. This graph is based on Example 15.1. Due to the assumptions that k_e and k_i remain unchanged as the degree of leverage changes, we find that both the curves are parallel to the X-axis. But as the degree of leverage increases, k_0 decreases and approaches the cost of debt when leverage is 1.0, that is, ($k_0 = k_i$). It will obviously be so owing to the fact that there is no equity capital in the capital structure. At this point, the firm's overall cost of capital would be minimum. The significant conclusion, therefore, of the NI Approach is that the firm can employ almost 100 per cent debt to maximise its value.

SECTION 3 NET OPERATING INCOME (NOI) APPROACH

Another theory of capital structure, suggested by Durand[2], is the Net Operating Income (NOI) Approach. This Approach is diametrically opposite to the NI Approach. The essence of this Approach is that the capital structure decision of a firm is irrelevant. Any change in leverage

will not lead to any change in the total value of the firm and the market price of shares as well as the overall cost of capital is independent of the degree of leverage.

The NOI Approach is based on the following propositions.

Overall Cost of Capital/Capitalisation Rate (k_0) is Constant

The NOI Approach to valuation argues that the overall capitalisation rate of the firm remains constant, for all degrees of leverage. The value of the firm, given the level of EBIT, is determined by Eq. 15.13.

$$V = \frac{\text{EBIT}}{k_0} \qquad \textbf{(15.13)}$$

In other words, the market evaluates the firm as a whole. The split of the capitalisation between debt and equity is, therefore, not significant.

Residual Value of Equity

The value of equity is a residual value which is determined by deducting the total value of debt (B) from the total value of the firm (V). Symbolcially, Total market value of equity capital (S) = $V - B$.

Changes in Cost of Equity Capital

The equity-capitalisation rate/cost of equity capital (k_e) increases with the degree of leverage. The increase in the proportion of debt in the capital structure relative to equity shares would lead to an increase in the financial risk to the ordinary shareholders . To compensate for the increased risk, the shareholders would expect a higher rate of return on their investments. The increase in the equity-capitalisation rate (or the lowering of the price-earnings ratio, that is, P/E ratio) would match the increase in the debt-equity ratio. The k_e would be = $k_0 + (k_0 - k_i)\ [B/S]$

Cost of Debt

Explicit cost is the rate of interest paid on debt.

Implicit cost is the increase in cost of equity due to increase in debt.

The cost of debt (k_i) has two parts: **(a) Explicit cost** which is represented by the rate of interest. Irrespective of the degree of leverage, the firm is assumed to be able to borrow at a given rate of interest. *This implies that the increasing proportion of debt in the financial structure does not affect the financial risk of the lenders* and they do not penalise the firm by charging higher interest; **(b) Implicit** *or* '**hidden**' *cost.* As shown in the assumption relating to the changes in k_e, increase in the degree of leverage or the proportion of debt to equity causes an increase in the cost of equity capital. This increase in k_e, being attributable to the increase in debt, is the implicit part of k_i.

Thus, the advantage associated with the use of debt, supposed to be a 'cheaper' source of funds in terms of the explicit cost, is exactly neutralised by the implicit cost represented by the increase in k_e. As a result, **the real cost of debt and the real cost of equity**, according to the NOI Approach, **are the same and equal k_0.**

Optimum Capital Structure

The total value of the firm is unaffected by its capital structure. No matter what the degree of leverage is, the total value of the firm will remain constant. The market price of shares will

also not change with the change in the debt-equity ratio. There is nothing such as an *optimum capital structure*. Any capital structure is optimum, according to the NOI Approach.

The effect of NOI Approach on value of the firm, k_e, and the market price per share is illustrated in Example 15.2.

Example 15.2

Assume the figures given in Example 15.1: operating income Rs 50,000; cost of debt, 10 per cent; and outstanding debt, Rs 2,00,000. If the overall capitalisation rate (overall cost of capital) is 12.5 per cent, what would be the total value of the firm and the equity-capitalisation rate?

Solution

The computation is depicted in Table 15.4.

TABLE 15.4 Total Value of the Firm (Net Operating Income Approach)

Net operating income (EBIT)	Rs 50,000
Overall capitalisation rate (k_0)	0.125
Total market value of the firm (V) = EBIT/k_0	4,00,000
Total value of debt (B)	2,00,000
Total market value of equity (S) = ($V - B$)	2,00,000
Equity-capitalisation rate, $k_e = \frac{\text{EBIT} - \text{I}}{V - B} = \frac{\text{Earnings available to equityholders}}{\text{Total market value of equity shares}}$	
$= \frac{\text{Rs } 50,000 - \text{Rs } 20,000}{\text{Rs } 2,00,000}$	0.15
Alternatively, $k_e = k_0 + (k_0 - k_i)B/S$: $0.125 + (0.125 - 0.10)\left[\frac{\text{Rs } 2,00,000}{\text{Rs } 2,00,000}\right]$	0.15
The weighted average cost of capital to verify the validity of the NOI Approach:	
$k_0 = k_i(B/V) + k_e(S/V) = 0.10\left[\frac{\text{Rs } 2,00,000}{\text{Rs } 4,00,000}\right] + 0.15\left[\frac{\text{Rs } 2,00,000}{\text{Rs } 4,00,000}\right]$	0.125

Thus, we find that the overall cost of capital is 12.5 per cent as per the requirement of the NOI Approach.

In order to examine the effect of leverage, let us assume that the firm increases the amount of debt from Rs 2,00,000 to Rs 3,00,000 and uses the proceeds of the debt to repurchase equity shares. The value of the firm would remain unchanged at Rs 4,00,000, but the equity-capitalisation rate would go up to 20 per cent as shown in Table 15.5.

TABLE 15.5 Value of the Firm (NOI Approach)

Net operating income (EBIT)	Rs 50,000
Overall capitalisation rate (k_0)	0.125
Total market value of the firm (V) = EBIT/k_0	4,00,000
Total value of debt (B)	3,00,000
Total market value of equity (S) = ($V - B$)	1,00,000
$k_e = \frac{\text{Rs } 50,000 - \text{Rs } 30,000}{\text{Rs } 1,00,000}$	0.20

(*Contd.*)

(*Contd.*)

Alternatively: $k_e = 0.125 + (0.125 - 0.10)\left[\frac{\text{Rs } 3,00,000}{\text{Rs } 1,00,000}\right]$	0.20
$k_0 = 0.10\left[\frac{\text{Rs } 3,00,000}{\text{Rs } 4,00,000}\right] + 0.20\left[\frac{\text{Rs } 1,00,000}{\text{Rs } 4,00,000}\right]$	0.125

Let us further suppose that the firm retires debt by Rs 1,00,000 by issuing fresh equity shares of the same amount. The value of the firm would remain unchanged at Rs 4,00,000 and the equity-capitalisation rate would come down to 13.33 per cent as manifested in the calculations in Table 15.6.

TABLE 15.6 Total Value of the Firm (NOI Approach)

Net operating income (EBIT)	Rs 50,000	
Overall capitalisation rate (k_0)		0.125
Total market value of the firm (V) = EBIT/k_0	4,00,000	
Total value of debt (B)	1,00,000	
Total market value of equity (S) = ($V - B$)	3,00,000	
$k_e = \frac{\text{Rs } 50,000 - \text{Rs } 10,000}{\text{Rs } 3,00,000}$		0.133
Alternatively: $k_e = 0.125 + (0.125 - 0.10)\left[\frac{\text{Rs } 1,00,000}{\text{Rs } 3,00,000}\right]$		0.133
$k_0 = 0.10\left[\frac{\text{Rs } 1,00,000}{\text{Rs } 4,00,000}\right] + 0.133\left[\frac{\text{Rs } 3,00,000}{\text{Rs } 4,00,000}\right]$		0.125

The significant feature is that the equity-capitalisation rate, k_e, increases with the increase in the degree of leverage. It has gone up from 15 per cent to 20 per cent with the increase in leverage from 0.50 to 0.75. The equity capitalisation rate decreases with the decrease in the degree of leverage. It has come down from 15 per cent to 13.33 per cent with the decrease in leverage from 0.50 to 0.25.

Market Price of Shares

In Example 15.2, let us suppose the firm with Rs 2 lakh debt has 2,000 equity shares (of Rs 100 each) outstanding. The firm has issued additional debt of Rs 1,00,000 to repurchase its shares amounting to Rs 1,00,000; it has to repurchase 1,000 shares of Rs 100 each from the market. It, then, has 1,000 equity shares outstanding, having total market value of Rs 1,00,000. The market price per share, therefore, is Rs 100 (Rs 1,00,000 ÷ 1,000) as before.

In the second situation the firm issues, 1,000 equity shares of Rs 100 each to retire debt aggregating Rs 1,00,000. It will have 3,000 equity shares outstanding, having total market value of Rs 3,00,000, thus, giving a market price of Rs 100 per share.

Thus, we note that there is no change in the market price per share due to change in leverage.

We have portrayed the relationship between the leverage and the various costs, viz. k_i, k_e and k_0 in Fig. 15.2.

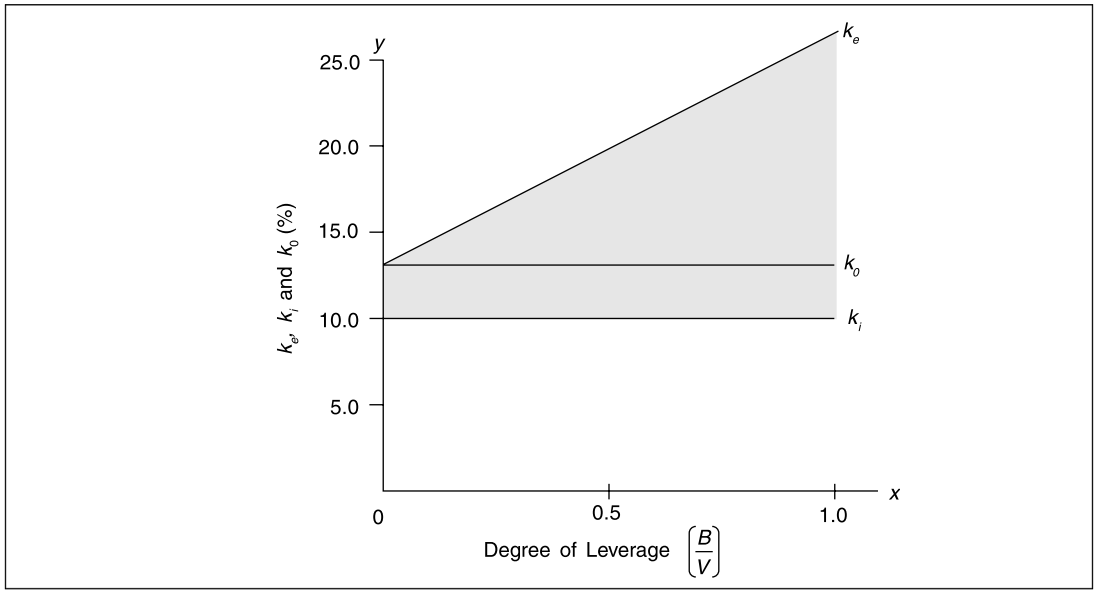

FIGURE 15.2 Leverage and Cost of Capital (NOI Approach)

The graph is based on Example 15.2. Due to the assumption that k_0 and k_i remain unchanged as the degree of leverage changes, we find that both the curves are parallel to the X-axis. But as the degree of leverage increases, the k_e increases continuously.

SECTION 4 MODIGLIANI-MILLER (MM) APPROACH

The Modigliani-Miller Thesis[3] relating to the relationship between the capital structure, cost of capital and valuation is akin to the NOI Approach. The NOI Approach, as explained above, is definitional or conceptual and lacks behavioural significance.[4] The NOI Approach, in other words, does not provide operational justification for the irrelevance of the capital structure. The MM proposition supports the NOI Approach relating to the independence of the cost of capital of the degree of leverage at any level of debt-equity ratio. The significance of their hypothesis lies in the fact that it provides behavioural justification for constant overall cost of capital and, therefore, total value of the firm. In other words, the MM Approach maintains that the weighted average (overall) cost of capital does not change, as shown in Fig. 15.3, with a change in the proportion of debt to equity in the capital structure (or degree of leverage). They offer operational justification for this and are not content with merely stating the proposition.

Basic Propositions

There are three basic propositions of the MM Approach:

I The overall cost of capital (k_0) and the value of the firm (V) are independent of its capital structure. The k_0 and V are constant for all degrees of leverage. The total value is given by capitalising the expected stream of operating earnings at a discount rate appropriate for its risk class.

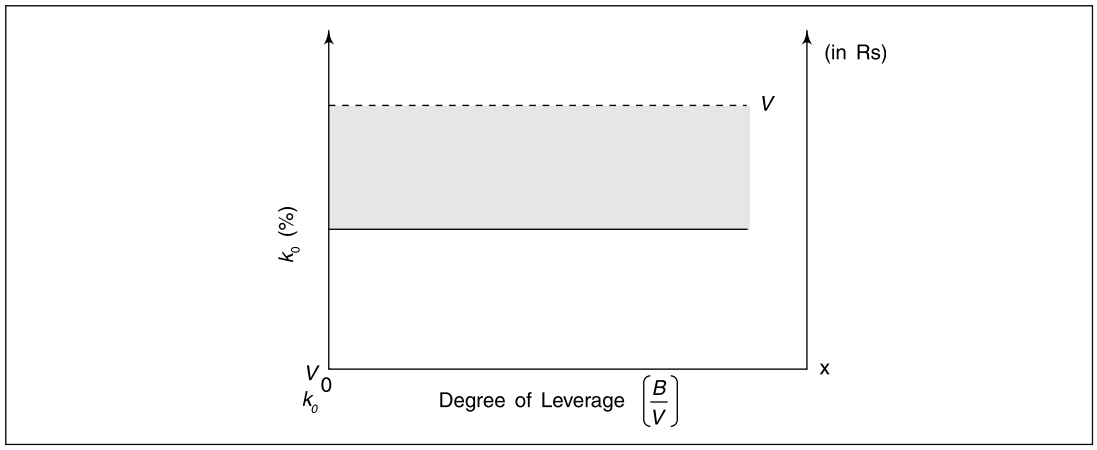

FIGURE 15.3 Leverage and Cost of Capital (MM Approach)

II The second proposition of the MM Approach is that the k_e is equal to the capitalisation rate of a pure equity stream plus a premium for financial risk equal to the difference between the pure equity-capitalisation rate (k_e) and k_i times the ratio of debt to equity. In other words, k_e increases in a manner to offset exactly the use of a less expensive source of funds represented by debt. MM proposition II states that the corporate's cost of equity (k_e) consists of two elements: **(i)** k_o, the required, rate of return on the total assets of the firm whose value depends on the business risk; and **(ii)** $(k_o - k_i)\ B/S$ which is determined by the company's capital structure.[5] For a zero-debt company, this component is zero. As the company starts using debt, the k_e increases **and the equity-investor is to be compensated for it**. The higher the employment of debt in financing company's assets, the higher is the financial risk as well as the financial risk premium.

Debt financing increases financial risk. The cost of equity depends on business risk and financial risk. Business risk is affected by the business operations of the firm and is independent of its financing pattern. Financial risk is determined exclusively by the financing pattern/capital structure.

Thus, MM proposition II is in conformity with the NOI approach (**already explained**).

III The cut-off rate for investment purposes is completely independent of the way in which an investment is financed.

We are interested mainly in exploring the relationship between leverage and valuation. Our focus, therefore, is on proposition(1).

Assumptions

The proposition that the weighted average cost of capital is constant irrespective of the type of capital structure is based on the following assumptions:

(a) *Perfect capital markets*: The implication of a perfect capital market is that **(i)** securities are infinitely divisible; **(ii)** investors are free to buy/sell securities; **(iii)** investors can borrow without restrictions on the same terms and conditions as firms can; **(iv)** there are no transaction costs; **(v)** information is perfect, that is, each investor has the same information which is readily available to him without cost; and **(vi)** investors are rational and behave accordingly.

(b) Given the assumption of perfect information and rationality, all investors have the same expectation of firm's net operating income (EBIT) with which to evaluate the value of a firm.

(c) Business risk is equal among all firms within similar operating environment. That means, all firms can be divided into 'equivalent risk class' or 'homogeneous risk class'. The term equivalent/homogeneous risk class means that the expected earnings have identical risk characteristics. Firms within an industry are assumed to have the same risk characteristics. The categorisation of firms into equivalent risk class is on the basis of the industry group to which the firm belongs.

(d) The dividend payout ratio is 100 per cent.

(e) There are no taxes. This assumption is removed later.

Proposition I The basic premise of the MM Approach (proposition I) is that, given the above assumptions, the total value of a firm must be constant irrespective of the degree of leverage (debt-equity ratio). Similarly, the cost of capital as well as the market price of shares must be the same regardless of the financing-mix.

The operational justification for the MM hypothesis is the **arbitrage process**. The term 'arbitrage' refers to an act of buying an asset/security in one market (at lower prices) and selling it in another (at higher price). As a result, equilibrium is restored in the market price of a security in different markets. The essence of the arbitrage process is the purchase of securities/assets whose prices are lower (undervalued securities) and, sale of securities whose prices are higher, in related markets which are temporarily out of equilibrium. The arbitrage process is essentially a balancing operation. It implies that a security cannot sell at different prices. The MM Approach illustrates the arbitrage process with reference to valuation in terms of two firms which are exactly similar in all respects except leverage so that one of them has debt in its capital structure while the other does not. Such homogeneous firms are, according to Modigliani and Miller, perfect substitutes. The total value of the homogeneous firms which differ only in respect of leverage cannot be different because of the operation of arbitrage. The investors of the firm whose value is higher will sell their shares and instead buy the shares of the firm whose value is lower. Investors will be able to earn the same return at lower outlay with the same perceived risk or lower risk. They would, therefore, be better off. The behaviour of the investors will have the effect of **(i)** increasing the share prices (value) of the firm whose shares are being purchased; and **(ii)** lowering the share prices (value) of the firm whose shares are being sold. This will continue till the market prices of the two identical firms become identical. Thus, the switching operation (arbitrage) drives the total value of two homogeneous firms in all respects, except the debt-equity ratio, together. The arbitrage process, as already indicated, ensures to the investor the same return at lower outlay as he was getting by investing in the firm whose total value was higher and yet, his risk is not increased. This is so because the investors would borrow in the proportion of the degree of leverage present in the firm. The use of debt by the investor for arbitrage is called as 'home-made' or 'personal' leverage. The essence of the arbitrage argument of Modigliani and Miller is that the investors (arbitragers) are able to substitute personal leverage or home-made leverage for corporate leverage, that is, the use of debt by the firm itself.

Arbitrage implies buying a security in a market where price is low and selling where it is high.

Homemade leverage can replicate the firm's capital structure, thereby causing investers to be indifferent to it.

The operation of the arbitrage process is illustrated in Example 15.3.

Example 15.3

Assume there are two firms, L and U, which are identical in all respects except that firm L has 10 per cent, Rs 5,00,000 debentures. The earnings before interest and taxes (EBIT) of both the firms are equal, that is, Rs 1,00,000. The equity-capitalisation rate (k_e) of firm L is higher (16 per cent) than that of firm U (12.5 per cent).

Solution

The total market values of firms L and U are computed in Table 15.7.

TABLE 15.7 Total Value of Firms L and U

Particulars	*Firms*	
	L	*U*
EBIT	Rs 1,00,000	Rs 1,00,000
Less: Interest	50,000	—
Earnings available to equity-holders	50,000	1,00,000
Equity-capitalisation rate (k_e)	0.16	0.125
Total market value of equity (S)	3,12,500	8,00,000
Total market value of debt (B)	5,00,000	—
Total market value (V)	8,12,500	8,00,000
Implied overall capitalisation rate/cost of capital (k_0) = EBIT/V	0.123	0.125
Debt-equity ratio = B/S	1.6	—

Thus, the total market value of the firm which employs debt in the capital structure (L) is more than that of the unlevered firm (U). According to the MM hypothesis, this situation cannot continue as the arbitrage process, based on the substitutability of personal leverage for corporate leverage, will operate and the values of the two firms will be brought to an identical level.

Arbitrage Process The *modus operandi* of the arbitrage process is as follows:

Suppose an investor, Mr X, holds 10 per cent of the outstanding shares of the levered firm (L). His holdings amount to Rs 31,250 (i.e. 0.10 × Rs 3,12,500) and his share in the earnings that belong to the equity shareholders would be Rs 5,000 (0.10 × Rs 50,000).

He will sell his holdings in firm L and invest in the unlevered firm (U). Since firm U has no debt in its capital structure, the financial risk to Mr X would be less than in firm L. To reach the level of financial risk of firm L, he will borrow additional funds equal to his proportionate share in the levered firm's debt on his personal account. That is, he will substitute personal leverage (or home-made leverage) for corporate leverage. In other words, instead of the firm using debt, Mr X will borrow money. The effect, in essence, of this is that he is able to introduce leverage in the capital structure of the the unlevered firm by borrowing on his personal account. Mr X in our example will borrow Rs 50,000 at 10 per cent rate of interest. His proportionate holding (10 per cent) in the unlevered firm will amount to Rs 80,000 on which he will receive a dividend income of Rs 10,000. Out of the income of Rs 10,000 from the unlevered firm (U), Mr X will pay Rs 5,000 as interest on his personal borrowings. He will be left with Rs 5,000 that is, the same amount as he was getting from the levered firm (L). But his investment outlay in firm U is less (Rs 30,000) as compared with that in firm L (Rs 31,250). At the same time, his risk is identical in both the situations. The effect of the arbitrage process is summarised in Table 15.8.

TABLE 15.8 Effect of Arbitrage

(A) Mr X's position in firm L (levered) with 10 per cent equity-holding			
(i) Investment outlay			Rs 31,250
(ii) Dividend Income			5,000
(B) Mr X's position in firm U (unlevered) with 10 per cent equity holding			
(i) Total funds available (own funds, Rs 31,250 + borrowed funds, Rs 50,000)			81,250
(ii) Investment outlay (own funds, Rs 30,000 + borrowed funds, Rs 50,000)			80,000
(iii) Dividend Income:			
Total Income (0.10 × Rs 1,00,000)	Rs 10,000		
Less: Interest payable on borrowed funds	5,000		5,000
(C) Mr X's position in firm U if he invests the total funds available			
(i) Investment costs			81,250.00
(ii) Total income			10,156.25
(iii) Dividend income (net) (Rs 10,156.25 – Rs 5,000)			5,156.25

It is, thus, clear that Mr X will be better off by selling his securities in the levered firm and buying the shares of the unlevered firm. With identical risk characteristics of the two firms, he gets the same income with lower investment outlay in the unlevered firm. He will obviously prefer switching from the levered to the unlevered firm. Other investors will also, given the assumption of rational investors, enter into the arbitrage process. The consequent increasing demand for the securities of the unlevered firm will lead to an increase in the market price of its shares. At the same time, the price of the shares of the levered firm will decline. This will continue till it is possible to reduce the investment outlays and get the same return. Beyond this point, switching from firm L to firm U or arbitrage will not be identical. This is the point of equilibrium. At this point, the total value of the two firms would be identical. The cost of capital of the two firms would also be the same. Thus, it is unimportant what the capital structure of firm L is. The weighted cost of capital (k_0) after the investors exercise their home-made leverage is constant because investors exactly offset the firm's leverage with their own.[6]

Arbitrage Process: Reverse Direction According to the MM hypothesis, since debt financing has no advantage, it has no disadvantage either. In other words, just as the total value of a levered firm cannot be more than that of an unlevered firm, the value of an unlevered firm cannot be greater than the value of a levered firm. This is because the arbitrage process will set in and depress the value of the unlevered firm and increase the market price and, thereby, the total value of the levered firm. The arbitrage would, thus, operate in the opposite direction. Here, the investors will dispose of their holdings in the unlevered firm and obtain the same return by acquiring proportionate share in the equity capital and the debt of the levered firm at a lower outlay without any increase in the risk. This is illustrated in Example 15.4.

Example 15.4

Assume that in Example 15.3, the equity-capitalisation rate (k_e) is 20 per cent in the case of the levered firm (L), instead of the assumed 16 per cent. The total values of the two firms are given in Table 15.9.

TABLE 15.9 Total Value of Firms L and U

Particulars	*L*	*U*
EBIT	Rs 1,00,000	Rs 1,00,000
Less: Interest	50,000	—
Income to equity holders	50,000	1,00,000
Equity-capitalisation rate (k_e)	0.20	0.125
Market value of equity	2,50,000	8,00,000
Market value of debt	5,00,000	—
Total value (V)	7,50,000	8,00,000
(k_0)	0.133	0.125
B/S	2	0

Since both firms are similar, except for financing-mix, a situation in which their total values are different, cannot continue, as arbitrage will drive the two values together.

Suppose, Mr Y has 10 per cent shareholdings of firm U. He earns Rs 10,000 (0.10 × Rs 1,00,000). He will sell his securities in firm U and invest in the undervalued levered firm, L. He can purchase 10 per cent of firm L's debt at a cost of Rs 50,000 which will provide Rs 5,000 interest and 10 per cent of L's equity at a cost of Rs 25,000 with an expected dividend of Rs 5,000 (0.10 × Rs 50,000). The purchase of a 10 per cent claim against the levered firm's income costs Mr Y only Rs 75,000, yielding the same expected income of Rs 10,000 from the equity shares of the unlevered firm. He would prefer the levered firm's securities as the outlay is lower. Table 15.10 portrays the reverse arbitrage process.

TABLE 15.10 Effect of Reverse Arbitrage Process

(A) Mr Y's current position in firm U

Investment outlay	Rs 80,000
Dividend income	10,000

(B) Mr Y sells his holdings in firm U and purchases 10 per cent of the levered firm's equity and debentures

	Investment	*Income*
Debt	Rs 50,000	Rs 5,000
Equity	25,000	5,000
Total	75,000	10,000

Y would prefer alternative B to A, as he is able to earn the same income with a smaller outlay.

(C) He invests the entire sum of Rs 80,000 in firm L

	Investment	*Income*
Debt	Rs 53,333.00	Rs 5,333.30
Equity	26,667.00	5,333.40
Total	80,000,00	10,666.70

He augments his income by Rs 666.70.

The above illustrations establish that the arbitrage process will make the values of both the firms identical. Thus, Modigliani and Miller show that the value of a levered firm can neither be greater nor smaller than that of an unlevered firm; the two must be equal. There is neither an advantage nor a disadvantage in using debt in the firm's capital structure. The principle involved is simply that investors are able to reconstitute their former position by off-setting

changes in corporate leverage with personal leverage. As a result the investment opportunities available to them are not altered by changes in the capital structure of the firm.[7]

Limitations

Does the MM hypothesis provide a valid framework to explain the relationship between capital structure, cost of capital and total value of a firm? The most crucial element in the MM Approach is the *arbitrage process* which forms the behavioural foundation of, and provides operational justification to, the MM hypothesis. The arbitrage process, in turn, is based on the crucial assumption of perfect substitutability of personal/home-made leverage with corporate leverage. The validity of the MM hypothesis depends on whether the arbitrage process is effective in the sense that personal leverage is a perfect substitute for corporate leverage. The arbitrage process is, however, not realistic and the exercise based upon it is purely theoretical and has no practical relevance.

Risk Perception In the first place, the risk perceptions of personal and corporate leverage are different. If home-made and corporate leverages are perfect substitutes, as the MM Approach assumes, the risk to which an investor is exposed, must be identical irrespective of whether the firm has borrowed (corporate leverage) or the investor himself borrows proportionate to his share in the firm's debt. If not, they cannot be perfect substitutes and consequently the arbitrage process will not be effective. The risk exposure to the investor is greater with personal leverage than with corporate leverage. The liability of an investor is limited in corporate enterprises in the sense that he is liable to the extent of his proportionate shareholdings in case the company is forced to go into liquidation. The risk to which he is exposed, therefore, is limited to his relative holding. The liability of an individual borrower is, on the other hand, unlimited as even his personal property is liable to be used for payment to the creditors. The risk to the investor with personal borrowing is higher. In Example 15.3, for instance, Mr X's liability (risk), when the firm has borrowed (levered firm), is Rs 31,250, that is, his 10 per cent share in firm L. If he were to borrow equal to his proportionate share in the firm's debt (Rs 50,000), his total liability will be Rs 80,000. Thus, investments in a levered firm (corporate leverage) and in an unlevered firm (personal leverage) are not on an equal footing from the viewpoint of risks to the investors. Since investors can reasonably be expected to prefer an arrangement which, while giving the same return, ensures lower risk, the personal and corporate leverages cannot be perfect substitutes.

Convenience Apart from higher *risk exposure*, the investors would find the personal leverage *inconvenient*. This is so because with corporate leverage the formalities and procedures involved in borrowing are to be observed by the firms while these will be the responsibility of the investor-borrower in case of personal leverage. That corporate borrowing is more convenient to the investor means, in other words, that investors would prefer them rather than to do the job themselves. The perfect substitutability of the two types of leverage is, thus, open to question.

Cost Another constraint on the perfect substitutability of personal and corporate leverage and, hence, the effectiveness of the arbitrage process is the relatively *high cost of borrowing* with personal leverage. If the two types of leverage are to be perfect substitutes, the cost of borrowing ought to be identical for both: borrowing by the firm and borrowing by the investor-borrower. If the borrowing costs vary so that they are higher/lower depending on whether

the borrowing is done by a firm or an individual, the borrowing arrangement with lower cost will be preferred by the investors. That lending costs are not uniform for all categories of borrowers is, as an economic proposition, well recognised. As a general rule, large borrowers with high credit-standing can borrow at a lower rate of interest compared to borrowers who are small and do not enjoy high credit-standing. For this reason, it is reasonable to assume that a firm can obtain a loan at a cost lower than what the individual investor would have to pay. As a result of higher interest charges, the advantage of personal leverage would largely disappear and the MM assumption of personal and corporate leverages being perfect substitutes would be of doubtful validity. In fact, borrowing by a firm has definite superiority over a personal loan from the viewpoint of the cost of borrowing. Investors can be expected to definitely prefer corporate borrowing as they would not be in the same position by borrowing on personal account.

Institutional Restrictions Yet another problem with the MM hypothesis is that *institutional restrictions* stand in the way of a smooth operation of the arbitrage process. Several institutional investors such as insurance companies, mutural funds, commercial banks and so on are not allowed to engage in personal leverage. Thus, switching the option from the unlevered to the levered firm may not apply to all investors and, to that extent, personal leverage is an imperfect substitute for corporate leverage.

Double leverage includes leverage both in personal portfolio as well as in the firm's portfolio.

Double Leverage A related dimension is that in certain situations, the arbitrage process (substituting corporate leverage by personal leverage) may not actually work. For instance, when an investor has already borrowed funds while investing in shares of an unlevered firm. If the value of the firm is more than that of the levered firm, the arbitrage process would require selling the securities of the overvalued (unlevered) firm and purchasing the securities of the levered firm. Thus, an investor would have *double leverage* both in personal portfolio as well as in the firm's portfolio. The MM assumption would not hold true in such a situation.

Transaction Costs Transaction costs would affect the arbitrage process. The effect of transaction/flotation cost is that the investor would receive net proceeds from the sale of securities which will be lower than his investment holding in the levered/unlevered firm, to the extent of the brokerage fee and other costs. He would, therefore, have to invest a larger amount in the shares of the unlevered/ levered firm, than his present investment, to earn the same return.

Personal leverage and corporate leverage are, therefore, not perfect substitutes. This implies that the arbitrage process will be hampered and will not be effective. To put it differently, the basic postulate of the MM Approach is not valid. Therefore, a firm may increase its total value and lower its weighted cost of capital with an appropriate degree of leverage. Thus, the capital structure of the firm is not irrelevant to its valuation and the overall cost of capital. In brief, imperfections in the capital market retard perfect functioning of the arbitrage. As a consequence, the MM Approach does not appear to provide a valid framework for the theoretical relationship between capital structure, cost of capital and valuation of a firm.

Taxes Finally, if corporate taxes are taken into account, the MM Approach will fail to explain the relationship between financing decision and value of the firm. Modigliani and Miller themselves, as shown below, are aware of it and have, in fact, recognised it.

Corporate Taxes

As already mentioned, MM agree[8] that the value of the firm will increase and cost of capital will decline with leverage, if corporate taxes are introduced in the exercise. Since interest on debt is tax-deductible, the effective cost of borrowing is less than the contractual rate of interest. Debt, thus, provides a benefit to the firm because of the *tax-deductibility* of interest payments. Therefore, a levered firm would have greater market value than an unlevered firm. Specifically, MM state that the value of the levered firm would exceed that of the unlevered firm by an amount equal to the levered firm's debt multiplied by the tax rate. Symbolically,

$$V_l = V_u + Bt \qquad \textbf{(15.14)}$$

where V_l = value of levered firm,
V_u = value of unlevered firm,
B = amount of debt and
t = tax rate

Since the value of the levered firm is more than that of the unlevered firm, it is implied that the overall cost of capital of the former would be lower than that of the latter.

Equation 15.14 also implies that the market value of a levered firm (V_l) is equal to the market value of an unlevered firm (V_u) in the same risk class plus the discounted present value of the tax saving resulting from tax-deductibility of interest payments.[9]

Example 15.11

The earnings before interest and taxes are Rs 10 lakh for companies L and U. They are alike in all respects except that Firm L uses 15 per cent debt of Rs 20 lakh; Firm U does not use debt. Given the tax rate of 35 per cent, the stakeholdeRs of the two firms will receive different amounts as shown in Table 15.11.

TABLE 15.11 Effect of Leverage on Shareholders

Particulars	*Company L*	*Company U*
EBIT	Rs 10,00,000	Rs 10,00,000
Less: Interest	3,00,000	—
Earnings before taxes	7,00,000	10,00,000
Less: Taxes	2,45,000	3,50,000
Income available for equity-holders	4,55,000	6,50,000
Income available for debt-holders and equity-holders	7,55,000	6,50,000

The total income to both debt holders and equity holders of levered Company L is higher. The reason is that while debt-holders receive interest without tax-deduction at the corporate level, equity-holders of Company L have their incomes after tax-deduction. As a result, total income to both types of investors increases by the interest payment times the rate, that is, Rs 3,00,000 × 0.35 = Rs 1,05,000.

Assuming further that the debt employed by Company L is permanent, the advantage to the firm is equivalent to the present value of the tax shield, that is, Rs 7 lakh (Rs 1,05,000/0.15). Alternatively, it can be determined with reference to Equation 15.15.

$$\frac{Brt}{r} = Bt \qquad \textbf{(15.15)}$$

where t = Corporate tax,
r = Rate of interest on debt and
Bt = Amount of debt = 0.35 × Rs 20 lakh = Rs 7 lakh.

It may be noted that value of levered firm (as shown by equation 15.14) reckons this tax shield due to debt.

The implication of MM analysis in this case is that the value of the firm is maximised when its capital structure contains only debt. In other words, a firm can lower its cost of capital continnually with increased leverage. However, the extensive use of debt financing would expose business to high probabilities of default; it would find it difficult to meet the promised payments of interest and principal. Moreover, the firm is likely to incur costs and suffer penalties if it fails to make payments of interest and principal when they become due. Legal expenses, disruption of operations, and loss of potentially profitable investment opportunities may result. As the amount of debt in the capital structure increases, so does the probability of incurring these costs. Consequently, there are disadvantages of debt; and excessive use of debt may cause a rise in the cost of capital owing to the increased financial risk and may reduce the value of the firm.[10] Again, we find that MM's proposition is unjustified when leverage is extreme, that is, when the firm uses virtually 100 per cent debt and no equity. Clearly, the optimal capital structure is not one which has the maximum amount of debt, but, one which has the desired amount of debt, determined at a point and/or range where the overall cost of capital is minimum. Modigliani and Miller also recognise that extreme leverage increases financial risk as also the cost of capital. They suggest that firms should adopt '*target debt ratio*' so as not to violate limits of leverage imposed by the creditors. This suggestion indirectly admits that there is a safe limit for the use of debt and firms should not use debt beyond that limit/point. It implies that the cost of capital rises beyond a certain level on the use of debt. There is, therefore, an optimal capital structure.

Bankruptcy Costs

Bankruptcy costs imply high probability of default.

MM assume that there are no bankruptcy costs. However, in practice, excessive use of debt would involve such costs. These costs expose businesses to high probabilities of default. A firm would find it difficult to meet the obligations relating to payments of interest and repayment of principal. This, in turn, may lead to liquidation of the firm. Bankruptcy costs can be classified into two categories: **(1)** direct bankruptcy costs and **(2)** indirect bankruptcy costs.

Direct bankruptcy costs are legal and administrative costs associated with bankruptcy proceedings and dismantling/ removal costs of undersold assets.

Direct Bankruptcy Costs These are the legal and administrative costs associated with the bankruptcy proceedings of the firm. They also include the costs of selling assets at a price lower than their worth/book value. In fact, it is very hard to find buyers for the expensive assets like plant and equipment as they are configured to a company's specific needs and it is not easy to dismantle and move them.[11] The firm may incur heavy dismantling and removal costs.

Direct bankruptcy costs can be staggering and may be a disincentive to debt financing. Such costs are referred to as **bankruptcy tax**.[12] There is a tax shield on debt/borrowings, but it has potential dangers/threats in that the more a company borrows, the more likely it is that it will become bankrupt and pay the bankruptcy tax. Therefore, a company faces a trade-off between advantages and disadvantages of debt financing.

Indirect bankruptcy costs are costs of the threat of bankruptcy in terms of disruption of normal business and adverse effect on sales.

Indirect Bankruptcy Costs These are the costs of avoiding a bankruptcy filing by a financially distressed firm.[13] What happens in such firms is that valuable employees leave, suppliers do not grant credit, customers seek more reliable suppliers and lenders demand higher interest rates and impose more restrictive/protective covenants in loan agreements. In brief, normal business operations are disrupted and sales are adversely affected. Customers avoid buying from such firms as they fear that the company might not honour the warranty and it might be difficult to purchase/replaced parts. All these costs are the costs of the threat of bankruptcy and not bankruptcy *per se*. Therefore, prohibitive bankruptcy costs discourage corporates to use excessive levels of debts. Debt should, therefore, be used in safe limits. Figure 15.4 is modified to incorporate the impact of bankruptcy cots on k_e.

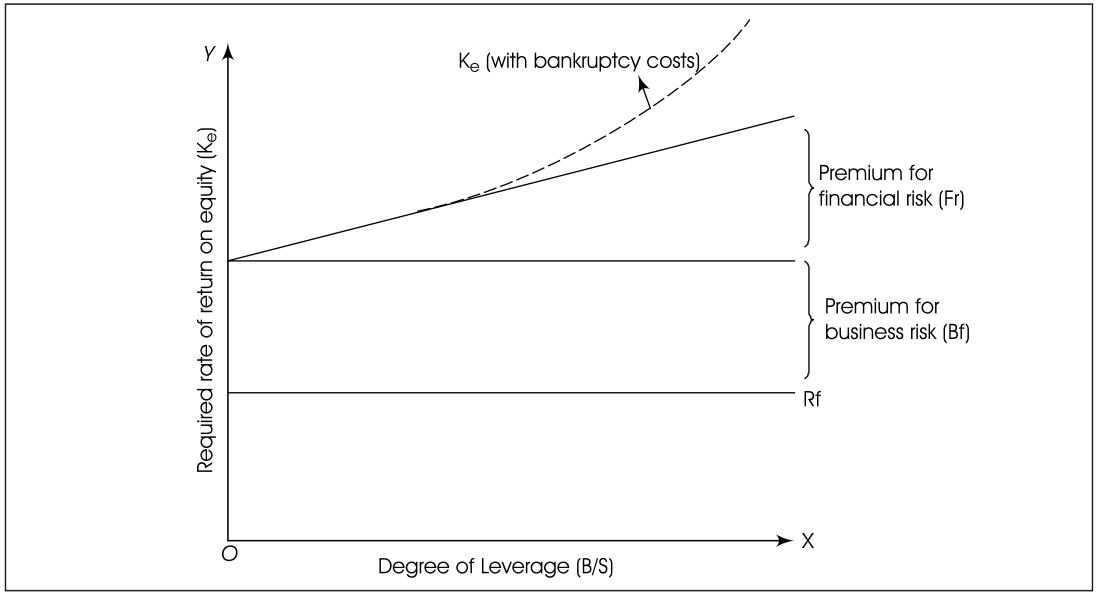

FIGURE 15.4 Cost of Equity, k_e and Bankruptcy Costs
Source: VanHorne, J.C., *Op.cit*., p.287.

Figure 15.4 portrays the cost components of k_e (Risk-free rate of return R_f, Business risk premium, B_p, Financial risk premium, F_p) and the impact of bankruptcy costs on it. Business risk premium is a constant amount as it is not affected by debt financing. Therefore, the line representing it is parallel to the '*X*' axis. Financial risk premium increases with the increased debt-equity ratio. Bankruptcy costs result when debt is used beyond some point and such costs increase with higher debt-equity ratio entailing increasing probability of bankruptcy. As leverage increases, so does the penalty. For extreme leverage, the penalty becomes very substantial indeed.[14]

Thus, the value of a levered firm would be lower due to bankruptcy costs. As a result, the value of a levered firm would be less than the value shown as per equation 15.14 by the amount of bankruptcy costs (BC). Symbolically,

$$V_l = V_u + Bt - BC \qquad \textbf{(15.16)}$$

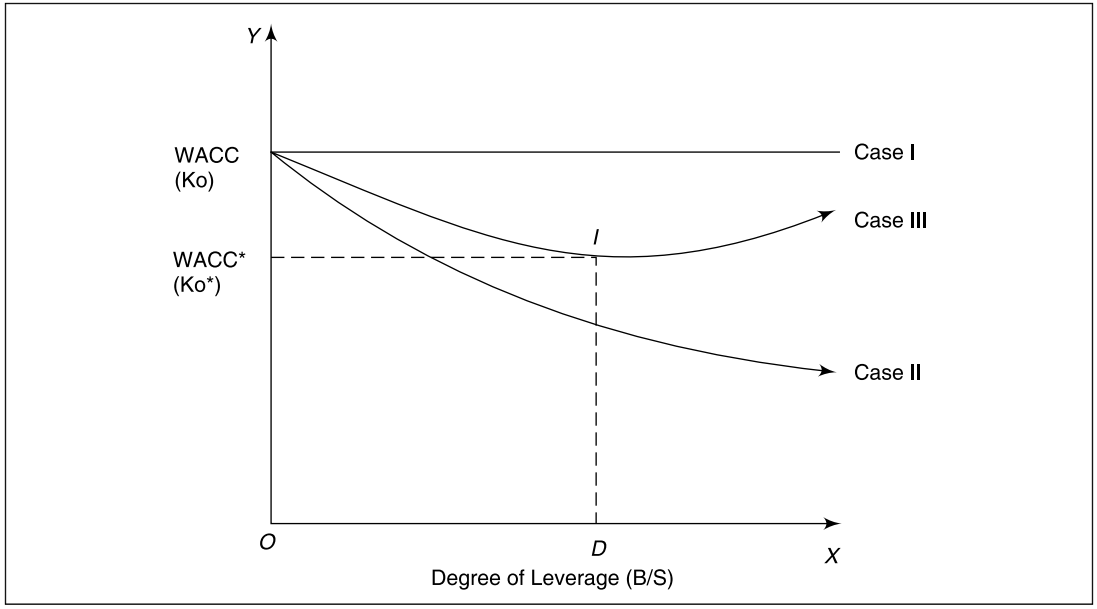

FIGURE 15.5 Degree of Leverage (*B/S*) and WACC
Source: Ross, S.A. et al., *Op.cit.*, p.572.

Figure 15.5 shows the impact of MM approach on weighted average cost of capital, WACC (k_o) in three specific cases. The Case I shows k_o remains constant at varying debt-equity ratios (in a world of no taxes). The advantage of debt as a cheaper source of finance is exactly offset by the increased equity capitalisation rate. In a situation of taxes (Case II), there is always an advantage in using debt according to MM. Therefore, k_o consistently decreases with the increased leverage. Case III recognises the presence of bankruptcy costs due to excessive use of debt. As a result, beyond point, '**D**', bankruptcy costs are higher than the advantage of using debt. Prior to point '**D**', there is a net advantage of leverage. Therefore, $WACC^*/k_o^*$ is minimum at **OD** point of leverage.

Trade-off Theory

The preceding arguments on the use of debt as a means of corporate finance have led to the genesis of **the trade-off theory on capital structure**. It trades off the advantage of debt financing (interest tax shields) against the costs of financial distress (consisting of higher interest rates and bankruptcy costs).

Figure 15.5 illustrates the debt-equity trade-off. There is some threshold level of debt (indicated by labeled '**D**' in Case III), at which the overall cost of capital is minimum (k_o^*). Beyond level '**D**', the bankruptcy costs become increasingly important and exceed the tax benefits of debt. As a result, increased use of debt causes increase in k_o and corresponding decrease in the valuation of the firm. Prior to level '**D**', bankruptcy-related costs reduce the tax benefits of debt but not completely. Therefore, the increased use of debt upto level **'D'** leads to decrease in k_o and increase in value of the firm. **At the point of 'D' the company has an optimal structure.** The level of '*d*' (debt) would vary from firm to firm depending on its business risk (indicated by degree of operating leverage) and bankruptcy costs.

The theory provides a useful explanation for inter-industry differences in capital structure. While debt ratios are relatively higher in industries with stable revenues and earnings, they are lower in more risky industries with volatile revenues and earnings.

The traditional theory (**explained subsequently in this chapter**) does not make a reference to bankruptcy-related costs and interest tax shield. Yet, it explicitly recognises the pros and cons of debt financing. **Its conclusion that debt should be used within safe limits converages with the trade-off theory.**

Signalling Theory

MM assume that there is an information symmetry about the firm's prospects between management and investors/shareholders (i.e., **symmetric information)**. Symmetric information refers to the situation in which shareholders and managers have identical information about a firm's prospects.[15] In reality, this is not true. Managers, in general, have more information about business operations and future prospects of a firm than its investors. This situation is technically called **asymmetric information**. The empirical evidence suggests that the greater the asymmetry in information between the inside managers and outside investors, the greater is the likely share price reaction to a financing announcement.[16] In operational terms, asymmetric information has an important impact on the capital structure decisions.

Asymmetric information is a situation in which managers have more information about operations/ prospects of a firm than its investors.

Let us assume that the management of a firm (through its Research and Development) has discovered a new product, leading to a very profitable investment opportunity. Its execution needs additional financing. In case the corporate decides to sell equity shares when profits start accruing from the new product, their prices would rise sharply and the new subscribers would be as much benefited as the current shareholders. Evidently, the existing shareholders would have benefited more, if the additional financing would not have been through the equity. The issue of equity shares has created a situation in which the existing shareholders have to share the benefits from increased earnings of a new product with the new subscribers. In other words, it would be more beneficial to the existing shareholders if the management uses debt instead of equity to raise the required funds. The decision of issuing debt in such a favourable situation is consistent with the basic objective of financial management to maximise the wealth of the existing shareholders.

In view of the above, it is expected that a corporate with very favourable prospects would avoid selling shares. The required funds should be raised through other means, including debt even beyond the normal target capital structure.[17] The operational implication is that debt financing is a positive signal suggesting that the management believes that the share prices are under-valued.

In contrast, the management may apprehend poor outlook of the firm in the future. The reason may be that a competitor has come out with a better quality product due to installation of a new technology. Obviously, the management of the firm has no option but to buy new technology even to maintain its existing sales. As a result, there would be an adverse impact on its profitability. The firm would be required to raise additional funds. It would like to raise funds through issue of equity shares as the price of its shares would decline when the market comes to know of its depressed rates of return/.lower profitability. Issuing of shares enables the existing shareholders to have the new subscribers to share the losses. Hence, the theory that the unfavourable business prospects warrant the equity issue so that the loss of the existing shareholders is minimised.

In view of the above, shareholders more often interpret the announcement of a share issue as a **negative signal** that the firm's prospects (as perceived by the management) are not bright and as a result share prices decline.[18]

In brief, as per the signalling theory, debt issues are considered as "**good news**" and share issues as "**bad news**", the underlying principle being that the management would prefer to issue overvalued security. The theory suggests that since share issue sends a negative signal, which in turn, causes decline in share prices even when future prospects are bright, the firm should maintain some **reserve borrowing capacity** by keeping relatively low levels of debt than suggested by the trade-off theory. This debt reserve can be used to avail of good investment opportunities in future without causing an adverse impact on the share price as the required finances would be raised through debt.

Pecking-Order Theory

Pecking-order theory enumerates the preferred order of raising finance normally followed by corporates.

The pecking-order theory enumerates the **preferred** order of financing, that should be followed by the corporates in practice. The firms prefer internal financing/retained earnings to external financing. The key principle of pecking-order theory is in conformity with the, signalling theory, the presence of asymmetric information and the need to incur flotation costs for new issues. The rationale for the preference for retained earnings is that selling securities to raise funds externally involves flotation costs and which the corporates would like to avoid. The most profitable companies within an industry tend to have the least amount of debt/leverage.[19] In view of their large earnings, more often than not, they never need external financing.

Retentions are justifiable from the view point of equity-owners. As such companies can earn more on retained earnings than what the shareholders themselves could have earned, if the earnings were distributed among them as dividends. The payment of lower dividend is more than offset by the enhanced market price of their shares.

Continuing with the argument of very profitable investment opportunities with such firms and now assuming that the retained earnings falling short of investment requirements, the management would prefer, as per asymmetric information and signalling theory, debt to raise the residual required funds. It may not be out of place to mention here that the flotation costs of raising debt are lower *vis-à-vis* share issue. It is for these reasons that the pecking-order theory aptly suggests the first preference for debt, among the external sources of finance, followed by preference shares and hybrid securities like convertible debentures. The issue of new equity shares is the last resort.[20]

In a nutshell, the financing choices in order of preferences are: **(1)** retained earnings, **(2)** non-convertible debt, **(3)** preference shares, **(4)** hybrid securities like convertible debentures, and **(5)** equity.

Implications of the Pecking-Order[21] The significant implications of the pecking-order theory are as follows:

(1) No Target-Capital Structure Finance theory strongly advocates for target and sound capital structure which minimises the overall cost of capital and maximises the value of a firm. In contrast, the pecking-order choice virtually ignores the concept of target or optimal debt-equity mix. In fact, a firm's capital structure is dictated essentially with reference to the availability of

current retained earnings, *vis-à-vis* its current investment requirement. In case of a deficiency, debt is to be raised, disregarding the requirement of target/optimal capital structure.

(2) Relatively Less Use of Debt by Profitable Firms Profitable firms, in view of large internal cash accruals at their disposal to meet their investment requirements, tend to use less amount of debt as external financing requirement not because they have low target debt-ratios, but because of preference for internally-generated funds. This again flouts sound tenets of finance theory. Such firms, due to favourable financial leverage, can magnify their **RoR** (rate of return) for their equity owners by employing higher debt.

(3) Need to Build-up Cash Reserves Corporates would need to have reserves in the form of cash and marketable securities so that they are readily available to finance investment projects.

(4) Tax-shield on Interest is Secondary In the pecking-order theory, the tax-shield on interest is regarded as the secondary consideration and relegated to the second place in designing capital structure.

In brief, the capital structure decisions under pecking-order theory are essentially a by-product of the corporate's financial requirements and internally generated cash surplus retained after meeting the dividend requirements (**explained in Chapter 19**).

SECTION 5 TRADITIONAL APPROACH

The preceding discussions clearly show that the Net Income Approach (NI) as well as Net Operating Income Approach (NOI) represent two extremes as regards the theoretical relationship between financing decisions as determined by the capital structure, the weighted average cost of capital and total value of the firm. While the NI Approach takes the position that the use of debt in the capital structure will *always* affect the overall cost of capital and the total valuation, the NOI Approach argues that capital structure is totally irrelevant. The MM Approach supports the NOI Approach. But the assumptions of MM hypothesis are of doubtful validity. The Traditional Approach is midway between the NI and NOI Approaches. It partakes of some features of both these Approaches. It is also known as the **Intermediate** Approach. It resembles the NI Approach in arguing that cost of capital and total value of the firm are not independent of the capital structure. But it does not subscribe to the view (of NI Approach) that value of a firm will necessarily increase for all degrees of leverage. In one respect it shares a feature with the NOI Approach that beyond a certain degree of leverage, the overall cost increases leading to a decrease in the total value of the firm. But it differs from the NOI Approach in that it does not argue that the weighted average cost of capital is constant for all degrees of leverage.

The crux of the traditional view relating to leverage and valuation is that through **judicious** use of debt-equity proportions, a firm can increase its total value and thereby reduce its overall cost of capital. The rationale behind this view is that debt is a relatively cheaper source of funds as compared to ordinary shares. With a change in the leverage, that is, using more debt in place of equity, a relatively cheaper source of funds replaces a source of funds which involves a relatively higher cost. This obviously causes a decline in the overall cost of capital. If the debt-equity ratio is raised further, the firm would become financially more risky to the investors who would penalise the firm by demanding a higher equity-capitalisation rate

(k_e). But the increase in k_e may not be so high as to neutralise the benefit of using cheaper debt. In other words, the advantages arising out of the use of debt is so large that, even after allowing for higher k_e, the benefit of the use of the cheaper source of funds is still available. If, however, the amount of debt is increased further, two things are likely to happen: **(i)** owing to increased financial risk, k_e will record a substantial rise; **(ii)** the firm would become very risky to the creditors who also would like to be compensated by a higher return such that k_i will rise. The use of debt beyond a certain point will, therefore, have the effect of raising the weighted average cost of capital and conversely the total value of the firm. Thus, up to a point/degree of leverage, the use of debt will favourably affect the value of a firm; beyond that point, use of debt will adversely affect it. At that level of debt-equity ratio, the capital structure is an optimal capital structure. **At the optimum capital structure, the marginal real cost of debt, defined to include both implicit and explicit, will be equal to the real cost of equity. For a debt-equity ratio before that level, the marginal real cost of debt would be less than that of equity capital, while beyond that level of leverage, the marginal real cost of debt would exceed that of equity.**

There are, of course, variations to the Traditional Approach. According to one of these, the equity-capitalisation rate (k_e) rises only after a certain level of leverage and not before, so that the use of debt does not necessarily increase the k_e. This happens only after a certain degree of leverage. The implication is *that a firm can reduce its cost of capital significantly with the initial use of leverage.*

Another variant of the Traditional Approach suggests that there is no one single capital structure, but, there is a range of capital structures in which the cost of capital (k_0) is the minimum and the value of the firm is the maximum. In this range, changes in leverage have very little effect on the value of the firm.

The *modus operandi* of the Traditional Approach is illustrated in Example 15.6.

Example 15.6

Let us suppose that a firm has 20 per cent debt and 80 per cent equity in its capital structure. The cost of debt and the cost of equity are assumed to be 10 per cent and 15 per cent respectively. What is the overall cost of capital, according to the traditional Approach?

Solution

The overall cost of capital (k_0) $= k_i$ i.e. $0.10\left[\frac{20}{100}\right] + k_e$ i.e. $0.15\left[\frac{80}{100}\right] = 14$ per cent

Further, suppose, the firm wants to increase the percentage of debt to 50. Due to the increased financial risk, the k_i and k_e will presumably rise. Assuming, they are 11 per cent (k_i) and 16 per cent (k_e), the cost of capital (k_0) would be: $= 0.11\left[\frac{50}{100}\right] + 0.16\left[\frac{50}{100}\right] = 13.5$ per cent

It can, thus, be seen that with a rise in the debt-equity ratio, k_e and k_i increase, but, k_0 has declined presumably because these increases have not fully offset the advantages of the cheapness of debt.

Assume further, the level of debt is raised to 70 per cent of the capital structure of the firm. There would consequently be a sharp rise in risk to the investors as well as creditors. The k_e would be, say, 20 per cent and the k_i 14 per cent. The k_0 $= 0.14\left[\frac{70}{100}\right] + 0.20\left[\frac{30}{100}\right] = 15.8$ per cent

The overall cost of capital has actually risen when the firm tries to employ more of what appeared, at the previous debt-equity ratio, to be the least costly source of funds, that is, debt. Therefore, the firm should take into account the consequences of raising the percentage of debt to 70 per cent on the cost of both equity and debt.

The above illustration eloquently demonstrates that the increasing use of debt does not always lower k_0. In fact, excessive use of debt greatly increases financial risk and completely offsets the advantage of using the lower-cost debt. Therefore, the firm should consider the two off-setting effects of increasing the proportion of debt in the capital structure: the rise in k_i and k_e and the decrease or increase in k_0 and total value (V), generated by using a greater proportion of debt. The traditional Approach is illustrated in Example 15.7.

Example 15.7

Assume a firm has EBIT of Rs 40,000. The firm has 10 per cent debentures of Rs 1,00,000 and its current equity capitalisation rate is 16 per cent. The current value of the firm (V) and its overall cost of capital would be, as shown in Table 15.12.

TABLE 15.12 Total Value and Cost of Capital (Traditional Approach)

Net operating income (EBIT)	Rs 40,000
Less: Interest (I)	10,000
Earnings available to equityholders (NI)	30,000
Equity capitalisation rate (k_e)	0.16
Total Market value of equity (S) = NI/k_e	1,87,500
Total Market value of debt (B)	1,00,000
Total value of the firm (V) = $S + B$	2,87,500
Overall cost of capital, k_0 = EBIT/V	0.139
Debt-equity ratio (B/S) = (Rs 1,00,000 ÷ Rs 1,87,500)	0.53

The firm is considering increasing its leverage by issuing additional Rs 50,000 debentures and using the proceeds to retire that amount of equity. If, however, as the firm increases the proportion of debt, k_i would rise to 11 per cent and k_e to 17 per cent, the total value of the firm would increase and k_0 would decline as shown in Table 15.13.

TABLE 15.13 Total Value and Cost of Capital (Traditional Approach)

Net operating income (EBIT)	Rs 40,000
Less: Interest (I)	16,500
Earnings available to equityholders (NI)	23,500
Equity capitalisation rate (k_e)	0.17
Total Market value of equity (S) = NI/k_e	1,38,235
Total Market value of debt (B)	1,50,000
Total value of the firm (V) = $S + B$	2,88,235
Overall cost of capital, k_0 = EBIT/V	0.138
Debt-equity ratio (B/S)	1.08

Let us further suppose that the firm issues additional Rs 1,00,000 debentures instead of Rs 50,000 (that is, having Rs 2,00,000 debentures) and uses the proceeds to retire that amount of equity. Due to increased financial risk, k_i would rise to 12.5 per cent and k_e to 20 per cent, the total value of the firm would decrease and k_0 would rise as is clear from Table 15.14.

TABLE 15.14 Total Value and Cost of Capital (Traditional Approach)

Net operating income (EBIT)	Rs 40,000	
Less: Interest (I)	25,000	
Earnings available to equityholders (NI)	15,000	
Equity capitalisation rate (k_e)		0.20
Total Market value of equity (S) = NI/k_e	75,000	
Total Market value of debt	2,00,000	
Total value of the firm (V) = $S + B$	2,75,000	
Overall cost of capital, k_0 = EBIT/V		0.145
Debt-equity ratio (B/S) (Rs 2,00,000 ÷ Rs 75,000)		2.67

In Example 15.7, it is clear that the optimal debt-equity ratio must be less than 2.67 since at this ratio, the value of the firm is Rs 2,75,000, while at a debt-equity ratio of 1.08 it is Rs 2,88,235.

The traditional Approach suggests that:

> Other things being equal, the market value of a company's securities will rise as the amount of leverage (L) in its financial structure is increased from zero to some point determined by the capital market's evaluation of the level of business uncertainty involved. Beyond this point and up to a second point, changes in leverage have very little effect, that is, within this range of leverage the total market value of the company is unchanged as leverage changes. Beyond this range of 'acceptable' leverage, the total market value of securities will decline with further increase in L.[22]

The effect of increase in leverage from zero, on cost of capital and valuation of the firm, can be thought to involve three distinct phase.[23]

Increased Valuation and Decreased Overall Cost of Capital

During the fiRs t phase, increasing leverage increases the total valuation of the firm and lowers the overall cost of capital. As the proportion of debt in the capital structure increases, the cost of equity (k_e) begins to rise as a reflection of the increased financial risk. But it does not rise fast enough to off set the advantage of using the cheaper source of debt capital. Likewise, for most of the range of this phase, the cost of debt (k_i) either remains constant or rises to a very small extent because the proportion of debt by the lender is considered to be within safe limits. Therefore, they are prepared to lend to the firm at almost the same rate of interest. Since debt is typically a cheaper source of capital than equity, the combined effect is that the overall cost of capital begins to fall with the increasing use of debt. Example 15.7 has shown that an increase in leverage (B/S) from 0.53 to 1.08 has had the effect of increasing the total market value from Rs 2,87,500 to Rs 2,88,235 and decreasing the overall capitalisation rate from 13.9 to 13.8 per cent.

Constant Valuation and Constant Overall Cost of Capital

After a certain degree of leverage is reached, further moderate increases in leverage have little or no effect on total market value. During the middle range,the changes brought in equity-capitalisation rate and debt-capitalisation rate balance each other. As a result, the values of (V) and (k_0) remain almost constant.

Decreased Valuation and Increased Overall Cost of Capital

Beyond a certain critical point, further increases in debt proportions are not considered desirable. They increase financial risks so much that both k_e and k_i start rising rapidly causing (k_0) to rise and (V) to fall. In Example 15.7, the effect of an increase in B/S ratio from 1.08 to 2.67 is to increase (k_0) from 13.8 to 14.5 per cent and to decrease (V) from Rs 2,88,235 to Rs 2,75,000.

A numerical illustration, given in Table 15.15[24] and its graphic presentation in Fig.15.4[25] further help to clarify the relationship between leverage and cost of capital. They present hypothetical changes similar to those envisaged by the traditional approach and examine the effect of leverage on the individual variables. We have assumed, in addition to other assumptions already stated at the beginning of the chapter, that given capital market conditions, the company can repurchase its own shares. The face value of a share is Rs 10 and that of debentures Rs 100 each. The symbols used in Table 15.15 have the same meaning as explained at the beginning of the chapter.

TABLE 15.15 Leverage, Capitalisation Rates and Valuation[a]

B	k_i *(%)*	*EBIT*	*I*	*NI (EBIT-I)*	k_e *(%)*	*Number of shares*	*Amount of shares (book value)*	*S (NI ÷ k_e)*	*Market value per share*	*V (B + S)*	k_0 *%*	L_1 *(B/S)*	L_2 *(B/V)*
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*
0	4.0	Rs 100	Rs Nil	Rs 100	10.0	100	Rs 1,000	Rs 1,000	Rs 10.00	Rs 1,000	10.2	0	0
100	4.0	100	4.0	96	10.0	90	900	960	10.67	1,060	9.4	0.10	0.09
200	4.0	100	8.0	92	10.3	80	800	893	10.16	1,093	9.1	0.22	0.18
300	4.2	100	12.6	87.4	10.8	70	700	810	11.57	1,111	9.0	0.33	0.27
400	4.5	100	18.0	82	11.5	60	600	711	11.85	1,111	9.0	0.56	0.36
500	5.0	100	25.0	75	12.3	50	500	611	12.22	1,111	9.0	0.82	0.45
600	5.5	100	33.0	67	13.1	40	400	512	12.80	1,111	9.0	1.17	0.54
700	7.0	100	49.0	51	14.0	30	300	364	12.13	1,064	9.4	1.92	0.65
800	8.5	100	68.0	32	15.0	20	200	213	10.65	1,013	9.9	3.76	0.79

[a] Solomon, E., *Theory of Financial Management*, Columbia University Press, New York, 1969, p. 95. Reprinted with permission from Columbia University Press, New York, USA.

Table 15.15 as well as Fig. 15.6 reveal that with an increase in leverage (B/V) from zero to 0.27, the market value of the firm increases (from Rs 1,000 to Rs 1,111) and the overall cost of capital declines from 10 to 9 per cent (Phase I). With further increases in leverage from 0.27 up to 0.54, there is no change either in (V) or in (k_0); both the values remain constant, that is, Rs 1,111 and 9 per cent respectively (Phase 2). During Phase 3, with an increase in the ratio beyond 0.54 up to 0.79, there is a decrease in market value of the firm (from Rs 1,111 to Rs 1,013) and an increase in (k_0) (from 9 to 9.4 per cent), suggesting that the optimal leverage lies within the range of 0.27 to 0.54 debt-equity ratio.

In practice, it may not be possible to determine the minimum overall cost of capital. Therefore, a diagrammatic presentation is useful as it depicts a range over which the cost of capital is minimised. The (k_0) curve developed in Fig. 15.6 is a fairly shallow saucer with a horizontal section over the middle ranges of leverage (0.27 to 0.54). *The firm should not go to the left or to the right of the saucer* part of the curve.

The traditional view on leverage is commonly referred to as one of **'U' shaped cost of capital curve** (as shown in Fig. 15.7). In such a situation, the degree of leverage is optimum at a point at which the rising marginal cost of borrowing is equal to the average overall cost

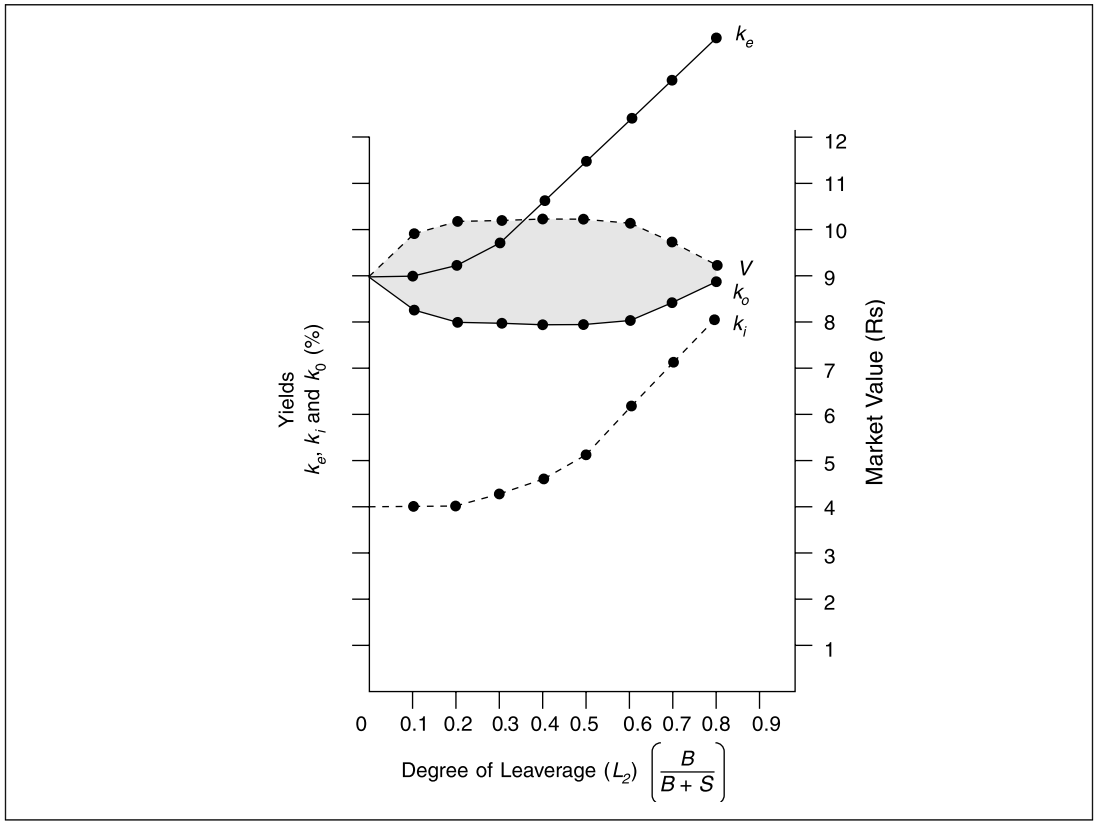

FIGURE 15.6 Leverage and Cost of Capital (Traditional Approach)

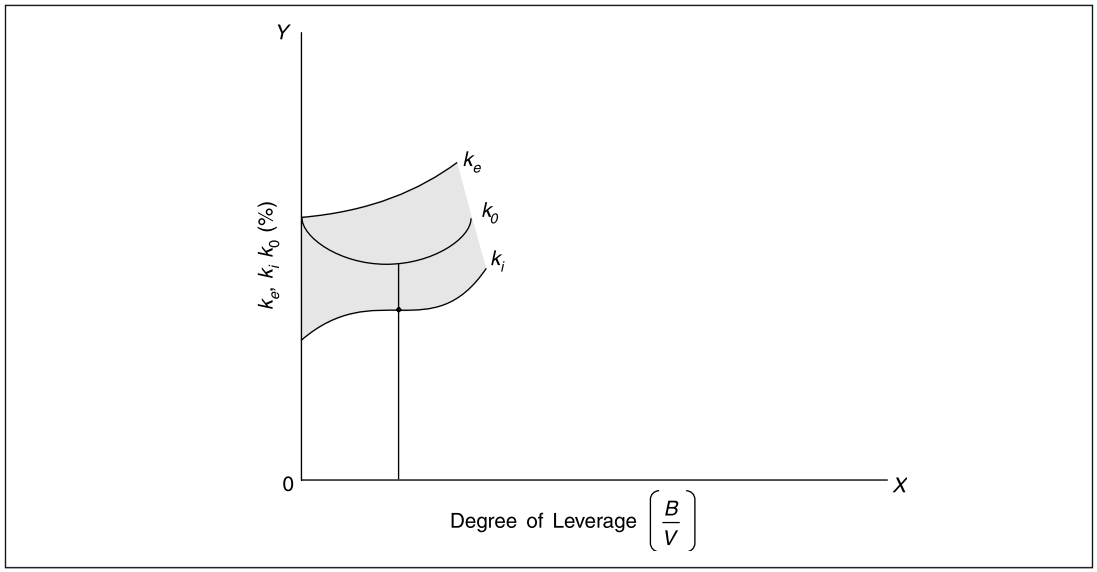

FIGURE 15.7 Leverage and Cost of Capital (Traditional Approach)

of capital. For this purpose, marginal cost of a unit of debt capital consists of two parts: **(i)** the increase in total interest payable on debt; **(ii)** the amount of extra net earnings required to restore the value of equity component to what it would have been under the pre-existing capitalisation rate before the debt is increased.

Thus, in Table 15.15, the marginal cost of borrowing the seventh to Rs 100 units of funds is Rs 19 or 19 per cent. It is determined as follows:

	(i) Increase in total interest payable (I) Rs 49 (when B is Rs 700) – Rs 33 (when B is 600)	Rs 16
Plus:	(ii) Increase in net income required for shareholders (When the value of a share is Rs 12.13, the required earnings are Rs 51. Therefore, to maintain the value of share at Rs 12.80, the earnings are Rs 54 i.e. $\left[\frac{\text{Rs } 12.80}{\text{Rs } 12.13}\right] \times \text{Rs } 51$; thus, the increased earnings required is Rs 3).	3

Since the marginal cost of debt is 19 per cent, while the over all cost of capital is 9 per cent, the use of more debt at this stage is imprudent. In other words, *a mix of debt of Rs 600 with equity capital of Rs 400 provides the optimum combination of debt and equity and optimum capital structure.*

Thus, according to the traditional approach, the cost of capital of a firm as also its valuation is dependent upon the capital structure of the firm and there is an optimum capital structure in which the firm's k_0 is minimum and its (V) the maximum.

Summary

- Capital structure refers to the mix or proportion of different sources of finance (debt and equity) to total capitalisation. A firm should select such a financing-mix which maximises its value/the shareholders' wealth (or minimises its overall cost of capital). Such a capital structure is referred to as the optimum capital structure.
- Capital structure theories explain the theoretical relationship between capital structure, overall cost of capital (k_0) and valuation (V). The four important theories are: **(i)** Net income (NI) approach, **(ii)** Net operating income (NOI) approach, **(iii)** Modigliani and Miller (MM) approach and **(iv)** Traditional approach.
- According to the NI approach, capital structure is relevant as it affects the k_0 and V of the firm. The core of this approach is that as the ratio of less expensive source of funds (i.e., debt) increases in the capital structure, the k_0 decreases and V of the firm increaseas. With a judicious mixture of debt and equity, a firm can evolve an optimum capital structure at which the k_0 would be the lowest, the V of the firm the highest and the market price per share the maximum.
- The NOI approach is diametrically opposite to the NI approach. The essence of this approach is that capital structure decision of a corporate does not affect its cost of capital and valuation, and, hence, irrelevant.

  The main argument of NOI is that an increase in the proportion of debt in the capital structure would lead to an increase in the financial risk of the equityholders. To compensate for the increased risk, they would require a higher rate of return (k_e) on their investment. As a result, the advantage of the lower cost of debt would exactly be neturalised by the increase in the cost of equity.

The cost of debt has two components: (i) explicit, represented by rate of interest, and (ii) implicit, represented by the increase in the cost of equity capital. Therefore, the real cost of debt and equity would be the same and there is nothing like an optimum capital structure.

- Modigliani and Miller (MM) concur with NOI and provide a behavioural justification for the irrelevance of capital structure. They maintain that the cost of capital and the value of the firm do not change with a change in leverage.
- They contend that the total value of homogeneous firms that differ only in respect of leverage cannot be different because of the operations of arbitrage. The arbitrage refers to the switching over operations, that is, the investors switch over from the over-valued firm (levered firm) to the under-valued firms (unlevered). The essence of arbitrage is that the investors (arbitragers) are able to substitute personal or home-made leverage for corporate leverage. The switching operation drives the total value of the two homogeneous firms equal.
- The basic premises of the MM approach, in practice, are of doubtful validity. As a result, the arbitrage process is impeded. To the extent, the arbitrage process is imperfect, it implies that the capital structure matters.
- MM contend that with corporate taxes, debt has a definite advantage as interest paid on debt is tax-deductible and leverage will lower the overall cost of capital. The value of the levered firm (V_1) would exceed the value of the unlevered firm (V_u) by an amount equal to levered firm's debt multiplied by tax rate.
- Bankruptcy costs arise due to a firm's inability to meet the promised payments of interest and principal. These costs, sometimes, may lead to its liquidation.
- Bankruptcy costs are of two types: direct and indirect. Direct bankruptcy costs are the legal and administrative costs associated with the bankruptcy proceedings of the firm. Indirect bankruptcy costs are the costs of avoiding a threat to bankruptcy which, in turn, causes valuable employees to leave, suppliersshy of granting credit, customers seeking more reliable suppliers and lenders demanding higher interest rates. As a result, normal business operations are disrupted and sales are adversely affected.
- Bankruptcy costs can be exorbitant and a disincentive to use excessive levels of debt. Primarily due to these costs, the use of debt beyond safe limits offsets the tax advantage of using debt.
- Bankruptcy costs depress the value of levered firm (V_l). MM suggest $V_l = V_u + B_t$. The $V_l = V_u + B_t$ – Bankruptcy Costs.
- Trade-off theory on capital structure trades off the advantages of debt financing (interest tax shield) against the costs of financial distress (consisting of higher interest rates and bankruptcy costs). It warns against the excessive use of debt.
- While symmetric information refers to a situation in which inside managers and outside investors have identical information about business operations and future prospects of a firm, asymmetric information implies a situation in which managers have more information than the investors do.
- Signalling theory is based on the premise of asymmetric information. The theory suggests that a corporate with favourable prospects would avoid selling shares as future increase in profits would tend to increase share prices. The advantage of increase in share prices would be shared with the new equity shareholders, if equity shares have been used as a source of financing. Debt financing is a positive signal to the market for upward trend of share price. Equity shares should be used to finance the projects if prospects of a firm are not good. It enables existing shareholders to have new subscribers to share the losses.
- According to signalling theory, debt issues are considered as good news and share issues as bad news. Since issue of shares causes a decline in share prices, the corporates should

maintain reserve borrowing capacity by keeping relatively low levels of debt to finance profitable investment projects in the future.

- The pecking-order theory enumerates the preferred order of raising finances normally followed by the corporates in practice. These choices in order of preference are: **(1)** retained earnings, **(2)** non-convertible debt/straight debentures, **(3)** preference shares, **(4)** hybrid securities like convertible bonds and **(5)** equity.
- The suggestions of pecking-order theory are in conformity with the signalling theory and the presence of asymmetric information. The rationale for the first preference for retained earnings is that corporates would like to avoid flotation costs associated with raising funds externally.
- The major implications of pecking order theory are: **(1)** It, by and large, disregards target/optimal capital structure concept **(2)** Profitable firms depend more on retained earnings to finance investment projects and **(3)** Tax shield on debt is of secondary importance.
- The traditional approach is mid-way between the two extreme (the NI and NOI) approaches. The crux of this approach is that through a judicious combination of debt and equity, a firm can increase its value (V) and reduce its cost of capital (k_0) upto a point. However, beyond that point, the use of additional debt will increase the financial risk of the investors as well as of the lenders and as a result will cause a rise in the k_0. At such a point, the capital structure is optimum. In other words, at the optimum capital structure the marginal real cost of debt (both implicit and explicit) will be equal to the real cost of equity.

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22. Solomon, E, *op. cit.* p. 93. Reprinted with permission from Columbia University Press, New York, USA.

23. *Ibid.* p. 94.
24. Based on Solomon, E *op. cit.* p. 95.
25. *Ibid.* p. 96.

Practical Problems

P.15.1 Assuming no taxes and given the earnings before interest and taxes (EBIT), interest (I) at 10 per cent and equity capitalisation rate (k_e) below, calculate the total market value of each firm.

Firms	*EBIT*	*I*	k_e *(per cent)*
X	Rs 2,00,000	Rs 20,000	12
Y	3,00,000	60,000	16
Z	5,00,000	2,00,000	15
W	6,00,000	2,40,000	18

Also, determine the weighted average cost of capital for each firm.

Solution

Determination of K_0 and V of firms X, Y, Z and W

Particulars	*X*	*Y*	*Z*	*W*
EBIT	Rs 2,00,000	Rs 3,00,000	Rs 5,00,000	Rs 6,00,000
Less: Interest	20,000	60,000	2,00,000	2,40,000
Net income for equity-holders	1,80,000	2,40,000	3,00,000	3,60,000
Equity capitalisation rate (k_e)	0.12	0.16	0.15	0.18
Market value of equity (S))	15,00,000	15,00,000	20,00,000	20,00,000
Market value of debt (B) = I/0.10	2,00,000	6,00,000	20,00,000	24,00,000
Total value of firm (V)	17,00,000	21,00,000	40,00,000	44,00,000
Weighted average cost of capital (k_0) = EBIT/V (%)	11.76	14.29	12.5	13.64

P.15.2 Company X and Company Y are in the same risk class, and are identical in every respect except that company X uses debt, while company Y does not. The levered firm has Rs 9,00,000 debentures, carrying 10 per cent rate of interest. Both the firms earn 20 per cent operating profit on their total assets of Rs 15 lakhs. Assume perfect capital markets, rational investors and so on; a tax rate of 35 per cent and capitalisation rate of 15 per cent for an all-equity company.

(a) Compute the value of firms X and Y using the Net Income (NI) Approach.
(b) Compute the value of each firm using the Net Operating Income (NOI) Approach.
(c) Using the NOI Approach, calculate the overall cost of capital (k_0) for firms X and Y.
(d) Which of these two firms has an optimal capital structure according to the NOI Approach? Why?

Solution

(a)

Valuation under NI approach

Particulars	*Firm X*	*Firm Y*
EBIT	rs3,00,000	Rs 3,00,000
Less: Interest	90,000	—
Taxable income	2,10,000	3,00,000
Less: Taxes	73,500	1,05,000
Earnings for equity holders	1,36,500	1,95,000
Equity capitalisation rate (k_e)	0.15	0.15
Market value of equity (S)	9,10,000	13,00,000
Market value of debt (B)	9,00,000	—
Total value of firm (V)	18,10,000	13,00,000

(b) Valuation under NOI Approach

$$V_Y = \frac{\text{Rs } 3{,}00{,}000\ (1 - 0.35)}{0.15} = \text{Rs } 13{,}00{,}000$$

V_X = Rs 13,00,000 + Rs 9,00,000 (0.35) = Rs 16,15,000

(c) $K_{o_x} = k_d\ (.065)\left[\frac{\text{Rs } 9{,}00{,}000}{\text{Rs } 16{,}15{,}000}\right] + k_e\ (0.191)\left[\frac{\text{Rs } 7{,}15{,}000}{\text{Rs } 16{,}15{,}000}\right] = 12.1$ per cent

Similarly, K_{oy} = 15 per cent

Working Notes

EBIT	Rs 3,00,000
Less: Interest	90,000
Taxable income	2,10,000
Less: Taxes	73,500
NI	1,36,500
V as determined in (ii)	16,15,000
B	9,00,000
$S\ (V - B)$	7,15,000

$$k_e = \frac{\text{Rs } 1{,}36{,}500}{\text{Rs } 7{,}15{,}000} = 19.1 \text{ per cent}$$

k_d = 0.10 (1–0.35) = 6.5 per cent

(d) Neither firm has an optimum capital structure according to the NOI Approach. Under the MM assumptions, the optimum capital structure requires 100 per cent debt.

P.15.3 Companies U and L are identical in every respect, except that U is unlevered while L is levered. Company L has Rs 20 lakh of 8 per cent debentures outstanding. Assume **(1)** that all the MM assumptions are met, **(2)** that the tax rate is 35 per cent, **(3)** that EBIT is Rs 6 lakh and that equity-capitalisation rate for company U is 10 per cent.

(a) What would be the value for each firm according to the MM's Approach?

(b) Suppose V_u = Rs 25,00,000 and V_l = Rs 35,00,000. According to MM do they represent equilibrium values? If not, explain the process by which equilibrium will be restored.

Solution

(a) $V_u = \frac{\text{EBIT}\ (1 - t)}{k_e} = \frac{\text{Rs } 6{,}00{,}000\ (1 - 0.35)}{0.10} = \text{Rs } 39{,}00{,}000$

$V_l = V_u + Bt$ = Rs 39,00,000 + Rs 20,00,000 (0.35) = Rs 46,00,000

(b) Firm U is undervalued and firm L is overvalued. Investors will be better off by investing in the undervalued firm as they will require lower investment cost to earn the same income as they earn in the overvalued firm. Therefore, they will sell their holdings of the overvalued firm (L) and buy shares of the undervalued firm (U). As a result, the price of shares of company L will come down while that of company U will rise. This process will continue until equilibrium in the values is restored.

P.15.4 In considering the most desirable capital structure of a company, the following estimates of the cost of debt and equity capital (after tax) have been made at various levels of debt-equity mix:

Debt as percentage of total capital employed	*Cost of debt (per cent)*	*Cost of equity (per cent)*
0	5.0	12.0
10	5.0	12.0
20	5.0	12.5
30	5.5	13.0
40	6.0	14.0
50	6.5	16.0
60	7.0	20.0

You are required to determine the optimal debt-equity mix for the company by calculating the composite cost of capital.

Solution

Solution table

k_d(%)	k_e(%)	W_1 (B/V)	W_2 S/V = (1 − B/V)	$k_d(W_1) + K_e(W_2) = k_0$(%)
5.0	12.0	0.0	1.0	12.00
5.0	12.0	0.1	0.9	11.30
5.0	12.5	0.2	0.8	11.00
5.5	13.0	0.3	0.7	10.75
6.0	14.0	0.4	0.6	10.80
6.5	16.0	0.5	0.5	11.25
7.0	20.0	0.6	0.4	12.20

Optimal debt-equity mix for the company is at a point where the composite cost of capital is minimum. When debt is 30 per cent of the total capital employed, the k_0 is minimum. Therefore, 30 per cent debt and 70 per cent equity mix would be an optimal debt-equity mix for the company.

P.15.5 A company wishes to determine the optimal capital structure. From the following selected information supplied to you, determine the optimal capital structure of the company.

Situation	*Debt*	*Equity*	*After tax cost of debt (%)*	k_e (%)
1	Rs 4,00,000	Rs 1,00,000	9	10
2	2,50,000	2,50,000	6	11
3	1,00,000	4,00,000	5	14

Solution

Situation	k_d (%)	k_e (%)	W_1 (B/V)	W_2 (S/V)	$k_d(W_1) + k_e(W_2) = k_0$ (%)
1	9	10	0.8	0.2	9.2
2	6	11	0.5	0.5	8.5
3	5	14	0.2	0.8	12.2

The optimal capital structure for the company is in situation 2, when it uses 50 per cent debt and 50 per cent equity, as its cost of capital at this level of debt is minimum.

P.15.6 Compute the equilibrium values and capitalisation rates of equity (K) of the companies A and B on the basis of the following data. Assume that **(i)** there is no income tax, and **(ii)** the equilibrium value of average cost of capital (P) is 8.5 per cent.

Particulars	*Initial disequilibrium*	
	Company A	*Company B*
Total market value	Rs 250	Rs 300
Debt (*L*)	0	150
Equity (*S*)	250	150
Expected net operating income (*X*)	25	25
Interest (*K.L*)	0	9
Net income (*X* – *K.L*)	25	16
Cost of equity (k_e)	0.10	0.107
Leverage (*L*/*V*)	0	0.5
Average cost of capital (*P*)	0.10	0.833

Solution

(i) The equilibrium values $(V_e) = \frac{X}{P} = \frac{\text{Rs } 25}{\text{Rs } 0.085} = \text{Rs } 294.12$

(ii) **Equity-capitalisation rates for companies A and B**

Particulars	*Company A*	*Company B*
Expected net operating income (*X*)	Rs 25	Rs 25
Less: Interest (*K.L*)	—	9
NI available for equity (*X* – *K.L*)	25	16
Equilibrium cost of capital (*P*)	0.085	0.085
Total value of company (*X*/*P*)	294.12	294.12
Market value of debt (*L*)	—	150.00
Market value of equity (*S*)	294.12	144.12
Cost of equity, $\frac{(X - K.L)}{S}$	0.085	0.111

Alternatively, k_e for the levered company B can be determined as follows:

$$k_e = k_0 + (k_0 - k_i)\ \frac{B}{S},\ k_i = 0.06 \text{ (Rs 9 interest on Rs 150 debt)}$$

$$= 0.085 + (0.085 - 0.06) \times \left[\frac{\text{Rs } 150}{\text{Rs } 144.12}\right]\ 0.1111$$

For the unlevered company (A) $K_e = k_0$, as there is no k_i.

P.15.7 The values of two firms X and Y in accordance with the traditional theory are given below:

Particulars	*X*	*Y*
Expected operating income ($\bar{X}$)	Rs 50,000	Rs 50,000
Total cost of debt ($k_d.D = R$)	0	10,000
Net income ($\bar{X} - R$)	50,000	40,000
Cost of equity (k_e)	0.10	0.1111
Market value of shares (*S*)	5,00,000	3,60,000
Market value of debt (*D*)	0	2,00,000
Total value of firm (*V* = *S* + *D*)	5,00,000	5,60,000
Average cost of capital (k_0)	0.10	0.09
Debt equity ratio	0	0.556

Compute the values of firms X and Y as per the MM thesis. Assume that **(i)** corporate income taxes do not exist, and **(ii)** the equilibrium values of k_0 is 12.5 per cent.

Solution

Valuation of firms X and Y

Particulars	*Company X*	*Company Y*
Expected operating income ($\bar{X}$)	Rs 50,000	Rs 50,000
Total cost of debt (kd.D = R)	0	10,000
Net income for equity, $\bar{X} - R$	50,000	40,000
Equilibrium cost of capital (k_0)	0.125	0.125
Total value of company = $\bar{X}/k_0$	4,00,000	4,00,000
Market value of debt (D)	—	2,00,000
Market value of equity ($V - D$)	4,00,000	2,00,000
Cost of equity (k_e) = $\dfrac{\bar{X} - R}{S}$	0.125	0.20

P.15.8 Given **(i)** the EBIT of Rs 2,00,000, **(ii)** the corporate tax rate of 35 per cent, and **(iii)** the following data, determine the amount of debt that should be used by the firm in its capital structure to maximise the value of the firm.

Debt	k_i *(before tax) (%)*	k_e*(%)*
Nil	Nil	12.0
Rs 1,00,000	10.0	12.0
2,00,000	10.5	12.6
3,00,000	11.0	13.0
4,00,000	12.0	13.6
5,00,000	14.0	15.6
6,00,000	17.0	20.0

Solution

Valuation of firm at varying amount of debt

EBIT	*I*	*NI*	*Taxes (t)*	*EAT (NI − t)*	K_d *(%)*	K_e *(%)*	*B*	*S*	*V*
Rs 2,00,000	—	Rs 2,00,000	Rs 70,000	Rs 1,30,000	—	12.0	—	Rs 10,83,333	Rs 10,83,333
2,00,000	Rs 10,000	1,90,000	66,500	1,23,500	6.5	12.0	Rs 1,00,000	10,29,167	11,29,167
2,00,000	21,000	1,79,000	62,650	1,16,350	6.8	12.6	2,00,000	9,23,413	11,23,413
2,00,000	33,000	1,67,000	58,450	1,08,550	7.1	13.0	3,00,000	8,35,000	11,35,000
2,00,000	48,000	1,52,000	53,200	98,800	7.8	13.6	4,00,000	7,26,471	11,26,471
2,00,000	70,000	1,30,000	45,500	84,500	9.1	15.6	5,00,000	5,41,667	10,41,667
2,00,000	1,02,000	98,000	34,300	63,700	11.0	20.0	6,00,000	3,18,500	9,18,500

The firm should use Rs 3,00,000 debt to maximise the value of the firm.

P.15.9 A company's current operating income is Rs 4 lakh. The firm has Rs 10 lakh of 10 per cent debt outstanding. Its cost of equity capital is estimated to be 15 per cent.

(a) Determine the current value of the firm, using traditional valuation approach.

(b) Calculate the overall capitalisation rate as well as both types of leverage ratio:(a) B/S (b) B/V.

(c) The firm is considering increasing its leverage by raising an additional Rs 5,00,000 debt and using the proceeds to retire that amount of equity. As a result of increased financial risk, k_i is likely to go up to 12 per cent and k_e to 18 per cent. Would you recommend the plan?

Solution

(a) and **(b)** **Valuation of firm and overall capitalisation rate**

EBITRs 4,00,000	
Less: Interest	1,00,000
Earnings for equityholders(*NI*)	3,00,000
Equity-capitalisation rate (k_e)	0.15
Market value of equity (*S*)	20,00,000
Market value of debt (*B*)	10,00,000
Total market value of firm (*S* + *B*)	30,00,000
Overall capitalisation rate = EBIT/*V*	0.1333
(a)Debt/equity ratio (*B*/*S*)	0.5
(b)Debt/value ratio (B/*V*)	0.33

Alternatively, $k_0 = k_i(B/V) + k_e(S/V) = 0.10\left[\frac{\text{Rs } 10,00,000}{\text{Rs } 30,00,000}\right] + 0.15\left[\frac{\text{Rs } 20,00,000}{\text{Rs } 30,00,000}\right] = 0.1333$

(c) **Valuation of firm at higher level of debt**

EBIT	Rs 4,00,000
Less: Interest	1,80,000
Earnings for equity-holders (*NI*)	2,20,000
Equity-capitalisation rate (k_e)	0.18
Market value of equity (*S*)	12,22,222
Market value of debt (*B*)	15,00,000
Total market value of firm (*S* + *B*) = *V*	27,22,222

No, we shall not recommend the plan, as the increased proportion of debt would lower the value of the firm from Rs 30,00,000 to Rs 27,22,222.

P.15.10 The two companies X and Y belong to the same risk class. They have everything in common except that firm Y has 10% debentures of Rs 5 lakh. The valuation of the two firms is assumed to be as follows:

Particulars	*X*	*Y*
Net operating income (EBIT)	Rs 7,50,000	Rs 7,50,000
Interest on debt (*I*)	Nil	50,000
Earnings to equityholders (*NI*)	7,50,000	7,00,000
Equity-capitalisation rate (k_e)	0.125	0.14
Market value of equity (*S*)	60,00,000	50,00,000
Market value of debt (*B*)	—	5,00,000
Total market value of the firm (*V*)	60,00,000	55,00,000
Implied overall capitalisation rate (k_0)	0.125	0.1363
Debt-equity ratio (*B*/*S*)	0	0.1

An investor owns 10 per cent of the equity shares of the overvalued firm. Determine his investment cost of earnings the same income so that he is at a break-even point? Will he gain by investing in the undervalued firm?

Solution

Arbitrage process

(a)	Investor's position in over valued firm X		
	Investment cost (0.10 × Rs 60,00,000)		Rs 6,00,000
	Dividend income (0.10 × Rs 7,50,000)		75,000
(b)	He sells his holdings in firm X and purchases 10 per cent equity shares and 10 per cent of debentures of under valued firm Y to earn Rs 75,000.		
		Investment	Income
	Shares	Rs 5,00,000	Rs 70,000
	Debentures	50,000	5,000
		5,50,000	75,000

The investment of Rs 5,50,000 earns the same amount of income which he was earning on an investment of Rs 6,00,000 in the overvalued firm. Clearly, he will gain by investing in the under valued firm Y.

P.15.11 The following is the data regarding two companies 'X' and 'Y'belonging to the same risk class:

Particulars	*Company X*	*Company Y*
Number of ordinary shares	90,000	1,50,000
Market price per share	1.20	1.00
6% Debentures	60,000	—
Profit before interest	18,000	18,000

All profits after debentures interest are distributed as dividends.

Explain how under Modigliani and Miller Approach an investor holding 10 per cent of shares in Company X will be better off in switching his holdings to Company Y.

Solution

Arbitrage process

(a)	Investor's current position in Firm X with 10 per cent equity holdings:	
	(i) Investments (9,000 shares × Rs 1.20)	Rs 10,800
	(ii) Dividend income 0.10 ´ (Rs 18,000 – Rs 3,600)	1,440
(b)	Investor sells his holdings of Firm X for Rs 10,800 and creates a personal leverage by borrowing Rs 6,000 (0.10 × Rs 60,000). Thus, the total amount available with him is Rs 16,800.	
(c)	He purchases 10 per cent equity holdings of Company Y for Rs 15,000 (15,000 shares ´ Re 1); his dividend income is Rs 1,800 (Rs 18,000 × 0.10).	
(d)	Gross income	1,800
	Less: Interest on personal borrowings (0.06 × Rs 6,000)	360
	Net income	1,440
	He breaks-even by investing in Firm Y. But in the process he reduces his investment outlay by Rs 1,800. Therefore, he is better off by investing in Firm Y. Alternatively, by investing Rs 16,800, he could augment his income to Rs 1,656:	
	Dividend income from Firm Y $\text{Rs } 18{,}000\left(\frac{\text{Rs } 16{,}800}{\text{Rs } 1{,}50{,}000}\right)$	Rs 2,016
	Less: Interest on personal borrowings	360
	Net income	1,656

Mini Case

15.C.1 In considering the most appropriate capital structure for the NOID Manufacturers Ltd (NML), its finance department has made estimates of the interest rate on debt and the cost of equity capital at various levels of debt-equity mix summarised below:

Debt-equity mix (leverage)	*Coupon rate (%)*	*Cost of equity (%)*
0	8	12.0
10	8	12.0
20	9	12.5
30	9	13.5
40	10	14.5
50	13	16.0
60	15	20.0
70	18	25.0

The debt is in the form of 10-year redeemable at par Rs 1,000 debentures with coupon rates varying with the equity-debt ratio and 5 per cent flotation cost. As a matter of policy, NML always keeps 10 per cent of its finances in the form of preference shares carrying 2 per cent extra return compared to the debenture coupon rates. The duration and the flotation costs are similar to debentures.

Required Assuming (i) 17.5 per cent dividend distribution tax and (ii) corporate tax rate, 35 per cent, determine the optimal capital structure (debt-equity mix) for the NML.

Solution

Determination of Optimum Capital Structure

Degree of leverage	*Coupon rate (%) (I)*	*Preference dividend (%) (D_p)*	*Cost of equity (ke)*	K_d@	Kp@@	Ko@@@
0	8.0	10.0	12.0	0.0585	0.1256	0.1206
10	8.0	10.0	12.0	0.0585	0.1256	0.1144
20	9.0	11.0	12.5	0.0651	0.1377	0.1143
30	9.0	11.0	13.5	0.0651	0.1377	0.1143
40	10.0	12.0	14.5	0.0718	0.1497	0.1162
50	13.0	15.0	16.0	0.0918	0.1859	0.1285
60	15.0	17.0	20.0	0.1051	0.2100	0.1441
70	18.0	20.0	25.0	0.1251	0.2462	0.1622

Conclusion: The optimum capital structure lies between 20 and 30 per cent of leverage.

Working Notes

@ $k_d = [I\ (1 - t) + \text{Flotation costs}/N] \div (RV + SV)/2$

@@ $k_p = [D_p\ (1 + D_t) + \text{Flotation costs}/N] \div (RV + SV)/2$

where I = Interest, D_p = dividend on preference shares, t = tax rate, RV = redemption value, SV = sale value (face value – flotation cost), n = maturity period, D_t = dividend payment tax

@@@ $k_o = (W_d \times K_d) + (W_p \times K_p) + (W_e + K_e)$. It may be noted that 10% debt-equity mix implies, 90% shareholdersequity (consisting 10 % of preference shares and 80% of ordinary shares].

Review Questions

RQ.15.1 Provide the appropriate answers to the following:

(i) According to NI approach capital structure decision is _____ to the valuation of the firm. (relevant/irrelevant)

(ii) Market price per share _____ if more debt is used in NI approach. (increases/decreases/remains unchanged)

(iii) According to NOI approach, cost of equity is _____.

(iv) _____ implies buying securities in a market where price is low and selling where it is high.

(v) In the traditional approach, the cost of equity is independent of amount of debt. (True/False)

(vi) In practice, equity financing allows firm to go for cheaper sources of finance in future. (True/False)

(vii) What is the value of a levered firm L if it has the same EBIT as an unlevered firm U, (with value of Rs 700 lakh), has a debt of Rs 200 lakh, tax rate is 35 per cent under MM approach?

(a) Rs 770 lakh **(b)** Rs 500 lakh **(c)** Rs 630 lakh **(d)** Rs 900 lakh

(viii) What is the value of an unlevered firm U if it has the same EBIT as a levered firm L, (with value of Rs 700 lakh), has a debt of Rs 200 lakh, tax rate of 35 per cent under MM approach?

(a) Rs 770 lakh **(b)** Rs 500 lakh **(c)** Rs 630 lakh **(d)** Rs 900 lakh

(ix) According to the traditional approach, what is the effect of increase in degree of leverage on the valuation of the firm?

(a) Increases **(b)** Decreases
(c) Remains Unaffected **(d)** Increases first and then decreases

(x) According to NOI approach, with increase in debt/equity ratio the financial risk of equityholders_____

(a) decreases **(b)** increases
(c) no Change **(d)** depends on degree of leverage

[Answers: (i) Relevant (ii) Increases (iii) Residual (iv) Arbitrage process (v) False (vi) True (vii) Rs 770 lakh (viii) Rs 630 lakh (ix) Increase first then decreases and (x) Increases]

RQ.15.2 What is meant by the concept 'financial risk'? What is the relationship between leverage and the cost of capital? Explain.

RQ.15.3 Give a critical appraisal of the (a) traditional Approach and (b) the Modigliani-Miller Approach to the theory of capital structure.

RQ.15.4 Explain briefly the view of traditional writers on the relationship between capital structure and the value of a firm.

RQ.15.5 'The total value of a firm remains unchanged regardless of variations in its financing mix'. Discuss this statement and point out the role of arbitraging and homemade leverage.

RQ.15.6 Is the MM thesis realistic with respect to capital structure and the value of a firm? If not, what are its main weaknesses?

RQ.15.7 Write notes on: **(a)** Home made leverage, **(b)** Arbitrage process, **(c)** NI and NOI Approaches, **(d)** Reverse leverage, and (e) MM's thesis with corporate taxes.

RQ.15.8 How would you determine the following?

(a) The cost of equity in the NOI Approach,

(b) The value of equity, given the equity capitalisation rate, EBIT and interest,

(c) The overall capitalisation rate, given the EBIT, value of equity and value of debentures,

(d) The value of levered firm under MM's thesis with taxes, and

(e) The overall capitalisation rate, given k_e, k_d, S and B.

RQ.15.9 How will a firm go about determining its 'optimal capital structure'?

RQ.15.10 State the order in which firms will obtain financing under the pecking-order theory. Also state, in brief, the rationale for the order.

RQ.15.11 Enumerate the direct and indirect bankruptcy costs. How do such costs affect the valuation of levered firm, in a world of taxes?

RQ.15.12 Briefly describe the trade-off theory of capital structure. How does it differ from MM proposition with taxes?

RQ.15.13 Explain how `asymmetric information' and "signals" affect corporate's capital structure decisions. How do the firm's financing decisions give investors signals that reflect the management's view of share value.

Examination Questions

Theory Questions

15.1 Explain the main assumptions of the traditional approach of capital structure. (*Delhi University, 2011*)

15.2 Write short note on ideal capital structure. (*Gujarat University, 2010*)

15.3 What is an optimum capital structure? Explain its essential features. (*Madras University, 2010*)

15.4 Enumerate the main assumptions of the 'net income approach' of capital structure. Is there an 'optimal capital structure' as per this approach? Explain. (*Delhi University, 2010*)

15.5 Is the MM hypothesis realistic with respect to capital structure and the value of a firm in actual practice? If not, what are its main weaknesses? (*Delhi University, 2009*)

15.6 Explain the traditional theory of cost of capital and capital structure. (*Delhi University, 2009*)

15.7 Compare the 'net income' and net operating 'income' approaches to capital structure and firm valuation. (*Delhi University, 2007*)

15.8 Explain and illustrate 'arbitrage process' of MM theory of capital structure. (*Delhi University, 2006*)

15.9 Discuss the relationship between leverage and cost of capital as per the net income approach. How is it different from net operating income approach? (*Delhi University, 2005*)

15.10 Comment upon the utility of net income approach of capital structure in practical world. (*Delhi University, 2005*)

15.11 'The total value of a firm remains unchanged regardless of variations in its financial mix'. Discuss this statement and point out the role of arbitraging and home made leverage. *(Periyar University, Oct./Nov. 2004)*

15.12 (a) Explain the assumptions and implications of the NI and NOI approach.
(b) What is capital structure? Explain the factorswhich determine capital structure.
(c) The total value of a firm remains unchanged regardless of variations in its financial mix. Discuss this statement and point out the role of arbitraging and home made leverage. *(Periyar University, Oct./Nov. 2004)*

15.13 Give a critical appraisal of the (i) The net income approach and (ii) The net operating income approach to the theory of capital structure. *(Delhi University, 2004)*

15.14 Analyse in brief the traditional approach and Modigliani-Miller approach to the theory of capital structure. *(Delhi University, 2003)*

15.15 (a) What is the Modigliani-Miller approach to capital structure theory? Under what assumptions do their conclusions hold?
(b) Illustrate the arbitrage mechanism suggested by MM with the help of a suitable numerical example. *(Calcutta University, 2003)*

15.16 (a) What are the features of an appropriate capital structure?
(b) Explain the limitations of M.M. Hypothesis.
(c) Explain the factors that determine the capital structure of a firm. *(Bharatiyar University, April 2003)*

15.17 Explain briefly the net operating income approach. *(Delhi University, 2002)*

15.18 Explain the traditional approach of capital structure theory and examine its rationality. *(Calcutta University, 2002)*

15.19 Modigliani and Miller argue that in the absence of taxes, a firm's market value and cost of capital remain invariant to the changes in the capital structure. What behavioural justification they give in support of their hypothesis? *(Delhi University, 2001)*

15.20 (a) Define and explain the term 'capital structure'. What are the key issues involved in capital structure theories?

(b) Explain the net income approach to capital structure theories and examine its rationality. *(Calcutta University, 2001)*

15.21 (a) What is meant by capital structure? When is it said to be optimum capital structure?

(b) What is optimum capital structure? *(Bharatiyar University, April 2001)*

15.22 Choose the best answer

1. Optimum capital structure implies
   (a) Maximum cost of capital. (b) Minimum cost of capital.
   (c) Normal cost of capital. (d) Minimum value for the firm.
2. Optimum capital structure is one where
   (a) Cost of capital is minimum and value of the firm is maximum.
   (b) Cost of capital is maximum and value of the firm is minimum.
   (c) Minimum cost and minimum value of the firm.
   (d) Maximum cost and maximum value of the firm. *(Bharatiyar University, April 2001)*
3. Optimal capital structure results in
   (a) Maximum value of the firm. (b) Minimum value to the firm.
   (c) Maximum cost of capital. (d) None of the above.
   (Bharatiyar University, November 2001)
4. Capital structure means
   (a) Entire liability side. (b) Proportion of long-term funds.
   (c) Long-term and short-term funds. (d) Only equity.
   (Bharatiyar University, April 2003)

15.23 Whether the following statement is 'correct' or 'incorrect'?
According to Modigliani Miller Approach, the value of firm is affected by the debt-equity mix. *(Delhi University, 2000)*

15.24 Critically examine the net income and net operating income approaches to capital structure. *(Delhi University, 2000)*

15.25 Explain in brief the net income method and net operating income method of capital structure theories. *(Calcutta University, 2000)*

15.26 Explain and illustrate the 'Net Income Approach'. *(Delhi University, 1999)*

15.27 Explain briefly the 'Net operating income' approach and Modigliani Miller approach to the problem of capital structure. *(Delhi University, 1998)*

Numerical Questions

15.1 Two companies are identical except that A Ltd. has a debt of Rs 10,00,000 at 10% whereas B Ltd. does not have debt in its capital structure. The total assets of both the companies *A* and *B* are same i.e. Rs 20,00,000 on which each company earns 20% return. Find the value of each company and overall cost of capital using net operating income (NOI) approach. Equity capitalisation rate for B Ltd. is 15%. The tax rate is 50%. (*Delhi University, 2011*)

Solution

(a) valuation of unlevered firm, *B* and its overall cost of capital

Particulars	*Amount*
EBIT (Rs 20,00,000 × 20%)	Rs 4,00,000
Less taxes (50%)	2,00,000
EAT (Earnings available for equityholders, EAEH)	2,00,000
Equity capitalisation rate (k_e)	0.15
Market value of equity (EAEH/k_e= *S*)	13,33,333
Overall cost of capital = k_e (as there is no debt)	0.15

(b) Valuation of levered firm, *A*: $V_l = V_u + Dt$ = Rs 13,33,333 + (Rs 10 lakh × 0.5) = Rs 18,33,333

(c) Computation of overall cost of capital: (i) Cost of debt = 10% (1 – 0.5) = 5%

(ii) Statement showing cost of equity

EBIT	Rs 4,00,000
Less interest (Rs 10 lakh × 10%)	1,00,000
EBT	3,00,000
Less taxes (0.50)	1,50,000
EAT/EAEH	1,50,000
Valuation (V) as per (b) above	18,33,333
Less valuation of debt (*B*)	10,00,000
Valuation of equity (*V* – *B*) = *S*	8,33,333
k_e (Rs 1,50,000/Rs 8,33,333) (%)	18

$K_0 = k_d (B/V) + k_e (S/V)$ = 0.5 (Rs 10,00,000/Rs 18,33,333) + 0.18 (Rs 8,33,333/Rs 18,33,333) = 0.05 (0.545) + 0.18 (0.455) = 0.02725 + 0.0819 = 0.10915 = 10.92%

15.2 The two companies, *V* and *L*, belong to an equivalent risk class. These two firms are identical in every respect except that *V* company is unlevered while *L* company has 10% debentures of Rs 5,00,000. The other relevant data regarding their valuation and capitalisation rates are as follows:

Particulars	*L*	*V*
EBIT	Rs 1,00,000	Rs 1,00,000
Less: Interest	50,000	50,000
Earnings available to equity-holders	50,000	50,000
Equity capitalisation rate	0.16	0.125
Market value of equity	3,12,500	8,00,000
Market value of debt	5,00,000	—
Total market value	8,12,500	8,00,000
Overall cost of capital	0.123	0.125
Debt equity ratio	1.6	—

(i) An investor owns 10% equity shares of company *L*. Show the arbitrage process and amount by which he could reduce his outlay through the use of leverage.

(ii) According to Modigliani and Miller, when will this arbitrage process come to an end?

(*Delhi University, 2011*)

Solution

(a)	Investor's position in firm *L*:	
	Investment (10% × Rs 3,12,500)	Rs 31,250
	Dividend income (10% × Rs 50,000)	5,000
(b)	He sells his holdings of firm *L* for Rs 31,250 and creates a personal leverage by borrowing Rs 50,000 (0.1 × Rs 5,00,000 debt level of firm *L*). Total amount available with him is	81,250
(c)	He purchase 10% equity shares of company company *V* for Rs 80,000 (10% × Rs 8,00,000)	80,000
(d)	Gross income from company *V* (10% × Rs 1,00,000)	10,000
	Less interest on personal borrowings (10% × Rs 50,000)	5,000
	Net income (identical to his income from firm *L*)	5,000
	Investment outlay	80,000

Conclusion: Investor reduces his investment by Rs 1,250 (Rs 81,250 available – Rs 80,000 invested) through the use of leverage. According to MM, the arbitrage process will come to an end when the values of both the firms become identical.

15.3 Two firms `L' and `U' are identical in all respects except fro the debt equity mix. Firm `L' has issued 12% debentures of Rs 15,00,000. Firm *U* has no debt. Both *L* and *U* earn 30% before interest and taxes on their total assets of Rs 20,00,000. The tax rate is 50% and equity capitalisation rate is 20%. Compute the value of the firms using net income approach.

(*Madras University, 2010*)

Solution

Statement showing valuation of firm, using net income (NI) approach.

Particulars	*L*	*U*
EBIT (Rs 20 lakh × 30%)	Rs 6,00,000	Rs 6,00,000
Less interest	1,80,000	—
Earnings before taxes	4,20,000	6,00,000
Less taxes (0.50)	2,10,000	3,00,000
Earnings after taxes	2,10,000	3,00,000
Equity capitalisation rate	0.20	0.20
Market value of equity (*S*)	Rs 10,50,000	Rs 15,00,000
Market value of debt (*D*)	15,00,000	—
Value of firm, *V* (*S* + *D*)	25,50,000	15,00,000

15.4 The company's current operating income is Rs 4 lakh. The firm has Rs 10 lakh of 10% debt outstanding. Its cost of equity capital is estimated to be 15%.

(a) Determine the current value the firm using the traditional valuation approach.

(b) Calculate the firm's overall capitalisation rate.

(c) The firm is considering to increase its leverage by raising an additional Rs 5,00,000 debt and using the proceeds to retire that amount of equity. As a result of increased financial risk, the k_d is likely to go up to 12% and k_e to 18%. Would you recommend the plan?

(*Pune University, 2009*)

Solution

Valuation of firm and overall capitalisation rate (current situation)

Particulars	*Amount*
EBIT (operating income)	Rs 4,00,000
Less interest (Rs 10 lakh × 0.10)	1,00,000
Earnings for equityholders (EBIT – *I*)	3,00,000
Equity capitalisation rate (k_e)	0.15
Market value of shares (EBIT – *I*)/k_e), *S*	20,00,000
Market value of debt (*D*)	10,00,000
Total value of firm (*S* + *D* = *V*)	30,00,000
Overall capitalisation rate, ke (EBIT/*V*) (%)	13.33
Valuation of firm and k_0 (revised):	
Operating income (EBIT)	Rs 4,00,000
Less interest (Rs 15 lakh <180> 0.12)	1,80,000
(EBIT – *I*) i.e. (EAEH)	2,20,000
Equity capitalisation rate (k_e)	0.18
Market value of shares (EAEH/k_e), *S*	12,22,222
Market value of debt (*D*)	15,00,000
Total value of firm (*S* + *D*), *V*	27,22,222
Overall capitalisation rate, *ke* (EBIT/*V*) (%)	14.70

Recommendation: The company should not increase its financial leverage as it lowers overall valuation of the firm and increases overall capitalisation rate.

15.5 A company has earned before interest and tax of Rs 1,00,000. It expects a return of 12.5%. Determine total value of the firm according to Miller-Modigliani theory.

(*Punjab University, 2007*)

Solution

V = EBIT/k_0 = Rs 1,00,000/0.125 = Rs 8,00,000

Where, EBIT = Earnings before interest and tax, Rs 1,00,000

K_0 = Overall capitalization rate, 12.5%

15.6 The two companies *U* and *L*, belong to an equivalent risk class. These two firms are identical in every respect except that *U* company is unlevered while company *L* has 10% debentures of Rs 30 lakhs. The other relevant information regarding their valuation and capitalisation rates are as follows:

Particulars	*Firm U*	*Firm L*
Net operating income (EBIT)	Rs 7,50,000	Rs 7,50,000
Interest on debt (I)	—	3,00,000
Earnings to equity-holders (NI)	7,50,000	4,50,000
Equity capitalisation rate (ke)	0.15	0.20
Market value of equity (S)	50,00,000	22,50,000
Market value of debt (B)	—	30,00,000
Total value of firm (V) = (S + B)	50,00,000	52,50,000
Overall capitalisation rate (k_0)	0.15	0.143
Debt-equity ratio (B/S)	0	1.33

(i) An investor owns 10% equity shares of company *L*. Show the arbitrage process and the amount by which he could reduce his outlay through the use of leverage.

(ii) According to Modigliani and Milller, when will this arbitrage process come to an end?

(*Delhi University, 2007*).

Solution

(i) Arbitrage process

(i)	Investor's current position (in firm *L*)	
	Dividend income	Rs 45,000
	Investment cost	2,25,000
(ii)	He sells his holdings of firm *L* for Rs 2,25,000 and creates a personal leverage by borrowing Rs 3,00,000 (0.10 × Rs 30,00,000 debt of firm *L*). The total amount with him is Rs 5,25,000. Income required to break even would be:	
	Dividend income (*L* firm)	45,000
	Interest on personal borrowing (0.10 × Rs 3,00,000)	30,000
		75,000
(iii)	He purchases 10 per cent equity holdings of the firm *U* for Rs 5,00,000.	
	Dividend income (*U* firm) 0.10 × Rs 7,50,000)	75,000
	Amount of investment	5,50,000

He will reduce his outlay by Rs 25,000 through the use of leverage.

(ii) According to Modigilani and Miller, this arbitrage process will come to an when the values of both the firms are identical.

15.7 A company expects operating income of Rs 80,000. It has Rs 2,00,000, 8% debentures. The equity capitalisation rate of the company is 10%. Calculate the value of firm and overall capitalisation rate according to the net Income approach (ignore income tax). (*Punjab University, 2006*)

Solution

Statement showing valuation of company and its overall capitalisation rate under net income approach.

Particulars	*Amount*
Operating income (EBIT)	Rs 80,000
Less interest (Rs 2,00,000 × 8%)	16,000
EBT = Earnings available for equityholders (as there are not taxes), EAEH	64,000
Equity capitalisation rate, k_e	0.10
Market value of equity's (EAEH/k_e)	6,40,000
Market value of debt, (*D*)	2,00,000
Value of company, *V* (*S* + *D*)	8,40,000
Overall capitalisation rate, k_0 (EBIT/*V*) (%)	9.52

15.8 Companies *U* and *L* are identical in every respect except that *U* is unlevered while *L* has Rs 20 lakh of 8% debt. EBIT of both firms is Rs 6 lakh and tax rate is 35%. Equity capitalisation rate for *U* is 10%. Calculate the value of each firma according to M-M approach and cost of equity for L Ltd. (*Delhi University, 2006*)

Solution

(a) Valuation of unlevered firm, *U*

Particulars	*Amount*
EBIT	Rs 6,00,000
Less interest	—
EBT	6,00,000
Less taxes (35%)	2,10,000
EAT/Earnings available for equityholders (EAEH)	3,90,000
Equity capitalisation rate (ke)	0.10
Market value of equity (*S*): EAEH/k_e	39,00,000

(b) Valuation of levered firm L (V_l) = V_u + Dt = Rs 39,00,000 + (Rs 20 lakh × 0.35) = Rs 46,00,000.

(c) Computation of cost of equity (k_e) of firm L

Particulars	*Amount*
Value of firm	Rs 46,00,000
Less value of debt	20,00,000
Value of equity (S)	26,00,000
EBIT	6,00,000
Less interest	1,60,000
EBT	4,40,000
Less taxes (0.35)	1,54,000
EAT/EAEH	2,86,000
Cost of equity (EAEH/S):(Rs 2,86,000/Rs 26,00,000) (%)	11

15.9 Two companies are identical in all respects except that X Ltd., has debt of Rs 5,00,000 borrowed at the rate of 12% whereas Y Ltd., has no debt in its capital structure. The total assets of both the companies amount to Rs 15,00,000 on which the companies have earnings of 20%. You are required to do the following:

(i) Calculate value of companies and k_0 using NI approach taking k_e as 18%.

(ii) Calculate value of companies and k_e using NOI approach taking k_0 as 18%.

(iii) Compare the results and comment on the difference of the two approaches.

(*Delhi University, 2006*)

Solution

(i) Statement showing valuation of X Ltd. and Y Ltd. and k_0 under NI approach.

Particulars	*X Ltd*	*Y Ltd*
EBIT (Rs 15,00,000 × 20%)	Rs 3,00,000	Rs 3,00,000
Less interest	60,000	—
Earnings before interest/Earnings available for equity-holders (EAEH)	2,40,000	3,00,000
Equity capitalisation rate (k_e)	0.18	0.18
Market value of equity (EAEH/ke) (S)	13,33,333	16,66,667
Market value of debt (B)	5,00,000	—
Value of companies (S + B + V)	18,33,333	16,66,667
Cost of capital k0 = EBIT/V (%)	16.36	18\

(ii) Statement showing valuation of X Ltd and Y Ltd and their k_e under NOI approach.

Particulars	*X Ltd*	*Y Ltd*
EBIT	Rs 3,00,000	Rs 3,00,000
Cost of capital	0.18	0.18
Value of companies (EBIT/ke)	16,66,667	16,66,667
Less value of debt	5,00,000	—
Value of equity (S)	11,66,667	16,66,667
Earnings for equity-holders (EAEHs)	2,40,000	3,00,000
Cost of equity (EAEH/S) (%)	20.5	18

(iii) Comments: (a) Use of debt is favourable under NI approach. Therefore, levered firm (X) has higher valuation than unlevered firm (Y). For the same reason, firm X has lower k_0 than firm Y.

(b) Under NOI approach, K_0 is independent of leverage. Therefore, valuation of companies X Ltd and Y Ltd is the same at Rs 16,66,667. Since k_0 is the same for both companies, the levered

firm (X) has higher k_e to compensate the higher risk (due to use of debt) than the unlevered firm (Y).

15.10 ABC Ltd. has all equity capital structure with a cost of capital of 15%. The company decides to raise Rs 2,00,000, 12% debt and use the proceeds to retire the equity. The expected level of EBIT is Rs 90,000 which is expected to remain unchanged. Assuming net income approach assumptions are applicable, calculate value of equity, debt and the value of firm before and after change in capital structure. Also, calculate weighted average cost of capital after the change.

(*Delhi University, 2006*)

Solution

Value of equity, debt and of firma and k_0 under NI approach (before and after change in capital structure)

Particulars	*All equity*	*Equity + debt*
EBIT	Rs 90,000	Rs 90,000
Less interest	—	24,000
EBT/Earnings available for equity holders (as there are no taxes), EAEH	90,000	66,000
Equity capitalisation rate (k_e)	0.15	0.15
Value of equity (S) (EAEH/k_e)	6,00,000	4,40,000
Value of debt (B)	—	2,00,000
Value of firm ($S + B$), V	6,00,000	6,40,000
Overall cost of capital (k_0), EBIT/V (%)	15	14.06

15.11 Z Ltd. has 10 lakh equity shares outstanding at the beginning of the year 2009. The current market price of the shares is Rs 150 each. The company recommended Rs 8 per share as dividend. The capitalisation rate is 12%.

(i) Based on MM approach, calculate the market price of the share of the company when the recommended dividend is (a) declared, and (b) not declared.

(ii) How many new shares are to be issued by the company at the end of the accounting year on the assumption that the net income for the year is Rs 2 crore and the investment budget is Rs 4 crores when dividends are distributed? What will be the market value of shares at the end of accounting year? (*Delhi University, 2009, 2006*)

Solution

(i) MPS (P_1 at year-end):

(a) When dividends are paid: $P_0 = \dfrac{D_1 + P_1}{(1 + k_e)}$

Rs 150 = (Rs 8 + P_1)/1.12 = Rs 168 = Rs 8 + P_1 or P_1 = Rs 160

(b) When dividends are not paid: Rs 150 = (0 + P_1)/1/1.2 = Rs 168 = P_1

(ii) Amount required for new financing = $I - (E - nD_1)$

Rs 4 crore – (Rs 2 crore – Rs 0.80 crore) = Rs 2.8 crore

Number of new shares (Δn) = Rs 2.8 crore/Rs 160 = 1,75,000

Market value of shares (year-end): (10,00,000 existing shares + 1,75,000 additional = 11,75,000 shares) × Rs 160 = Rs 18.8 crore.

Chapter

16

Designing Capital Structure

Learning Objectives

1. Understand the key factors having a bearing on the choice of an appropriate capital structure
2. Illustrate EBIT-EPS analysis and coverage ratio as an approach to design capital structure
3. Explain cash flow analysis as an approach to set debt policy for a firm

INTRODUCTION

The preceding chapter, focusing on the theoretical relationship between capital structure, cost of capital and valuation, has shown that although the empirical evidence is not conclusive, theoretically a judicious combination of debt and equity does affect the cost of capital as also the total value of the firm. There is, in other words, an optimum capital structure. The capital structure is said to be optimum when the marginal real cost (explicit as well as implicit) of each available source of financing is identical. With an optimum debt and equity mix, the cost of capital is minimum and the market price per share (or total value of the firm) is maximum. The use of debt in capital structure or financial leverage has both benefits as well as costs. While the principal attraction of debt is the tax benefit, its cost is *financial distress* and reduced commercial profitability. The term **financial distress**[1] includes a broad spectrum of problems ranging from relatively minor liquidity shortages to bankruptcy. The problem of financial distress will magnify with an increase in financial leverage. Beyond a certain point, the expected cost of financial distress will outweigh the tax benefit. A firm is, thus, concerned with a trade-off between risk and return emanating from the use of debt. A proper balance between the two is, therefore, called for.

Financial distress includes a broad spectrum of problems ranging from minor liquidity shortages to bankruptcy.

Given the objective of maximisation of shareholders' wealth, the need for an optimal capital structure cannot, therefore, be overemphasized. In operational terms, every firm should try to design such a capital structure. But the determination of an optimum capital structure is a

formidable task. It should be clearly understood that identifying the *precise percentage* of debt that will maximise price per share is almost impossible. It is possible, however, to determine the *approximate proportion* of debt to use in the financial plan in conformity with the objective of maximising share prices.

In theory, one can speak of an **optimum** capital structure, but, in practice, it is very difficult to design one. There are significant variations among industries as also among individual companies within the same industry in respect of capital structure. This is so because there are a host of factors, both quantitative and qualitative, including subjective judgement of financial managers which determine the capital structure of a firm. These factors are highly complex and cannot fit entirely into a theoretical framework. From the operational standpoint, therefore, what should be attempted is an **appropriate** capital structure, given the facts of a particular case.

The present chapter which focuses on determining the *appropriate* mix of debt to be used along with equity in the capital structure discusses the important factors which have a bearing on designing capital structure of a firm. The terms **designing capital structure, capital structure decision, factors determining capital structure and capital structure planning** are used interchangeably here.

It may be noted, at the outset, that there are certain common, and often, conflicting considerations involved in determining the methods of financing assets because the position of each company is different. Accordingly, the weight given to various factors also varies widely, according to conditions in the economy, the industry and the company itself. Above all, the freedom of management to adjust the mix of debt and equity in accordance with these criteria is limited by the availability of the various types of debt to have an appropriate capital structure, but the debt may not be available to the company because the suppliers of the funds may think that it will involve too much financial risk for them. Consequently, the plans that management ultimately makes in the light of these considerations often involve a compromise between the desires and conditions imposed by the suppliers of funds. Moreover, none of the factors by itself is completely satisfactory. But, collectively, they provide sufficient information for taking rational decisions. The key factors governing the capital structure decisions are **(i)** profitability aspect, **(ii)** liquidity aspect, **(iii)** control, **(iv)** leverage ratios in industry, **(v)** nature of industry, **(vi)** consultation with investment banks/lenders, **(vii)** commercial strategy, **(viii)** timing, **(ix)** company characteristics and **(x)** tax planning.

SECTION I PROFITABILITY ASPECT

EBIT-EPS analysis/ approach is an approach for selecting capital structure that maximises earnings per share (EPS) over the expected range of earnings before interest and taxes.

Earnings Before Interest and Tax (EBIT) – Earnings per Share (EPS) Analysis

Keeping in view the primary objective of financial management of maximising the market value of the firm, the **EBIT-EPS analysis** should be considered logically as the first step in the direction of designing a firm's capital structure. As discussed in detail in Chapter 15, the EBIT-EPS analysis shows the impact of various financing alternatives on EPS at various levels of EBIT. This analysis is useful for two reasons: **(i)** the EPS is a measure of a firm's performance—given the P/E ratio, the larger the EPS, the larger would be the value of a firm's shares; and **(ii)** given the

importance of EPS and the function of the EBIT-EPS analysis to show the value of EPS under various financial alternatives at different levels of EBIT, the EBIT-EPS analysis information can be extremely useful to the finance manager in arriving at an appropriate financing decision. The EBIT-EPS analysis is illustrated in Chapter 14. From Fig. 14.1, [based on Example 14.7 (i)], we see that the EPS is Rs 6.5 per share at the point of intersection of two financial alternatives: **(i)** 100 per cent equity financing, and **(ii)** 50 per cent equity financing and 50 per cent debt financing. At that point, EPS is equal under both the plans. At the point of intersection, the EBIT level is Rs 3 lakh. Beyond the point of intersection, the EPS is higher under alternative **(ii)** which uses 50 per cent debt than alternative **(i)**. Below the point of intersection, the EPS is higher under alternative **(i)** which exclusively uses equity rather than the half debt-mixed alternative (ii) which financial plan should be adopted, is to be determined with reference to the likely level of EBIT. If the company's likely level of EBIT is Rs 4.5 lakh, the debt-mixed alternative should be preferred as the EPS is Rs 13 under this alternative while it is Rs 9.75 under the equity alternative. Thus, the finance manager can compare the point of intersection with the most likely level of EBIT and can decide the financing mix. The manager should determine the probability of 'critical' levels of EBIT. If the probability of EBIT going below Rs 3 lakh is negligible or very low, the debt-mix alternative should be recommended by the finance manager. On the other hand, if the probability of EBIT falling below the indifference point is high, the equity-alternative should be preferred. In general, the higher the level of EBIT and the lower the probability of downward fluctuation, the greater is the amount of debt that can be employed. While taking a decision in this respect, it should be remembered that P/E ratio is less for a levered financial plan due to increased financial risk. Therefore, increase in EPS should be greater so that its advantage is not completely offset or more than offset by using debt in the capital structure. Moreover, if the debt alternative entails a provision for creating a sinking fund, the finance manager should keep in mind that earnings available for payment of dividends and reinvestment to further expand facilities would be reduced by the amount of the sinking fund payment. The indifference point would then be computed using Eq. 16.1.

$$\frac{\text{UEPS-Debt Plan}}{\dfrac{(\text{EBIT} - I)(1-t) - SF}{N_1}} = \frac{\text{UEPS-Equity Plan}}{\dfrac{(\text{EBIT})(1-t)}{N_2}} \qquad \textbf{(16.1)}$$

where UEPS = uncommitted earnings per share

SF = sinking fund payment per annum

I = interest payments

Let us suppose in our example 14.7(i), the sinking fund payment is Rs 1,50,000 for 10 years. The indifference point would have to be escalated to Rs 81,00,000. The earlier decision of going for debt at the most likely level of EBIT of more than Rs 3.0 lakh will be reversed. Likewise, in calculating the indifference level of EBIT, he should take cognizance of fixed interest or sinking fund liability on the other debts already outstanding. If preference shares are outstanding, its dividend (and sinking fund, if any, in the case of redeemable preference shares) requirements should also be provided for.

Coverage ratio measures the size of interest payments relative to the EBIT and the adequacy of EBIT to meet payment obligations.

Coverage Ratio

Apart from the EBIT-EPS/EBIT-MPS analysis, the ability of a firm to use debt, from the profitability point of view, can also be judged in terms of a coverage ratio, namely,

$$\text{EBIT}/I \qquad \textbf{(16.2)}$$

Or

$$\frac{\text{EBIT}}{I + \left[\dfrac{SF}{1-t}\right]} \qquad \textbf{(16.3)}$$

The ratio measures the size of the interest payments relative to the EBIT. The reciprocal of this ratio (I/EBIT) measures the proportion of EBIT devoted to interest payments. The higher the coverage ratio, the greater is the certainty that the firm would be in a position to meet its obligations of interest payment.

The coverage ratio can be calculated, like the EPS, for various levels of EBIT. This would provide a better picture of the firm's most likely EBIT to meet out specific commitments. It will throw light on the adequacy of EBIT to meet the firm's annual burden of payments connected with interest on loan, preference dividend, contribution to sinking fund (if any) and other repayments of principal.

SECTION 2 LIQUIDITY ASPECT

Cash Flow Analysis

EBIT-EPS analysis and coverage ratios are very useful in making explicit the impact of leverage on EPS and on the firm's ability to meet its commitments at various levels of EBIT. But the EBIT/interest ratio is less than a perfect measure to analyse the firm's ability to service fixed charges because the firm's ability to do so depends on the total payments required, that is, interest and principal, in relation to the cash flow available to meet them. Therefore, the analysis of the cash flow ability of the firm to service fixed charges is an important exercise to be carried out in capital structure planning in addition to profitability analysis. The exercise is of overwhelming significance in the context of the risk of bankruptcy. If the firm borrows more than its debt capacity and, therfore, fails to meet its obligations in future, the lenders may seize the assets of the company to satisfy their claims. Thus, the basic existence of the company would be endangered.

It may be possible that the company's EBIT is adequate to cover its specific commitments, arising out of debt obligations; but, the firm may not have sufficient cash to pay as its income is blocked within the firm in the form of higher inventory, receivables and/or sometimes purchases of fixed assets, particularly, when the company is a growing one. In the absence of cash flow analysis, a company, which is otherwise profitably sound, would, in case of default, run into great difficulties. Thus, cash flow analysis is an essential ingredient of any sound capital structure decision.

Cash flow analysis yields a number of distinct advantages in the crucial task of setting debt policy: **(i)** it focuses on the *solvency* of the firm during adverse circumstances in contrast to EBIT-EPS analysis which is concerned with the effects of leverage under normal circumstances; **(ii)** it takes into consideration the balance sheet changes and other cash flows that do not

appear in the profit and loss account; **(iii)** it gives an insight into the **inventory of financial resources** available in the event of recession; and **(iv)** finally, it views the problem in a dynamic context over time whereas EBIT/EPS and coverage analysis normally consider only a single year. From all these points, it can be concluded that the cash flow analysis evaluates the risk of financial distress and should be recognised as a good supporting supplement to the EBIT/EPS analysis in framing the firm's capital structure.

Cash flow analysis evaluates the risk of financial distress.

In assessing the liquidity position of a firm in terms of its **cash flow analysis**, various measures can be employed. One such measure[2] is the *ratio of fixed charges to net cash inflows*. This ratio measures the coverage of fixed financial charges (interest plus repayment of principal, if any) to net cash inflows. In other words, it indicates the number of times the fixed financial requirements are covered by the net cash inflows. The greater the coverage ratio, the greater is the amount of debt (and other sources of funds carrying a fixed rate of interest/dividend) that a firm can use.

Another measure[3] to analyse the cash flow ability of a firm to service fixed charges in determining an appropriate capital structure is to prepare a cash budget to determine whether the expected cash flows are sufficient to cover the fixed obligations.[4] The purpose of preparing the cash budget is to find out possible deviations in actual cash flows from those that are expected. Therefore, cash budgets should be prepared for a range of possible cash inflows with a probability attached to each of them. This information can be used to evaluate the ability of the firm to meet its fixed obligations. Since the probability of various cash flow patterns is known, the firm can work out the amount of fixed charges as well as the debt that the firm can employ and still remain within an **insolvency limit tolerable to the management**.[5]

Suppose, the firm is of the view that 5 per cent is the maximum probability of not having cash to meet charges that can be tolerated (i.e. it will not cause insolvency). Further, suppose that the actual probability of being out of cash on the basis of the cash budget prepared under adverse circumstances is also 5 per cent. In such a situation, according to Van Horne, debt can be employed up to a point where the cash balance is just sufficient to cover the fixed charges. That is to say, debt can be increased up to the point at which the additional cash drain would cause the probability of cash insolvency to equal the risk tolerance specified by management. It is, of course, not necessary that the debt would be increased to that point. This method of analysis suggested by Van Horne provides a means for assessing the effect of increase in debt on the risk of cash insolvency. On the basis of the information available from this analysis, the firm would determine the most appropriate level of debt.

Debt capacity relates to how much debt can be comfortably serviced.

A similar type of analysis has been suggested by Gordon Donaldson.[6] It is argued that a firm will normally be able to meet its fixed obligations in terms of interest as well as repayment of principal. It is only during adverse circumstances that firms will not be able to maintain their ability to meet contractual obligations and would be exposed to the *risk of bankruptcy* or the extreme form of **risk of financial distress**. Donaldson terms these as **recession** conditions. To examine the impact of alternative debt policies on the risk of bankruptcy, therefore, what is required is a careful analysis. of how a firm's cash flows would be affected by recession conditions.

SECTION 3 CONTROL

Another consideration in planning the types of funds to use is the attitude of the management towards control. Lenders have no direct voice in the management of a company. They may, of course, place certain restrictions in the loan agreement on the management's activities. So long as there is no default in the payment of interest or the repayment of the principal, there is little that they can do legally against the company. For all practical purposes, they have very little say in the policy-decisions of the company or in the selection of the board of directors. Likewise, preference shareholders do not have the right to vote for the appointment of the board of directors. However, if the financial affairs of the company have deteriorated to such an extent that dividends on preference shares have not been paid for a certain number of years (2-year period in India), they are given the right to attend the meetings and participate in the voting. In most of the cases, they, like the creditors, do not have any say in the selection of the management. The power to choose the management in most cases rests with the equity-holders. Accordingly, if the main object of the management is to maintain control, they will like to have a greater weightage for debt and preference shares in additional capital requirements, since by obtaining funds through them the management sacrifices little or no control. However, it should be remembered that if the company borrows more than what it can service or repay, the creditors may seize the assets of the company to satisfy their claims. In that situation, the management would lose all control. It might be better to sacrifice a measure of control by some additional equity financing rather than run the risk of losing all control to creditors by employing too much debt.[7] The same holds true for preference shares. In such a situation, equity would be a better source of financing. However, if the firm has the ability, as determined by profitability and solvency considerations discussed above, and the management wants to maintain control in its own hands, the issue of senior securities will be recommended as the issue of additional equity shares would involve the risk of losing control. This will be all the more true if the company is *closely held*. The management of widely-held companies runs little risk of losing continuation of control. The shares of such companies are widely distributed. Most of the shareholders are interested simply in the return and have neither the time nor the inclination to participate in management. If they are not satisfied, they will switch over to other companies.

SECTION 4 LEVERAGE RATIOS FOR OTHER FIRMS IN THE INDUSTRY

Yet another approach to the capital structure decisions is to make a comparison with the debt-equity ratios of companies belonging to the same industry, having a similar business risk. The rationale of the use of industry standards is that debt-equity ratios appropriate for other firms in a similar line of business should be appropriate for the company as well. Industry standards provide a useful benchmark. If the firm is out of line, it is conspicuous in the market place. This does not necessarily imply that the firm's capital structure planning is inappropriate. It may well be possible that other firms may not be using appropriate debt-equity ratios. They may be more conservative or more aggressive risk-takers than desired. However, comparison is helpful as it acts as a red signal to the management that there may be something wrong with the debt-equity mix of the company. In other words, what it suggests is that if a firm is out of line, it should know the reasons why and be satisfied that there are good reasons for it.[8]

SECTION 5 NATURE OF INDUSTRY

The nature of industry is one of the most important elements in determining the degree of financial leverage a firm can carry safely without any risk of bankruptcy. If an industry's sales are subject to wide fluctuations, over a business cycle, the firm should have a low degree of financial leverage. Such firms will already have a high operating leverage. In case both are high, the total risk of the firm as determined by the combined leverage (the product of operating leverage and financial leverage) would become unduly high.[9] The firms with high debt ratios belonging to industries such as refrigeration, televisions, machine tools and capital equipment manufacturing, run the risk of not being able to meet the required payments in lean years which would cause financial distress. Clearly, such firms should have a more conservative capital structure and rely less on debt. On the other hand, industries dealing with non-durable consumer goods (food) or with inexpensive items (paper clips, match boxes) or with items in habitual use (cigarettes) or all those products which have an inelastic demand are not likely to be subject to wide fluctuations in sales. Such industries can afford to have higher debt proportions in capital structure as in lean years they do not run the risk of being unable to meet their commitments.

Judging industry by its competitive nature, it may be inferred that those industries which have keen competition among themselves should have a relatively greater proportion of equity than debt. For example, in the garment industry much of the competition is based on style. The styles being unpredictable and transitory the profits also fluctuate accordingly. Therefore, such firms should emphasise equity over debt because of the excessive risk of not being able to meet payments on borrowed funds. At the other extreme, there are public utility undertakings involved in the production of electricity, gas, water, transportation services or telephone services, which are relatively free from intra-industry competition. Their sales are more stable and predictable. Therefore, such companies can afford to use more debt.

The stage of the life cycle of the industry has also a crucial bearing in assigning relative weightage to various sources of raising finance. If the industry is in its infancy, the probability of the rate of mortality would be high. Therefore, more emphasis needs to be placed on equity capital. The firm would do well to avoid seeking funds from senior securities which require fixed payments. At such a stage, risk outweighs the attractions of financial leverage. When the industry has reached maturity and is passing through the period of rapid growth, the firm should pay special attention to manoeuverability to assure that as it grows it obtains funds when needed and under acceptable terms. If the outlook is for a long-term decline in business, the firm should build such a plan which allows for easy contraction in the sources of the funds used.[10] For this purpose, the firm can have 'call' provision in the case of senior securities.

SECTION 6 CONSULTATION WITH INVESTMENT BANKERS AND LENDERS

Another useful approach in deciding the proportion of various securities in a firm's structure is to seek the opinion of investment analysts, institutional investors, investment bankers and lenders. These analysts, having been in business for a considerable period of time, acquire expertise and have access to information regarding securities of a large number of companies and know how the market evaluates them. They are, therefore, in a better position to assess a particular financial plan.

Similarly, the opinions of prospective lenders and investors are likely to be very useful to

the firm; it is they who will ultimately provide funds to the firm. Therefore, the type of securities which they will prefer to buy is very significant information for the financial manager and helps him in taking a decision regarding the form of securities to be issued. It is imperative that if a financial decision is to contribute to the valuation of the firm, the finance manager must think in a way similar to that of the investors.

SECTION 7 MAINTAINING MANOEUVERABILITY FOR COMMERCIAL STRATEGY

Manoeuverability implies the ability to adjust source of funds in response to change in the need for funds.

Manoeuverability refers to a firm's ability to adjust its sources of funds in either direction–increase or decrease–in response to changes in the need for funds. That is, the finance manager must keep himself in a situation where he can change positions. Therefore, while designing the capital structure, he should not lose sight of the future impact on the present financial plan. For instance, the firm may adopt an aggressive debt policy as it looks good at one point but if in future the firm is in need of additional funds, it may be forced to issue equity shares on unfavourable terms as the firm has a too heavy debt and is, therefore, unable to obtain funds in this form. Due to increased financial risk, the cost of equity would be higher. Clearly, the opportunity cost of an unwise debt-policy could turn out to be very high. Therefore, in order to preserve operating flexibility, a firm is well advised to have unused debt capacity for future needs, that is, it should operate below the maximum safe debt level. The preservation of unused debt capacity can be an important consideration for the company whose funds requirements are sudden and unpredictable. It gives the company financial manoeuverability by virtue of leaving the options open.[11]

Flexibility as to financing is important when future external financing will be necessary.

There should be room for **flexibility** not only in obtaining funds but also in refunding them. To provide the desired flexibility, the firm might incorporate a call provision as one of the covenants of the agreement with the suppliers of funds. The call provision implies that the firm with an adequate notice can repay their principal sum.

Flexibility, however, can be obtained only at a cost. When a finance manager achieves flexibility, it means that the party at the other end of the transaction is foregoing something and for doing this would like to be compensated. *Callable* preference shares and options for advance payment of long-term debt are devices for maintaining flexibility. But, they will require higher yield to be paid than *non-callable* preference shares and long-term debts for a definite number of years. Therefore, the finance manager faces the task of risk/return trade-off. He is to assure himself that he is *not buying flexibility at a higher cost than is warranted by gains achieved through flexibility.*

SECTION 8 TIMING OF ISSUE

Closely related to flexibility in deciding the types of funds to be used, is the question of timing. Frequently very substantial savings may be obtained by proper timing of security issues. Thus, the timing of the public offerings is also an important consideration in capital structure decisions of a firm. Public offering should be made at a time when the state of the economy as well as the capital market is ideal to provide the funds. The monetary and fiscal policies

that are pursued by the government are also important in this regard. *The government follows a cheap money policy to boost the economy during a recession and a dear money policy during inflationary periods.* The type of policy pursued by the government reflects itself in prices as well as yields on senior securities and equity. High debentures yields are associated with relative scarcity of debt money and low P/E ratios on shares are an indication of the relative scarcity of equity funds. Frequently, therefore, the company has to decide whether to finance initially with an equity issue and later with a debt issue, or *vice-versa.* Consequently, it is forced to evaluate the alternative methods of financing in the light of general market conditions and expectations for the company itself. If the management feels that borrowed funds will become costly or scarce, the firm may like to use the benefit of financial leverage immediately. An expected decline in interest rates may encourage the firms to postpone borrowings, and remain in a flexible position which helps to take advantage of lower interest rates in the future.

At times, funds will be needed and must be obtained if they are relatively costly. This aspect of our discussion is related to the internal rate of return (IRR). If the project materialises just when demand for the product involved is strong, the early return to flow of funds is higher; the IRR is higher and perhaps a somewhat higher cost of capital can be profitably tolerated. The differential increase in the rate of return, at this time, is more than the differential in the cost of money. It is foolhardy for a finance manager to chase the lowest cost of money only to find that he has procured the funds at bargain rates when the time for their usefulness has passed.[12]

However, it should be borne in mind, that timing is not the only consideration. The timing analysis may suggest, for instance, use of debt. But the company cannot go in for debt if its existing capital structure is already top-heavy with debt. Agreements with the existing lenders of the funds may impose certain other restrictions. Thus, timing in obtaining funds is exercised within limits imposed by the timing of needs for funds, the extent of flexibility, and existing explicit agreements, sometimes an implicit understanding, with lenders and owners.

SECTION 9 CHARACTERISTICS OF THE COMPANY

The characteristics of a company in terms of size and credit standing, among others, also play a vital role in determining the share of senior securities and equity in its capital structure.

The management's freedom of choice is extremely limited in the case of small and very large companies. Companies that are very small must rely, to a considerable degree, upon the owner's funds for their financing; they find it very difficult to obtain long-term debts. In the minds of investors, generally, small firms are considered to be more risky than large firms. Therefore, such firms do not have ready access to different types of funds from various sources. They are generally in a weak bargaining position in obtaining funds. Since their sources of raising funds are limited, they can assign larger weights to the factor of flexibility. In contrast, very large companies are compelled to make use of different sources of raising funds as no single source can cater to their total requirements of funds.

Firms enjoying a high credit standing among investors/lenders in the capital market are in a better position to get funds from the sources of their choice. If the credit standing is poor, the firm's choice of obtaining funds is rather limited.

The choice of an appropriate debt policy involves a trade-off between tax benefits and the cost of financial distress. The greater the operating risk, the less is the debt the firm can use. Moreover, the management should consider the implicit cost of the tax subsidy in using debt. 'The tax subsidy is valuable, but, to go too far in exploiting it can be costly. The use of debt

in lieu of equity represents essentially a gamble in which the firm sets a part of its future to obtain the tax benefit today. Such sets should be placed with caution.'[13]

Above all, it should be remembered that 'financial theory has not developed to the point where data relative to these considerations are fed at one end of a computer and an ideal financial structure pops out of the other. Consequently, human judgement must be used to resolve the many conflicting forces in laying plans for the types of funds to be sought.'[14]

Summary

- A host of factors, both quantitative and qualitative, including subjective judgment of financial managers, have a bearing on the determination of an optional capital structure of a firm. They are not only highly complex but also conflicting in nature and, therefore, cannot fit entirely into a theoretical framework. Moreover, the weights assigned to various factors also vary widely, according to conditions in the economy, the industry and the company itself. Therefore, a corporate should attempt to evolve an appropriate capital structure, given the facts of a particular case.
- The key factors relevant to designing an appropriate capital structure are: **(i)** profitability, **(ii)** liquidity, **(iii)** control, **(iv)** leverage ratios in industry, **(v)** nature of industry, **(vi)** consultation with investment banks/lenders, **(vii)** commercial strategy, **(viii)** timing, (ix) company characteristics and **(x)** tax planning.
- Given the objective of financial management to maximise the shareholders wealth, a corporate should carry out profitability analysis in terms of determining the amount of EBIT (indifference point) at which its MPS is identical under two proposed financial plans. In general, the higher the level of EBIT than the indifference point and the lower the probability of its downward fluctuation, the greater is the amount of debt that can be employed by a corporate.

  Coverage ratio can also be used to judge the adequacy of EBIT to meet the firm's obligations to pay financial charges, interest on loan, preference dividend and repayment of principal. A higher ratio implies that the firm can go for larger proportion of debt in its capital structure.
- Liquidity position of a firm is analysed by cash flow analysis. One measure relates the ratio of fixed financial charges to net cash inflows. A firm can afford higher debt if the ratio is high.

  Another measure to determine the adequacy of cash flows to meet the fixed obligations in cash budget. A cash budget should be prepared for a range of possible cash inflows with a probability attached to each of them. Since the probability of various cash flow pattern is known, the firm can determine the level of debt it can employ and still remain within an insolvency limit tolerable to the management.
- To retain control over management, a firm would prefer use of debt to equity.
- The debt-equity ratio of a firm should be similar to those of other companies in the industry.
- In case sales are subject to wide fluctuations, a firm should employ less debt. Firms subject to keen competition should prefer a greater proportion of equity. The corporates in industry groups which are at their infancy should rely more on equity capital.
- Investment analysts/bankers/institutional investors understand the capital market better as well as requirements of investors/lenders. Their opinion is also useful in designing capital structure.
- An appropriate capital structure should provide room for flexibility not only in obtaining funds but also in refunding them.
- Public issue of share as well as debt capital should be made at a time when the state of the economy as well as the capital market is ideal to provide the funds. For instance, it will be useful to postpone borrowings if decline in interest rates is expected in the future.

- The characteristics of company, *inter-alia,* in terms of size and credit standing are decisive in determining its capital structure. While large firms enjoying a high credit standing among investors are in a better position to obtain funds from the sources of their choice, the relatively small firms, new firms and firms having poor credit standing have limited option in this regard.

References

1. Solomon, E and J J Pringle, *Introduction to Financial Mangement*, Goodyear Publishing Co., Santa Monica, California 1977, p 471.
2. Johnson, R L, *Financial Decision Makving*, Goodyear Publishing Co., California, 1973, p 216.
3. Van Horne, *op. cit.* p 232.
4. The preparation of cash budget is discussed in detail in Chapter 11.
5. Van Horne, *op. cit.* p 233.
6. Donaldson, G, *Corporate Debt Capacity*, Harvard University Press, Boston, 1961; also 'Strategy for Financial Emergencies', *Harvard Business Review*, December 1969, pp 67-79.
7. Johnson, R W, *Financial Management*, 1971, Allyn and Bacon, Boston, p 227.
8. Solomon, E and J J Pringle, *op. cit.* p 478.
9. For a discussion of 'operating and financial leverage' refer to Chapter 10.
10. Johnson, R W, *op. cit.* p 233.
11. Van Horne, *op. cit.* p 259.
12. Nemmers, E F and A Grunewald, *Basic Managerial Finance*, West Publishing Co., New York, 1975, p 556.
13. Solomon, E and J J Pringle, *op. cit.* p 491.
14. Johnson, R W, *op. cit.* p 234.

Practical Problems

P.16.1 The Hardware Company Ltd has to make a choice between debt issue and equity issue for its expansion programme. Its current position is as follows:

5% Debt	Rs 20,000
Equity capital (Rs 10 per share)	50,000
Surpluses	30,000
Total capitalisation	1,00,000
Sales	3,00,000
Total costs	2,69,000
Income before interest and taxes	31,000
Interest	1,000
Earnings before taxes	30,000
Income tax	10,500
Income after taxes	19,500

The expansion programme is estimated to cost Rs 50,000. If this is financed through debt, the rate of interest on new debt will be 7 per cent and the price-earnings ratio will be 6. If the expansion programme is financed through equity, new shares can be sold netting Rs 25 per share; and the price-earnings ratio will be 7. The expansion will generate additional sales of Rs 1,50,000 with a return of 10 per cent on sales before interest and taxes.

If the company is to follow a policy of maximising the market value of its shares, which form of financing should it choose?

Solution

Determination of market value of a share under different financing alternatives

Particulars	*Financial plan*	
	7% debt issue	*Equity issue*
EBIT	Rs 46,000	Rs 46,000
Less: Interest	4,500	1,000
Earnings after interest	41,500	45,000
Less: Taxes	14,525	15,750
EAT	26,975	29,250
EPS (EAT/Number of shares)	5.395	4.18
Price earning ratio	6	7
Market value per share	32.37	29.25

Recommendation The company should choose debt form of financing to maximise the market value of its shares.

Working Notes

(i) Present EBIT Rs 31,000
Plus expected EBIT (0.10 × Rs 1,50,000) 15,000
Total EBIT 46,000

(ii) Number of equity shares: With debt financing, the number of ordinary shares = 5,000 (Rs 50,000 ÷ Rs 10). In case of equity financing = additional 2,000 (Rs 50,000 ÷ Rs 25) new equity shares.

P.16.2 AB Limited provides you with the following information:

Profit	Rs 3,00,000
Less: Interest on debentures (0.12)	60,000
Earnings before taxes	2,40,000
Less: Taxes (0.35)	84,000
Earnings after taxes	1,56,000
Number of equity shares (Rs 10 each)	40,000
Earnings per share	3.9
Ruling market price	39
P/E ratio (Price/EPS) (times)	10

The company has undistributed reserves, Rs 6,00,000. It needs Rs 2,00,000 for expansion which will earn the same rate as funds already employed.

You are informed that a debt-equity ratio (debt/debt-equity) higher than 35 per cent will push the P/E ratio down to 8 and raise the interest rate on additional amount borrowed to 14 per cent.

You are required to ascertain the probable price of the equity share:

(a) If the additional funds are raised as debt; and

(b) If the amount is raised by rising equity shares (at current market price).

Solution

Probable price of equity share of AB Ltd under different alternatives

Particulars	*14% Debt*	*Equity shares*
EBIT at 20%* on capital employed@	Rs 3,40,000	Rs 3,40,000
Less: Debenture interest	60,000	60,000
Less: Interest on borrowings	28,000	—
Earnings before taxes	2,52,000	2,80,000
Less: Taxes	88,200	98,000
Earnings after taxes	1,63,800	1,82,000
Number of equity shares	40,000	45,128
EPS	4.095	4.033
X P/E ratio (times)	8	10
MPS	32.76	40.33

@Rs 17,00,000 [Rs 4,00,000 equity + Rs 6,00,000 reserves + Rs 5,00,000 (Rs 60,000/0.12 debentures) + Rs 2,00,000 proposed to be raised).

* Rs 3,00,000/Rs 15,00,000 = 0.20

P.16.3 The Evergreen Company has the choice of raising an additional sum of Rs 50 lakh either by the sale of 10 per cent debentures or by issue of additional equity shares of Rs 50 per share. The current capital structure of the company consists of 10 lakh ordinary shares.

At what level of earnings before interest and tax (EBIT) after the new capital is required, would earnings per share (EPS) be the same whether new funds are raised by issuing ordinary shares or by issuing debentures? Also, determine the level of EBIT at which uncommitted earnings per share (UEPS) would be the same if sinking fund obligations amount to Rs 5 lakhs per year. Assume a 35 per cent tax rate. Discuss the relevance of the calculation.

Solution

(i) Determination of indifference point

Debt alternative	=	*Equity alternative*
$\frac{(X-I)(1-t)}{N_1}$	=	$\frac{(X)(1-t)}{N_2}$
$\frac{(X-\text{Rs } 5,00,000)(1-0.35)}{10,00,000}$	=	$\frac{x(1-0.35)}{11,00,000}$
X	=	Rs 55,00,000

Verification table

Particulars	*10% Debt alternative*	*Equity alternative*
EBIT	Rs 55,00,000	Rs 55,00,000
Less: Interest	5,00,000	Nil
Earnings after interest	50,00,000	55,00,000
Less: Taxes	17,50,000	19,25,000
EAT	32,50,000	35,75,000
N	10,00,000	11,00,000
EPS	3.25	3.25

(ii) Determination of indifference point with sinking funds

Debt alternative	=	*Equity alternative*
$\frac{(X-I)(1-t)-S}{N_1}$	=	$\frac{(X)(1-t)}{N_2}$
$\frac{(X-\text{Rs } 5,00,000)\times(0.65)-(\text{Rs } 5,00,000)}{10,00,000}$	=	$\frac{0.65X}{11,00,000}$
X	=	Rs 1,39,61,538

Verification table

Particulars	*10% Debt*	*Equity*
EBIT	Rs 1,39,61,538	Rs 1,39,61,538
Less: Interest	5,00,000	Nil
EBT	1,34,61,538	1,39,61,538
Less: Taxes	47,11,538	48,86,538
Earnings after taxes	87,50,000	90,75,000
Less: Sinking fund payment	5,00,000	Nil
Earnings for equityholders	82,50,000	90,75,000
N	10,00,000	11,00,000
EPS	8.25	8.25

The relevance of indifference level of EBIT is that it enables the management to take better financial decisions. It is a point beyond which the leverage (use of debt) becomes favourable in that the use of debt could be employed to enhance the EPS. Therefore, if the estimated EBIT is more than the indifference level, debt alternative to raise finance should be used, otherwise the equity alternative would be preferred.

The uncommitted EPS approach is useful to the conservative decision makers, who look to debt not only in terms of interest payment but also in terms of its repayment. Therefore, they want to get an idea of earnings which, could meet both the payments. However, this approach is of short-term significance only as after the redemption of debentures, the sinking fund balance is transferred to general reserves and thus forms a part of the equity holders' funds.

P.16.4 The balance sheet of Smart Ltd as on March 31, current year is as follows (*Figures in lakhs of rupees*):

Liabilities	*Amount*	*Assets*	*Amount*
Share capital	200	Fixed assets	500
Reserves	140	Inventories	300
Long-term loans	360	Receivables	240
Short-term loans	200	Cash and bank	60
Payables	120		
Provisions	80		
	1,100		1,100

Sales for the current year were Rs 600 lakh. For the next year ending on March 31, they are expected to increase by 20 per cent. The net profit margin after taxes and dividend payout are expected to be 4 and 50 per ent respectively.

You are required to:

(a) Quantify the amount of external funds required.

(b) Determine the mode of raising the funds given the following parameters.

(i) current ratio should be 1.33.
(ii) Ratio of fixed assets to long-term loans should be 1.5.
(iii) Long-term debt to equity ratio should not exeed 1.06.
(iv) The funds are to be raised in the order of (1) short-term bank borrowings, (2) long-term loans and (3) equities.

Solution Assuming, assets will increase *pari passu* with sales, the level of projected assets will be Rs 1,100 lakh × 1.2 = Rs 1,320 lakh. The incremental assets required are Rs 1,320 lakhs – Rs 1,100 lakh = Rs 220 lakh.

Assuming that payables and other provisions (CL) are also likely to move with sales, the projected payables and provisions will be Rs 200 lakh × 1.2 = Rs 240 lakh.

Expected retained earnings = (Expected EAT – Divdiend paid) = (0.04 × Rs 720 lakh = Rs 28.8 lakh – Rs 14.4 lakh Dividend paid) = Rs 14.4 lakh.

(a) External funds needed:

(Rs lakh)

Projected level of assets	Rs 1,320
Less: Payable and provisions	240
Less: Retained earnings	14.4
Less: Existing funds useds	
(Rs 200 lakh + Rs 140 lakh + Rs 360 lakh + Rs 200 lakh)	900
External funds reuqired	165.6

(b) Mode of raising funds:

(i) Short-term borrowings (additional)

$$1.33 = CA/CL = \frac{\text{Existing CA, Rs 600 lakh} \times 1.2}{(\text{Existing payable} + \text{Provision}) \times 1.2 + \text{Short-term loan (STL)}}$$

1.33 = Rs 720 lakh/Rs 240 lakh + STL

1.33 (240 lakh+ STL) = Rs 720 lakh or 1.33 STL = Rs 400.8 or STL = Rs 400.8/1.33 = Rs 301.35 lakh.

Additional STL = Rs 301.35 lakh – Rs 200.00 = Rs 101.35 lakh.

(ii) Long-term loan (additional)

Desired ratio of fixed assets (FA) to long-term loan (LTL) = 1.5

$$1.5 = \frac{\text{FA (Rs 500 lakh} \times 1.2)}{\text{LTL}} = 1.5 \text{ LTL} = \text{Rs 600 lakh or LTL} = \text{Rs 400 lakh}$$

Additional LTL = Rs 400 lakh – Rs 360 lakh = Rs 40 lakh

(iii) Equity funds (additional): (Rs lakh)

Total external funds required	Rs 165.6
Less: Additional short-term bank borrowings	101.35
Less: Additional long-term loan	40.00
Equity capital to be issued	24.25

$$\frac{\text{New level of debt (long-term)}}{\text{Equity funds (ESC + Reserves)}} = \text{Rs 400 lakh/(Rs 224.25 lakh + Rs 154.5 lakh)} = 1.056^*$$

*Requirement of LTD/equity ratio of not more than 1.06 is satisfied.

(c) Funds required to be raised: (Rs lakh)

Short-term bank borrowings	Rs 101.35
Long-term loans	40.00
Equity share capital	24.25
	165.60

Mini Case

16.C.1 The following is the balance sheet as at 31st March, 2007 of S Co. Ltd:

Share capital:		
10,000 equity shares of Rs 100 each fully paid up	Rs 10,00,000	
25,000 11% cumulative preference shares of Rs 10 each fully paid up	2,50,000	Rs 12,50,000
Reserves and surplus		25,00,000
Secured loans		20,00,000
Unsecured loans		12,00,000
Trade creditors		18,00,000
Outstanding expenses		7,50,000
		95,00,000
Represented by		
Fixed assets	55,00,000	
Current assets	37,00,000	
Advances and deposits	3,00,000	95,00,000

The company plans to manufacture a new product in line with its current production, the capital cost of which is estimated to be Rs 25 lakh. The company desires to finance the new project to the extent of Rs 16 lakh by issue of equity shares at a premium of Rs 100 per share and the balance to be raised from internal sources.

Additional informations made available to you are:

(a) Rate of dividends declared in the past five years (including 2007) i.e. year ended 31st March, 2007, 31st March, 2006, 31st March, 2005, 31st March, 2004 and 31st March 2003 were 24 per cent, 24 per cent, 20 per cent, 20 per cent, 18 per cent respectively.

(b) Normal earning capacity (net of tax) of the business is 10 per cent.

(c) Turnover in the last three years was Rs 80 lakh (31.3.2007), Rs 60 lakh (31.3.2006) and Rs 50 lakh (31.3.2005)

(d) Anticipated additional sales from the new project Rs 30 lakh annually.

(e) Net profit before tax from the existing business which was 10 per cent in the last three years (2005-07) is expected to increase to 12 per cent on account of new product sales.

(f) Income-tax rate is 35 per cent.

(g) The trend of market price of the equity share of the company, quoted on the stock exchange was:

Year	*High*	*Low*
2006-2007	Rs 300	Rs 190
2005-2006	250	180
2004-2005	240	180

You are required to examine whether the company's proposal is justified. Do you have any suggestions to offer in this regard? All workings must form part of your answer.

Solution

Determination of MPS subsequent to implementation of new project, financed by equity and internal sources

Particulars	*Amount*
Sales (existing Rs 80 lakh + additional Rs 30 lakh)	Rs 1,10,00,000
Earnings before taxes (Rs 110 lakh × 12 per cent)	13,20,000
Less: Taxes (Rs 13,20,000 × 0.35)	4,62,000
Earnings after taxes	8,58,000
Less: Preference share dividend (Rs 2,50,000 × 0.11)	27,500
Earnings available for equityholders	8,30,500
Divided by number of equityshares outstanding (10,000 existing + 8,000 additional)[1]	18,000
Earnings per share (Rs 8,30,500/18,000 shares)	46.14
Multiply by existing price-earnings ratio[2]	4.9746
Market price per share	229.53

Working Notes

(1)	(Rs 16 lakh worth of equity shares/Issue price Rs 200 i.e., Rs 100 face value + Rs 100 premium)	8,000	
(2)	Statement showing existing EPS and existing P/E ratio		
	Earnings before taxes (Rs 80 lakh × 10%)	Rs 8,00,000	
	Less: Taxes (Rs 8 lakh × 0.35)	2,80,000	
	Earnings after taxes	5,20,000	
	Less: Preference dividend	27,500	
	Earnings available for equity-holders	4,92,500	
	Divided by number of existing equity-shares	10,000	
	Earnings per share (Rs 4,92,500/10,000 shares)		49.25
	Market price, average (Rs 300/Rs 190)/2		245
	P/E ratio [Rs 245/Rs 49.25]		4.9746

It is apparent that the market price of equity shares of the firm declines after the introduction of the new product/subsequent to the implementation of the new proposal. This decline is primarily attributable to dilution of existing EPS. Therefore, the proposal is not justifiable.

Suggestions The firm's existing total debt to total assets ratio is (Rs 57.5 lakh/Rs 95 lakh) 60.53 per cent which, as per prudential norms of finance, is on higher side. In other words, the firm does not have unutilised debt capacity. Moreover, use of debt may further increase financial risk, which in turn, may depress P/E ratio.

Given the normal earnings capacity (net of taxes) of 10 per cent, issue of additional 11 per cent cumulative preference shares also does not find favour as it decrease EPS.

Yet another possibility is to mainitain existing TD/TA ratio around 60 per cent and to finance part of the project through debt.

Maximum amount of debt possible to be raised is Rs 14.5 lakh as shown below: *(Rs lakh)*

Total assets (after expansion Rs 95 lakh + Rs 25 lakh)	Rs 120
Maximum debt possible (Rs 120 lakh × 0.6)	72
Less: Existing amount of the debt	57.5
Maximum debt possible to be issued	14.5

It is reasonable to assume that debt can be raised (say at 10 per cent) as 11 per cent is the coupon rate of preference shares.

Based on the assumption that Rs 14.5 lakh debt has been raised at 10 per cent and Rs 10.5 lakh worth of equity shares have been issued at Rs 200 per share (including Rs 100 premium), the total number of equity shares being 5,250 and no change in p/E ratio, the revised statement is prepared as follows showing EPS and MPS.

Determination of MPS

Earnings before taxes	Rs 13,20,000
Less: Interest (additional), Rs 14.5 lakh × 0.10	1,45,000
Earnings before taxes	11,75,000
Less: Preference dividend	27,500
Earnings available for equityholders	11,47,500
Divided by number of equity-shares outstanding (10,000 + 5,250)	15,250
EPS	75.25
Multiply by existing P/E ratio (times)	× 4.97
MPS	374.00

There is enhancement in EPS as well as MPS. Hence the above proposed financing plan merits consideration.

Review Questions

RQ.16.1 Provide the appropriate answers for the following:

(i) Financial distress is exclusively related to the risk of bankruptcy. (True/False)

(ii) In case, the projected level of EBIT is substantially higher than the indifference point, the levered plan is likely to be beneficial for the firm. (True/False)

(iii) _____ analysis is better than EBIT-EPS analysis (from the point of view of profitability) in evaluating proposed financial plans.

(iv) Indifference point which factors provision for sinking fund also provides _____ earnings per share. (uncommitted/committed)

(v) Coverage ratio which considers sinking fund payments also is determined dividing EBIT by _____.

(vi) To retain control over management, a firm would prefer use of _____. (debt/equity)

(vii) In case sales are subject to wide fluctuations, a firm should employ more _____ . (debt/equity)

(viii) Firms at their infancy should rely more on (debt/equity).

(ix) The _____ implies that the firm with an adequate notice can repay the suppliers of funds.

(x) Cost of debt relates only to the amount of interest payable on borrowings. (True/False)

[Answers: (i) False (ii) True (iii) EBIT-MPS (iv) Uncommitted (v) EBIT/I + [SF/(I-t)] (vi) Debt (vii) Equity (viii) Equity (ix) Call provision (x) False]

RQ.16.2 Define capital structure. What is an appropriate capital structure? What is a flexible capital structure?

RQ.16.3 Write a note on the important determination of the capital structure of a firm.

RQ.16.4 '.....an analysis of the magnitude and stability of cash flows relative to fixed charges is extremely important in determining an appropriate capital structure.' Comment.

RQ.16.5 How can the effect of profitability on designing an appropriate capital structure be analysed? Illustrate your answer with the help of EBIT-EPS analysis.

Examination Questions

Theory Questions

16.1 What is capital structure? Explain factors affecting determination of capital structure? (*Gujarat University, 2010*)

16.2 What do you mean by capital structure? What different criteria should be considered in determining capital structure. (*Pune University, 2009*)

16.3 Mention the factors that determine the capital structure of a firm. (*Calcutta University, Bangalore University, 2009*)

16.4 Explain factors that affect the planning of capital structure of the organsiation. (*Pune University, 2008*)

16.5 What do you mean by capital structure? Explain any three factors that are to be considered in determining it. (*Calcutta University, 2007*)

16.6 What is capital structure? (*Bangalore University, 2006*)

16.7 Define capital structure. What are the major determinants of it? (*Bangalore University, 2006*)

16.8 Define capital structure. (*Madras University, 2010 and Punjab University, 2005*)

Numerical Questions

16.1 A company with net operating earnings of Rs 3,00,000 is attempting to evaluate a number of possible capital structures, given below. Which of the capital structure will you recommend and why?

Capital structure	*Debt in capital structure*	*Cost of debt (%)*	*Cost of equity (%)*
1	Rs 1,00,000	10	12.0
2	2,00,000	10	12.0
3	3,00,000	10	12.0
4	4,00,000	10	12.5
5	5,00,000	11	13.5
6	6,00,000	12	15.0
7	7,00,000	14	18.0

(*Delhi University, 2010*)

Solution

Statement showing valuation of firm at varying amount of debt

Debt (D)	*EBIT*	*Kd (%)*	*Interest (I)*	*EAEH* (EBIT-I)*	*Ke (%)*	*S@ (EBIT-I)/Ke*	*V@@ (D + S)*
Rs 1,00,000	Rs 3,00,000	10	Rs 10,000	Rs ,2,90,000	12	Rs 24,16,667	Rs 25,16,667
2,00,000	3,00,000	10	20,000	2,80,000	12	23,33,333	25,33,333
3,00,000	3,00,000	10	30,000	2,70,000	12	22,50,000	25,50,000
4,00,000	3,00,000	10	40,000	2,60,000	12.5	20,80,000	24,80,000
5,00,000	3,00,000	11	55,000	2,45,000	13.5	18,14,815	23,14,815
6,00,000	3,00,000	12	72,000	2,28,000	15.0	15,20,000	21,20,000
7,00,000	3,00,000	14	98,000	2,02,000	18.0	11,22,222	18,22,222

*Earnings available for equityholders;@ Value of shares; @@ Total value.

Recommendation: The company should use Rs 3,00,000 debt to maximise its valuation (at Rs 25,50,000).

16.2 The existing capital structure of ABC Ltd is as follows: Equity shares of Rs 100 each, Rs 40,00,000; Retained earnings, Rs 10,00,000; 9% Preference shares, Rs 25,00,000; and 7% Debentures, Rs 25,00,000.

The company earns a return (EBIT) of 12% and the tax on income is 50%. The company wants to raise Rs 25,00,000 for its expansion project for which it is considering following alternatives: **(i)** Issue of 20,000 Equity shares at a premium of Rs 25 per share, **(ii)** Issue of 10% preference shares, and **(iii)** Issue of 9% debentures. It is projected that the *P/E* ratios in cases of equity, preference and debenture financing would be 20, 17 and 16 respectively. Which alternative would you consider to be the best? Give reasons for your choice. (*Delhi University, 2010*)

Solution

Determination of market price per share (MPS) under different financial alternatives

Particulars	*Financial plans*		
	Equity shares	*10% Pref. shares*	*9% Debentures*
EBIT[@]	Rs 15,00,000	Rs 15,00,000	Rs 15,00,000
Less interest (existing)	1,75,000	1,75,000	1,75,000
Less interest (additional)	—	—	2,25,000
Earnings before taxes	13,25,000	13,25,000	11,00,000
Less taxes (50%)	6,62,500	6,62,500	5,50,000
Earnings after taxes (EAT)	6,62,500	6,62,500	5,50,000
Less preference dividend (existing)	2,25,000	2,25,000	2,25,000
Less preference dividend (additional)	—	2,50,000	—
Earnings available for equity holders (EAEH)	4,37,500	1,87,500	3,25,000
Number of equity shares (N)	60,000	40,000	40,000
EPS (EAEH/N)	7.292	4.6875	8.125
(x) P/E ratio (No. of times)	20	17	16
MPS	145.84	79.69	130.00

[@]EBIT is 12% (Rs 40 lakh equity share + Rs 10 lakh retained earnings + Rs 25 lakh 9% preference shares + Rs 25 lakh 7% debentures + Rs 25 lakh additional funds = total Rs 125 lakh) = Rs 15 lakh.

Recommendation: Since MPS is maximum under equity alternative, raising funds through issue of additional equity shares is the best alternative.

16.3 Blue Sky Ltd. has an EBIT of Rs 2,00,000. The cost of debt is 10% and the outstanding debt is Rs 9,00,000. The overall capitalisation rate (k_o) is 12.5%. Calculate the total value of the firm (V) and equity capitalisation rate (k_e). (*Madras University, 2010*)

Solution

Statement sharing valuation of firm (V) and equity capitalisation rate (k_e)

EBIT	Rs 2,00,000
Divided by overall capitalisation rate (k_o) (%)	12.5
Valuation of firm (V), (EBIT/k_o)	16,00,000
Less value of debt ($V - D$)	9,00,000
Value of equity (s)	7,00,000
Earnings available to equityholders (EAEH) (EBIT, Rs 2,00,000 – Interest, Rs 90,000)	1,10,000
Equity capitalization rate, k_e = (EAEH/S) (%)	15.71
Alternatively $k_e = k_o + (k_o - k_i)\ D/S$ = 12.5% + (12.5% – 10.0) 9/7 = 12.5% + (2.5% × 9/7) =	15.71

16.4 In considering the most desirable capital structure for a company, the following estimates of cost of debt and equity capital (after tax) have been made at various levels of debt-equity mix:

Debt as % of total capital employed	*Cost of debt (%)*	*Cost of equity (%)*
0	5	12
10	5	12
20	5	12.5
30	5.5	13
40	6	14
50	6.5	15.5
60	8	20

You are required to determine the optimal debt-equity mix for the company by calculating composite cost of capital. (*Calcutta University, 2010*)

Solution

Statement showing computation of composite cost of capital

Cost of debt (k_d) (%)	*Weight of debt (w_d)*	*Cost of equity (k_e) (%)*	*Weight of equity k_e, $w_e(1 - w_d)$*	*Composite cost of capital (%) ($K_0 = k_d w_d + k_e w_e$)*
5.0	0	12.0	1.0	(5% × 0) + (12% × 1.0) = 12
5.0	0.1	12.0	0.9	(5% × .1) + (12% × .09) = 11.3
5.0	0.2	12.5	0.8	(5% × 0.2) + (12.5% × 0.8) = 11.0
5.5	0.3	13.0	0.7	(5.5% × 0.3) + (13% × 0.7) = 10.75
6.0	0.4	14.0	0.6	(6% × 0.4) + (14% × 0.6) = 0.80
6.5	0.5	11.5	0.5	(6.5% × 0.5) + (15.5% × 0.5) = 11.00
8.0	0.6	20.0	0.4	(8.0% × 0.6) + (20% × 0.4) = 12.80

The optimal debt-equity mix of the company is when it employs 30% debt in total capital used; at this mix its overall cost of capital (k_0) is the lowest (10.75%).

16.5 From the following data, find the equity capitalization rat, k_e: EBIT, Rs 1,50,000; Overall cost of capital, 15%; 10% Debentures, Rs 6,00,000. (*Punjab University, 2009*)

Solution

Statement showing computation of equity capitalisation rate

EBIT	Rs 1,50,000
Less interest on debentures (Rs 6,00,000 × 10%)	60,000
Earnings available for equityholders	90,000
Valuation of firm (EBIT/overall cost of capital, 0.15)	Rs 10,00,000
Valuation of equity (Rs 10,00,000 – Rs 6,00,000 debentures)	4,00,000
Equity capitalisation rate (Rs 90,000/Rs 4,00,00) (%)	22.5

16.6 A company's expected annual net operating income (EBIT) is Rs 1,50,000. The company has Rs 6,00,000, 10% debentures. Its overall cost of capital K_0 is 15%.

(a) Find the value of the firm, value of equity and equity capitalisation rate, K_e.

(b) What will happen to the market value of the firm and equity capitalisation rate if debentures are increased to Rs 7,00,000?

(c) What will happen to the market value of the firm and its equity capitalisation rate if the debentures are decreased to Rs 5,00,000? (*Punjab University, 2008*)

Solution

(a) Valuation of firm, value of equity and equity capitalisation rate

Particulars	*Amount*
EBIT	Rs 1,50,000
Less interest on debentures (Rs 6,00,000 × 0.10)	60,000
Earnings for equity holders (EAEH), as there are no taxes	90,000
Value of firm (EBIT/Overall cost of capital, 0.15)	10,00,000
Value of equity (Rs 10,00,000 – Rs 6,00,000 Debt)	4,00,000
Equity capitalisation rate (Rs 90,000/Rs 4,00,000) (%)	22.5

(b) Change in k_e due to change in debt

Particulars	*Amount*
EBIT	Rs 1,50,000
Less interest on debentures (Rs 7,00,000 × 0.10)	70,000
Earnings for equity holders (EAEH), as there are no taxes	80,000
Value of firm (EBIT/Overall cost of capital, 0.15)	10,00,000
Value of equity (Rs 10,00,000 – Rs 7,00,000 Debt)	3,00,000
Equity capitalisation rate (Rs 90,000/Rs 3,00,000) (%)	26.67

(c) Change in k_e, due to change in debt

Particulars	*Amount*
EBIT	Rs 1,50,000
Less interest on debentures (Rs 5,00,000 × 0.10)	50,000
Earnings for equity holders	1,00,000
Value of firm	10,00,000
Value of equity (Rs 10,00,000 – Rs 5,00,000)	5,00,000
Equity capitalisation rate (Rs 1,090,000/Rs 5,00,000) (%)	20

Note: The intention of question is to make use of net operating income approach.

16.7. A company's capital structure consists of the following:

Equity shares (of Rs 100 each)	Rs 10,00,000
Retained earnings	5,00,000
9% Preference shares	6,00,000
7% Debentures	4,00,000
Total	25,00,000

The company earns 12% on its capital. The income tax rate is 50%. The company requires a sum of Rs 12,50,000 to finance its expansion programme for which the following alternatives are available: **(i)** Issue of 10,000 equity shares at a premium of Rs 25 per share, **(ii)** Issue of 10% preference shares, and **(iii)** Issue of 8% debentures.

It is estimated that the *P/E* ratios of equity, preferences and debenture financing would be 21, 17 and 15 respectively. Which of the three financing alternatives would you recommend and why?

(*Bangalore University, 2006*)

Solution

Determination of market price per share (MPS) under 3 financial plans

Particulars	*Financial Plans*		
	Equity	*10% Preference*	*8% Debenture*
EBIT (12% of Rs 25 lakh + Rs 12.5 lakh = Rs 37.5 lakh capital employed)	Rs 4,50,000	Rs 4,50,000	Rs 4,50,000
Less existing interest (7% × Rs 4 lakh)	28,000	28,000	28,000
Less additional interest	—	—	1,00,000
Earnings before taxes (EBT)	4,22,000	4,22,000	3,22,000
Less taxes (50%)	2,11,000	2,11,000	1,61,000
Earnings after taxes (EAT)	2,11,000	2,11,000	1,61,000
Less preference dividend	—	1,25,000	—
Earnings (EAEH) available for equity holders	2,11,000	86,000	1,61,000
Number of equity shares (Existing shares are 10,000 + Additional 10,000), N	20,000	10,000	10,000
Earnings per share (EPS); EAEH/N	Rs 10.55	Rs 8.6	Rs 16.10
Multiply by P/E ratio	21	17	15
Market price per share (MPS)	Rs 221.55	Rs 146.20	Rs 241.50

Recommendation: The company is advised to raise funds through issue of 8% debentures, as it yields maximum market price per share (Rs 241.50).

Chapter

17

Sources of Long-term Finance

Learning Objectives

1. Discuss the general features of equity/ordinary shares, the important aspect of preemptive rights of shareholders and the merits and demerits of ordinary share financing
2. Understand the characteristics of terms loans, positive and negative covenants in a loan agreement and loan amortisation
3. Describe the basic characteristics of corporate debentures/bond/notes, general features of a debenture issue, bond rating and bond refunding options
4. Understand the basic rights of preference shareholders, the features of preference shares and the advantages and disadvantages of preference share financing
5. Describe the general features of convertible debentures, various innovative bonds, and demonstrate the procedure for determining the value of both compulsorily convertible debentures and partially convertible debentures—straight debenture value, conversion value and option value
6. Explain the basic characteristics of warrants, the implied price of a warrant and the values of a warrant—theoretical, market and warrant premium
7. Define leasing, describe its main features and classification of leasing and its significance and limitations

INTRODUCTION

The long-term investment decisions of a firm involves the acquisition of long-term/fixed assets. They have to be financed with long-term sources of finance. The main sources of long-term finance fall into two broad groups: **(i)** Internal and **(ii)** External.

The internal sources of long-term funds of an existing company consist of depreciation charges and retained earnings. The depreciation charges are normally used to replace the concerned asset(s). In a way, therefore, the only internal source of financing expansion/growth/diversification for such companies are retained earnings. In fact, they are an important source of long-term finance for corporate enterprises in India.

As a source of long-term finance, retained earnings have some commendable features. They are readily available to the firm. Flotation/issue costs and losses on account of underpricing associated with external equity are avoided/eliminated. There is no dilution of control of the firm by the existing shareholders. However, the magnitude of financing through retained earnings may be limited and variable/unstable/fluctuating primarily as a result of the quantum and variability of profits after taxes. It has, moreover, high opportunity cost in terms of dividends foregone by the shareholders.

For the shareholders, retention of profits by a firm is a convenient way of reinvestment of their profits. But shareholders who want a current income would find it inconvenient to the extent that they will be constrained to sell some shares to convert them into income. Moreover, the easy availability of retained earnings coupled with the notion of low cost may result in investment in sub-marginal/unprofitable projects which would have serious implications for, and hurt the interest of, the shareholders.

Thus, retained earnings have both positive and negative attributes from the viewpoint of the firm as well as the shareholders/investors and should be employed with caution. They involve high cost and no risk and put no restraint on management freedom and do not dilute control. **Retained earnings, as an internal source of finance, are significantly affected by the dividend policy of the firm**. The focus of Chapter 18 is, therefore, on the long-term external financing sources.

The external sources of long-term funds comprise of **(i)** equity capital, **(ii)** term loans, **(iii)** debentures/notes/bonds including innovative debt instruments, **(iv)** hybrid sources such as preference capital, convertibles, warrants and options, **(v)** leasing and hire-purchase finance and **(vi)** venture capital financing. The equity and preference capitals represent ownership securities/capital, while debentures and term loans are creditorship securities/loan capital. Firms that require long-term funds from external sources obtain them from the capital market. This part of the book describes the features of the various sources and evaluates them from the point of both the firm which uses them and the investors who provide them. The main instruments of long-term financing covered are equity shares/capital (Section 1), Debt instruments/capital (Section 2) and Hybrid instruments/sources (Section 3). The main points are summarised in Section 4.

SECTION I EQUITY/ORDINARY SHARES

Equity/ordinary share capital, as a long-term source of finance, represents ownership capital/securities and its owners—equity-holders/ordinary shareholders—share the reward and risk associated with the ownership of corporate enterprises. It is also called ordinary share capital in contrast with preference share capital which carries certain preferences/prior rights in regard to income and redemption. When a company is formed, it first issues equity shares to the promoters. As the need for financing increases, the company may issue ordinary shares to specific and small number privately to promoters' relatives, friends, business associates, employees, financial institutions, mutual funds, venture capital funds and so on. As the company grows further, it raises capital from the public. The first issue of equity shares to the public by an unlisted company is called the **initial public offering** (IPO). Subsequent offerings are called further issues/offerings. This section discusses the ordinary/equity shares. It describes their fundamentals in terms of **(1)** types, **(2)** features/attributes and **(3)** evaluation.

Authorised share capital is the number of ordinary shares capital that a firm can raise without further shareholder approval.

Types

Authorised equity/share capital represents the maximum amount which a company can raise from the ordinary share holders and can be changed in the prescribed manner. The portion of the authorised capital offered by the company to the investors is the **Issued** capital. **Subscribed** share capital is that part of the issued capital which has been accepted/subscribed by the investors. The actual amount paid by the shareholders is the *Paid-up capital*. The issued, subscribed and *paid-up* capitals are generally the same.

Subscribed share capital is the number of shares (capital) outstanding.

Par (face) value is a value arbitrarily placed on the shares.

Ordinary shares have typically a **par/face value** in terms of the price for each share, the most popular denomination being Rs 10. The price at which the equity shares are issued is the **Issue** price. The issue price for new companies is generally equal to the face value. It may be higher for existing companies, the difference/ excess being *share premium*. The **book value** of ordinary shares refers to the paid-up capital plus reserves and surplus (net worth) divided by the number of outstanding shares. The price at which equity shares are traded in the stock market is their **market value**. However, the market value of unlisted/thinly traded shares is not available.

Features

The ordinary shares have some special features in terms of the rights and claims of their holders.

Residual Claim to Income The equity shareholders have a residual claim to the income of the company. They are entitled to the remaining income/profits of the company after all outside claims are met. The earnings/income available to the shareholders (EAS) equals profit after tax (PAT) minus preference dividend; the PAT is equal to operating profits (EBIT) less taxes. However, the residual claim is only a theoretical entitlement as the amount actually received by the shareholders in the form of dividend will depend on the decision of the board of directors. The directors have the right to decide what portion of the EAS will be distributed to the shareholders as cash dividend and what portion will be ploughed back as retained earnings which the shareholders will receive later in the form of capital appreciation/bonus shares. In other words, the payment of dividends depends on the discretion of management and the shareholders have no legal right to receive/the company has no legal obligation to distribute, dividends out of EAS. This is in sharp contrast to the claims of debenture-holders which as a contractual obligation of the company must always be honoured irrespective of its financial position.

Residual Claim on Assets The ordinary shareholders' claim in the assets of the company is also residual in that their claim would rank after the claims of the creditors and preference shareholders in the event of liquidation. If the liquidation value of assets is insufficient, their claims may remain unpaid.

Right to Control As owners of the company, the equity-holders have the right to control the operations of/ participate in the management of, the company. Their control is, however, indirect. The major policies/decisions are approved by the Board of Directors and the Board-appointed management carries out the day-to-day operations. The shareholders have the legal right/power to elect the board of directors as well as vote on every resolution placed in various meetings of the company. Though, in theory, they have indirect right to control/ participate in management, in actual practice, it is weak and ineffective partly because of the

apathy and indifference of the majority of the shareholders who rarely bother to cast their votes and partly because scattered and by and large unorganised equity-holders are unable to exercise their collective power effectively.

Majority voting is the system where by in the election of directors, each shareholder is entitled to one vote for each share held and he can vote all shares for each director separately.

Voting System The ordinary shareholders exercise their right to control through voting in the meetings of the company. According to the most commonly used system of voting in India, namely, **majority rule voting**, each share carries one vote and each director is elected individually. Therefore, a shareholder can cast the total number of shares held by him for the election of each director separately. As a result, shareholders/group holding more than 50 per cent of the outstanding equity shares would be able to elect all the directors of their choice. An alternative is **proportionate rule voting** under which the number of votes held by a shareholder/group equals the number of shares held by him multiplied by/times the number of directors to be elected. The total votes held may be cast/spread in any manner: all just for one candidate or spread over as many candidates as the shareholders wishes to vote for. The proportionate voting system may enable even minority shareholders some representation on the board while all the members of the board may be elected by the holders of the majority of ordinary shares.

Proportionate voting is the system under which each share is allotted a number of votes equal to the number of directors to be elected and votes can be given to any director.

Pre-emptive right (rights) is a legal right of existing shareholders to be offered by the company in the first opportunity to purchase additional equity shares in proportion to their current holdings.

Pre-emptive Right The ordinary shareholders of a company enjoy **pre-emptive** rights in the sense that they have a legal right to be offered by the company the first opportunity to purchase additional issue of equity capital in proportion to/pro rata basis their existing/current holdings/ownership. A shareholder owning 2 per cent of the existing issued capital is entitled/has a pre-emptive right to acquire 2 per cent of additional shares to be issued by the company. The option to the shareholders to purchase a specified number of equity shares at a stated price during a given period is called **rights**. The shareholders can **(i)** exercise, **(ii)** sell in the market and **(iii)** renounce/forfeit their pre-emptive right partially or completely. The shares available as a result of non-exercise of right would be allotted on a *pro rata* basis to shareholders exercising the right. Any balance of shares can be offered to the public for subscription.

Dilution of control/financial interest occurs when a new share issue results in each existing shareholder having a claim in a smaller part of the firm's earnings than before.

While the pre-emptive rights ensure that management cannot issue additional shares to strengthen its control by selling them to persons/groups favourably inclined to it, on one hand, it protects the existing shareholders from **dilution of their financial interest** as a result of new equity issues, on the other.

Assume Avon Industries Ltd (AIL) has currently 30,00,000 shares outstanding. The market price is Rs 65 per share. The AIL plans to issue 10,00,000 additional shares at a subscription/issue price of Rs 40 per share. The number of rights to buy a new share = 30 lakh/10 lakh = 3. The market price of a share after right issue

$= \frac{(30,00,000 \times \text{Rs } 65) + (10,00,000 \times \text{Rs } 40)}{(30,00,000 + 10,00,000)}$ = Rs 58.75. A shareholder can buy one new share for Rs 40 plus 3 rights. The total value of 3 rights = Rs 58.75 – Rs 40 = Rs 18.75. The value of each right = Rs 18.75/3 = Rs 6.25. Thus, the *ex-right* price of a share drops by Rs 6.25 from the *cum-right* (rights-on) price of Rs 65 to the ex-rights price of Rs 58.75. The existing shareholders do not gain/lose from rights issue. What he receives in the form of value of a right, he loses in the form of a decline in the share price. His financial interest remains unaffected when he exercises his right or sells his rights. In case he does not exercise his right, there will a dilution of his financial interest.

Assume further, Mr X owns 300 shares of AIL. His total wealth/financial interest is Rs 19,500 (300 × Rs 65). After the exercise of his right, his holdings will be 400 shares. His total wealth would be Rs 23,500 (400 × Rs 58.75). But he has spent Rs 4,000 (Rs 40 × 100) to acquire additional shares. So his net financial interest = Rs 23,500 – Rs 4,000 = Rs 19,500, that is, equal to before rights issue.

In case Mr X sells his right @ Rs 6.25, his total financial position in AIL would be Rs 19,500 [(Rs 58.75 × 300) + (Rs 6.25 × 300)]: the same as before the rights issue.

If he does not exercise his right to buy/sell, his financial interest will suffer a dilution as his total wealth = Rs 17,625 (Rs 58.75 × 300), that is, a dilution of Rs 1,875 (Rs 19,500 – Rs 17,625).

In brief, **an investor suffers dilution of financial interest when he does not exercise his pre-emptive rights**.

Limited Liability Although the equity holders share the ownership risk, their liability is limited to the extent of their investment in the share capital of the company.

Evaluation

As the single most important source of long term funds, equity capital has merits as well demerits from the viewpoint of the company as well as the shareholders.

Merits The advantages of equity capital to a company are: first, it is a permanent source of funds without any repayment liability; second, it does not involve obligatory dividend payment and, thirdly, it forms the basis of further long-term financing in the form of borrowing related to the creditworthiness of the firm. The shareholders with limited liability exercise control and share other ownership rights in the income/assets of the firm.

Demerits The disadvantages of equity capital from the viewpoint of a company are: **(i)** High cost of funds reflecting the high required rate of return of investors as a compensation for higher risk as also the fact that equity dividends are not tax-deductible payments. They are paid out of post-tax profits; **(ii)** High flotation cost in terms of underwriting, brokerage and other issue expenses compared to other securities; **(iii)** Dilution of control of existing shareholders on sale of new shares to outsiders/public. The disadvantages associated with equity capital for the shareholders are: **(i)** The equity capital is in reality risk capital as it ranks the last as a claimant to income as well as the assets of the company. **(ii)** The scattered and unorganised shareholders are unable to exercise effective and real control over the company. **(iii)** The shareholders cannot claim dividend as a matter of right. **(iv)** There is a wide fluctuation in share prices with attendant risk for the investors.

In brief, equity capital is a high risk-high reward permanent source of long-term finance for corporate enterprises. The shareholders who desire to share the risk, return and control

associated with ownership of companies would invest in corporate equity. **As a source of long-term fund, it has high cost, low/nil risk, does not dilute control and puts no restraint on managerial freedom**.

SECTION 2 TERM LOANS AND DEBENTURES/BONDS

Apart from owners share capital, corporate enterprises raise long-term funds from creditors in the form of term loans, debentures, bonds and so on. The bulk of term loans raised by the corporates was provided by the financial institutions such as IDBI, ICICI and IFCI. Their support has declined substantially in recent years. Banks have entered term-lending business in the last few years, particularly in the infrastructure/core sector. Bonds/debentures have emerged as substantial source of debt finance to corporates in India in the context of **(i)** lesser term loan support by financial institutions, **(ii)** freedom to corporates to design debt instruments, **(iii)** withdrawal of interest ceilings on debt instruments, **(iv)** credit rating of debt instruments, **(v)** setting up of the wholesale debt market (WDM) segment by the NSE and **(vi)** depressed conditions in the equity market in the last few years. Securitisation of loan portfolios is also poised to emerge as a popular instrument in the corporate debt market in India. This Section focuses on term loans and debentures/bonds.

Term Loans

Term (long-term) loan is a loan made by a bank/financial institution to a business having an initial maturity of more than 1 year.

Term loans are also known as term/**project finance**. The primary source of such loans are financial institutions. Commercial banks also provide term finance in a limited way. The financial institutions provide project finance for new projects as also for expansion/diversification and modernisation whereas the bulk of term loans extended by banks is in the form of working capital term loan to finance the working capital gap. Though they are permitted to finance infrastructure projects on a long-term basis, the quantum of such financing is marginal.

Secured loan is a loan that has specific assets pledged as collateral.

Features of Term Loans ***Maturity*** The maturity period of term loans is typically longer in case of sanctions by financial institutions in the range of 6-10 years in comparison to 3-5 years of bank advances. However, they are rescheduled to enable corporates/borrowers tide over temporary financial exigencies.

Collateral (secondary) involves the items used by a borrower to back up a loan; any asset against which a lender has a legal claim if the borrower defaults on some provisions of the loan agreement.

Negotiated The term loans are negotiated loans between the borrowers and the lenders. They are akin to private placement of debentures in contrast to their public offering to investors.

Security All term loans are **secured**. While the assets financed by term loans serve as primary security, all the other present and future assets of the company provide **collateral/secondary** security for the term loan. Generally, all the present as well as the future immovable properties of the borrower constitute a general mortgage/ first equitable mortgage/floating charges for the entire institutional loan including commitment charges, interest, liquidated damages and so on. They are additionally secured by

hypothetication of all movable properties subject to prior charge in favour of banks in respect of working capital finance/advance.

Restrictive covenants are contractual clauses in loan agreements that place certain operating and financial constraints on the borrower.

Covenants *Negative* To protect their interest, the financial institutions reinforce the asset security stipulation with a number of restrictive terms and conditions. These are known as **covenants**. They are both positive/affirmative and negative in the sense of what the borrower should and should not do in the conduct of its operations and fall broadly into four sets as respectively related to assets, liabilities, cashflows and control. *Some negetive covenants are discussed as under:*

Asset-Related Covenants are intended to ensure the maintenance of a minimum asset base by the borrowers. Included in this set of covenants are:

- Maintenance of working capital position in terms of a minimum current ratio,
- Restriction on creation of further charge on asset,
- Ban on sale of fixed assets without the lenders concurrence/approval.

Liability-Related Covenants may, *inter alia*, include:

- Restrain on the incurrence of additional debt/repayment of existing loan, say, without the concurrence/prior approval of the lender/financial institution,
- Reduction in debt-equity ratio by issue of additional capital, and
- Prohibition on disposal of promoters shareholding.

Cashflow Related Covenants which are intended to restrain cash outflows of the borrowers may include:

- Restriction on new projects/expansion without prior approval of the financial institution,
- Limitation on dividend payment to a certain amount/rate and prior approval of the financial institutions for declaration of higher amount/rate,
- Arrangement to bring additional funds as unsecured loans/deposits to meet overrun/shortfall, and
- Ceiling on managerial salary and perks.

Control Related Covenants aim at ensuring competent management for the borrowers. This set of covenants may include

- Boroadbasing of board of directors and finalisation of management set-up in consultation with the financial institution,
- Effective organisational changes and appointment of suitable professional staff, and
- Appointment of nominee directors to represent the financial institutions and safeguard their interests.

Positive In addition to the foregoing negative covenants, certain positive/affirmative covenants stating what the borrowing firm should do during the term of a loan are also included in a loan agreement. They provide, *inter alia*, for **(i)** furnishing of periodical reports/financial statements to the lenders, **(ii)** maintenance of a minimum level of working capital, **(iii)** creation of sinking fund for redemption of debt and **(iv)** maintenance of certain net worth.

Repayment Schedule/Loan Amortisation The term loans have to be amortised according to predetermined schedule. The payment/repayment has two components: **(i)** interest and **(ii)** repayment of principal.

The interest component of loan amortisation is a legally enforceable contractual obligation. The borrowers have to pay a commitment charge on the unutilised amount. The interest on term loans by the financial institutions, subject to a minimum prime lending/floor rate (PLR), is risk-related and varies with the credit risk of the borrower. In case of default in respect of both the interest and principal components, liquidated damages/penal interest at a specified rate for the period of default on the default amount has to be paid.

Typically, the principal is repayable over 6-10 years period after an initial grace period of 1-2 years. Whereas the mode of repayment of term loans is equal semi-annual instalments in case of institutional borrowings, the term loans from banks are repayable in equal quarterly instalments. With this type of loan amortisation pattern, the total debt servicing burden declines over time, the interest burden declining and principal repayment remaining constant. In other words, the common practice in India to amortise loan is repayment of principal in equal instalments (semi-annual/annual) and payment of interest on the unpaid/outstanding loans. A loan amortisation schedule is illustrated in Table 17.1.

TABLE 17.1 Loan Amortisation Schedule (Equal Principal Repayment)

(Rs thousands)

Year	*Beginning loan*	*Principal repayment*	*Interest (0.14)*	*Loan payment*	*Ending loan*
(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
1	60.00	7.50	8.40	15.90	52.50
2	52.50	7.50	7.35	14.85	45.00
3	45.00	7.50	6.30	13.80	37.50
4	37.50	7.50	5.25	12.75	30.00
5	30.00	7.50	4.20	11.70	22.50
6	22.50	7.50	3.15	10.65	15.00
7	15.00	7.50	2.10	9.60	7.50
8	7.60	7.50	1.05	8.55	0.00

The debt servicing/loan amortisation pattern involving equal instalment (interest + repayment of principal) is portrayed in Table 17.2.

TABLE 17.2 Loan Amortisation Schedule (Equal Instalment)

Year	*Beginning loan*	*Payment instalment*[@]	*Interest (0.14)*	*Principal repayment [3 – 4]*	*Ending loan [2 – 5]*
(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
1	Rs 60,000	Rs 12,934	Rs 8,400	Rs 4,535	Rs 55,466
2	55,466	12,934	7,776	5,168	50,298
3	50,298	12,934	7,042	5,896	44,406
4	44,406	12,934	6,216	6,718	37,688
5	37,688	12,934	5,276	7,658	30,030
6	30,030	12,934	4,204	8,730	21,300
7	21,300	12,934	2,982	9,952	11,348
8	11,348	12,934	1,588	11,346	0

[@] Payment instalment = (Rs 60,000/PVIFA 8,14) = (Rs 60,000/4.6389) = Rs 12,934.

Evaluation Term loans have merits as well demerits both for the borrower and the lenders.

From the perspective of borrowers, term loan offer all the advantages and disadvantages associated with debenture financing. An additional demerit is that term loan contracts contain restrictive covenants restricting managerial freedom. The right of lenders to nominate directors on the board of the borrowing company may further restrict managerial discretion.

Similarly, the term loans provide all the advantages and disadvantages of debenture financing to the lending institutions together with the additional benefit of restrictive covenants to protect their interests. However, term loans are not represented by negotiable securities. Debt securitisation would go a long way in removing this limitation of term loans *vis-a-vis* debentures.

To conclude, *term loans carry low cost and involve high risk. There is no adverse effect on control but there is moderate restraint on managerial freedom.*

Debentures/Bonds/Notes

Debenture/bond is a debt instrument indicating that a company has borrowed certain sum of money and promises to repay it in future under clearly defined terms.

Akin to a promissory note, **debentures/bonds** represent creditorship securities and debenture-holders are long-term creditors of the company. As a secured instrument, it is a promise to pay interest and repay principal at stipulated times. In contrast to equity capital which is a variable income (dividend) security, the debentures/notes are fixed income (interest) security.

Attributes As a long-term source of borrowing, debentures have some contrasting features compared to equities.

Trust Indenture When a debenture is sold to investing public, a trustee is appointed through an **indenture/trust deed**. It is a legal agreement between the issuing company and the trustee who is usually a financial institution/bank/ insurance company/firm of attorneys. The trust deed provides the specific terms of agreement such as description of debentures, rights of debenture-holders, rights of the issuing company and responsibilities of the **trustee**. The trustee is responsible to ensure that the borrower/ company fulfills all its contractual obligations.

Trust (bond) indenture is a complex and lengthy legal document stating the conditions under which a bond has been issued.

Trustee is a bank/financial institution/ insurance company/firm of attorneys that acts as the third party to a bond/debenture indenture to ensure that the issuer does not default on its contractual responsibilities to the bond/ debentureholders.

Interest The debentures carry a fixed (coupon) rate of interest, the payment of which is legally binding/enforceable. The debenture interest is tax-deductible and is payable annually/semi-annually/quarterly. Some public sector undertakings issue tax-free bonds the income from which is exempted from tax in the hands of the investors. A company is free to choose the coupon rate which may be fixed or floated, being determined in relation to some benchmark rate. It is also related to the credit rating of the debenture as an instrument.

Maturity It indicates the length of time for redemption of par value. A company can choose the maturity period, though the redemption period for non-convertible debentures is typically 7-10 years. The redemption of debentures can be accomplished in either of two ways: **(i)** debentures redemption reserve (sinking fund) and **(ii)** call and put (buy-back) provision.

Debenture redemption reserve is a requirement in a debenture indenture providing for the systematic retirement of debentures/bonds prior to their maturity.

Debenture Redemption Reserve (DRR) A **DRR** has to be created for the redemption of all debentures with a maturity period exceeding 18 months equivalent to at least 50 per cent of the amount of issue/redemption before commencement of redemption.

Call price is the stated price at which a bond may be repurchased by use of a call feature prior to maturity.

Call and Put Provision The call/buy-back provision provides an option to the issuing company to redeem the debentures at a specified price before maturity. The **call price** may be more than the par/face value by usually 5 per cent, the difference being **call premium**. The put option is a right to the debenture-holder to seek redemption at specified time at predetermined prices.

Call premium is the amount by which a bonds' call price exceeds its par value.

Security Debentures are generally secured by a charge on the present and future immovable assets of the company by way of an equitable mortgage.

Convertibility Apart from pure non-convertible debentures (NCDs), debentures can also be converted into equity shares at the option of the debenture-holders. The conversion ratio and the period during which conversion can be affected are specified at the time of the issue of the debenture itself. The convertible debentures may be fully convertible (FCDs) or partly convertible (PCDs). The FCDs carry interest rates lower than the normal rate on NCDs; they may even have a zero rate of interest. The PCDs have two parts: **(a)** convertible part, **(b)** non-convertible part. Typically, the convertible portion is converted into equity share at a specified premium after a specified date from the date of allotment,while the non-convertible portion is payable/ redeemable in specified equal instalments on the expiry of specified years from the date of allotment.

Credit Rating To ensure timely payment of interest and redemption of principal by a borrower, all debentures must be compulsorily rated by one or more of the four credit rating agencies, namely, Crisil, Icra, Care and FITCH India.

Claim on Income and Assets The payment of interest and repayment of principal is a contractual obligation enforceable by law. Failure/default would lead to bankruptcy of the company. The claim of debenture-holders on income and assets ranks *pari passu* with other secured debt and higher than that of shareholders–preference as well as equity.

Evaluation The merits and demerits of debentures as a source of long-term funds from the point of view of the company and investors/debenture-holders are as follows:

Advantages The advantages for company are **(i)** lower cost due to lower risk and tax-deductibility of interest payments, **(ii)** no dilution of control as debentures do not carry voting rights. For the investors, debentures offer stable return, have a fixed maturity, are protected by the debenture trust deed and enjoy preferential claim on the assets in relation to shareholders.

Disadvantages The disadvantages for the company are the restrictive covenants in the trust deed, legally enforceable contractual obligations in respect of interest payments and repayments, increased financial risk and the associated high cost of equity. The debenture-holders have no voting rights and debenture prices are vulnerable to change in interest rates.

To summarise, *debentures, as long-term source of funds, have low cost, do not dilute control, involve high risk and put some restraint on managerial freedom.*

Innovative Debt Instruments In order to improve the attractiveness of bonds/debentures, some new features are added. As a result, a wide range of innovative debt instruments have emerged in India in recent years. Some of the important ones among these are discussed below.

Zero Interest Bonds/Debentures (ZIB/D) Also known as zero coupon bonds/debentures, ZIBs do not carry any explicit/coupon rate of interest. They are sold at a discount from their maturity value. The difference between the face value of the bond and the acquisition cost is the gain/return to the investors. The implicit rate of return/interest on such bonds can be computed by Equation 17.1.

$$\text{Acquisition price} = \text{Maturity (face) value}/(1 + i)^n \qquad \textbf{(17.1)}$$

Where i = rate of interest, and n = maturity period (years)

Deep Discount Bond (DDB) A deep discount bond is a form of ZIB. It is issued at a deep/steep discount over its face value. It implies that the interest (coupon) rate is far less than the yield to maturity. The DDB appreciates to its face value over the maturity period.

The DDBs are being issued by the public financial institutions in India, namely, IDBI, SIDBI and so on. For instance, IBDI sold in 1992 a DDB of face value of Rs 1 lakh at a deep discount price of Rs 2,700 with a maturity period of 25 years. If the investor could hold the DDB for 25 years, the annualised rate of return would work out to 15.54 per cent. The investor had the option to withdraw (put option) at the end of every five years with a specified maturity/deemed face value ranging between Rs 5,700 (after 5 years) and Rs 50,000 (after 20 years), the implicit annual rate of interest being 16.12 and 15.71 per cent respectively. The investors could also sell the DDBs in the market. The IBDI had also the option to redeem them (call option) at the end of every 5 years presumably to take advantage of prevailing interest rates. A second series of DDBs was issued by the IDBI in 1996 with a face value of Rs 2 lakh and a maturity period of 25 years, the deep discount issue price being Rs 5,300.

The merit of DDBs/ZIDs is that they enable the issuing companies to conserve cash during their maturity. They protect the investors against the reinvestment risk to the extent the implicit interest on such bonds is automatically reinvested at a rate equal to its yield to maturity. However, they are exposed to high repayment risk as they entail a balloon payment on maturity.

Secured Premium Notes (SPNs) The SPN is a secured debenture redeemable at a premium over the face value/purchase price. It resembles a ZIB. There is a lock-in period for SPN during which no interest is paid. The holder has the option to sell back the SPN to the issuing company at par after the lock-in-period. The redemption is made in instalments. The SPN is a tradeable instrument. A typical example is the SPN issued by TISCO in 1992. Its salient features were:

- Each SPN had a face value of Rs 300. No interest would accrue during the first year after allotment.

- During years 4-7, principal will be repaid in annual instalment of Rs 75. In addition, Rs 75 will be paid each year as interest and redemption premium. The investor could choose a mix of low interest/high premium or high interest/low premium from three options: **(i)** interest, Rs 37.5, premium, Rs 37.50; **(ii)** interest, Rs 25 and premium, Rs 50 and **(iii)** interest, Rs 50 and premium, Rs 25.
- A warrant was attached to the SPN entitling the holder to acquire one equity share for cash by payment of Rs 100. The option could be exercised between first year and one-and-a-half year after allotment by which time the SPN will be fully paid up.
- The holder was given an option to sell back the SPN at the par value of Rs 300.

Although the SPN is akin to a ZIB to the extent it has no coupon rate of interest, the interest payment and principal repayment are spread over a period of 4 years whereas in case of ZIBs the entire payment is made in lump sum on maturity.

The before tax rate of return on the SPN = 13.65 per cent, that is,

$$300 = \frac{0}{(1+r)} + \frac{0}{(1+r)^2} + \frac{0}{(1+r)^3} + \frac{150}{(1+r)^4} + \frac{150}{(1+r)^5} + \frac{150}{(1+r)^6} + \frac{150}{(1+r)^6}$$

Floating Rate Bonds (FRBs) The interest on such bonds is not fixed. It is floating and is linked to a benchmark rate such as interest on treasury bills, bank rate, maximum rate on term deposits. It is typically a certain percentage point higher than the benchmark rate. The prices of FRBs tend to be fairly stable and close to par value in comparison with fixed interest bonds. They provide a protection against inflation risk to investors, particularly banks and financial institutions.

Call provision is a provision/ feature that gives the issuers the opportunity to repurchase bonds at a stated price prior to maturity.

Callable/Puttable Bonds/Debentures/Bond Refunding Beginning from 1992 when the Industrial Development Bank of India issued bonds with **call features**, several callable/puttable bonds have emerged in the country in recent years. The call provisions provide flexibility to the company to redeem them prematurely. Generally, firms issue bonds presumably at lower rate of interest when market conditions are favourable to redeem such bonds. In other words, the firm refunds its debt.

Evaluation The bond refunding decision can be analysed as a capital budgeting decision. **If the present value of the stream of net cash savings exceeds the initial cash outlay, the debt should be refunded**.

Example 17.1

The 22 per cent outstanding bonds of the Bharat Industries Ltd (BIL) amount to Rs 50 crores, with a remaining maturity of 5 years. It can now issue fresh bonds of 5 year maturity at a coupon rate of 20 per cent. The existing bonds can be refunded at a premium (call premium) of 5 per cent. The flotation costs (issue expenses + discount) on new bonds are expected to be 5 per cent. The unamortised portion of the issue expenses on existing bonds is 1.5 crore. They would be written off as soon as the existing bonds are called/refunded.

If the BIL is in 35 per cent tax bracket, would you advise it to call the bond?

Solution

(Amount in Rs crore)

Annual net cash savings (Working note 2)	0.71
PVIFA (10,13) (Working note 3)	3.517
Present value of annual net cash savings	2.497
Less: Initial outlay ((Working note 1)	3.600
NPV (bond refunding)	(1.103)

It is not advisable to call the bond as the NPV is negative.

Working Notes

(1) (a) Cost of calling/refunding existing bonds

Face value		50.0	
Plus: Call premium (5 per cent)		2.5	52.5
(b) Net proceeds of new bonds			
Gross proceeds		50.0	
Less: Flotation costs		2.5	47.5
(c) Tax savings on expenses			
Call premium	2.5		
Plus: Unamortised issue costs	1.5		
	4.0 × (0.35 tax)		1.40
Initial outlay [(1a) – (1b) – (1c)]			3.60

(2) (a) Annual net cash outflow on existing bonds

Interest expenses	11.00	
Less: Tax savings on interest expenses and amortisation of issue costs : 0.35 [11.0 + (1.5/5)]	3.96	7.04
(b) Annual net cash outflow on new bonds		
Interest expenses	10.00	
Less: Tax savings on interest expenses and amortisation of issue costs : 0.35 [11.0 + (2.5/5)]	3.67	6.33
Annual net cash savings [(2a) – (2b)]		0.71

(3) Present value interest factor of 5 year annuity, using a 13 per cent after tax [0.20 (1 – 0.35)] cost of new bonds = 3.517

SECTION 3 HYBRID FINANCING/INSTRUMENTS

As hybrid source of financing has characteristics of both straight debt and straight equity falling somewhere in between. The important hybrid instruments/sources of financing are: **(i)** preference shares/capital, **(ii)** convertible/exchangeable debentures/bonds, and **(iii)** warrants. These are covered in this Section. The focus is on their features and valuation.

Preference Share Capital

Preference capital is a unique type of long-term financing in that it combines some of the features of equity as well as debentures. As a *hybrid* security/form of financing, it is similar to debenture insofar as: **(i)** it carries a fixed/stated rate of dividend, **(ii)** it ranks higher than equity as a claimant to the income/assets, **(iii)** it normally does not have voting rights and **(iv)** it does not have a share in residual earnings/assets. It also partakes some of the attributes of equity capital, namely, **(i)** dividend on preference capital is paid out of divisible/after tax profit, that is, it is not

tax-deductible, **(ii)** payment of preference dividend depends on the discretion of management, that is, it is not an obligatory payment and non-payment does not force insolvency/liquidation and **(iii)** irredeemable type of preference shares have no fixed maturity date.

Features/Attributes The main attributes of preference shares/capital are discussed below.

Prior Claim on Income/Assets Preference capital has a prior claim/preference over equity capital both on the income and assets of the company. In other words, preference dividend must be paid in full before payment of any dividend on the equity capital and in the event of liquidation, the whole of preference capital must be paid before anything is paid to the equity capital. Thus, preference capital stands midway between debentures and equity as regards claim on income and assets of the company. It is also referred to as a *senior security*. Stated in terms of risk perspective, preference capital is less risky than ordinary shares but more risky than debentures.

Cumulative (dividend) preference shares are preference shares for which all unpaid dividends in arrears must be paid along with the current dividend prior to the payment of dividends to ordinary shareholders.

Cumulative Dividends Preference capital is cumulative in the sense that all unpaid dividends are carried forward and payable before any ordinary dividend is paid.

Redeemability Preference capital has a limited life/specified/fixed maturity after which it must be retired. However, there are no serious penalties for breach of redemption stipulation.

The preference shares have a stated call price which is above the original issue price and decreases over time. Like the call feature on bonds, the call feature on preference shares provides flexibility to the issuer company. Since the market price of **straight preference shares** tends to fluctuate with changes in interest rate, the value of the preference share call feature is determined by the same considerations as is the call feature for bonds. The refund of preference share is illustrated in Example 17.2.

Straight preference shares value/ price is the price at which a preference share would sell without the redemption/call feature.

Example 17.2

Delhi Manufacturing Company (DMC) is considering refunding its preference shares. They have a par value of Rs 100 and a stated dividend of 12 per cent. The call price is Rs 104 per share and 5,00,000 shares are outstanding. The DMC can issue new preference shares at 11 per cent. The new issue can be sold at par, the total par value being Rs 5 crore. Flotation costs would be Rs 13,60,000. Marginal tax rate is 35 per cent. A 90-day period of overlap is expected between the time the new preferences share are issued and the time the existing preference shares are retired. Should the DMC refund its preference shares?

Solution

Analysis of Preference Shares Refund Using Capital Budgeting Analysis

Net Cash Outflow:		
1	Cost of calling old preference shares (5,00,000 × Rs 104)	Rs 5,20,00,000
2	Net proceeds of new issues (Rs 5 crore – Rs 13,60,000)	4,86,40,000
3	Difference (1 – 2)	33,60,000
4	Preference share dividend on old preference shares during overlap (5,00,000 × Rs 104 × 3/12)	15,60,000

(*Contd.*)

(*Contd.*)

5	Net cash outlay (3 + 4)	49,20,000
6	Annual net cash outflow on old preference shares: Preference share dividend	60,00,000
7	Annual net cash outflow on new preference share: Preference share dividend	55,00,000
8	Difference (6 – 7)	5,00,000
9	Present value (Rs 5,00,000 ÷ 0.11[@])	45,45,454
10	Net benefit (Rs 45,45,454 – Rs 49,20,000)	(3,74,454)

[@]Discounted at 11 per cent for a perpetuity.

Decision The preference share issue should not be refunded as the benefit is negative.

Fixed Dividend Preference dividend is fixed and is expressed as a percentage of par value. Yet, it is not a legal obligation and failure to pay will not force bankruptcy. Preference capital is also called a *fixed income* security.

Convertibility Preference share capital may sometimes be convertible partly/fully into equity shares/debentures at a certain ratio during a specified period. A variant in India is cumulative convertible preference shares which combine the cumulative and convertibility features. It has, however, been a non-starter so far.

Conversion feature (convertibility) is a feature that allows preference shareholders to change each share in a stated number of ordinary shares.

Voting Rights Preference capital ordinarily does not carry voting rights. It is, however, entitled to vote on every resolution if **(i)** the preference dividend is in arrears for two years in respect of cumulative preference shares or **(ii)** the preference dividend has not been paid for a period of two/more consecutive preceding years or for an aggregate period of three/more years in the preceding six years ending with the expiry of the immediately preceding financial year.

Participation Features Preference capital may be participating, entitling **participation** in surplus profits, if any, that is, profits after payment of preference dividend and equity dividend at a certain specified rate. Similarly, it may be entitled to participate in the residual assets after the payment of their normal claim according to a specific formula in the event of liquidation of the company.

Participation is a feature that provides for dividend payments based on certain formula allowing preference shareholders to participate with ordinary shareholders in the receipt of dividends beyond a specified amount.

Evaluation Preference capital, as a source of long-term financing, has merits and demerits from the point of view of the investors/ shareholders as well as the company.

Merits The advantages for the investors are: **(i)** stable dividend, **(ii)** the exemption to corporate investors on preference income to the extent of dividend paid out. The issuing companies enjoy several advantages, namely, **(i)** no legal obligation to pay preference dividend and skipping of dividend without facing legal action/bankruptcy, **(ii)** redemption can be delayed without significant penalties, **(iii)** as a part of net worth, it improves the credit-worthiness/ borrowing capacity and, **(iv)** no dilution of control.

Demerits The shareholders suffer serious disadvantages such as (a) vulnerability to arbitrary managerial action as they cannot enforce their right to dividend/right to payment in case of rede-mption, and (b) modest dividend in the context of the associated risk. For the company, the preference capital is an expensive source of finance due to non-tax deductibility of preference dividend.

In brief, preference capital ***(i)*** *involves high cost;* ***(ii)*** *does not dilute control,* ***(iii)*** *has negligible risk and* ***(iv)****, puts no restraint on managerial freedom.* The shareholders receive modest returns and are vulnerable to arbitrary managerial actions. It is not a popular source of long-term finance in India.

Convertible Debentures/Bonds

Convertible debentures give the holders the right (option) to change them into a stated number of shares.

Conversion ratio is the ratio at which a convertible debenture can be exchanged for shares.

Conversion price is the per share price that is effectively paid for the shares as the result of exchange of a convertible debenture.

Conversion time is the period from the date of allotment after which the option can be exercised.

Features **Convertible debentures** give the debenture-holders the right (option) to convert them into equity shares on certain terms. The holders are entitled to a fixed income till the conversion option is exercised and would share the benefits associated with equity shares after the conversion. The operational features of convertible debentures in India at present are as follows.

All the details about conversion terms, namely, conversion ratio, conversion premium/price and conversion timing are specified in the offer document/prospectus. The companies can issue fully convertible debentures (FCDs) or partly convertible debentures (PCDs). The number of ordinary shares for each convertible debenture is the **conversion ratio**. The **conversion price** is the price paid for the ordinary share at the time of conversion. Thus, conversion ratio equals par value of convertible debentures divided by the conversion price. The **conversion time** refers to the period from the date of allotment of convertible debentures after which the option to convert can be exercised. If the conversion is to take place between 18-36 months, the holder will have the option to exercise his rights in full or part. A conversion period exceeding 36 months is not permitted without put and call options. The call options give the issuer the right to redeem the debentures/bonds prematurely on stated terms. The investor has the right to prematurely sell them back to the issuer on specified terms. In addition, compulsory credit rating is necessary for fully convertible debentures.

Valuation The convertible debentures presently in India can be of three types: **(i)** compulsorily convertible within 18 months, **(ii)** optionally convertible within 36 months and **(iii)** convertible after 36 months with *call* and *put* features. However, only the first two types are popular.

Compulsory Partly/Fully Convertible Debentures *Value* The holders of PCDs receive interest at a specified rate over the term of the debenture plus equity share(s) on part conversion and repayment of unconverted part of principal. Symbolically,

$$V_0 = \sum_{t=1}^{n} \frac{I_t}{(1+k_d)^t} + \frac{aP_i}{(1+k_e)^i} + \sum_{j=m} \frac{F_j}{(1+k_d)^j} \qquad \textbf{(17.2)}$$

where V_0 = Value of the convertible debenture at the time of issue,
I_t = Interest receivable at the end of period, t,
n = Term of debentures,
a = Equity shares on part conversion at the end of period, i,
P_i = Expected pre-equity share price at the end of period, i,
F_j = Instalment of principal payment at the end of period, j,
k_d = Required rate of return on debt, and
k_e = Required rate of return on equity.

Example 17.3

The Tata Iron & Steel Ltd (TISCO) had offered in June 1989, Rs 30 lakh partly convertible debentures of Rs 1,200 each at par. The conversion terms were: **(i)** compulsory conversion of Rs 600 par value into an equity share of Rs 100 at a premium of Rs 500 within six months of the date of allotment, that is, on February 1, 1990. **(ii)** 12 per cent per annum interest payable half-yearly and **(iii)** redemption of non-convertible portion of the debentures at the end of 8 years.

It had also simultaneously issued 32, 54, 167, 12 per cent FCDs of Rs 600 each at par on rights basis to the existing shareholders. Each debenture was fully convertible into one share of Rs 600, that is, Rs 100 par plus a premium of Rs 500 within six months from the date of allotment of debentures.

Assuming 8 and 10 per cent as the half-yearly required rate of return on debt and equity respectively, find the value of a TISCO convertible debenture at the time of issue.

Solution

$$\text{Value of the PCD} = \left[\frac{\text{Rs } 72}{1.08}\right] + \sum_{t=2}^{16}\left[\frac{36}{(1.08)^t}\right] + \left[\frac{1 \times \text{Rs } 1{,}200}{(1.10)^1}\right] + \left[\frac{\text{Rs } 600}{(1.08)^{16}}\right]$$

$$= \text{Rs } 352.03 + \text{Rs } 1{,}090.91 + \text{Rs } 175.20 = \text{Rs } 1{,}618.14$$

Cost The cost of partly convertible debenture (k_c) is given by Equation 17.3.

$$S_0 = \sum_{t=1}^{n}\frac{I_t(1-T)}{(1+k_c)^t} + \frac{aP_i b}{(1+k_c)^i} + \sum_{j=m}^{n}\frac{F_j}{(1+k_c)^j} \qquad \textbf{(17.3)}$$

S_0 = net subscription price of debentures at the time of issue,
I_t = interest payable at the end of period, t,
T = tax rate,
a = number of equity shares offered on the occurrence of conversion at the end of period, i,
P_i = per equity share price at the end of period i,
b = proportion of net realisable proportion of Pi on the equity share issues to the public,
F_j = principal repayment instalment at the end of period, j, and
k_c = cost of capital/discount rate.

For the TISCO convertible issue as detailed in Example 17.1, assuming further issue expenses, Rs 80, 35 per cent tax rate and 75 per cent as the net realisable proportion of equity shares issued to public, the cost of capital (convertible debenture) on a semi-annual basis is the discount rate by solving the following equation:

$$1{,}120 = \frac{72(1-0.35)}{(1+k_c)} + \sum_{t=2}^{16}\frac{36(1-0.35)}{(1+k_c)^t} + \frac{1 \times 1{,}200 \times 0.75}{(1+k_c)} + \frac{600}{(1+k_c)^{16}} \text{ or } k_c = 11.5 \text{ per cent}$$

Straight debenture value is the price at which a convertable bond would sell in the market without the conversion feature.

Optionally Convertible Debentures The value of a debenture depends upon three factors: **(i)** straight debenture value, **(ii)** conversion value and **(iii)** option value.

Straight Debenture Value (SDV) equals the discounted value of the receivable interest and principal repayment, if retained as a straight debt instrument. The discount factor would depend upon the credit rating of the debenture.

$$\text{Symbolically SDV} = \sum_{t=1}^{n} \frac{I}{(1+k_d)} + \frac{P}{(1+k_d)^{16}} = \sum_{t=1}^{8} \frac{12}{(1.16)^t} + \frac{100}{(1.16)^8} \qquad \textbf{(17.4)}$$

where,

Maturity period = 8 years, Discount factor = 0.16, Interest = 0.12 payable annually and Face value of debenture = Rs 100.

Conversion value is the value of a convertible debenture measured in terms of the market price of shares into which it can be converted.

Conversion Value (CV) if the holders opt for conversion, is equal to the share price multiplied by the conversion ratio, that is, the number of equity share offered for each debenture.

If the price of share is, Rs 50 and one debenture is convertible into 5 shares (conversion ratio = 5), the CV = Rs 250 (Rs 50 × 5).

The value of a convertible debenture cannot be less than the SDV and CV which, in a sense, represent its two floor values. In other words, the value of convertible debenture would be the higher of the SDV and CV.

Option Value (OV) The investors have an option, that is, they may not exercise the right/exercise the right at a time of their choosing and select the most profitable alternative. Thus, the option has value in the sense that the value of debenture will be higher than the floor values. Therefore, the value of the convertible debentures = Max [SDV, CV] + OV.

Evaluation Convertible debentures/bonds have emerged as fairly popular instruments of long-term finance in India in recent years. In the first place, they improve *cash flow matching* of firms. With the invariably lower initial interest burden, a growing/expanding firm would be in a better position to service the debt/debenture. Subsequently, when it would do well, it can afford the servicing of the financing instrument after conversion.

Secondly, they generate *financial synergy*. The assessment of risk characteristics of a new firm is costly and difficult. Convertible debentures provide a measure of protection against error of risk assessment. They have two components: straight debentures and call option. In case the firm turns out risky, the former will have a low value while the latter will have a high value and *vice versa* if the firm turns out to be relatively risk free. As a result, the required yield will not be very sensitive to default risk. In other words, firms with widely varying risks can issue convertible debentures on similar terms whereas the cost for straight debentures would be substantially different. Thus, convertible debentures offer a combination/financial synergy/risk synergy to companies to obtain capital on more favourable terms.

Finally, convertible debentures can mitigate agency problems associated with financing arising out of conflicting demand of equity-holders and debenture-holders/lenders. The focus of the latter is on minimising default risk whereas the former would like the firm to undertake

high risk projects. This conflict can be resolved by the issue of convertible debentures/bonds. The debenture-holders would not impose highly restrictive covenants to protect the interest and firms cane undertake profitable investment opportunities.

Warrants

A **warrant** entitles its holders to subscribe to the equity capital of a company during a specified period at a stated/particular/certain price. The holder acquires only the right (option) but he has no obligation to acquire the equity shares. Warrants are generally issued in conjunction with/tied to other instruments, for example, attached to **(i)** secured premium notes of TISCO in 1992, **(ii)** de-bentures of Deepak Fertilisers & Petrochemical Corporation Ltd in 1987, Ranbaxy and Reliance in 1995. They can be/are issued independently also.

Warrant is an instrument that gives its holder the right to purchase a certain number of shares at a specified price over a certain period of time.

Difference with Convertible Debentures Warrants are akin to convertible debentures to the extent that both give the holder the option/right to buy ordinary shares but there are differences between the two. While the debenture and conversion option are inseparable, a warrant can be detached. Similarly, conversion option is tied to the debenture but warrants can be offered independently also. Warrant are typically exercisable for cash.

Features The important features of warrants are as follows:

Exercise Price It is the price at which the holder of a warrant is entitled to acquire the ordinary shares of the firm. Generally, it is set higher than the market price of the shares at the time of the issue.

Exercise price is the price at which holders of warrant can purchase a specified number of shares.

Exercise Ratio It reflects the number of shares that can be acquired per warrant. Typically, the ratio is 1:1 which implies that one equity share can be purchased for each warrant.

Expiry Date It means the date after which the option to buy shares expires, that is, the life of the warrant. Usually, the life of warrants is 5-10 years although theoretically perpetual warrants can also be issued.

Types Warrants can be **(i)** detachable, and **(ii)** non-detachable. A detachable warrant can be sold separately in the sense that the holder can continue to retain the instrument to which the warrant was tied and at the same time sell it to take advantage of price increases. Separate sale independent of the instrument is not possible in case of non-detachable warrants. The detachable warrants are listed independently for stock exchange trading but non-detachable warrants are not.

Implied Price of an Attached Warrant The **implied price of a warrant** is the price effectively paid for each warrant attached to a bond. It can be computed using Equation 17.5

Implied price of all warrants = Price of bond with warrants attached – Straight bond/debenture value **(17.5)**

Implied price of a warrant is the price effectively paid for each warrant attached to a bond.

The straight debenture value can be computed using the method to value convertible debentures.

$$\text{The implied price of each warrant} = \frac{\text{Implied price of all warrants}}{\text{Number of warrants attached to each bond}}.$$

The procedure is illustrated in Example 17.4.

Example 17.4

Delhi Traders (TD) has issued 10 per cent, Rs 1,000 at par, 10-year bond paying annual interest and having 15 warrants attached for the purchase of its shares. The bonds were initially sold for their par value. Similar-risk straight bonds were selling to yield 12 per cent rate of return. Determine the implied price of an attached warrant.

Solution

Computation of Straight Bond Value

Years	*Payments (1)*	*PVIF (0.12) (2)*	*Total present value (3) [(1) × (2)]*
1 – 10	Rs 100	5.650	Rs 565
20	1,000	0.322	322
Straight bond value			887

Implied price of all warrants = Rs 1,000 – Rs 887 = Rs 113

Implied price of each warrant = Rs 113 ÷ 15 = Rs 7.53

The implication is that an investor is effectively paying Rs 7.53 each warrant while purchasing bonds with attached warrants for Rs 1,000.

The implied price of each warrant would be useful to estimate the true market value of each warrant if compared with the specific features of each warrant such as **(i)** number of shares that can be purchased and **(ii)** the specified exercise price. If the implied price is more than the esti-mated market value, the price of the bond with attached warrants may be too high. The bond may be quite attractive in case estimated market value exceeds the implied price.

Warrant premium is the difference between the actual market value and theoretical value of a warrant.

Value of Warrants Like convertible bonds, a warrant has a **(i)** market value and **(ii)** and a theoretical value. The diffe-rence between them is known as the warrant premium.

Theoretical Value of Warrant (TVW) The theoretical value of a warrant is the amount for which the warrant can be expected to be sold in the market. Symbolically, theoretical value of a warrant (TVW)

$$= (P_0 - E) \times N \qquad \textbf{(17.6)}$$

Where, P_0 = current market of a share, E = exercise price of the warrant, and N = number of shares obtainable with one warrant.

Example 17.5

Avon Manufacturers (AM) has outstanding warrants that are exercisable at Rs 100 per share. They entitle the holders to purchase 2 shares. The shares of AM are currently selling for Rs 112.50 per share. What is the theoretical value of the warrants of AM?

Solution

$$\text{Theoretical value of warrants} = (P_0 - E) \times N$$
$$= [(\text{Rs } 11.250 - \text{Rs } 100) \times 2] = \text{Rs } 25$$

The warrants should sell for Rs 25 in the market.

Market Value of Warrant (MVW) The MVW is generally more than the TVW. The two values are close only when **(i)** the TVW is very high or **(ii)** the warrant is near its expiration date. The max-imum excess of MVW over the TVW generally is when the market price of shares is close to the exercise price of the warrant per share. The amount of time until expiration also effects the MVW. In general, the closer the warrant is to its expiration date, the more likely the MVW would equal the TVW.

Warrant Premium The warrant premium is the amount by which MVW exceeds the TVW. It results from a combination of **(i)** positive investor expectations and **(ii)** the ability of the investor to obtain larger potential return/risk by trading in warrants instead of the underlying shares (i.e. leverage opportunities). Consider Example 17.6.

Example 17.6

An investor has Rs 24,300 to invest in Avon Manufacturers (AM). Its shares are currently selling for Rs 112.50 per share. The MVW is Rs 45 per warrant. Each warrant entitles the holder to purchase 2 shares of AM at Rs 100 per share. Compute the warrant premium for the investor.

Solution

The investor could invest his Rs 24,300 in either of two ways. Assuming no transaction costs, he could purchase (i) 216 shares of AM at Rs 112.50 per share or (ii) 540 warrants at Rs 45 per warrant. Assuming the market price of shares of AM increase by Rs 7.50 to Rs 120. If the investor sells his shares, his gain (Rs 7.50 × 216) = Rs 1,620. His total gain on the sale of warrants = Rs 8,100 [(Rs 7.50 × 2 shares) × 540 warrants. Thus, warrant premium = Rs 6,480 (Rs 18,100 − Rs 1,620).

If the market price of shares decline by Rs 7.50 per share, the loss to the investor would be: **(i)** on sale of shares, (Rs 7.50 × 216) = Rs 1,620; **(ii)** on sale of warrants [(Rs 7.50 × 2) × 540) = Rs 8,100. Thus, the use of warrants by the investor is more risky than trading the underlying shares of AM.

Options

Option is an instrument that provides its holders with an opportunity to purchase/sell a specified asset at a stated price on or before a set expiration date.

Option is a **derivative security** and derives its value from an underlying security/asset. An option is an instrument that provides to its holders an opportunity to purchase/sell a specified security/asset at a stated price on/before a specified expiration date. The focus in options is on options related to shares. They are traded in India on the NSE and the BSE as securities. There are three basic forms of options: **(i)** rights, **(ii)** warrants, and **(iii)** calls and puts. While rights are discussed in Chapter 18, warrants are described and illustrated in the preceding section. This section explains the call and put option As an investment vehicle, however, they are not a source of financing. The options are issued by investors and not by firms. They are used to earn a return or to protect/lock-in returns already earned on securities by fund managers. But they do stabilise market prices of shares by increasing trading activity in them. Unlike shareholders, buyers of option have no voting rights. The finance managers do not deal with them as a part of fund-raising activities.

Derivative security is a security that derives its value from an underlying asset that is often another security for example, equity shares.

Call option is an option to purchase a specified number of shares on or before a specified future date at a stated price.

Put option is an option to sell a given number of shares on or before a specified future date at a stated price.

Striking price is the price at which the holder of a call option can buy (or the holder of a put option can sell) a specified amount of shares at any time prior to the expiration date.

Call and Put Options A **call option** is an option to purchase a specified number of shares on/before a specified future date at stated/strike price. The **striking price** is the price at which the holder of the option can buy the shares at any time prior to the expiration date of the option. It is set at/near the prevailing market price of the shares at the time the option is issued.

A **put option** is an option to sell a given number of shares on/before a specified future date at a stated striking price. Like the call option, the striking price of the put is also set close to the market price of the underlying stock at the time of the deal.

Options transactions are done on futures and options (F&O) segment of the NSE/BSE. The call and put option contracts have one month, two months and three months expiry cycles. All co-ntracts expire on the last Thursday of every month. Thus, a January expiration contract would expire on the last Thursday of January. On the Friday following the last Thursday, a new contract having a 3-month expiry would be introduced for trading. Thus, at any point of time, three contracts would be available for trading with the first contract expiring on the last Thursday of that month. The contract size is 100 or multiples thereof, minimum value being Rs 2,00,000. The minimum tick size for a contract is Rs 0.05. A single move in option trading would imply a res-ultant gain/loss of Rs 10 (i.e. Rs 0.05 × 200 units) on an open position of 200 units.

Call options are purchased in the expectation that the market price of the underlying shares will rise while put options are purchased in the expectation that the share price would decline over the life of the option. The logic underlying the purchase of a put is exactly the opposite of that underlying the use of call options.

Example 17.7

Assume an investor pays Rs 2,500 for a 3-month call option on Reliance Industries (RI) at a striking price of Rs 500. By paying Rs 2,500, the investor is entitled to purchase 100 shares of RI at Rs 500 per share at any time during the next 3 months. It implies that the share price must rise to Rs 525, that is, Rs 5 per share (Rs 500 ÷ 100 shares) to cover the cost of option (Rs 2,500), assuming no transaction costs. Suppose the share prices of RI increase to Rs 600 during the 3-month period, the net profit to the investor would be Rs 7,500 [(100 shares × Rs 600) – (Rs 500 × 100 shares) – Rs 2,500]. Thus, option offers a very high return on in-vestment of Rs 2,500. However, if the share prices do not rise above Rs 500 per share, the investor would lose Rs 2,500 as he would not exercise the option. If the share prices increase between Rs 500 and Rs 525, he would exercise the option to reduce loss to below Rs 2,500.

Example 17.8

Assume an investor pays Rs 3,250 for a 3-month put option on Reliance Industries (RI) at a striking price of Rs 400. The investor is sure that he can sell 100 shares at Rs 400 at any time during the next 3 months by paying option money of Rs 3,250. Assuming no transaction cost, the price of shares of RI must decline by (Rs 3,250 ÷ 100 shares) Rs 32.5 to Rs 367.5 per share to cover the cost of option (Rs 3,250) of the investor. In case the share prices drop to Rs 300 during the 3-month period, the net profit to the investor would be [(100 shares × Rs 400) – (100 shares × Rs 300) – Rs 3,250] Rs 6,750. Thus, on an investment of Rs 3,250, option offer a very high potential profit (Rs 6,750) to the investor. If the share price fall to between Rs 367.5 and Rs 400 per share, the investor should exercise the option to reduce his loss below Rs 3,250. However, if the prices rise above Rs 400, the investor would not exercise his option and lose Rs 3,250.

SECTION 4 LEASE FINANCING

This section explains the theoretical framework of leasing in terms of concept and classification of leasing and its significance and limitation. It also discusses the financial evaluation of leasing from the viewpoint of both the lessee, and the lessor.

Leasing is the process by which a firm can obtain the use of a certain fixed asset for which it must make a series of contractual, periodic, tax-deductible payments (lease rentals).

Concept and Classification

Concept The conceptual aspect of leasing include its meaning and essential elements.

Meaning Conceptually, a **lease** may be defined as a contractual arrangement/transaction in which a party owning an asset/equipment (lessor) provides the asset for use to another/transfer the right to use the equipment to the user (lessee), over a certain/for an agreed period of time, for consideration in form of/in return for periodic payment (rentals), with or without a further pay-ment (premium). At the end of the period of contract (lease period), the asset/equipment reverts back to the lessor unless there is a provision for the renewal of the contract. Leasing essentially involves the *divorce of ownership from the economic use of an asset/equipment*. It is a device of financing the cost of an asset. It is a contract in which a specific equipment required by the lessee is purchased by the lessor (financier) from a manufacturer/vendor selected by the lessee. The lessee has possession and use of the asset on payment of the specified rentals over a predetermined period of time. Lease financing is, thus, a device of financing/money lending. The position of a lessee is akin to that of a person who owns the same asset with borrowed money. The real function of a lessor is not renting of the asset but lending of funds/finance/credit, and lease financing is, in effect, a contract of lending money. The lessor (financier) is the nominal owner of the asset as the possession and economic use of the equipment vests in the lessee. The lessee is free to choose the asset according to his requirements and the lessor does not take recourse to the equipment as long as the rentals are regularly paid to him.

Essential Elements The essential elements of leasing are the following:

Lessor is the owner of the assets that are being leased.

Lessee is the receiver of the services of the assets under a lease contract.

Parties to the Contract There are essentially two parties to a contract of lease financing, namely, the owner and the user, called the **lessor** and the **lessee**, respectively. Lessors as well as lessees, may be individuals, partnerships, joint stock companies, corporations or financial institutions. Sometimes there may be joint lessors or joint lessees, particularly where the properties or the amount of finance involved is enormous. Besides, there may be a lease broker who acts as an intermediary in arranging these deals. Merchant banking divisions of certain foreign banks in India, subsidiaries of some Indian banks and even some private merchant bankers are acting as lease brokers. They charge a certain percentage of fees for their services, ranging between 0.50 to 1 per cent. Besides, a lease contract may involve a *lease financier*, who refinances the lessor, either by providing term loans or by subscribing to equity or lending under a specific refinance scheme.

Assets The assets, property or equipment to be leased is the subject matter of a lease financing contract. The asset may be an automobile, plant and machinery, equipment, land and building, factory, a running business, an aircraft and so on. The asset must, however, be of the lessee's choice, suitable for his business needs.

Ownership Separated from User The essence of a lease financing contract is that during the lease tenure, ownership of the asset vests with the lessor and its use is allowed to the lessee. On the expiry of the lease tenure, the asset reverts to the lessor.

Term of Lease The term of lease is the period for which the agreement of lease remains in operation. Every lease should have a definite period, otherwise it will be legally inoperative. The lease period may sometimes stretch over the entire economic life of the asset (i.e. financial lease) or a period shorter than the useful life of the asset (i.e. operating lease). The lease may be perpetual, that is, with an option at the end of lease period to renew the lease for the further specific period.

Lease Rentals The consideration that the lessee pays to the lessor for the lease transaction is the lease rental. Lease rentals are structured so as to compensate (in the form of depreciation) the lessor for the investment made in the asset, and for expenses like interest on the investment, repairs and servicing charges borne by the lessor over the lease period.

Modes of Terminating the Lease At the end of the lease period, the lease is terminated and various courses are possible, namely,

(a) The lease is renewed on a prepetual basis or for a definite period, or
(b) The asset reverts to the lessor, or
(c) The asset reverts to the lessor and the lessor sells it to a third party or
(d) The lessor sells the asset to the lessee.

The parties may mutually agree to and choose any of the aforesaid alternatives at the beginning of a lease term.

Risk is the possibility of loss arising on account of under-utilisation or technological obsolescence of the equipment.

Finance (capital) leases are for terms that approach the economic life of the asset; the total payments over the term of the lease are greater than the lessor's initial cost of the leased asset.

Classification An equipment lease transaction can differ on the basis of **(i)** the extent to which the risks and rewards of ownership are transferred, **(ii)** number of parties to the transactions, **(iii)** domiciles of the equipment manufacturer, the lessor, the lessee and so on. **Risk,** with reference to leasing, refers to the possibility of loss arising on account of under-utilisation or technological obsolescence of the equipment, while **reward** means the incremental net cash flows that are generated from the usage of the equipment over its economic life and the realisation of the anticipated residual value on expiry of the economic life. On the basis of these variations, leasing can be classified into the following types: **(a)** Finance lease and Operating lease, **(b)** Sales and lease back and Direct lease, **(c)** Single investor lease and Leveraged lease and **(d)** Domestic lease and International lease.

Finance Lease and Operating Lease: **Finance Lease** According to the International Accounting Standards (IAS-17), in a **finance lease** the lessor transfers, substantially all the risks and rewards incidental to the ownership of the asset to the lessee, whether or not the title is eventually transferred. It involves payment of rentals over an obligatory non-cancellable lease

period, sufficient in total to amortise the capital outlay of the lessor and leave some profit. In such leases, the lessor is only a financier and is usually not interested in the assets. It is for this reason that such leases are also called **full payout leases**, as they enable a lessor to recover his investment in the lease and derive a profit. Types of assets included under such leases are ships, aircrafts, railway wagons, lands, buildings, heavy machinery, diesel generating sets and so on.

The IAS-17 stipulates that a substantial part of the ownership related risks and rewards in leasing are transferred when:

(i) The ownership of the equipment is transferred to the lessee by the end of the lease firm; or

(ii) The lessee has the option to purchase the asset at a price that is expected to be sufficiently lower than the fair market value at the date the option becomes exercisable and if at the inception of the lease it is reasonably certain that the option will be exercised; or

(iii) The lease term is for a major part of the useful life of the asset; the title may not eventually be transferred. The useful life of an asset refers to the minimum of its (i) *physical* life in terms of the period for which it can perform its function, (ii) *technological life* in the sense of the period in which it does not become obsolete and (iii) *product market life* defined as the period during which its product enjoys a satisfactory market. The criterion/cut-off point is that if the lease term exceeds 75 per cent of the useful life of the equipment, it is a finance lease or

(iv) The present value of the minimum lease payment is greater than, or substantially equal to, the fair market value of the asset at the inception of the lease (cost of equipment). The title may or may not be eventually transferred. The cut-off point is that the present value exceeds 90 per cent of the fair market value of the equipment. The present value should be computed by using a discount rate equal to the rate implicit in the lease, in the case of the lessor, and the incremental rate in the case of the lessee.

According to the Accounting Standard (AS)-19: Lease issued by the Institute of Chartered Acco-untants of India (ICAI) in January 2001, the classification of leases is based on the extent to which risks and rewards incidental to ownership of a leased asset lie with the lessor or the lessee. Risks include the possibility of losses from the idle capacity or technological obsolescence and of variation in return due to changing economic conditions. Rewards may be represented by the expectation of profitable operation over the economic life of the asset and of gain from appreciation in the value of the residual value that has been realised.

A lease is classified as a *finance lease* if it transfers substantially all the risk and rewards inc-idental to ownership. Title may or may not eventually be transferred. A lease is classified as an *operating lease* if it does not transfer substantially all the risks and rewards incidental to ownership. Since the transaction between a lessor and lessee is based on a lease agreement common to both parties, it is appropriate to use consistent definitions. The application of these definitions to the differing circumstances of the two parties may sometimes result in the same lease being classified differently by the lessor and the lessee. Whether a lease is a finance lease or an operating lease depends on the substance of the transaction rather than its form. Examples of situations that would normally lead to a lease being classified as a finance lease are:

(a) The lease transfers ownership of the asset to the lessee by the end of the lease term;

(b) The lessee has the option to purchase the asset at a price that is expected to be suf-

ficiently lower than the fair value at the date the option becomes exercisable such that, at the inception of the lease, it is reasonably certain that the option will be exercised;

(c) The lease term is for the major part of the economic life of the asset even if title is not transferred;

(d) At the inception of the lease, the present value of the minimum lease payments amounts to greater than or at least substantially equal to the fair value of the leased asset and

(e) The leased asset is of a specialised nature such that only the lessee can use it without major modifications being made.

Indicators of situations, that individually or in combination, could also lead to a lease being classified as a finance lease are:

(a) If the lessee can cancel the lease, the lessor's losses associated with the cancellation are borne by the lessee;

(b) Gains or losses from the fluctuation in the fair value of the residual fall to the lessee (for example in the form of a rent rebate equalling most of the sales proceeds at the end of the lease) and

(c) The lessee can continue the lease for a secondary period at a rent that is substantially lower than market rent.

Lease classification is made at the inception of the lease. If at any time, the lessee and the lessor agree to change the provisions of the lease, other than by renewing the lease, in a manner that would have resulted in a different classification of the lease under the criteria outlined above, or had the changed terms been in effect at the inception of the lease, the revised agreement is considered as a new agreement over its revised term. Changes in estimates (for example, changes in estimate of the economic life or of the residual value of the leased asset) or changes in cir-cumstances (for example, default by the lessee), however, do not give rise to a new classification of a lease for accounting purposes. A finance lease is structured to include the following features:

(i) The lessee (the intending buyer) selects the equipment according to his requirements, from its manufacturer or distributor;

(ii) The lessee negotiates and settles with the manufacturer or distributor, the price, the delivery schedule, installation, terms of warranties, maintenance and payment and so on;

(iii) The lessor purchases the equipment either directly from the manufacturer or distributor (un-der straight foward leasing) or from the lessee, after the equipment is delivered (under sale and lease back);

(iv) The lessor then leases out the equipment to the lessee. The lessor retains the ownership while lessee is allowed to use the equipment;

(v) A finance lease may provide a right or option, to the lessee, to purchase the equipment at a future date. However, this practice is rarely found in India;

(iv) The lease period spreads over the expected economic life of the asset. The lease is originally for a non-cancellable period called the **primary lease period** during which the lessor seeks to recover his investment alongwith some profit. During this period, cancellation of lease is possible only at a very heavy cost. Thereafter, the lease is subject to renewal for the **secondary lease period**, during which rentals are substantially low;

(vii) The lessee is entitled to exclusive and peaceful use of the equipment during the entire lease period, provided he pays the rentals and complies with the terms of the lease;

(viii) As the equipment is chosen by the lessee, the responsibility of its suitability, the risk of

obsolescence and the liability for repair, maintenance and insurance of the equipment rest with the lessee.

Operating Lease According to the IAS-17 and AS-19, an **operating lease** is one that is not a finance lease. In a operating lease, the lessor does not transfer all the risks and rewards incidental to the ownership of the asset and the cost of the asset is not fully amortised during the primary lease period. The lessor provides services (other than the financing of the purchase price) attached to the leased asset, such as maintenance, repair and technical advice. For this reason, an operating lease is also called a '**service lease**'. The lease rental is an operating lease that includes a cost for the 'services' provided, and the lessor does not depend on a single lessee for recovery of his cost. An operating lease is generally used for computers, office equipment, automobiles, trucks, other equipment, telephones and so on. An operating lease is structured with the following features:

Operating leases are for a time shorter than the economic life of the asset; generally the payments over the term of the lease are less than the lessor's initial cost of the leased asset.

(i) An operating lease is generally for a period significantly shorter than the economic life of the leased asset. In some cases, it may be even on an hourly, daily, weekly or monthly basis. The lease is cancellable by either party during the lease period.

(ii) Since the lease periods are shorter than the expected life of the asset, the lease rentals are not sufficient to totally amortise the cost of assets.

(iii) The lessor does not rely on the single lessee for recovery of his investment. His ultimate interest is in the residual value of the asset. The lessor bears the risk of obsolescence, since the lessee is free to cancel the lease at any time;

(iv) Operating leases normally include a maintenance clause requiring the lessor to maintain the leased asset and provide services such as insurance, support staff, fuel and so on.

Examples of operating leases are:

(a) Providing mobile cranes with operators;

(b) Chartering of aircrafts and ships, including the provision of crew, fuel and support services;

(c) Hiring of computers with operators;

(d) Hiring a taxi for a particular travel, which includes service of the driver, provision for main-tenance, fuel, immediate repairs and so on.

Sale-lease back is a lease under which the lessee sells an asset for cash to a prospective lessor and then leases back the same asset, making fixed periodic payments for its use.

***Sale and Lease Back and Direct Lease*: Sale and Lease Back** In a way, it is an indirect form of leasing. The owner of an equipment/asset sells it to a leasing company (lessor) that leases it back to the owner (lessee). A classic example of this type of leasing is the sale and lease back of safe deposit vaults by banks. Banks sell the vaults in their custody to a leasing company at a market price substantially higher than the book value and the leasing company in turn offers these lockers on a long-term basis to the bank. The bank sub-leases the lockers to its customers. The *lease back* arrangement in sale and lease back type of leasing can be in the form of a finance lease or an operating lease.

Direct lease is a lease under which a lessor owns/acquires the assets that are leased to a given lessee.

Direct Lease In direct lease, the lessee, and the owner of the equipment are two different en-tities. A direct lease can be of two types: bipartite and tripartite lease.

Bipartite Lease There are two parties in this lease transaction, namely, **(i)** the equipment supplier-cum-lessor and **(ii)** the lessee. Such a lease is typically structured as an operating lease with inbuilt facilities like upgradation of the equipment (Upgrade lease), addition to the original equipment configuration and so on. The lessor maintains the asset and, if necessary, replaces it with a similar equipment that is in working condition (Swap lease).

Tripartite Lease Such a lease involves three different parties in the lease agreement: **(i)** the equipment supplier, **(ii)** the lessor and **(iii)** the lessee. An innovative variant of the tripartite lease is the sales-aid lease under which the equipment supplier arranges for lease finance in various forms by:

- Providing reference about the customer to the leasing company;
- Negotiating the terms of the lease with the customer and completing all the formalities on behalf of the leasing company;
- Writing the lease on his own account and discounting the lease receivables with the designated leasing company. The effect is that the leasing company owns the equipment and obtains an assignment of the lease rental.

The sales-aid lease is usually with recourse to the supplier in the event of default by the lessee, either in the form of an offer from the supplier to buy back the equipment from the lessor or a guarantee on behalf of the lessee.

Significance and Limitations

The advantages and limitations of leasing are summarised below.

***Advantage of Leasing:* To the Lessee** Lease financing has the following advantages to the lessee:

Financing of Capital Goods Lease financing enables the lessee to avail of finance for huge investments in land, building, plant, machinery, heavy equipment, and so on, upto 100 per cent, without requiring any immediate down payment. Thus, the lessee is able to commence his bus-iness virtually without making any initial investment (of course, he may have to invest a minimal sum for working capital needs).

Additional Sources of Finance Leasing facilitates the acquisition of equipment, plant and machinery without the necessary capital outlay and, thus, has a competitive advantage of mobilising the scarce financial resources of a business enterprise. It enhances the working capital position and makes available the internal accruals for business operations.

Less Costly Leasing as a method of financing is less costly than other alternatives available.

Ownership Preserved Leasing provides finance without diluting the ownership or control of the promoters. As against it, other modes of long-term finance—for example, equity—normally dilute the ownership of the promoters.

Avoids Conditionalities Lease finance is considered preferable to institutional finance as in the former case there are no strings attached. Lease financing is beneficial since it is free from restrictive covenants and conditionalities, such as representation on the board, conversion of debt into equity, payment of dividend and so on, which usually accompany institutional finance and term loans from banks.

Flexibility in Structuring of Rentals Lease rentals can be structured to accommodate the cash flow situation of the lessee, making the payment of rentals convenient to him. Lease rentals

are so tailor-made that the lessee is able to pay the rentals from the funds generated from operations. The lease period is also chosen so as to suit the lessee's capacity to pay rentals and considering the operating life-span of the asset.

This flexibility is not available in the debt servicing pattern of a conventional loan; institutional borrowings, for instance. Such loans have to be typically repaid over a specified number of instalments resulting in heavy debt servicing burden in the earlier years of a project, whereas the project may actually generate substantial cash flows in later years.

Simplicity A lease finance arrangement is simple to negotiate and free from cumbersome procedures with faster and simple documentation. As against it, institutional finance and term loans require compliance of covenants, formalities and a bulk of documentation, causing procedural delays.

Tax Benefits By suitable structuring of lease rentals, a lot of tax advantage can be derived. If the lessee is in a tax paying position, the rental may be increased to lower his taxable income. The cost of the asset is thus amortised more rapidly than in a case where the asset is owned by the lessee, since depreciation is allowable at the prescribed rates. If the lessor is in a tax paying position, the rentals may be lowered to pass on a part of the tax benefit to the lessee. Thus, rentals can be suitably adjusted for postponement of taxes.

Obsolescence Risk is Averted In a lease arrangement, the lessor, being the owner, bears the risk of obsolescence and the lessee is always free to replace the asset with the latest technology.

To the Lessor A lessor has the following advantages:

Full Security The lessor's interest is fully secured since he is always the owner of the leased asset and can take repossession of the asset if the lessee defaults. As against it, realising an asset secured against a loan is more difficult and cumbersome.

Tax Benefit The greatest advantage of the lessor is the tax relief by way of depreciation. If the lessor is in a high tax bracket, he can lease out assets with high depreciation rates and, thus, reduce his tax liability substantially. Besides, the rentals can be suitably structured to pass on some tax benefit to the assessee.

High Profitability The leasing business is highly profitable since the rate of return is more than what the lessor pays on his borrowings. Also, the rate of return is more than in case of lending finance directly.

Trading on Equity The lessor usually carrys out his operations with greater financial leverage. That is, he has a very low equity capital and use a substantial amount of borrowed funds and deposits. Thus, the ultimate return on equity is very high.

High Growth Potential The leasing industry has a high growth potential. Lease financing enables the lessees to acquire equipment and machinery even during a period of depression, since they do not have to invest any capital. Leasing, thus, maintains the economic growth even during a recessionary period.

Limitations of Leasing Lease financing suffers from certain limitations too:

Restrictions on Use of Equipment A lease arrangement may impose certain restrictions on use of the equipment, acquiring compulsory insurance and so on. Besides, the lessee is not free to make additions or alterations to the leased asset to suit his requirement.

Limitations of Financial Lease A financial lease may entail a higher payout obligation if the equipment is not found to be useful and the lessee opts for premature termination of the lease agreement. Besides, the lessee is not entitled to the protection of express or implied warranties since he is not the owner of the asset.

Loss of Residual Value The lessee never becomes the owner of the leased asset. Thus, he is deprived of the residual value of the asset and is not even entitled to any improvements done by the lessee or caused by inflation or otherwise, such as appreciation in value of leasehold land.

Consequence of Default If the lessee defaults in complying with any terms and conditions of the lease contract, the lessor may terminate the lease and take over the possession of the leased asset. In case of finance lease, the lessee may be required to pay for damages and accelerated rental payments.

Understatement of Lessee's Asset Since the leased asset does not form part of the lessee's assets, there is an effective understatement of his assets, which may sometimes lead to gross underestimation of the lessee. However, there is now an accounting practice to disclose the leased assets by way of a footnote to the balance sheet.

Double Sales Tax With the amendment of the sales tax law of various States, a lease financing transaction may be charged sales tax twice—once when the lessor purchases the equipment and again when it is leased to the lessee.

Summary

- Equity/ordinary share capital represents ownership capital and its owners—equity-holders/ordinary shareholders—share the reward and risk associated with the ownership of corporate enterprises.
- The ordinary shares have some special features in terms of the rights and claims of their holders: **(i)** residual claim to income, **(ii)** residual claim on assets, **(iii)** right to control, **(iv)** pre-emptive rights and **(v)** limited liability.
- A shareholder can **(1)** exercise **(2)** sell in the market and **(3)** renounce/forfeit his pre-emptive right partially/completely. He does not gain/lose from rights issues. However, he would suffer dilution of financial interest if he does not exercise his pre-emptive right.
- Ordinary share capital is a high-risk-high-reward source of finance for corporates. The shareholders share the risk, return and control associated with ownership of companies.
- Term loans/term/project finance are negotiated loans between the borrower and the lenders with a maturity of up to 10 years. They are employed to finance acquisition of fixed assets and working capital margin. All term loans are secured. The asset security stipulations are reinforced by a number of positive/affirmative and negative covenants. While negative covenants are **(i)** asset-related, **(ii)** liability-related, **(iii)** cashflow-related and **(iv)** control-related, the positive covenants relate to maintenance of **(i)** networth, **(ii)** level of working capital, **(iii)** creation of redemption funds and so on. The term loans have to be amortised according to the predetermined schedule. They carry low cost and involve high risk. They have no adverse effect on control but there is a moderate restraint on managerial freedom.
- Debentures represent creditorship securities and debenture-holders are long-term creditors of the company. As long-term source of finance, debentures have some contrasting features compared to equity shares. When they are sold to public, a trustee is appointed through a trust deed/indenture to ensure that the borrower fulfills all contractual obligations. The coupon rate of interest is

legally enforceable as well as tax-deductible. A typical non-convertible debenture (NCD) has a maturity of 7-10 years. The redemption of debentures can be accomplished in either of the two ways: **(i)** debenture redemption reserves (sinking fund) and **(ii)** call and put (buy-back) provision. They are generally secured by way of an equitable mortgage. The convertible debentures can be partly/fully converted into equity shares. All debentures must be rated by a rating agency. As long-term source of funds, debentures **(i)** have low cost, **(ii)** do not dilute control, **(iii)** involve high risk and **(iv)** put some restraint on managerial freedom. To improve the attractiveness of debentures, a wide range of innovative instruments have emerged such as deep discount bonds, secured premium notes and floating rate bonds.

- A hybrid source of financing partakes some features of equity shares and some features of debt instruments. The important hybrid instruments are: preference shares, convertible debentures/bonds, warrants and options. The issue procedure for these instruments is similar to the raising of equity shares.
- The main attributes of preference shares **(i)** prior claim on income/assets, **(ii)** cumulative dividends, **(iii)** redeemability, **(iv)** voting rights when preference dividend is in arrears, **(v)** participation in surplus profits/excess assets and so on.
- Preference capital involves high cost, does not dilute owners control of the company, has negligible risk and puts no restraint on managerial freedom. The shareholders receive modest return and are vulnerable to arbitrary managerial actions. It is not a popular source of long-term finance in India.
- Convertible debentures (CDs) confer on their holders the right/option to convert them partly (PCDs)/fully (FCDs) into equity at a later date on specified terms/conditions.
- Their operational features, namely, conversion ratio, conversion premium and conversion timing are specified in advance. The call option gives the issuer the right to redeem to redeem the debentures prematurely. The investor has also the right to prematurely sell them back.
- The value of a compulsorily/fully/partly CDs,

$$V_0 = \sum_{t=1}^{n} \frac{I_t}{(1+K_d)^t} + \frac{aP_i}{(1+K_e)^j} + \sum_{j=m} \frac{F_j}{(1+K_d)^j}$$

- The cost of a PCDs, $Kc = S_0 = \sum_{t=1}^{n} \frac{I_t\,(1-T)}{(1+K_c)^t} + \frac{aP_i\,b}{(1+K_c)^l} + \sum_{j=m}^{n} \frac{F_j}{(1+K_c)^j}$
- The value of optionally CDs depends upon three factors: **(i)** straight debenture value, **(ii)** conversion value and **(iii)** option value.
- The reasons for the popularity of CDs are **(1)** cashflow matching of firms, **(2)** financial synergy and **(3)** mitigation of agency problem.
- A warrant entitles its holders to subscribe to the equity capital of a company during a specified period at a stated/particular/striking price. It differs from a CD in that while debenture and conversion option are irreparable a warrant can be detached. Unlike CDs, warrants can be offered independently also.
- The important features of warrants are **(1)** exercise, price, **(2)** exercise ratio and **(3)** expiry date.
- The implied price of an attached warrant is the price effectively paid for each warrant. It is equal to price of bond with attached warrants less straight debenture/warrant value.
- A warrant has a market value and a theoretical value. The difference between them is the warrant premium.
- The theoretical value of a warrant = $(P_0 - E) \times N$.
- A warrant premium results from a combination of (1) positive investor expectation and (ii) the ability of the investor to obtain larger potential return by trading in warrants instead of under-lying shares.

- Options are not a source of financing like shares, debentures, CDs and warrants. But they do stabilise prices of shares by increasing trading activity in them.
- An option is an instrument that provides to its holders an opportunity to purchase (call option)/ sell (put option) specified security/asset at a stated striking price on/before a specified expiration date.
- Lease is a contractual arrangement under which the owner of an asset (lessor) allows the use of the asset to the user (lessee) for an agreed period of time (lease period) in consideration for the periodic payment (lease rent). At the end of the lease period, the asset reverts back to the owner, unless there is a provision for the renewal of the lease contract.
- Leasing can be classified into four categories: **(i)** sale and lease back, and direct lease, **(ii)** single investor lease and leveraged lease, **(iii)** domestic lease and international lease, and **(iv)** finance lease and operating lease.
- Sale and lease back arrangement provides for the sale of the asset by the present owner to the lessor who leases it back to the owner (lessee). In contrast, the lessee and the owner of the asset are two different entities in direct lease.
- While a single investor lease involves two parties to the lease transaction, namely, the single investor/the leasing company (lessor) and the lessee, a leveraged lease involves, besides the lessor and the lessee, a third party (a lender) who ordinarily funds a major share of the asset's price.
- In domestic lease, all parties of a lease transaction are domiciled in the same country. In international lease, parties to the lease transactions are domiciled in different countries.
- Short-term or cancelable leases (at the option of the lessee) are referred to as operating leases while long-term or non-cancellable leases are known as financial leases. The distinction between the two is based on the extent to which the risks and rewards of ownership are trans-ferred from the lessor to the lessee. If a lease transfers a substantial part of the risks and rewards, it is called finance lease; otherwise, it is operating lease.
- The cut-off criterion in India is that if the lease term exceeds 75 per cent of the useful life of the asset or if the present value of the minimum lease rentals exceeds 90 per cent of the fair market value (cost) of the equipment at the inception of the lease, the lease is classified as finance lease.
- Lease financing provides several advantages to the lessee such as hundred per cent financing, tax-based benefits, convenience, better utilisation of own funds, expeditious use of asset, flexibility in lease rentals, and so on.
- Full security, tax benefit, high profitability, trading on equity and so on are the major advantages to the lessor.

Practical Problems

P.17.1 Delhi Manufacturers (DMs) intend to raise Rs 40,00,000 of equity capital through a rights offering. It currently has 10,00,000 shares outstanding which have been most recently selling/trading for Rs 50 and Rs 56 per share. In consultation with the SEBI Caps, the DM has set the subscription price for the rights at Rs 50 per share.

Required:

1. Determine the number of new shares DM should sell to raise the desired amount of capital.
2. Ascertain the number of shares each right would entitle a holder of one share to purchase. How many additional shares can an investor who holds 10,000 shares of DM purchase?
3. Compute the theoretical value of a right if the current market price is Rs 54 **with rights** and the subscription price is Rs 50 for both shares selling **with rights** and shares selling **ex-rights** (i.e. the value of the right is not included in the market price of shares).

Solution

1. Number of new shares = $\frac{\text{Rs } 40,00,000 \text{ (to be raised)}}{\text{Rs } 50 \text{ (subscription price)}}$ = 80,000 shares

2. Number of shares per right = $\frac{80,000 \text{ (new shares)}}{10,00,000 \text{ (shares outstanding)}}$ = 0.08 share

Additional shares = 0.08 shares/right × 1 right/share × 10,000 shares = 800 shares

3. Theoretical value of right with rights, Rw:

$$R_w = \frac{M_w - S}{N + 1}$$

Where

R_w = theoretical value of a right when the share is selling with rights/cum rights
M_w = market value of the stock with rights/cum-rights
S = subscription price of the shares
N = number of rights needed to purchase one share

Substituting the values,

$$R_w = \frac{\text{Rs } 54 - \text{Rs } 50}{12.5^{@} + 1} = \frac{\text{Rs } 4}{13.5} = \text{Rs } 0.296$$

$^{@}N = \frac{1}{0.08}$ = 12.5 rights need to purchase one new share.

Theoretical value of right ex-right,

$$R_e = \frac{M_e - S}{N}$$

Where

R_e = theoretical value of a right when the share is trading **ex-right**
M_e = market value of shares trading ex-right.

Substituting the values,

$$\frac{\text{Rs } 53.704^{@@} - \text{Rs } 50}{12.5} = \frac{\text{Rs } 3.704}{12.5} = \text{Rs } 0.296$$

$^{@@}M_w - R_w$ = Rs 54 − Rs 0.296 = Rs 53.704

The investor would receive at least the theoretical value of Rs 0.296 per right × 10,000 shares = Rs 2,960. If he expects the price of DMs shares to increase during the period the rights are exercisable, the market value of the rights would be more than their theoretical value.

P.17.2 The Standard Company (SC) wishes to raise Rs 30,00,000 through a rights offering. It has currently 2,40,000 shares outstanding which have been most recently trading between Rs 106 and Rs 116 per share. On the advice of the SBI Caps, the SC has set the subscription price for the rights at Rs 100 per share on the assumption that they will be fully subscribed.

Required:

(a) How many new shares should SC sell to raise the desired amount?
(b) How many shares will each right entitle a holder of one share to purchase?
(c) What is the theoretical value of a right if the current market price is Rs 109 with rights and the subscription price is Rs 100? Answer for both shares selling with rights and shares selling ex-rights?

Solution

(a) Number of new shares = $\frac{\text{Rs } 30,00,000}{\text{Rs } 100}$ = 30,000 shares

(b) Number of shares per right = $\frac{2,40,000}{30,000}$ = 8, that is, 8 shares rights are needed to purchase a new share at Rs 100. Each right entitles its holder to purchase one- right of a share.

(c) Value of a right, with rights

$$= \frac{\text{Rs } 109 - \text{Rs } 100}{8 + 1} = \text{Re } 1$$

Value of a right, ex-right

$$= \frac{\text{Rs } 108^{@} - \text{Rs } 100}{8} = \text{Re } 1$$

[@] Rs 109 – Re 1

Thus, the theoretical value of the right when the share is selling with rights or ex-rights is the same.

Review Questions

17.1 What are the different types of equity/ordinary share capital?
17.2 Discuss briefly the features of equity shares as sources of long-term finance.
17.3 Explain the pre-emptive rights of the ordinary shareholders. How is their financial interest affected by the issue of rights shares?
17.4 Discuss the merits and demerits of equity shares.
17.5 What is rights? Compare the value of rights when a share is selling with/cum-rights with its ex-rights value.
17.6 Describe briefly the features of term loans.
17.7 What are the main attributes of debentures/bonds? What are their merits and demerits?
17.8 Explain the innovative debt instruments.
17.9 What is bond refunding? How can bond refunding decision be analysed?
17.10 What is preference share? What are the key merits and demerits of preference shares as a source of long-term finance?
17.11 What is call/redeemable feature in a preference share?
17.12 What is conversion feature? What is conversion ratio?
17.13 Define straight bond value, conversion value, market value and market premium.
17.14 Discuss the method for valuation of compulsorily convertible debentures into shares.
17.15 How is the value of an optionally convertible debenture affected by the straight debenture value, conversion value and option value.
17.16 What is a warrant. How does it differ from convertible securities?
17.17 What is implied price of a warrant? How is it estimated?
17.18 Explain briefly (1) theoretical value of a warrant, (2) its market value, and (3) warrant premium.
17.19 What is equipment lease? What are its essential elements?
17.20 List the criteria for classifying lease as financial lease.

17.21 Distinguish between (i) financial and operating lease, (ii) single investor lease and leverage lease.

17.22 Discuss the advantages of leasing. What are its limitations?

Examination Questions

Theory Questions

17.1 Explain briefly—Equity shareholders provide risk capital. *(Delhi University, 2003)*

17.2 "Equity shareholders provide risk capital." Comment. *(Delhi University, 2004)*

17.3 Explain the concept of 'Inter-corporate Deposits'. *(Mumbai University, November 2001)*

17.4 What is meant by 'letter of credit'? *(Mumbai University, November 2002)*

17.5 (a) Explain the merits and drawbacks of debentures as a source of long-term finance of a firm.
(b) Examine the various approaches relating to financing of current assets.
(c) Enumerate the various sources of finance for long-term capital and short-term capital for a firm in India.
(d) What are the advantages of debentures as a source of finance?
(e) What are the advantages and limitations of term loans from commercial banks?
(f) Explain the features of various types of preference shares.
(Bharatiyar University, April 2001)

17.6 (a) Explain the features of preference shares as a source of finance.
(b) What are the merits and drawbacks of equity capital as a source of finance for a firm?
(Bharatiyar University, November 2001)

17.7 (a) Explain the important sources of internal finance.
(b) Explain the different sources of short-term finance. *(Bharatiyar University, April 2003)*

17.8 Choose the best answer

1. Preferred stock is
   (a) a ownership security. (b) a creditorship security.
   (c) a short-term source of finance. (d) all the above.
2. Preference shares have
   (a) a preferential right as to dividend.
   (b) a preferential right as to repayment of capital in the event of company's winding up
   (c) a preferential right as to dividend and preferential right as to repayment of capital in the event of company's winding up
   (d) none of the above.
3. Trade credit is a source of
   (a) long-term finance. (b) medium-term finance
   (c) short-term finance. (d) none of the above.
4. As a source of finance,
   (a) debt is costlier than equity. (b) debt is costlier than preference shares.
   (c) debt is cheaper than equity. (d) none of the above.
   (Bharatiyar University, April 2001)
5. Trade credit is a source of
   (a) long-term finance. (b) an appropriation of profit.
   (c) a form of short term financing. (d) none of the above.
6. Equity shares have
   (a) a preferential right as to dividend.
   (b) a preferential right to repayment of capital in the event of company's winding up.
   (c) no preferential right.
   (d) none of the above. *(Bharatiyar University, April 2003)*

17.9 What are the merits and demerits of preference share capital finance? *(Periyar University, Oct./Nov. 2004)*

17.10 What is meant by right issue of shares? (*Madras University, 2010*)

17.11 Write short notes on equity shares and preference shares. (*Gujarat University, 2010*)

17.12 Write short note on convertible securities. (*Calcutta University, 2009*)

17.13 Write short note on preference share capital. (*Mumbai University, 2009*)

17.14 Explain in detail different types of preference shares. (*Pune University, 2009*)

17.15 What do you understand by owned capital and borrowed capital? Also explain different types of debentures in detail. (*Pune University, 2009*)

17.16 Explain in detail the merits and limitations of raising funds by (a) equity shares and (b) debentures. (*Pune University, 2009*)

17.17 Briefly discuss the various sources of long term finance which a company can use and describe specific benefits of each such source. (*Punjab University, 2009*)

17.18 Discuss long-term sources of company finance. (*Punjab University, 2008 and 2006*)

17.19 Write the merits and demerits of convertible debentures. (*Calcutta University, 2007*)

17.20 What are different sources of external financing? Also explain advantages and limitations of these sources. (*Pune University*)

17.21 Distinguish between the following: Shares and debentures; and Equity shares and preferences. (*Pune University*)

PART 6

DIVIDEND DECISION

The third major decision area in financial management relates to dividend policy. The dividend policy decision involves the choice between distributing the profits belonging to the shareholders and their retention by the firm. The selection would be influenced by the effect on the objective of financial management of maximising shareholders' wealth. Given the net value maximisation objective, there are two aspects of dividend decision which are relevant. The first of these, that is, whether the dividend policy has a bearing on the value of the firm is discussed in Chapter 18. The focus of the chapter is primarily on the different theories/approaches to analyse the relationship between dividend policy and valuation of the firm. Chapter 19 describes the determinants of an appropriate dividend policy for a firm in the light of its facts and circumstances.

Chapter

18

Dividend and Valuation

Learning Objectives

1. Describe the residual theory of dividends and Modigliani-Miller (MM) approach to the irrelevance of dividends and evaluate its validity
2. Explain and illustrate the two models—Walter's and Gordon's—according to which dividends are relevant and affect the value of the firm

INTRODUCTION

Dividend refers to the corporate net profits distributed among shareholders.

Dividends refer to that portion of a firm's net earnings which are paid out to the shareholders. Our focus here is on dividends paid to the ordinary shareholders because holders of preference shares are entitled to a stipulated rate of dividend. Moreover, the discussion is relevant to widely-held public limited companies as the dividend issue does not pose a major problem for closely-held private limited companies. Since dividends are distributed out of the profits, the alternative to the payment of dividends is the retention of earnings/profits. The retained earnings constitute an easily accessible important source of financing the investment requirements of firms. There is, thus, a type of inverse relationship between retained earnings and cash dividends: *larger retentions, lesser dividends; smaller retentions, larger dividends*. Thus, the alternative uses of the net earnings–dividends and retained earnings–are competitive and conflicting.

A major decision of financial management is the dividend decision in the sense that the firm has to choose between distributing the profits to the shareholders and ploughing them back into the business. The choice would obviously hinge on the effect of the decision on the maximisation of shareholders' wealth. Given the objective of financial management of maximising present values, the firm should be guided by the consideration as to which alternative use is consistent with the goal of wealth maximisation. That is, the firm would be well advised to use the net profits for paying dividends to the shareholders if the payment will lead to the maximisation of wealth of the owners. If not, the firm should rather retain them

to finance investment programmes. The relationship between dividends and value of the firm should, therefore, be the decision criterion.

There are, however, conflicting opinions regarding the impact of dividends on the valuation of a firm. According to one school of thought, dividends are irrelevant so that the amount of dividends paid has no effect on the valuation of a firm. On the other hand, certain theories consider the dividend decision as relevant to the value of the firm measured in terms of the market price of the shares.

The purpose of the present Chapter is, therefore, to present a critical analysis of some important theories representing these two schools of thought with a view to illustrating the relationship between dividend policy and the valuation of a firm. While Section 1 focuses on the theory(ies) relating to the irrelevance of dividends to valuation, the theories which support the relevance hypothesis are examined in Section 2. The main points are summarised in the last Section.

SECTION I IRRELEVANCE OF DIVIDENDS

General

The crux of the argument supporting the irrelevance of dividends to valuation is that the dividend policy of a firm is a part of its financing decision. As a part of the financing decision, *the dividend policy of the firm is a* **residual decision** *and dividends are a passive residual.*[1]

Residual dividend policy pays out only excess cash.

If dividend policy is strictly a financing decision, whether dividends are paid out of profits, or earnings are retained, will depend upon the available investment opportunities. It implies that when a firm has sufficient investment opportunities, it will retain the earnings to finance them. Conversely, if acceptable investment opportunities are inadequate, the implication is that the earnings would be distributed to the shareholders. The test of adequate acceptable investment opportunities is the relationship between the return on the investments (r) and the cost of capital (k). As long as r exceeds k, a firm has acceptable investment opportunities. In other words, if a firm can earn a return (r) higher than its cost of capital (k),it will retain the earnings to finance investment projects. If the retained earnings fall short of the total funds required it will raise external funds–both equity and debt–to make up the shortfall. If, however, the retained earnings exceed the requirements of funds to finance acceptable investment opportunities, the excess earnings would be distributed to the shareholders in the form of cash dividends. The amount of dividend will fluctuate from year to year depending upon the availability of acceptable investment opportunities. With abundant opportunities, the dividend payout ratio (D/P ratio, that is, the ratio of dividends to net earnings) would be zero. When there are no profitable opportunities, the D/P ratio will be 100. For situations between these extremes, the D/P ratio will range between zero and 100.

That dividends are irrelevant, or are a passive residual, is based on the assumption that the investors are indifferent between dividends and capital gains. So long as the firm is able to earn more than the equity-capitalisation rate (k_e), the investors would be content with the firm retaining the earnings. In contrast, if the return is less than the k_e, investors would prefer to receive the earnings (i.e. dividends).

Residual Theory of Dividends

The residual theory of dividend suggests that the dividends paid by a corporate should be viewed as a **residual**, that is, the amount left over after meeting the financing requirements of all the acceptable/profitable investment projects.[2] Dividends can be paid only out of the left over amount after financing all new projects with positive NPV. If no amount is left, there will be no dividend payments. The treatment of dividend payments as a **passive residual** implies that the dividend decisions are **irrelevant**. The approach is guided not only by the availability of acceptable investment opportunities but is also concerned with maintaining a desirable/target capital structure in deciding about cash dividends. They are guided by the following four steps. The firm should:

(1) Prepare a **capital budget** indicating the capital expenditure requirements of all profitable investment projects.

(2) Determine the total equity funds requirements, based on the desired debt-equity ratio, to support the capital expenditure requirements in **Step 1**.

(3) Use the retained earnings to the maximum extent possible to meet the funds requirements as per **Step 2**. The retained earnings are preferred to the external equity as the cost of the former is lower than that of the later due to flotation costs. This is consistent with the pecking order hypothesis and signalling theory (**explained in Chapter 19**). New equity shares should be issued only when retained earnings are insufficient to meet the funds requirements of the target capital structure.

(4) Pays cash dividend only if its available earnings are more than the required amount of equity funds in terms of the desired debt-equity ratio.

*E*xample 18.1

Assume a company has **(i)** earnings after taxes (available for equityholders) of Rs 90 lakh, **(ii)** target debt-equity ratio of 1:2 and **(iii)** new profitable investment projects in the size range of (1) Rs 150 lakh, (2) Rs 120 lakh, (3) Rs 75 lakh, (4) Rs 60 lakh, and (5) zero. Determine the amount of dividends paid and dividend payout ratio at varying levels of investment requirements as per residual theory of dividends.

*S*olution

Table 18.1: Dividends Paid and Dividend Payout Ratio Under Residual Theory of Dividends (Amount in Rs lakh).

Particulars	*Profitable investment projects*				
	Case 1	*2*	*3*	*4*	*5*
Capital budget	Rs 150	Rs 120	Rs 75	Rs 60	Nil
Earnings after taxes	90	90	90	90	90
Target D/E ratio	1:2	1:2	1:2	1:2	1:2
Equity funds needed	100	80	50	40	Nil
Retained earnings available to pay dividends/ Dividends paid	Nil	10	40	50	90
Dividend payout ratio (%)	Nil	11.11	44.44	66.67	100

Table 18.1 indicates that the amount of dividends fluctuates depending on the availability of profitable investment projects and earnings. With abundant investment opportunities (**Case 1**), the dividend payout (D/P) ratio is zero. In contrast, in **Case 5** when there are no profitable investment projects, the D/P ratio is 100. For cases between these two extremes (i.e., **Cases 2 to 4**), the D/P ratio varies in the range of 11.11 to 66.67. Thus, it has inverse relationship with the available investment opportunities.

Given the fact that the earnings of a firm as well as the profitable investment projects available to it are likely to vary from year to year, strict adherence to the residual theory of dividends would result in wide fluctuations in dividend payments/unstable dividend policy from period to period. Since investors prefer stable dividend policies (**explained in Chapter 19)**, the residual dividend policy by a firm would require higher required rate of return for equity investors (k_e). This, in turn, would result in lower share prices. A firm should, therefore, attempt to stabilise its dividend over time. To achieve the same, it is suggested that[3] firms should **(1)** Estimate their net earnings after taxes and investment opportunities, on an average, for the next 5 years or so, **(2)** Use this forecasted information to determine the residual model payout ratio and absolute sum of dividend payments during the planning period and **(3)** Set a target dividend payout ratio on the basis of the projected data. A firm may smooth out actual dividend payments by saving some funds in surplus years, in anticipation of deficit/lean years.[4] Surplus funds may be invested temporarily in marketable securities.

The residual theory of dividends provides an explanation why mature industries (with few opportunities for growth) have large dividend payments and high dividend-payment ratios. They succeed in attracting equity investors–clientele who prefer high dividends. In contrast, high growth industries with abundant investment opportunities, prefer low dividend payments and attract equity investors who prefer capital gains.

In brief, the residual theory of dividends indicates that the dividend policy of a firm is a residual decision and not an active decision variable and dividends are a passive residual/irrelevant decision. Its strength is that a firm should retain its earnings when it has profitable investment projects and favours its distribution when such opportunities are lacking. The rationale is sound as firms would retain profits when they can earn higher than what the equityholders can and prefer distribution of earnings when shareholders can earn higher. Its adverse impact in terms of unstable dividends can be minimised by creating **dividend equalisation reserve**. Funds can be transferred to this reserve in surplus years to be used in lean years.

Modigliani and Miller (MM) Hypothesis

Dividend irrelevance implies that the value of a firm is unaffected by the distribution of dividends and is determined solely by the earning power and risk of its assets.

The most comprehensive argument in support of the **irrelevance of dividends** is provided by the MM hypothesis.[5] Modigliani and Miller maintain that dividend policy has no effect on the share price of the firm and is, therefore, of no consequence. What matters, according to them, is the investment policy through which the firm can increase its earnings and thereby the value of the firm. Given the investment decision of the firm, the dividend decision—splitting the earnings into packages of retentions and dividends—is a matter of detail and does not matter. 'Under conditions of perfect capital markets, rational investors, absence of tax discrimination between dividend income and capital appreciation, given the firm's investment policy, its dividend policy may have no influence on the market price of shares.'[6]

Assumptions The MM hypothesis of irrelevance of dividends is based on the following critical assumptions:

1. Perfect capital markets in which all investors are rational. Information is available to all free of cost, there are no transactions costs; securities are infinitely divisible; no investor is large enough to influence the market price of securities; there are no flotation costs.
2. There are no taxes. Alternatively, there are no differences in tax rates applicable to capital gains and dividends.

3. A firm has a given investment policy which does not change. The operational implication of this assumption is that financing of new investments out of retained earnings will not change the business risk complexion of the firm and, therefore, there would be no change in the required rate of return.
4. There is a perfect certainty by every investor as to future investments and profits of the firm. In other words, investors are able to forecast future prices and dividends with certainty. This assumption is dropped by MM later.

Crux of the Argument The crux of the MM position on the irrelevance of dividend is the arbitrage argument. The arbitrage process involves a switching and balancing operation. In other words, arbitrage refers to entering simultaneously into two transactions which exactly balance or completely offset each other. The two transactions here are the acts of paying out dividends and raising external funds—either through the sale of new shares or raising additional loans—to finance investment programmes. Assume that a firm has some investment opportunity. Given its investment decision, the firm has two alternatives: **(i)** it can retain its earnings to finance the investment programme; **(ii)** or distribute the earnings to the shareholders as dividend and raise an equal amount externally through the sale of new shares/bonds for the purpose. If the firm selects the second alternative, **arbitrage process** is involved, in that payment of dividends is associated with raising funds through other means of financing. The effect of dividend payment on shareholders' wealth will be exactly offset by the effect of raising additional share capital.

Arbitrage implies the distribution of earnings to shareholders and raising an equal amount externally; the effect of dividend payment would be offset by the effect of raising additional funds.

When dividends are paid to the shareholders, the market price of the shares will decrease. What is gained by the investors as a result of increased dividends will be neutralised completely by the reduction in the market value of the shares. The terminal value before and after the payment of dividend would be identical. The investors, according to Modigliani and Miller, would, therefore, be indifferent between dividend and retention of earnings. Since the shareholders are indifferent, the wealth would not be affected by current and future dividend decisions of the firm. It would depend entirely upon the expected future earnings of the firm.

There would be no difference to the validity of the MM premise, if external funds are raised in the form of debt instead of equity capital. This is because of their indifference between debt and equity with respect to leverage. The cost of capital is independent of leverage and the real cost of debt is the same as the real cost of equity.[7]

That investors are indifferent between dividend and retained earnings implies that the dividend decision is irrelevant. The arbitrage process[8] also implies that the total market value plus current dividends of two firms which are alike in all respects except D/P ratio will be identical. The individual shareholder can retain and invest his own earnings as well as the firm would.

With dividends being irrelevant, a firm's cost of capital would be independent of its D/P ratio.

Finally, the arbitrage process will ensure that under conditions of *uncertainty* also the dividend policy would be irrelevant. When two firms are similar in respect of business risk, prospective future earnings and investment policies, the market price of their shares must be the same. This, MM argue, is becuase of the rational behaviour of investors who are assumed

to prefer more wealth to less wealth. Differences in current and future dividend policies cannot affect the market value of the two firms as the present value of prospective dividends plus terminal value is the same.

Proof MM provide the proof in support of their argument in the following manner.

Step 1 The market price of a share in the beginning of the period is equal to the present value of dividends paid at the end of the period plus the market price of share at the end of the period. Symbolically,

$$P_0 = \frac{1}{(1 + k_e)} (D_1 + P_1) \quad \textbf{(18.1)}$$

where P_0 = Prevailing market price of a share,
k_e = Cost of equity capital,
D_1 = Dividend to be received at the end of period 1, and
P_1 = Market price of a share at the end of period 1

Step 2 Assuming no external financing, the total capitalised value of the firm would be simply the number of shares (n) times the price of each share (P_0). Thus,

$$nP_0 = \frac{1}{(1 + k_e)} (nD_1 + nP_1) \quad \textbf{(18.2)}$$

Step 3 If the firm's internal sources of financing its investment opportunities fall short of the funds required, and Δn is the number of new shares issued at the end of year 1 at price of P_1, Eq. 18.2 can be written as:

$$nP_0 = \frac{1}{(1 + k_e)} [(nD_1 + (n + \Delta n) P_1 - \Delta nP_1)] \quad \textbf{(18.3)}$$

where n = Number of shares outstanding at the beginning of the period, and
Δn = Change in the number of shares outstanding during the period/Additional shares issued

Equation 18.3 implies that the total value of the firm is the capitalised value of the dividends to be received during the period plus the value of the number of shares outstanding at the end of the period, considering new shares, less the value of the new shares. Thus, in effect, Eq. 18.3 is equivalent to Eq. 18.2.

Step 4 If the firm were to finance all investment proposals, the total amount raised through new shares issued would be given in Eq. 18.4.

$$\Delta nP_1 = I - (E - nD_1)$$

or

$$\Delta nP_1 = I - E + nD_1 \quad \textbf{(18.4)}$$

where ΔnP_1 = Amount obtained from the sale of new shares of finance capital budget,
I = Total amount/requirement of capital budget,
E = Earnings of the firm during the period,
nD_1 = Total dividends paid, and
$(E - nD_1)$ = Retained earnings

According to Equation 18.4, whatever investment needs (I) are not financed by retained earnings, must be financed through the sale of additional equity shares.

Step 5 If we substitute Eq. 18.4 into Eq. 18.3 we derive Eq. 18.5.

$$nP_0 = \frac{1}{(1 + k_e)}[nD_1 + (n + \Delta n)\ P_1 - (I - E + nD_1)] \qquad \textbf{(18.5)}$$

Solving Eq. 18.5 we have

$$nP_0 = \frac{nD_1 + (n + \Delta n)\ P_1 - I + E - nD_1}{(1 + k_e)}$$

There is a positive nD_1 and negative nD_1. Therefore, nD_1 cancels. We then have

$$nP_0 = \frac{(n + \Delta n)\ P_1 - I + E}{(1 + k_e)} \qquad \textbf{(18.6)}$$

Step 6 Conclusion Since dividends (D) are not found in Eq. 18.6, Modigliani and Miller conclude that dividends do not count and that dividend policy has no effect on the share price.

MM's approach to irrelevance of dividend to valuation is illustrated in Example 18.2.

Example 18.2

A company belongs to a risk class for which the approximate capitalisation rate is 10 per cent. It currently has outstanding 25,000 shares selling at Rs 100 each. The firm is contemplating the declaration of a dividend of Rs 5 per share at the end of the current financial year. It expects to have a net income of Rs 2,50,000 and has a proposal for making new investments of Rs 5,00,000. Show that under the MM assumptions, the payment of dividend does not affect the value of the firm.

Solution

(a) Value of the Firm, When Dividends Are Paid:

(i) Price per share at the end of year 1,

$$P_0 = \frac{1}{(1 + k_e)}(D_1 + P_1)$$

$$\text{Rs } 100 = \frac{1}{1.10}\ (\text{Rs } 5 + P_1)$$

$$110 = \text{Rs } 5 + P_1 \quad \text{or} \quad 105 = P_1$$

(ii) Amount required to be raised from the issue of new shares,

$$\Delta nP_1 = I - (E - nD_1)$$

$$= \text{Rs } 5{,}00{,}000 - (\text{Rs } 2{,}50{,}000 - \text{Rs } 1{,}25{,}000) = \text{Rs } 3{,}75{,}000$$

(iii) Number of additional shares to be issued,

$$\Delta n = \text{Rs } 3{,}75{,}000/\text{Rs } 105 = 75{,}000/21 \text{ shares}$$

(iv) Value of the firm,

$$nP_0 = \frac{(n + \Delta n)\ P_1 - I + E}{(1 + k_e)} = \left[\frac{25{,}000}{1} + \frac{75{,}000}{21}\right](\text{Rs } 105) - \text{Rs } 5{,}00{,}000$$

$$+ \text{Rs } 2{,}50{,}000 = \text{Rs } 27{,}50{,}000/1.1 = \text{Rs } 25{,}00{,}000$$

(b) Value of the Firm When Dividends Are Not Paid:

(i) Price per share at the end of the year 1, Rs $100 = \frac{P_1}{1.10}$, or $110 = P_1$

(ii) Amount required to be raised from the issue of new shares,

$$\Delta nP_1 = (\text{Rs } 5{,}00{,}000 - \text{Rs } 2{,}50{,}000) = \text{Rs } 2{,}50{,}000$$

(iii) Number of additional shares to be issued,

$$= \text{Rs } 2{,}50{,}000/\text{Rs } 110 = 25{,}000/11 \text{ shares}$$

(iv) Value of the firm

$$= \left[\frac{25{,}000}{1} + \frac{25{,}000}{11}\right] (\text{Rs } 110) - \text{Rs } 5{,}00{,}000 + \text{Rs } 2{,}50{,}000$$

$$= \text{Rs } 27{,}50{,}000/1.1 = \text{Rs } 25{,}00{,}000$$

Thus, whether dividends are paid or not, value of the firm remains the same.

The above example clearly demonstrates that the shareholders are indifferent between the retention of profits and the payment of dividend.

A Critique Modigliani and Miller argue that the dividend decision of the firm is irrelevant in the sense that the value of the firm is independent of it. The crux of their argument is that the investors are indifferent between dividend and retention of earnings. This is mainly because of the balancing nature of internal financing (retained earnings) and external financing (raising of funds externally) consequent upon distribution of earnings to finance investment programmes. Whether the MM hypothesis provides a satisfactory framework for the theoretical relationship between dividend decision and valuation will depend, in the ultimate analysis, on whether external and internal financing really balance each other. This, in turn, depends upon the critical assumptions stipulated by them. Their conclusions, it may be noted, under the restrictive assumptions, are logically consistent and intuitively appealing. But these assumptions are unrealistic and untenable in practice. As a result, the conclusion that dividend payments and other methods of financing exactly offset each other and, hence, the irrelevance of dividends, is not a practical proposition; it is merely of theoretical relevance. The validity of the MM Approach is open to question on two counts: **(i)** Imperfection of capital market, and **(ii)** Resolution of uncertainty.

Market Imperfection Modigliani and Miller assume that capital markets are perfect. This implies that there are no taxes; flotation costs do not exist and there is absence of transaction costs. These assumptions are untenable in actual situations.

Tax Effect An assumption of the MM hypothesis is that there are no taxes. It implies that *retention of earnings* (internal financing) and *payment of dividends* (external financing) are, from the viewpoint of tax treatment, on an equal footing. The investors would find both forms of financing equally desirable. The tax liability of the investors, broadly speaking, is of two types: **(i)** tax on dividend income, and **(ii)** capital gains. While the first type of tax is payable by the investors when the firm pays dividends, the capital gains tax is related to retention of earnings. From an operational viewpoint, capital gains tax is **(i)** lower than the tax on dividend income and **(ii)** it becomes payable only when shares are actually sold, that is, it is a deferred tax till the actual sale of the shares. The types of taxes, corresponding to the two forms of financing, are different, although the MM position would imply otherwise. The different tax treatment of dividend and capital gains means that with the retention of earnings the shareholders' tax liability would be lower or there would be tax saving for the shareholders. For example, a firm pays dividends to the shareholders out of the retained earnings. To finance its investment programmes, it issues rights shares. The shareholders would have to pay tax on the dividend income at rates appropriate to their income bracket.

Subsequently, they would purchase the shares of the firm. Clearly, the tax could have been avoided if, instead of paying dividend, the earnings were retained. If, however, the investors required funds, they could sell a part of their investments, in which case they will pay tax (capital gains) at a lower rate. There is a definite advantage to the investors owing to the **tax differential** in dividend and capital gains tax and, therefore, they can be expected to prefer retention of earnings. This line of reasoning is also supported by empirical evidence. Elton and Gruber[9] have shown that investors in high income brackets have a preference for capital gains over dividends while those in low tax brackets favour dividends. In a more comprehensive study Brittain[10] found an inverse relationship between dividend payout ratios and the differential between tax rates on dividend income and capital gains. That is, *rising tax rates tend to depress dividends*. In brief, the investors are not, from the viewpoint of taxes, indifferent between dividends and retained earnings. The MM assumption is, therefore, untenable.

Tax differentials are the different rates of taxes applicable to dividend and capital gains.

With effect from financial year 2003-4, dividend income from Indian corporate firms, and mutual funds is exempt from tax. However, the companies paying dividend are required to pay dividend distribution tax. Currently the effective dividend distribution tax rate in India works out at 16.61 per cent.

Flotation Costs Another assumption of a perfect capital market underlying the MM hypothesis is dividend irrelevance is the absence of flotation costs. The term '**flotation cost**' refers to the cost involved in raising capital from the market, for instance, underwriting commission, brokerage and other expenses. The presence of flotation costs affects the balancing nature of internal (retained earnings) and external (dividend payments) financing. The MM position, it may be recalled, argues that given the investment decision of the firm, external funds would have to be raised, equal to the amount of dividend, through the sale of new shares to finance the investment programme. The two methods of financing are not perfect substitutes because of flotation costs. The introduction of such costs implies that the net proceeds from the sale of new shares would be less than the face value of the shares, depending upon their size.[11] It means that to be able to make use of external funds, equivalent to the dividend payments, the firm would have to sell shares for an amount in excess of retained earnings. In other words, external financing through sale of shares would be costlier than internal financing *via* retained earnings. The smaller the size of the issue, the greater is the percentage flotation cost.[12] To illustrate, suppose the cost of flotation is 10 per cent and the retained earnings are Rs 900. In case dividends are paid, the firm will have to sell shares worth Rs 1,000 to raise funds equivalent to the retained earnings. That external financing is costlier is another way of saying that firms would prefer to retain earnings rather than pay dividends and then raise funds externally.

Flotation cost is the cost involved in raising capital from the market.

Transaction and Inconvenience Costs Yet another assumption which is open to question is that there are no transaction costs in the capital market. Transaction costs refer to costs associated with the sale of securities by the shareholder-investors. The *no-transaction costs postulate* implies that if dividends are not paid (or earnings are retained),the investors desirous of current income to meet consumption needs can sell a part of their holdings without incurring any cost, like brokerage and so on. This is obviously an

Transaction costs are costs involved in selling securities by the shareholders.

unrealistic assumption. Since the sale of securities involves cost, to get current income equivalent to the dividend, if paid, the investors would have to sell securities in excess of the income that they will receive. Apart from the transaction cost, the sale of securities, as an alternative to current income, is inconvenient to the investors. Moreover, uncertainty is associated with the sale of securities. For all these reasons, an investor cannot be expected, as MM assume, to be indifferent between dividend and retained earnings. The investors interested in current income would certainly prefer dividend payment to ploughing back of profits by the firm.

Institutional Restrictions The dividend alternative is also supported by legal restrictions as to the type of ordinary shares in which certain investors can invest. For instance, the life insurance companies are permitted in terms of section 27-A (1) of the Insurance Act, 1938, to invest in only such equity shares on which a dividend of not less than 4 per cent including bonus has been paid for 7 years or for atleast 7 out of 8 or 9 years immediately preceding. To be eligible for institutional investment, the companies should pay dividends. These legal impedients, therefore, favour dividends to retention of earnings. A variation of the legal requirement to pay dividends is to be found in the case of mutual funds. They are required in terms of the stipulations governing their operations, to distribute at least 90 per cent of its net income to investors. The point is that the eligible securities for investment by the mutual funds are assumed to be those that are on the dividend-paying list.

To conclude the discussion of market imperfections, there are four factors which dilute the indifference of investors between dividends and retained earnings. Of these, flotation costs seem to favour retention of earnings. On the other hand, the desire for current income and, the related transaction and inconvenience costs, legal restrictions as applicable to the eligible securities for institutional investment and tax exemption of dividend income imply a preference for payment of dividends. In sum, therefore, market imperfections imply that investors would like the company to retain earnings to finance investment programmes. The dividend policy is not irrelevant.

Resolution of Uncertainty Apart from the market imperfection, the validity of the MM hypothesis, insofar as it argues that dividends are irrelevant, is questionable under conditions of uncertainty. MM hold, it would be recalled, that dividend policy is as irrelevant under conditions of uncertainty as it is when perfect certainty is assumed. The MM hypothesis is, however, not tenable as investors cannot be indifferent between dividend and retained earnings under conditions of uncertainty. This can be illustrated with reference to four aspects: **(i)** near vs distant dividend; **(ii)** informational content of dividends; **(iii)** preference for current income; and **(iv)** sale of stock at uncertain price/underpricing.

Near Vs Distant Dividend One aspect of the uncertainty situation is the payment of dividend now or at a later date. If the earnings are used to pay dividends to the investors, they get 'immediate' or 'near' dividend. If, however, the net earnings are retained, the shareholders would be entitled to receive a return after some time in the form of an increase in the price of shares (capital gains) or bonus shares and so on. The dividends may, then, be referred to as 'distant' or 'future' dividends. The crux of the problem is: are the investors indifferent between immediate and future dividends? Or would they prefer one over the other? According to Gordon[13], investors are not indifferent; rather, they would prefer near dividend to distant dividend. The payment of dividend is uncertain; how much dividend and when it would be paid by the firm to the investors cannot be precisely forecast. The longer the distance in future dividend payment, the higher is the uncertainty to the shareholders. The uncertainty increases

the risk of the investors. The payment of dividend is not associated with any such uncertainty. In other words, payment of immediate dividend resolves uncertainty. The argument that near dividend implies resolution of uncertainty is referred to as the **'bird-in-hand' argument**. This argument is developed in some detail in the later part of this chapter. In brief, since current dividends are less risky than future/distant dividends, shareholders would favour dividends to retained earnings.

Bird-in-hand argument is the belief that current dividend payments reduce uncertainty and result in higher value of shares of a firm.

Informational Content of Dividends Another aspect of uncertainty, very closely related to the first (i.e. resolution of uncertainty or the 'bird-in-hand' argument) is the '**informational content of dividend**' argument. According to the latter argument, as the name suggests, the dividend contains some information vital to the investors. The payment of dividend conveys to the shareholders information relating to the profitability of the firm. If, for instance, a firm has been following a stable dividend policy in the sense of, say, Rs 4 per share dividend, an increase in the amount to, say, Rs 5 per share will signify that the firm expects its profitability to improve in future or *vice-versa*. The dividend policy is likely to cause a change in the market price of the shares. The significance of this aspect of current dividend payments is expressed by Ezra Solomon in these words:[14]

Informational content is the information provided by dividends of a firm with respect to future earnings which causes owners to bid up or down the price of shares.

> In an uncertain world in which verbal statements can be ignored or misinterpreted, dividend action does provide a clear-cut means of 'making a statement' that speaks louder than a thousand words.

Modigliani and Miller also concede the possibility of the effect of the informational content. But they still maintain that dividend policy is irrelevant as dividends do not determine the market price of shares. They contend that value is determined by the investment decision of the firm. All that the informational content of dividends implies is that dividends reflect the profitability of the firm. They cannot by themselves determine the market price of shares. The basic factor, therefore, is not dividend, but, **expectation of future profitability**.

The informational content argument finds support in some empirical evidence.[15] It is contended that changes in dividends convey more significant information than what earnings announcements do. Further, the market reacts to dividend changes—prices rise in response to a significant increase in dividends and fall when there is a significant decrease or omission.

Preference for Current Income The third aspect of the uncertainty question relating to dividends is based on the desire of investors for current income to meet consumption requirements. The MM hypothesis of irrelevance of dividends implies that in case dividends are not paid, investors who prefer current income can sell a part of their holdings in the firm for the purpose. But, under uncertainty conditions, the two alternatives are not on the same footing because **(i)** the prices of shares fluctuate so that the selling price is uncertain, and **(ii)** selling a small fraction of holdings periodically is inconvenient. That selling shares to obtain income, as an alternative to dividend, involves uncertain price and inconvenience, implies that investors are likely to prefer current dividend. The MM proposition would, therefore, not be valid because investors are not indifferent.

Underpricing Finally, the MM hypothesis would also not be valid when conditions are assumed to be uncertain because of the prices at which the firms can sell shares to raise

funds to finance investment programmes consequent upon the distribution of earnings to the shareholders. The irrelevance argument would be valid provided the firm is able to sell shares to replace dividends at the current price. Since the shares would have to be offered to new investors, the firm can sell the shares only at a price below the prevailing price. It is rightly contended by Lintner[16] that the equilibrium price of shares will decline as the firm sells additional stock to replace dividends. The **underpricing** or sale of shares at prices lower than the current market price implies that the firm will have to sell more shares to replace the dividend. The firm would be better off by retaining the profits as opposed to paying dividends.

Underpricing implies sale of shares at prices lower than the current market price.

Under conditions of uncertainty, therefore, the MM doctrine of irrelevance does not hold good.

To recapitulate the preceding discussion, in the context of market imperfections and uncertainty situations, shareholders are not indifferent between retained earnings and current dividends. The considerations that support the proposition that investors have a systematic preference for current dividend relative to retained earnings are **(i)** desire for current income, **(ii)** resolution of uncertainty and the allied aspect of informational content of dividends, **(iii)** transaction and inconvenience costs, and **(iv)** underpricing of new shares. The more favourable tax treatment of dividend income relative to capital gains favours distribution of earnings. The empirical evidence regarding the effect of dividends on the market price of shares is only suggestive.[17] Yet, it is indicative of the fact that companies behave as if dividends are relevant. The MM hypothesis, therefore, is untenable.

SECTION 2 RELEVANCE OF DIVIDENDS

Dividend relevance implies that shareholders prefer current dividends and there is no direct relationship between dividend policy and market value of a firm.

In sharp contrast to the MM position, there are some theories that consider dividend decisions to be an active variable in determining the value of a firm. The dividend decision is, therefore, relevant. We critically examine below two theories representing this notion: **(i)** Walter's Model and **(ii)** Gordon's Model.

Walter's Model

Proposition Walter's model[18] supports the doctrine that dividends are relevant. The investment policy of a firm cannot be separated from its dividends policy and both are, according to Walter, interlinked. The choice of an appropriate dividend policy affects the value of an enterprise.

The key argument in support of the relevance proposition of Walter's model is the relationship between the return on a firm's investment or its internal rate of return (r) and its cost of capital or the required rate of return (k). The firm would have an optimum dividend policy which will be determined by the relationship of r and k. In other words, if the return on investments exceeds the cost of capital, the firm should retain the earnings, whereas it should distribute the earnings to the shareholders in case the required rate of return exceeds the expected return on the firm's investments. The rationale is that if $r > k$, the firm is able to earn more than what the shareholders could by reinvesting, if the earnings are paid to them. The implication of $r < k$ is that shareholders can earn a higher return by investing elsewhere.

Walter's model, thus, relates the distribution of dividends (retention of earnings) to available investment opportunities. If a firm has adequate profitable investment opportunities, it will be able to earn more than what the investors expect so that $r > k$. Such firms may be called *growth firms*. For growth firms, the optimum dividend policy would be given by a D/P ratio of zero. That is to say, the firm should plough back the entire earnings within the firm. The market value of the shares will be maximised as a result.

In contrast, if a firm does not have profitable investment opportunities (when $r < k$), the shareholders will be better off if earnings are paid out to them so as to enable them to earn a higher return by using the funds elsewhere. In such a case, the market price of shares will be maximised by the distribution of the entire earnings as dividends. A D/P ratio of 100 would give an optimum dividends policy.

Finally, when $r = k$ (normal firms), it is a matter of indifference whether earnings are retained or distributed. This is so because for all D/P ratios (ranging between zero and 100) the market price of shares will remain constant. For such firms, there is no optimum dividend policy (D/P ratio).

Assumptions The critical assumptions of Walter's Model are as follow:

1. All financing is done through retained earnings: external sources of funds like debt or new equity capital are not used.
2. With additional investments undertaken, the firm's business risk does not change. It implies that r and k are constant.
3. There is no change in the key variables, namely, beginning earnings per share, E, and dividends per share, D. The values of D and E may be changed in the model to determine results, but, any given value of E and D are assumed to remain constant in determining a given value.
4. The firm has perpetual (or very long) life.

Formula Walter has evolved a mathematical formula to arrive at the appropriate dividend decision. His formula is based on a share valuation model which states:

$$P = \frac{D}{k_e - g} \qquad \textbf{(18.7)}$$

where P = Price of equity shares,
D = Initial dividend,
k_e = Cost of equity capital, and
g = Expected growth rate of earnings

To reflect earnings retentions, we have

$$P = \frac{D}{k_e - rb} \qquad \textbf{(18.8)}$$

where r = Expected rate of return on firm's investments, and b = Retention rate $(E - D)/E$

Thus, rb measures growth rate in dividends, which is the product of the rate of profitability of retained earnings (r) and the earnings retention percentage (b).

From Eq. 18.7, we derive an equation for determining k_e

$$k_e = \frac{D}{P} + g \qquad \textbf{(18.9)}$$

since $g = \frac{\Delta P}{P}$ we have,

$$k_e = \frac{D}{P} + \frac{\Delta P}{P}$$

and since $\Delta P = \frac{r}{k_e}(E - D)$,

substituting the value of ΔP, we have

$$k_e = \frac{D + \frac{r}{k_e}(E - D)}{P}$$

or

$$P = \frac{D + \frac{r}{k_e}(E - D)}{k_e} \quad \textbf{(18.10)}$$

where P = The prevailing market price of a share,
D = Dividend per share,
E = Earnings per share, and
r = The rate of return on the firm's investment

Equation 18.10 shows that the value of a share is the present value of all dividends plus the present value of all capital gains. Walter's model with reference to the effect of dividend/retention policy on the market value of shares under different assumptions of r (return on investments) is illustrated in Example 18.3.

Example 18.3

The following information is available in respect of a firm:

Capitalisation rate (k_e) = 0.10
Earnings per share (E) = Rs 10

Assumed rate of return on investments (r): (i) 15, (ii) 8, and (iii) 10.

Show the effect of dividend policy on the market price of shares, using Walter's model.

Solution

(i) *When r is 0.15, that is, $r > k_e$:* The effect of different D/P ratios depicted in Table 18.2.

(ii) *When r = 0.08 and 0.10, that is, $r < ke$ and $r = k_e$ respectively*: The effect of different D/P ratios on the value of shares is shown in Table 18.3.

TABLE 18.2 Dividend Policy and Value of Shares (Walter's Model)

(a) D/P ratio = 0 (Dividend per share = zero)

$$P = \frac{0 + \left[\frac{0.15}{0.10}\right](10 - 0)}{0.10} = \text{Rs}150$$

(b) D/P ratio = 25 (Dividend per share = Rs 2.5)

$$P = \frac{2.5 + \left[\frac{0.15}{0.10}\right](10 - 2.5)}{0.10} = \text{Rs } 137.50$$

(c) D/P ratio = 50 (Dividend per share = Rs 5)

$$P = \frac{5 + \left[\frac{0.15}{0.10}\right](10 - 5)}{0.10} = \text{Rs } 125$$

(Contd.)

(Contd.)

(d) D/P ratio = 75 (Dividend per share = Rs 7.5)

$$P = \frac{7.5 + \left[\frac{0.15}{0.10}\right](10 - 7.5)}{0.10} = \text{Rs } 112.50$$

(e) D/P ratio = 100 (Dividend per share = Rs 10)

$$P = \frac{10 + \left[\frac{0.15}{0.10}\right](10 - 10)}{0.10} = \text{Rs } 100$$

TABLE 18.3 Dividend Policy and Value of Shares (Walter's Model)

	(A) r = 0.8 ($r < k_e$)	*(B) r = 0.10 ($r = k_e$)*
(a) D/P ratio = Zero	$P = \frac{0 + \left[\frac{0.08}{0.10}\right](10 - 0)}{0.10} = \text{Rs } 80$	$P = \frac{0 + \left[\frac{0.10}{0.10}\right](10 - 0)}{0.10} = \text{Rs } 100$
(b) D/P Ratio = 25	$P = \frac{2.5 + \left[\frac{0.08}{0.10}\right](10 - 2.5)}{0.10} = \text{Rs } 85$	$P = \frac{2.5 + \left[\frac{0.10}{0.10}\right](10 - 2.5)}{0.10} = \text{Rs } 100$
(c) D/P Ratio = 50	$P = \frac{5 + \left[\frac{0.08}{0.10}\right](10 - 5)}{0.10} = \text{Rs } 90$	$P = \frac{5 + \left[\frac{0.10}{0.10}\right](10 - 5)}{0.10} = \text{Rs } 100$
(d) D/P Ratio = 75	$P = \frac{7.5 + \left[\frac{0.08}{0.10}\right](10 - 7.5)}{0.10} = \text{Rs } 95$	$P = \frac{7.5 + \left[\frac{0.10}{0.10}\right](10 - 7.5)}{0.10}$ Rs 100
(e) D/P Ratio = 100	$P = \frac{10 + \left[\frac{0.08}{0.10}\right](10 - 10)}{0.10} = \text{Rs } 100$	$P = \frac{10 + \left[\frac{0.10}{0.10}\right](10 - 10)}{0.10} = \text{Rs } 100$

Interpretation The calculations of the value of shares according to Walter's formula in Tables 18.2 and 18.3 yield the following conclusions:

1. When the firm is able to earn a return on investments exceeding the required rate of return that is, $r > K_e$, *the value of shares is inversely related to the D/P ratio: as the payout ratio increases, the market value of shares declines.* (Table 18.1). Its value is the highest when the D/P ratio is zero. If, therefore, the firm retains its entire earnings, it will maximise the market value of shares (Rs 150). When all earnings are distributed, its value is the lowest. In other words, the *optimum payout ration (dividend policy) is zero.*
2. It is clear from Table 18.2 that when $r < k_e$ that is, when the firm does not have ample profitable investment opportunities, *the D/P ratio and the value of shares are positively correlated: as the payout ratio increases, the market price of the shares also increases. The dividend policy*

is optimum when the D/P ratio = 100 per cent. In other words, when $r < k_e$, the firm would be well advised to distribute the entire earnings to the shareholders.

3. For a situation in which $r = k_e$, the market value of shares is constant irrespective of the D/P ratio (Table 18.2); there is *no optimum dividend policy (D/P)* ratio. In other words, the market price of shares in not affected by the *D/P ratio*. Whether the firm retains the profits or distributes dividends is a matter of indifference. *This is a hypothetical situation*. In actual practice, the two values (r and k_e) are different and Walter concludes that dividend policy does matter as a variable in maximising share prices.

Limitations The Walter's model, one of the earliest theoretical models, explains the relationship between dividend policy and value of the firm under certain simplified assumptions. Some of the assumptions do not stand critical evaluation. In the first place, the Walter's model assumes that the firm's investments are financed exclusively by retained earnings; no external financing is used. The model would be only applicable to all-equity firms. Secondly, the model assumes that r is constant. This is not a realistic assumption because when increased investments are made by the firm, r also changes. Finally, as regards the assumption of constant, k_e, the *risk complexion* of the firm has a direct bearing on it. By assuming a constant k_e, Walter's model ignores the effect of risk on the value of the firm.

Gordon's Model

Another theory which contends that dividends are relevant is Gordon's model.[19] This model, which opines that dividend policy of a firm affects its value, is based on the following assumptions:

1. The firm is an all-equity firm. No external financing is used and investment programmes are financed exclusively by retained earnings.
2. r and k_e are constant.
3. The firm has perpetual life.
4. The retention ratio, once decided upon, is constant. Thus, the growth rate, ($g = br$) is also constant.
5. $k_e > br$.

Arguments It can be seen from the assumptions of Gordon's model that they are similar to those of Walter's model. As a result, Gordon's model, like Walter's, contends that dividend policy of the firm is relevant and that investors put a positive premium on current incomes/dividends. The crux of Gordon's arguments is a two-fold assumption: **(i)** investors are risk averse, and **(ii)** they put a premium on a *certain* return and discount/penalise *uncertain* returns.

As investors are rational, they want to avoid risk. The term risk refers to the possibility of not getting a return on investment. The payment of current dividends *ipso facto* completely removes any chance of risk. If, however, the firm retains the earnings (i.e. current dividends are withhled), the investors can expect to get a dividend in future. The future dividend is uncertain, both with respect to the amount as well as the timing. The rational investors can reasonably be expected to prefer current dividend. In other words, they would discount future dividends, that is, they would place less importance on it as compared to current dividend. The retained earnings are evaluated by the investors as a risky promise. In case the earnings are retained, therefore, the market price of the shares would be adversely affected.

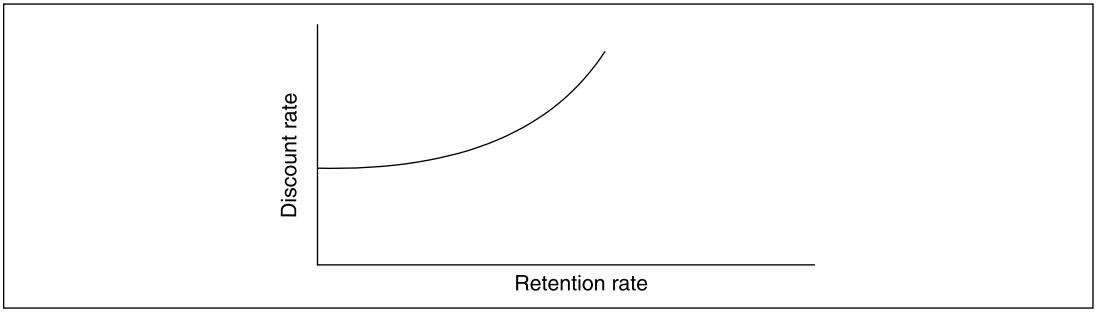

FIGURE 18.1 Retention Rate and Discount Rate

The above argument underlying Gordon's model of dividend relevance is also described as a *bird-in-the-hand argument.*[20] That a bird in hand is better than two in the bush is based on the logic that *what is* available at present is preferable to *what may* be available in the future. Basing his model on this argument, Gordon argues that the future is uncertain and the more distant the future is, the more uncertain it is likely to be. If, therefore, current dividends are withheld to retain profits, whether the investors would at all receive them later is uncertain. Investors would naturally like to avoid uncertainty. In fact, they would be inclined to pay a higher price for shares on which current dividends are paid. Conversely, they would discount the value of shares of a firm which postpones dividends. The discount rate would vary, as shown in Figure 18.1, with the *retention rate* or level of retained earnings. The term retention ratio means the percentage of earnings retained. It is the inverse of D/P ratio. The omission of dividends, or payment of low dividends, would lower the value of the shares.

Dividend Capitalisation Model According to Gordon, the market value of a share is equal to the present value of future streams of dividends. A simplified version of Gordon's model can be symbolically[21] expressed as

$$P = \frac{E(1-b)}{k_e - br} \qquad \textbf{(18.11)}$$

where P = Price of a share,
E = Earnings per share,
b = Retention ratio or percentage of earnings retained,
$1 - b$ = D/P ratio, i.e. percentage of earnings distributed as dividends,
k_e = Capitalisation rate/cost of capital, and
$br = g$ = Growth rate = rate of return on investment of an all-equity firm.

The implications of dividends policy according to Gordon's model are illustrated in Example 18.4.

Example 18.4

The following information is available in respect of the rate of return on investment (r), the capitalisation rate (k_e) and earnings per share (E) of Hypothetical Ltd.

r = 12 per cent
E = Rs 20

Determine the value of its shares, assuming the following:

	D/P ratio (1 – b)	*Retention ratio (b)*	k_e *(%)*
(a)	10	90	20
(b)	20	80	19
(c)	30	70	18
(d)	40	60	17
(e)	50	50	16
(f)	60	40	15
(g)	70	30	14

Solution

The value of shares of Hypothetical Ltd for different D/P and retention ratios is depicted in Table 18.4.

TABLE 18.4 Dividend Policy and Value of Shares of Hypothetical Ltd (Gordon's Model)

(a) D/P ratio 10 (Retention ratio 90)

$br(g) = 0.9 \times 0.12 = 0.108$

$$P = \frac{\text{Rs } 20\,(1-0.9)}{0.20-0.108} = \frac{\text{Rs } 2}{0.092} = \text{Rs } 21.74$$

(b) D/P ratio 20 (Retention ratio 80)

$br = 0.8 \times 0.12 = 0.096$

$$P = \frac{\text{Rs } 20\,(1-0.8)}{0.19-0.096} = \text{Rs } 42.55$$

(c) D/P ratio 30 (Retention ratio 70)

$br = 0.7 \times 0.12 = 0.084$

$$P = \frac{\text{Rs } 20\,(1-0.7)}{0.18-0.084} = \text{Rs } 62.50$$

(d) D/P ratio 40 (Retention ratio 60)

$br = 0.6 \times 0.12 = 0.72$

$$P = \frac{\text{Rs } 20\,(1-0.6)}{0.17-0.072} = \text{Rs } 81.63$$

(e) D/P ratio 50 (Retention ratio 50)

$br = 0.5 \times 0.12 = 0.060$

$$P = \frac{\text{Rs } 20\,(1-0.5)}{0.17-0.072} = \text{Rs } 100$$

(f) D/P ratio 60 (Retention ratio 40)

$br = 0.4 \times 0.12 = 0.048$

$$P = \frac{\text{Rs } 20\,(1-0.4)}{0.15-0.048} = \text{Rs } 117.65$$

(g) D/P ratio 70 (Retention ratio 30)

$br = 0.3 \times 0.12 = 0.036$

$$P = \frac{\text{Rs } 20\,(1-0.3)}{0.14-0.036} = \text{Rs } 134.62$$

Gordon, thus, contends that the dividend decision has a bearing on the market price of the share. The market price of the share is favourably affected with more dividends. (Table 18.4).

Summary

- There are divergent views regarding the impact of dividend policy (dividend payout, D/P ratio) on the market price of the share and the value of the firm.
- According to one view represented by Walter, Gordon and others, the D/P ratio is relevant and it certainly affects the market price of shares.
- The key argument in support of the relevance of Walter's model is the relationship between the return on a firm's investment(r) and its cost of capital/required rate of return (k). If $r > k$, the firm should retain the earnings (or D/P ratio should be zero) as it is able to earn higher than what the shareholders could by investing on their own. In case $r < k$, it implies that shareholders can earn a higher return by investing elsewhere. Therefore, the entire earnings (D/P ratio should be 100 per cent) should be distributed to them. By following such a policy, the market price of share is maximised.
- According to Walter, the value of the firm, as measured by the market price per share (P) is given by the following equation:

$$P = \frac{D + \frac{r}{k}(E - D)}{k}$$

  The value of P is maximum when D is zero (in situations of $r > k$); when $r < k$, the value of $E = D$ gives maximum P.
- Gordon's proposition that dividend policy of the firm is relevant is based on two tenable assumptions: (i) investors are risk averse, and (ii) they put a positive premium on current incomes/dividends. The retained earnings are evaluated by the investors as a risky promise as the future dividend receipts are perceived by them as uncertain, both with respect to the amount as well as the timing.
- According to Gordon, the market value of a share is equal to the present value of future streams of dividend. Symbolically,

$$P = \frac{E\,(1 - b)}{k_e - br}$$

  The value of P increases with the increase in the D/P ratio, and is maximum when there are no retentions.
- The residual theory of dividends suggests that the dividends paid by a corporate should be viewed as a residual – the amount left over from corporate earnings after taxes after meeting the requirement of all profitable investment projects, while maintaining a target debt-equity ratio. Cash dividends can be paid only if its available earnings are more than the required amount of funds to meet the desired debt-equity ratio.
- It results in fluctuating dividend payments, as earnings of a firm as well as profitable investment opportunities available to it are likely to vary from year to year.
- The dividend payment ratio may vary in the size range of zero to one-hundred depending on the size of earnings, capital expenditure requirements and the desired debt-equity ratio.
- Since stable dividend policy is desirable, a firm may smooth out actual dividend payments by creating a dividend equalisation fund.

- The other view, led by Modigliani and Miller (MM), takes a diametrically opposite position and contends that the dividend policy of a firm has no effect on its value.
- MM's proof in support of their argument is depicted in the following equation:

$$nP_0 = \frac{nD_1 + (n + \Delta n)p_1 - I + E - nD_1}{(1 + k_e)}$$

  Since nd_1 in numerator of the equation cancels nd_1 and dividends (D) are not found, MM conclude that dividends do not count and the dividend policy has no effect on the share price.
- The arguments in support of MM do not stand the test of scrutiny under real world/business situations. Investors, in general, prefer current dividends to retained earnings. The major factors affecting the validity of MM model are: **(i)** tax effect, **(ii)** flotation cost, **(iii)** transaction and inconvenience costs, **(iv)** preference for current dividend and **(v)** resolution of uncertainty.
- The available empirical evidence seems to support the view that dividend policy is relevant. A firm should try to follow an optimum dividend policy which maximises the shareholder's wealth in the long run.

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Practical Problems

P.18.1 (a) X company earns Rs 5 per share, is capitalised at a rate of 10 per cent and has a rate of return on investment of 18 per cent.

According to Walter's model, what should be the price per share at 25 per cent dividend payout ratio? Is this the optimum payout ratio according to Walter?

(b) Omega company has a cost of equity capital of 10 per cent, the current market value of the firm (V) is Rs 20,00,000 (@ Rs 20 per share). Assume values for I (new investment), Y (earnings) and D (dividends) at the end of the year as I = Rs 6,80,000, Y = Rs 1,50,000 and D = Re 1 per share. Show that under the MM assumptions, the payment of dividend does not affect the value of the firm.

*S*olution

(a) $$P = \frac{D + \frac{r}{k_e}(E - D)}{k_e} = \frac{\text{Rs } 1.25 + \left[\frac{0.18}{0.10}\right](\text{Rs } 5.0 - \text{Rs } 1.25)}{0.10} = \text{Rs } 80$$

This is not the optimum dividend payout ratio because Walter suggests a zero per cent dividend payout ratio in situations where $r > k_e$ to maximise the value of the firm. At this ratio, the value of the share would be maximum, that is, Rs 90.

(b) Value of the firm, when dividends are paid (MM assumptions):

(i) Market price of the share at the end of the year: $P_0 = \frac{1}{(1 + k_e)}(P_1 + D_1)$

$$\text{Rs } 20 = \frac{(P_1 + \text{Re } 1)}{1.10} = \text{Rs } 21 = P_1$$

(ii) Amount required for new financing: $I - (Y - nD_1)$ = Rs 6,80,000 – (Rs 1,50,000 – Rs 1,00,000) = Rs 6,30,000

(iii) Number of shares to be issued: $= \frac{\text{Rs } 6{,}30{,}000}{\text{Rs } 21} = 30{,}000$ shares

(iv) Value of the firm: $= \frac{1}{(1 + k_e)}[nD_1 + (n + \Delta n)P_1 - I + Y - nD1]$

$$\frac{\text{Rs } 1{,}00{,}000 + [(1{,}00{,}000 + 30{,}000) \times \text{Rs } 21] - \text{Rs } 6{,}80{,}000 + \text{Rs } 1{,}50{,}000 - \text{Rs } 1{,}00{,}000}{1.10}$$

$$= 20{,}00{,}000$$

(c) Value of the firm when dividends are not paid:

(i) Market price of the share at the end of the year: Rs 20 $= \frac{P_1 + \text{Zero}}{1.10}$, Rs 22 $= P_1$

(ii) Amount required for new financing: $I - (Y - nD_1)$ = Rs 6,80,000 – Rs 1,50,000 = Rs 5,30,000

(iii) Number of new shares to be issued = $\frac{\text{Rs } 5{,}30{,}000}{\text{Rs } 22}$ shares

(iv) Value of the firm: = $\frac{1}{1+k_e}$ $[(n + \Delta n)P_1 - I + Y]$

$$= \frac{\left[1{,}00{,}000 + \frac{5{,}30{,}000}{22}\right] \text{Rs } 22 - \text{Rs } 6{,}80{,}000 + \text{Rs } 1{,}50{,}000}{1.10} = \text{Rs } 20{,}00{,}000$$

Since the value of the firm is Rs 20,00,000, in both the situations when dividends are paid and when dividends are not paid, dividend does not affect the value of the firm.

P.18.2 (a) The Apex Company which earns Rs 5 per share, is capitalised at 10 per cent and has a return on investment of 12 per cent. Using Walter's dividend policy model, determ to as risk class for which the appropriate capitalisation rate is 10 per cent. It currently has 1,00,000 shares selling at Rs 100 each. The firm is contemplating the declaration of Rs 5 as dividend at the end of the current financial year, which has just begun. What will be the price of the share at the end of the year, if a dividend is not declared? What will it be if it is paid? Answer these on the basis of Modigliani and Miller model and assume no taxes.

*S*olution

(a) (i)According to Walter's formula, the optimum dividend payout ratio would be zero as $r > k_e$ because the value of the share of the firm would be maximum.

(ii) $$P = \frac{D + \frac{r}{k_e}(E - D)}{k_e} = \frac{(0.12 / 0.10)(\text{Rs } 5)}{0.10} = \text{Rs } 60$$

(b) (i) Price of the share when dividends are declared (MM assumptions): $P = \frac{1}{(1+k_e)}(D_1 + P_1)$

Rs 100 = $\frac{1}{1.10}$ (Rs 5 + P_1), Rs 105 = P_1

(ii) Price of share when dividends are not declared: Rs 100 = $\frac{(\text{Rs } 0 + P_1)}{1.10}$ or P_1 = Rs 110

P.18.3 Expandent Ltd had 50,000 equity shares of Rs 10 each outstanding on January 1. The shares are currently being quoted at par in the market. The company now intends to pay a dividend of Rs 2 per share for the current calendar year. It belongs to a risk class whose appropriate capitalisation rate is 15 per cent. Using Modigliani-Miller model and assuming no taxes, ascertain the price of the company's share at it is likely to prevail at the end of the year **(a)** when dividend is declared, and **(b)** when no dividend is declared. **(c)** Also, find out the number of new equity shares that the company must issue to meet its investment needs of Rs 2 lakh, assuming a net income of Rs 1.1 lakh and also assuming that the dividend is paid.

*S*olution

(a) Price of the share, when dividends are paid: $P_0 = \frac{D_1 + P_1}{(1+k_e)}$, Rs 10 = $\frac{\text{Rs } 2 + P_1}{1.15}$, Rs 9.5 = P_1

(b) Price of the share, when dividends are not paid: Rs 10 = $\frac{P_1}{1.15}$, Rs 11.5 = P_1

(c) Number of new equity shares to be issued: $\Delta n = \frac{I - (E - nD_1)}{P_1}$

$$= \frac{\text{Rs } 2{,}00{,}000 - (\text{Rs } 1{,}10{,}000 - 1{,}00{,}000)}{\text{Rs } 9.5}$$

$$= 20{,}000 \text{ shares}$$

P.18.4 The Asbestos Company belongs to a risk class of which the appropriate capitalisation rate is 10 per cent. It currently has 1,00,000 shares selling at Rs 100 each. The firm is contemplating the declaration of a Rs 6 dividend at the end of the current fiscal year, which has just begun. Answer the following questions based on Modigliani and Miller model and the assumptions of no taxes.

(a) What will be the price of the shares at the end of the year, if a dividend is not declared? What will it be if it is declared?

(b) Assuming that the firm pays dividend, has a net income of Rs 10,00,000 and makes new investments of Rs 20,00,000 during the period, how many new shares must be issued?

Solution

(a) **(i)** Price of the share, when dividend is declared: $\frac{D_1 + P_1}{(1 + k_e)}$, Rs 100 = $\frac{P_1 + \text{Rs } 6}{1.10}$, Rs 104 = P_1

(ii) Price of the share, when dividends are not paid: Rs 100 = $\frac{P_1 + 0}{1.10}$, Rs 110 = P_1

(b) Number of new shares to be issued: = $\frac{I - (E - nD_1)}{P_1}$

$$= \frac{\text{Rs } 20{,}00{,}000 - (\text{Rs } 10{,}00{,}000 - 6{,}00{,}000)}{\text{Rs } 104}$$

$$= 15{,}385 \text{ shares}$$

P.18.5 From the following information supplied to you, determine the theoretical market value of equity shares of a company as per Walter's model:

Earnings of the company	Rs 5,00,000
Dividends paid	3,00,000
Number of shares outstanding	1,00,000
Price earning ratio	8
Rate of return on investment	0.15

Are you satisfied with the current dividend policy of the firm? If not, what should be the optimal dividend payout ratio in this case?

Solution

$$P = \frac{D + \frac{r}{k_e}(E - D)}{k_e} = \frac{\text{Rs } 3 + \left[\frac{0.15}{0.125}\right](\text{Rs } 5 - \text{Rs } 3)}{0.125} = \text{Rs } 43.20$$

No, we are not satisfied with the current dividend policy. The optimal dividend payout ratio, given the facts of the case, should be zero.

Working Notes

(i) k_e is the reciprocal of P/E ratio = 1/8 = 12.5 per cent

(ii) E = Total earnings ÷ Number of shares outstanding

(iii) D = Total dividends ÷ Number of shares outstanding

P.18.6 The earnings per share of a company is Rs 8 and the rate of capitalisation applicable is 10 per cent. The company has before it, an option of adopting **(i)** 50, **(ii)** 75 and **(iii)** 100 per cent dividend

pay out ratio. Compute the market price of the company's quoted shares as per Walter's Model if it can earn a return of (a) 15, (b) 10 and (c) 5 per cent on its retained earnings.

Solution

(i) *D/P* ratio = 0.50	(ii) *D/P* ratio = 0.75	(iii) *D/P* ratio = 1
(a) Price of shares if $r = 0.15$		
$P = \frac{\text{Rs } 4 + \frac{0.15}{0.10}(\text{Rs } 8 - \text{Rs } 4)}{0.10}$	$P = \frac{\text{Rs } 6 + \frac{0.15}{0.10}(\text{Rs } 8 - \text{Rs } 6)}{0.10}$	$P = \frac{\text{Rs } 8 + \frac{0.15}{0.10}(\text{Rs } 8 - \text{Rs } 8)}{0.10}$
= Rs 100	= Rs 90	= Rs 80
(b) Price of share if $r = 0.10$		
$P = \frac{\text{Rs } 4 + \frac{0.10}{0.10}(\text{Rs } 8 - \text{Rs } 4)}{0.10}$	$P = \frac{\text{Rs } 6 + \frac{0.10}{0.10}(\text{Rs } 8 - \text{Rs } 6)}{0.10}$	$P = \frac{\text{Rs } 8 + \frac{0.10}{0.10}(\text{Rs } 8 - \text{Rs } 8)}{0.10}$
= Rs 80	= Rs 80	= Rs 80
(c) Price of share if $r = 0.05$		
$P = \frac{\text{Rs } 4 + \frac{0.05}{0.10}(\text{Rs } 8 - \text{Rs } 4)}{0.10}$	$P = \frac{\text{Rs } 6 + \frac{0.05}{0.10}(\text{Rs } 8 - \text{Rs } 6)}{0.10}$	$P = \frac{\text{Rs } 8 + \frac{0.05}{0.10}(\text{Rs } 8 - \text{Rs } 8)}{0.10}$
= Rs 60	= Rs 70	= Rs 80

P.18.7 A closely-held plastic manufacturing company has been following a dividend policy which can maximise the market value of the firm as per Walter's model. Accordingly, each year at dividend time, the capital budget is reviewed in conjunction with the earnings for the period and alternative investment opportunities for the shareholders. In the current year, the firm reports net earnings of Rs 5,00,000. It is estimated that the firm can earn Rs 1,00,000 if the amounts are retained. The investors have alternative investment opportunities that will yield them 10 per cent. The firm has 50,000 shares outstanding. What should be the D/P ratio of the company if it wishes to maximise the wealth of the shareholders?

Solution D/P ratio of the company should be zero because at this ratio, market price of the share would be the maximum as shown by the following calculations:

$$P = \left[D + \left(\frac{r}{K_e}\right)(E - D)\right] / K_e = [0 + 0.20/0.10\ (\text{Rs } 10 - 0)]/0.10$$

$$= \text{Rs } 20/0.10 = \text{Rs } 200$$

Working Notes

r = (Rs 1,00,000/Rs 5,00,000) × 100 = 20 per cent

E = Rs 5,00,000/50,000 = Rs 10

P.18.8 (i) From the following information supplied to you, ascertain whether the firm's D/P ratio is optimal according to Walter. The firm was started a year ago with an equity capital of Rs 20 lakh.

Earnings of the firm	Rs 2,00,000
Dividend paid	1,50,000
P/E ratio	12.5

Number of shares outstanding, 20,000 @ Rs 100 each. The firm is expected to maintain its current rate of earnings on investment.

(ii) What should be the P/E ratio at which the dividend payout ratio will have no effect on the value of the share?

(iii) Will your decision change if the P/E ratio is 8, instead of 12.5?

Solution

(i) P = [Rs 7.5 + (0.10/0.08) × (Rs 10 – Rs 7.5)]/0.08 = Rs 10.625/0.08 = Rs 132.81.
The firm's D/P ratio is not optimal. At 75 per cent D/P ratio, the price per share is Rs 132.81. The zero per cent D/P ratio would be optimum, as at this ratio the value of the share would be maximum as shown in the following calculations:
P = [0 + (0.10/0.08) × (Rs 10 – 0)]/0.08 = Rs 12.50/0.08 = Rs 156.25.

Working Notes

(a) K_e is the reciprocal of P/E ratio = 1/0.125 = 8 per cent
(b) EPS = Rs 2,00,000 ÷ 20,000 = Rs 10
(c) ROI(r) = (Rs 2,00,000 ÷ Rs 20,00,000) × 100 = 10 per cent

(ii) At P/E ratio of 10 times, D/P ratio would have no effect on the value of the share because at this rate $K_e = r$.

(iii) Yes, the decision would change if the P/E ratio is 8. This implies that K_e is 12.5 per cent. Since $K_e > r$, the 100 per cent dividend payout ratio would maximise the value of the share: P = [10 + (0.10/0.125) × (Rs 10 – Rs 10)]/0.125 = Rs 80. At all other D/P ratios, the value would be lower.

P.18.9 A textile company belongs to a risk-class for which the appropriate P/E ratio is 10. It currently has 50,000 outstanding shares selling at Rs 100 each. The firm is contemplating the declaration of Rs 8 dividend at the end of the current fiscal year which has just started. Given the assumption of MM, answer the following questions.

(i) What will the price of the share be at the end of the year: (a) if dividend is not declared, and (b) if it is declared?

(ii) Assuming that the firm pays the dividend, has a net income (y) of Rs 5,00,000 and makes new investments of Rs 10,00,000 during the period, how many new shares must be issued?

(iii) What will the value of the firm be: (a) if dividend is declared, and (b) if dividend is not declared?

Solution

(i) (a) Price, P_1, when dividend is not declared
$P_0 = (D_1 + P_1)/(1 + K_e)$ or Rs 100 = 0 + P_1/(1 + 0.10) = Rs 110 = P_1

(b) When dividend is declared
Price, $P_0 = (D_1 + P_1)/(1 + K_e)$ = Rs 100 = (Rs 8 + P_1)/0.10 = Rs 102

(ii) (a) Amount required for new financing
= $I – (Y – nD_1)$ = Rs 10,00,000 – (Rs 5,00,000 – Rs 4,00,000) = Rs 9,00,000

(b) New shares to be issued
Dn = Rs 9,00,000/102

(iii) (a) Value of the firm (V) when dividend is declared
$V = [nD_1 + (n + n)P_1 – I + Y – nD_1]/(1 + K_e)$
= [(Rs 4,00,000 + 102 × (50,000 + (Rs 9,00,000/102)] – 10,00,000 + 5,00,000 – 4,00,000]/1.10
= Rs 55,00,000/1.10 = Rs 50,00,000.

(b) Value, when dividend is not declared
$V = [(n + Dn)P_1 – I + Y]/(1 + K_e)$
= [(50,000 + Rs 5,00,000/100) × 110 – Rs 10,00,000 + Rs 5,00,000]/1.1
= [Rs 60,00,000 – Rs 10,00,000 + Rs 5,00,000]/1.10 = Rs 50,00,000.

P.18.10 The following information is supplied to you, about a company:

Earnings of the company	Rs 15,00,000
Dividends paid	5,00,000
Number of issued shares	1,00,000
Price earnings ratio	10
Rate of return on investment (%)	15

(i) Determine the theoretical market price of the share.
(ii) Are you satisfied with the current dividend policy of the Firm? If not, what should be the optimal dividend payment ratio in this case?

Solution

(i) $P = \dfrac{[\text{Rs } 5 + (0.15/0.10)(15 - 5)]}{0.10} = \dfrac{\text{Rs } 5 + 1.5(10)}{0.10} = \dfrac{\text{Rs } 20}{0.10} = \text{Rs } 200$

(ii) The Company's D/P ratio is not optimal. At 33.33 per cent D/P ratio, the price per share is Rs 200. The zero per cent D/P ratio would be optimum, as at this ratio the value of the share would be maximum as shown below:

$$P = \frac{[0 + 0.15/0.10][\text{Rs } 15 - 0]}{0.10} = \frac{1.5[\text{Rs } 15]}{0.10} = \text{Rs } 225$$

Working Notes

(a) K_e is the reciprocal of P/E ratio = 1/0.10 = 10 per cent.
(b) EPS = Rs 15,00,000 ÷ 1,00,000 = Rs 15.
(c) DPS = Rs 5,00,000 ÷ 1,00,000 = Rs 5.

P.18.11 Assume the Hypothetical Ltd expects a potential earnings after taxes of Rs 200 lakh next year. Its target debt ratio is 30 per cent. The capital budgeting department of the company projects the likely capital expenditure next year amounting to **(i)** Rs 100 lakh **(ii)** Rs 200 lakh and **(iii)** Rs 400 lakh. Determine the cash dividends likely to be paid and dividend payout ratio at varying levels of investment requirement under the residual dividend policy.

Solution

Dividends Paid and Dividend Payout Ratio Under Residual Dividend Policy (Amount in Rs lakh)

Particulars	*Size of Capital Budget*		
	(1)	*(2)*	*(3)*
Capital expenditure	Rs 100	Rs 200	Rs 400
Projected earnings after taxes	200	200	200
Target debt ratio (%)	30	30	30
Equity funds needed	70	140	280
Earnings available to pay dividends	130	60	Zero
Dividend payout ratio (%)	65	30	Zero

Review Questions

RQ.18.1 Give appropriate answers for the following:

(i) Which of the following is not an assumption of the MM theory for irrelevance of dividends?
(a) Irrational investors (b) No tax discrimination on capital gains and dividends (c) No transaction costs (d) No flotation costs

(ii) According to Walter's model, the value of the share is _____ proportion to the D/P ratio
(a) in inverse (b) in direct (c) not related at all (d) in linear

(iii) The test of adequate acceptable opportunities for the firm while considering its dividend policy is the relation between _____ and _____

(iv) If the cost of capital of the firm (k) is higher than the rate of return (r), the firm will retain its earnings as it would lead to the reduction of its cost of capital. (True/False)

(v) MM theory of irrelevance of dividends is applicable only to firms which have a constant investment policy. (True/False)

(vi) According to MM theory, the market price of the share will remain unchanged even after the payment of dividends (True/False)

(vii) The arbitrage process implies that the market value plus current dividends of two firms which are alike in all respects except _____ ratio will be identical.
(a) D/P (b) P/E (c) debt/equity

(viii) Investors can be expected to prefer _____ to _____ owing to the tax differential between the dividend and capital gains tax.

(ix) Under what condition is the Walter model similar to the MM hypothesis with regards to the payment of dividends?
(a) r > k (b) r = k (c) r < k

(x) Walter's model and Gordon's model are applicable to firms in which all financing is done through _____ and with _____ leverage.

(xi) According to the Gordon model, the discount rate used by the investors exhibits _____ relationship with the retention rate.
(a) a directly proportional (b) an inversely proportional (c) no relationship at all

(xii) The market price of the share, according to Gordon model, is _____ affected with the increasing payment of dividends.
(a) favourably **(b)** unfavourably **(c)** unaffected

[Answers: (i) Irrational investors (ii) Not related at all (iii) Return on investment and Cost of capital (iv) False (v) True (vi) True (vii) D/P Ratio (viii) Retention of earnings Payment of dividend (ix) r = k (x) Retained earnings, zero (xi) Directly proportional, and (xii) Favourably]

RQ.18.2 In a world of no taxes and no transaction costs, a firm cannot be made more valuable by manipulating the dividend payout ratio. Examine the validity of the statement.

RQ.18.3 What are the assumptions and arguments used by Modigliani and Miller in support of the irrelevance of dividends? Are dividends really irrelevant? If not, what are the arguments for relevance of dividend policy?

RQ.18.4 Explain, giving suitable illustrations, the formula given by Walter for determining dividend policy. What are the merits and limitations of this formula in designing the dividend policy for a company?

RQ.18.5 What is 'informational content' of dividend payments? Explain.

RQ.18.6 How far do you agree with the proposition that dividends are irrelevant?

RQ.18.7 What is the rationale of the residual theory of dividends? What are the steps a corporate shuld take to implement it?

RQ.18.8 In what way can the residual theory of dividend be used to establish a long-run target dividend payout ratio instead of dividend payments of each year? Explain with an appropriate example.

Examination Questions

Theory Questions

18.1 Whether the following statement is 'correct' or 'incorrect': under Walter's model, the payment-ratio for a normal firm ($r = k$) is irrelevant. *(Delhi University, 1999)*

18.2 "In a world of no taxes and no transaction costs, a firm cannot be made more valuable by manipulating the dividend payout ratio." Examine the validity of the statement.
(Delhi University, 2004)

18.3 What is the substance of Miller and Modigliani 'dividend irrelevance theorem'?
(Calcutta University, 2002)

18.4 (a) Explain the significance of Walter's model along with example.
(b) Critically examine the assumptions of Gordon's model. *(Calcutta University, 2003)*

18.5 What is the substance of Miller and Modigliani "dividend irrelevance theorem"?
(Calcutta University, 2004)

18.6 Choose the correct answer: If a firm distributes Rs 10 as dividend per share out of earnings per share of Rs 50 then dividend pay out ratio is
(a) 50% (b) 20% (c) 10% (d) 40%
(Bharatiyar University, April 2001)

18.7 (a) What are the essentials of Walter's dividend model?
(b) Give the arguments to support the view that dividends are relevant.
(c) In Walter's approach the dividend policy of a firm depends on availability of investment opportunity and the relationship between the firm's internal rate of return and the cost of capital. Discuss what the shortcomings of this view are.
(Periyar University, Oct./Nov. 2004)

18.8 Why is M-M model of dividend policy called dividend irrelevance theory?
(*Calcutta University and Bangalore University, 2010*)

18.9 State the Modigliani and Miller model relating to dividend policy. (*Calcutta University, 2009*)

18.10 Critically discuss Walter's dividend model. To what extent are the shortcomings of this model justified? (*Calcutta University, 2007*)

18.11 State the assumptions of MM model of dividend policy. (*Calcutta University, 2007*)

18.12 What is Modigliani-Miller's irrelevance hypothesis? (*Calcutta University, 2006*)

18.13 Explain Gordon's model in respect of dividend payout. (*Calcutta University, 2006*)

18.14 The key argument of Walter's model is that a firm would have an optimum dividend policy. Comment and explain taking suitable illustration. (*Delhi University, 2006*)

Numerical Questions

18.1 Determine the market value of equity shares of the company from the following information:

Earnings of the company	Rs10,00,000
Dividend paid	6,00,000
Number of shares outstanding	2,00,000
Price-earning ratio	8
Rate of return on investment (%)	15

Are you satisfied with the current dividend policy of the firm? If not, what should be the optimal dividend pay out ratio? Also calculate the price at this ratio. Apply Walter's model.
(*Delhi University, 2011*)

Solution

$$P = \frac{D + \frac{r}{K_e}(E - D)}{K_e} = \frac{\text{Rs } 3 + \frac{0.15}{0.125}(\text{Rs } 5 - \text{Rs } 3)}{0.125} = \frac{\text{Rs } 3 + 1.2(2)}{0.125} = \text{Rs } 43.20$$

No, current dividend policy of the firm is not satisfactory. The optimal dividend payout ratio should be zero, given the fact that $r > K_e$ (implying company can earn more than shareholders). At zero D/P ratio, price of the share would be higher as shown below: P = [Rs 0 + 0.15/0.125 (Rs 5 – 0)]/0.125 = Rs 6/0.125 = Rs 48.

Working Notes

(i) Cost of equity capital (ke) is reciprocal of P/E ratio = 1/8 = 12.5%

(ii) E (Earnings per share) = Total earnings/Number of equity shares = Rs 10,00,000/2,00,000 = Rs 5

(iii) D (Dividend per share) = Rs 6,00,000/2,00,000 = Rs 3

18.2 As per MM approach, the payment of dividend does not affect the value of the firm. Use the following data to prove the statement.

EPS = Rs 10, P/E = 10, K_e = 10%
No. of outstanding shares = 20,000
Expected dividend per share = Rs 5
Expected income = Rs 2,00,000
New investment = Rs 4,00,000

(*Delhi University, 2011*)

Solution

Value of firm, when dividends are paid (as per MM):

(i) $P_0 = (P_1 + D_1)/(1 + K_e)$; P_0 = EPS Rs 10 × P/E ratio, 10 = Rs 100
Rs 100 = (P_1 + Rs 5)/1.10; P_1 = Rs 110 – Rs 5 = Rs 105

(ii) Amount required for new financing = New investment – Retained earnings; $I - (E - nD_1)$ = Rs 4,00,000 – (Rs 2,00,000 – 20,000 shares × Rs 5) = Rs 3,00,000

(iii) Number of new shares (Δ_n) to be issued = Rs 3,00,000/Rs 105

(iv) Value of firm = $[nD_1 + (n + \Delta_n)\ P_1 - I + E - nD_1]/(1 + K_e)$
= [20,000 × Rs 5 + (20,000 + Rs 3,00,000/Rs 105) Rs × 105 – Rs 4,00,000 + Rs 2,00,000 – Rs 1,00,000]/1.10 = [Rs 1,00,000 + (Rs 21,00,000 + Rs 3,00,000) – Rs 4,00,000 + Rs 2,00,000 – Rs 1,00,000]/1.10 = Rs 22,00,000/1.10 = Rs 20,00,000

Value of firm, when dividends are not paid (as per MM):

(i) $P_0 = (P_1 + D_1)/(1 + K_e)$
Rs 100 = (P_1 + Zero)/1.1 or Rs 110 =

(ii) Amount required for new financing = $I\ (E - nD_1)$ = Rs 4,00,000 – Rs 2,00,000 = Rs 2,00,000

(iii) Number of new shares to be issued = Rs 2,00,000/Rs 110

(iv) Value of firm = $[nD_1 + (n + \Delta_n)\ P_1 - I + E - nD_1]/(1 + K_e)$
= [0 + (20,000 + Rs 2,00,000/Rs 110) × Rs 110 – Rs 4,00,000 + Rs 2,00,000 –0]/1.10 = [Rs 22,00,000 + Rs 2,00,000) – Rs 4,00,000 + Rs 2,00,000]/1.10 = Rs 22,00,000/1.10 = Rs 20,00,000
Since the value of firm is Rs 20 lakh in both situations (when dividends are paid and when they are not paid), MM approach indicates that the payment of dividend does not affect the value of the firm.

18.3 The following information relates to Vignesh Ltd. earning per share. Rs 9; internal rate of return, 18%; cost of capital, 12%; payout ratio, 33.33%. Compute the market price under the Walters model.
(*Madras University, 2010*).

Solution

Market price, $P = \dfrac{D + \dfrac{r}{C}(E - D)}{C}$

Where D = Dividend per share, Rs 9 × 1/3 = Rs 3
r = Rate of return company earns = 18%
C = Cost of capital = 12%
E = Earnings per share = Rs 9

P = [Rs 3 + 0.18/0.12 (Rs 9 – R 3)]/0.12 = [Rs 3 + 1.5 (Rs 6)]/ 0.12 = Rs 12/0.12 = Rs 100

18.4 The earnings per share of a company are Rs 12 and the rate of capitalisation applicable to the company is 10%. The productivity of earnings (r) is 10%. Based on Walter's model, compute the market value of the company's share if the payout ratio is **(a)** 25% **(b)** 50% **(c)** 75%.
(*Madras University, 2010*)

Solution

$$P = \frac{D + r/C\,(E - D)}{C}$$

Where D = Dividend per share
r = Rate of return earned by company on its investments, 10%
C = Market capitalisation rate, 10%
E = Earnings per share, Rs 12

MPS (P) at varying payment ratios

(a) 25%	*(b) 50%*	*(c) 75%*
$P = \frac{\text{Rs } 3 + 10\%/10\%(\text{Rs } 12 - \text{Rs } 2)}{10\%}$,	$\frac{\text{Rs } 6 + 0.1/0.1(\text{Rs } 12 - \text{Rs } 6)}{10\%}$,	$\frac{\text{Rs } 9 + 0.1/0.1(\text{Rs } 12 - \text{Rs } 9)}{10\%}$
= Rs 12/10% = Rs 120,	Rs 12/10% = Rs 120,	Rs 12/10% = Rs 120

The MPS remains unchanged at Rs 120. The reason is the company's rate of earning is equal to the capitailsation rate.

18.5 ABC Ltd was started a year ago with a paid-up equity capital of Rs 40,00,000. The other details are as under:
Earnings of the company, Rs 4,00,000; Dividend paid, Rs 3,20,000; Price-earnings ratio, 12.5; Number of shares, 40,000.

(i) Find the company's dividend payout ratio. Find the market price of a share of the company at this payout ratio, using Walter's model.

(ii) Is the company's dividend payout ratio optimal as per the Walter's model? Why?

(iii) What is the market price of a share of the company at the `optimal dividend payout' ratio as per the Walter's model? (*Delhi University, 2010*)

Solution

(i) D/P ratio = (Rs 3,20,000/Rs 4,00,000) × 100 = 80 per cent
MPS = $(D = r/k_e\,(E - D)]/k_e$
E = EPS = Rs 4,00,000/40,000 = Rs 10
D = DPS = Rs 3,20,000/40,000 = Rs 8
r = Rs 4,00,000/Rs 40,00,000 = 10%
K_e = Reciprocal of P/E ratio = 1/12.5 = 8%
P = [Rs 8 + 0.10/0.08 (Rs 10 – 8)]/0.08 = Rs 10.5/0/08 = Rs 131.25

(ii) The company's D/P ratio is not optimal. The zero D/P ratio would be optimal (the reason is $r > K_e$).

(iii) P (when D/P ratio is 0) = [0 + 0.10/0.08 (Rs 10)]/0/08 = Rs 12.5/0/08 = Rs 156.25

18.6 Z Co. Ltd. has an investment of Rs 10,00,000 in equity shares of Rs 100 each. The profitability rate of the company is 16%. Pay out ratio is 80%, cost of capital is 10%. What will be the price per share as per Walter's Model? Do you consider the given payout ratio as optimum? (*Calcutta University, 2009*)

$$P = \frac{D + r/K_e(E - D)}{K_e}$$

Solution

r = Rate of return earned by company (0.16)
E = Earnings per share (Total earnings, Rs 1,60,000/10,000 shares) = Rs 16
D = Dividend per share (Rs 16 × 0.8) = Rs 12.80
K_e = Cost of equity capital/capitalisation rate = 10%

P = [Rs 12.80 + 0.16/0.10 (Rs 16 – Rs 12.80)]/0.10
= (Rs 12.80 + Rs 5.12 = Rs 17.92)/0.10 = Rs 179.20

As per Walter's model, price of share is Rs 179.20. The dividend payout ratio of 80% is not optimal; it should be zero per cent. The reason is the MPS would be higher at this ratio (as the company can earn higher 16% compared to 10% by shareholders). MPS at 0% D/P ratio is Rs 256 as shown below:

P = [0 + 0.16/0.10 (Rs 16 – 0)]/0.10 = Rs 25.6/0.10 = Rs 256.

18.7 The following information is acquired from XYZ Ltd. Net earnings, Rs 1,00,000; Equity capital, 5,000 shares of Rs 10 each; Cost of capital, 10%; Expected rate of return, **(i)** 9%, **(ii)** 10% and **(iii)** 12%.

Assuming the dividend pay out ratios are 0%, 50% and 100% respectively, determine the effect of different policies on the share price of XYZ Ltd. for the above mentioned three alternative levels of return using Gordon's model. (*Calcutta University, 2008*)

Solution

According to Gordon's model, MPS (P) is given by: $P = \dfrac{E(1-b)}{K_e - b_r}$

E = Earnings per share; $(1 - b)$ = Retention ratio

K_e = Cost of capital; b_r = growth rate (product of retention rate and rate of return on investment, r)

E = Rs 1,00,000/5,000 = Rs 20; K_e = 10%

Determination of MPS at varying rates of return and varying dividend payout ratios

(I) Situation **(i)** rate of return is 9%:
- **(a)** D/P ratio = 0; Retention ratio = 100%; $b_r = 1.0 \times 0.09 = 0.09$
  P = (Rs 20 × 0)/(0.10 – 0.09) = zero
- **(b)** D/P ratio = 50%; Retention ratio = 50%; $b_r = 0.5 \times 0.09 = 0.045$:
  P = Rs 20 (0.5)/(0.10 – 0.045) = Rs 10/0.055 = Rs 181.82
- **(c)** D/P ratio = 100%; Retention ratio = 0%; $b_r = 0 \times 0.09 = 0$:
  P = Rs 20 (1 – 0)/(0.10 – 0) = Rs 20/0.10 = Rs 200

(II) Situation **(ii)** rate of return is 10%**:**
- **(a)** D/P ratio = 0; Retention ratio = 100%; $b_r = 1.0 \times 0.10 = 0.1$:
  P = Rs 20 (0)/(0.10 – 0.1) = 0
- **(b)** D/P ratio = 50%; Retention ratio = 50%; $b_r = 0.5 \times 0.10 = 0.05$:
  P = Rs 20 (1 – 0.5)/(0.10 – 0.5) = Rs 10/0.05 = Rs 200
- **(c)** D/P ratio = 100%; Retention ratio = 0%; $b_r = 0 \times 0.1 = 0$:
  P = Rs 20 (1 – 0)/(0.10 – 0) = Rs 20/0.10 = Rs 200

(III) Situation **(iii)** rate of return is 12%:
- **(a)** D/P ratio = 0; Retention ratio = 100%; $b_r = 1.0 \times 0.12 = 0.12$:
  P = Rs 20 (0)/(0.10 – 0.12) = 0
- **(b)** D/P ratio = 50%; Retention ratio = 50%; $b_r = 0.5 \times 0.12 = 0.06$:
  P = Rs 20 (1 – 0.5)/(0.10 – 0.6) = Rs 10/0.04 = Rs 250
- **(c)** D/P ratio = 100%; Retention ratio = 0%; $b_r = 0 \times 0.12 = 0$:
  P = Rs 20 (1 – 0)/(0.10 – 0) = Rs 20/0.10 = Rs 200

18.8 ABC Ltd. has a capital of Rs 10,00,000 in equity shares of Rs 100 each. The shares are currently quoted at par. The company proposes to declare a dividend of Rs 10 per share at the end of the current financial year. The capitalisation rate for the risk class to which the company belongs is 12%. What will be the market price of the share at the end of the year, if: **(i)** A dividend is not declared? **(ii)** A dividend is declared? **(iii)** Assuming that the company pays the dividend and has net profit of Rs 5,00,000 and makes new investments of Rs 10,00,000 during the period, how many new shares must be issued? Use the MM model. (*Delhi University, 2008*)

Solution

(i) $P_0 = (D_1 + P_1)/ 1 + Ke$ = Rs 100 = $(0 + P_1)/1.12 = P_1$ = Rs 112
Price at year-end is Rs 112 when dividends are not paid.

(ii) Rs 100 = (Rs 10 + P_1)/1.12 = Rs 112 = Rs 10 + P_1 or P_1 = Rs 102
Price at year-end is Rs 102 where dividends are paid.

(iii) Amount required for new financing: $I - (E - nd_1)$
Rs 10,00,000 – (Rs 5,00,000 – 10,000 shares × Rs 10) = Rs 6,00,000
Number of new shares (Δn) = Rs 6,00,000/Rs 102 = 5,883 shares.

18.9 Using the data given as: EPS, Rs 7; P/E, 10; *Ke*, 12%; No. of outstanding shares, 75,000; Expected dividend, Rs 5; Expected net income, 5,00,000; New investment, 8,00,000, show, using MM hypothesis, the payment of dividend does not affect value of the firm.

(*Delhi University, 2007*)

Solution

Value of firm, when dividends are paid (MM hypothesis):

(i) $P_0 = (P_1 + D_1)/(1 + K_e)$
= Rs 70 (EPS, Rs 7 × *P*/*E* ratio, 10) = $(P_1$ + Rs 5)/1.12
= Rs 70(1.12) = P_1 + Rs 5 or P_1 = Rs 78.4 – Rs 5.0 = Rs 73.4

(ii) Amount required for new financing (New investments – Retained earnings) = $I - (E - nD_1)$
= Rs 8,00,000 – (Rs 5,00,000 – 75,000 × Rs 5 = Rs 3,75,000) = Rs 6,75,000

(iii) Number of new shares to be issued = Rs 6,75,000/Rs 73.40

(iv) Value of firm = $[nD_1 + (n + \Delta n)P_1 - I + E - nD_1]/(1 + K_e)$
= [Rs 3,75,000 + (75,000 + 6,75,000/73.40) × Rs 73.40 – Rs 8,00,000
+ Rs 5,00,000 – Rs 3,75,000]/1.12
= [Rs 3,75,000 + (Rs 55,000 + Rs 6,75,000) – Rs 8,00,000 + Rs 5,00,000
– Rs 3,75,000]/1.12 ⇒ Rs 58,80,000/1.12, ⇒ Rs 52,50,000

Value of firm, where dividends are not paid:

(i) P_0 = (Rs P_1 + zero) 1.12 = Rs 70 × 1.12 = Rs 78.4 is P_1

(ii) Amount required for new financing = Rs 8,00,000 – (Rs 5,00,000 – 0) = Rs 3,00,000

(iii) Number of new shares (to be issued) = Rs 3,00,000/Rs 78.4

(iv) Value of firm: $[n + \Delta n)\ P_1 - I$ = [(75,000 + 30,000/78.4) × Rs 78.4 – Rs 8,00,000 + Rs 5,00,000]/1.12
= [Rs 58,80,000 + Rs 3,00,000 – Rs 8,00,000 + Rs 5,00,000]1/1.12
⇒ Rs 58,80,000/1.12 = Rs 52,50,000

Since the value of the firm is Rs 52,50,000 in both situations when dividends are paid and when dividends are not paid, the payment of dividend, according to the MM approach, does not affect the value of the firm.

18.10 The earnings per share of a company are Rs 12. Its equity capitalisation rate is 12.5% and the return on investment rate is 20%. Using Walter's formula, calculate the price per share if the company adopts a payout ratio of: (i) Nii, (ii) 40%, (iii) 100%. (*Delhi University, 2007*)

Solution

Determination of MPS at varying *D*/*P* ratio (Walter's formula):

(i) At zero *D*/*P* ratio: *P* = [0 + 0.2/0.125 (Rs 12 – 0)]/0.125 = 1.6 (Rs 12) = Rs 19.2/0.125 = Rs 153.60

(ii) At 40% *D*/*P* ratio: *P* = [4.8 + 0.2/0.125 (Rs 12 – 4.8)]/0.125 = [Rs 4.8 + 1.6 (7.2) or 11.52 = Rs 16.32]/0.125 = Rs 130.56

(iii) At 100% *D*/*P* ratio: *P* = [12 + 0.2/0.125 (Rs 12 – 12)]/0.125 = Rs 12/0/125 = Rs 96

18.11 The earnings per share of a company is Rs 8 and the rate of capitalisation applicable is 10%. The company has before it an option of adopting **(i)** 50%, **(ii)** 75% and **(iii)** 100 dividend payment ratio. Compute the market price of the company's quoted shares as per Walter's model if it can earn a return of **(i)** 15%, **(ii)** 10% and **(iii)** 5% on its retained earnings. (*Delhi University, 2007*)

Solution

(i) D/P ratio = 0.50	(ii) D/P ratio = 0.75	(iii) D/P ratio = 1
(a) Price of shares if r = 0.15		
$P = \frac{\text{Rs } 4 + \frac{0.15}{0.10}(\text{Rs } 8 - \text{Rs } 4)}{0.10}$	$P = \frac{\text{Rs } 6 + \frac{0.15}{0.10}(\text{Rs } 8 - \text{Rs } 6)}{0.10}$	$P = \frac{\text{Rs } 8 + \frac{0.15}{0.10}(\text{Rs } 8 - \text{Rs } 8)}{0.10}$
= Rs 100	= Rs 90	= Rs 80
(b) Price of shares if r = 0.10		
$P = \frac{\text{Rs } 4 + \frac{0.10}{0.10}(\text{Rs } 8 - \text{Rs } 4)}{0.10}$	$P = \frac{\text{Rs } 6 + \frac{0.10}{0.10}(\text{Rs } 8 - \text{Rs } 6)}{0.10}$	$P = \frac{\text{Rs } 8 + \frac{0.10}{0.10}(\text{Rs } 8 - \text{Rs } 8)}{0.10}$
= Rs 80	= Rs 80	= Rs 80
(c) Price of shares if r = 0.05		
$P = \frac{\text{Rs } 4 + \frac{0.05}{0.10}(\text{Rs } 8 - \text{Rs } 4)}{0.10}$	$P = \frac{\text{Rs } 6 + \frac{0.05}{0.10}(\text{Rs } 8 - \text{Rs } 6)}{0.10}$	$P = \frac{\text{Rs } 8 + \frac{0.05}{0.10}(\text{Rs } 8 - \text{Rs } 8)}{0.10}$
= Rs 60	= Rs 70	= Rs 80

18.12 The following information is available for *K* Music Company: Earnings per share = Rs 5.00; Rate of return required by shareholders = 16%. Assuming that Gordon Valuation model holds, what rate of return should be earned on investments to ensure that the market price is Rs 50 when the dividend payout is 40%? (*Delhi University, 2005*)

Solution

According to Gordon, MPS (P) is given by the following formula:

$$P = \frac{E(1-b)}{K_e - br},$$

Where E = EPS; b = Retention ratio, br = Growth rate (Retention ratio × Rate of return); K_e = Cost of equity capital

$$= \text{Rs } 50 = \frac{\text{Rs } 5.00\,(1-0.6)}{0.16 - 0.6r}$$

$$= \text{Rs } 8 - 30r = \text{Rs } 2$$

$$= \text{Rs } 6 = 30r$$

$$= r = 6/30 = 20 \text{ per cent}$$

18.13 The earnings per share of a company are Rs 10. It has rate of return of 15 per cent and the capitalisation rate of risk class is 12.5 per cent. If Walter's model is used:

(i) What should be the optimum payout ratio of the firm?

(ii) What would be the price of the share at this payout ratio?

(iii) How will the price of the share be affected if a different payout ratio was employed?

(Delhi University, 2004)

Solution

(i) Since the company's rate of earning/return (15 per cent) is higher than the capitalisation rate (12.5 per cent), the optimum dividend payout ratio according to Walter should be zero per cent as at such a rate, the price of the share will be maximum.

(ii) Market price of share at zero per cent D/P ratio

$$P = \frac{D + \frac{r}{c}(E - D)}{C}$$

$$= \frac{\text{Rs } 0 + \frac{0.15}{0.125}(10 - 0)}{0.125} = \frac{\text{Rs } 12}{0.125} = \text{Rs } 96$$

(iii) In case the firm follows any other D/P ratio, the market price of share will be less than Rs 96. Assume D/P ratio of 30 per cent.

$$P = \frac{\text{Rs } 3 + \frac{0.15}{0.125}(Rs\ 10 - 3)}{0.125} = \frac{\text{Rs } 11.4}{0.125} = \text{Rs } 91.2$$

It may be noted that P (MPS) at D/P ratio of 30 per cent is Rs 91.2 which is less than Rs 96.

18.14 The appropriate capitalisation rate for a company which belongs to a risk class is 10 per cent. Presently the company has 1,00,000 shares selling at Rs 100 each. The company is contemplating the declaration of Rs 5 as dividend at the end of the current financial year, which has just begun. What will be the price of the share at the end of the year, if a divided is not declared? What will it be if dividend is declared? Answer these on the basis of Modigliani and Miller model and assume no taxes. *(Calcutta University, 2004)*

Solution

(i) Price of the share (P_1), when dividend is not declared.

$P_0 = (D_1 + P_1)/(1+k_e)$ or Rs 100 = $(0 + P_1)/(1 + 0.1)$

Rs 100 $(1 + 0.1) = P_1$ or P_1 = Rs 110

(ii) P_1, When dividend of Rs 5 per share is declared

Rs 100 = (Rs 5 + P_1)/1.1 or Rs 110 = Rs 5 + P_1 or P_1 = Rs 105

18.15 Use Walter's model to determine the value of the firm in 3 cases:

(i) 100% retention;

(ii) 50% retention;

(iii) No retention.

Cost of capital = 10%

Rate of return on investment = 15%

Earnings per share = Rs 5

The firm has 10 lakh equity shares of Rs 10 each. *(Delhi University, 2003)*

Solution

Determination of Value of Firm as per Walter's Model

$$P = \frac{D + \frac{r}{c}(E - D)}{C}, \text{Valuation (V)} = P \times \text{No. of equity shares (N)}$$

(i) 100% retention (DPS = 0, EPS = Rs 5):

$$P = \frac{0 + \frac{0.15}{0.10}(\text{Rs } 5 - 0)}{0.10} = \frac{\text{Rs } 7.5}{0.1} = \text{Rs } 75,\ V = \text{Rs } 75 \times 10 \text{ lakh} = \text{Rs } 750 \text{ lakh}$$

(ii) 50% retention (DPS = Rs 2.5, EPS = Rs 5):

$$P = \frac{\text{Rs } 2.5 + \frac{0.15}{0.10}(\text{Rs } 5 - 2.5)}{0.10} = \frac{\text{Rs } 6.25}{0.1} = \text{Rs } 62.50,\ V = \text{Rs } 62.5 \times 10 \text{ lakh} = \text{Rs } 625 \text{ lakh}$$

(iii) No retention (DPS = Rs 5, EPS = 0):

$$P = \frac{\text{Rs } 5 + \frac{0.15}{0.10}(\text{Rs } 5 - 0)}{0.10} = \frac{\text{Rs } 5}{0.1} = \text{Rs } 50,\ V = \text{Rs } 50 \times 10 \text{ lakh} = \text{Rs } 500 \text{ lakh}$$

18.16 The following data are available for KPI Ltd.

Earnings per share – Rs 8.00

Rate of return on Investment 16 per cent

Rate of return required by shareholders 12 per cent

If Gordon's basic valuation formula holds, what will be price per share when the dividend pay out ratio is 25 per cent and 60 per cent. *(Calcutta University, 2003)*

Solution

Determination of price per share as per Gordon's modal:

(i) Dividend pay out ratio is 25 per cent:

$P = \frac{E(1-b)}{K_e - br}$; b = retention ratio, E = EPS,

r = rate of return on investment.

E = Rs 8, $(1 - b)$ = Dividend pay out ratio = 25 per cent

K_e = 12 per cent, br (g) = 0.75×0.16 = 12 per cent

P = Rs 8 $(1 - 0.75)/(0.12 - 0.12)$ = Rs 2/0 = ∞

(The answer is indeterminate as g is higher than k_e).

(ii) Dividend pay out ratio (D/P) is 60 per cent:

D/P ratio is 0.60, retention ratio 0.40

br = $0.40 \times 0.16 = 0.064$

P = Rs 8 $(1 - 0.40)/[0.12 - 0.064]$ = Rs 4.80/0.056 = Rs 85.71

18.17 A company belongs to a risk class for which the appropriate price-earnings ratio is 10. It currently has 25,000 outstanding equity shares selling at Rs 50 each. The company is contemplating the declaration of Rs 4 dividend per share in the current financial year which has just started. Given the assumption of Modigliani and Miller answer the following:

(1) What will be the price of the share at the end of the year **(i)** if dividend is not declared; **(ii)** if dividend is declared?

(2) Assume that the firm paying the dividend has net profit of Rs 2,50,000 and makes new investment of Rs 5,00,000 during the period, how many new shares must be issued?

(3) What will the value of the firm: **(i)** if dividend is not declared; **(ii)** if dividend is declared?

(Calcutta University, 2002)

Solution

1.(i) Price of the share (P_1), when dividend is not declared:

$P_0 = (D_1 + P_1)/(1 + k_e)$ or Rs 50 = $(0 + P_1)/(1 + 0.10)$

Rs 50 (1 + 0.10) = P_1 or P_1 = Rs 50 + Rs 5 = Rs 55

(ii) P_1, when dividend is declared:

Rs 50 = (Rs 4 + P_1)/1.1 or Rs 55 = Rs 4 + P_1 or P_1 = Rs 55 – Rs 4 = Rs 51

2.(i) Amount required for new financing, when dividends are paid

I Rs 5,00,000 – (E, Rs 2,50,000 – nD_1, Rs 1,00,000) = Rs 3,50,000

(ii) New shares (Δn) to be issued

Δn = Rs 3,50,000/Rs 51

3.(i) Value of the firm (V) when dividend is not declared

$V = [(n + \Delta n)\ P_1 - I + E]/(1 + k_e)$; Δn = (I, Rs 5,00,000 – E, Rs 2,50,000)/Rs55

= [(25,000 + Rs 2,50,000/55) Rs 55 – Rs 5,00,000 + 2,50,000]/1.10

= [Rs 13,75,000 + Rs 2,50,000 – Rs 5,00,000 + Rs 2,50,000]/1.1
= Rs 13,75,000/1.1 = Rs 12,50,000

(ii) Value of the firm (*V*) when dividend is declared

$V = [nD_1 + (n + \Delta n)\ P_1 - I + E - nD_1]/(1 + ke)$
= [Rs 1,00,000 + (25,000 + Rs 3,50,000/51) Rs 51 – Rs 5,00,000 + Rs 2,50,000 – Rs 1,00,000]/1.1
= [Rs 1,00,000 + Rs 12,75,000 + Rs 3,50,000 – Rs 5,00,000 + Rs 2,50,000 – Rs 1,00,000]/1.1
= Rs 13,75,000/1.1 = Rs 12,50,000

Chapter

19

Determinants of Dividend Policy

Learning Objectives

1. Describe the general factors that affect dividend policy
2. Review and evaluate the three basic types of dividend policies—constant dividend per share, constant payout ratio and stable dividend plus extra dividend
3. Contrast the basic features of bonus shares and share splits
4. Understand the legal, procedural and tax aspects of dividend policy

INTRODUCTION

The previous Chapter has provided an overview of the relationship between the dividend decision of a firm and its total value. In the light of the conflicting and contradictory viewpoints as also the available empirical evidence, there appears to be a case for the proposition that dividend decisions are relevant in the sense that investors prefer them over retained earnings and they have a bearing on the firm's objective of maximising the shareholders' wealth. Given the relevance proposition of the dividend decision of the firm, the present Chapter is devoted to a discussion of the determinants of the dividend policy of a firm. Unlike the theoretical nature of the discussion in the previous Chapter, this aspect of dividend policy is more practical. Section 1 of the Chapter discusses the factors which determine the dividend policy of a firm. The issues of bonus shares (Stock dividends), share split and related issues are covered in the subsequent Section. Section 3 outlines the legal, procedural and tax aspects of dividend payments. The last Section summarises the main points.

SECTION I FACTORS

The factors determining the dividend policy of a firm may, for purpose of exposition, be classified into: **(a)** Dividend payout (D/P) ratio, **(b)** Stability of dividends, **(c)** Legal, contractual and internal constraints and restrictions, **(d)** Owner's considerations, **(e)** Clientele effect, **(f)** Capital market considerations, and **(g)** Inflation.

Dividend policy involves decision to pay out earnings or to retain them for re-investment.

D/P (dividend payout) ratio indicates the percentage earnings distributed to shareholders in cash, calculated dividing the cash dividend per share by its earnings per share.

Dividend Payout (D/P) Ratio

A major aspect of the **dividend policy** of a firm is its dividend payout (D/P) ratio, that is, the percentage share of the net earnings distributed to the shareholders as dividends. The relevance of the **D/P ratio**, as a determinant of the dividend policy of a firm, has been examined at some length in the preceding chapter. It is briefly recapitulated here.

Dividend policy involves the decision to pay out earnings or to retain them for reinvestment in the firm. The retained earnings constitute a source of financing. The payment of dividends results in the reduction of cash and, therefore, in a depletion of total assets. In order to maintain the asset level, as well as to finance investment opportunities, the firm must obtain funds from the issue of additional equity or debt. If the firm is unable to raise external funds, its growth would be affected. Thus, dividends imply outflow of cash and lower future growth. In other words, the dividend policy of the firm affects both the shareholders' wealth and the long-term growth of the firm. The optimum dividend policy should strike the balance between current dividends and future growth which maximises the price of the firm's shares.[1] The D/P ratio of a firm should be determined with reference to two basic objectives—maximising the wealth of the firm's owners and providing sufficient funds to finance growth. These objectives are not mutually exclusive, but interrelated.

Given the objective of wealth maximisation, the firm's dividend policy (D/P ratio) should be one which can maximise the wealth of its owners in the 'long run'. In theory, it can be expected that the shareholders take into account the long-run effects of D/P ratio, that is, if the firm is paying low dividends and having high retentions, they recognise the element of growth in the level of future earnings of the firm. However, in practice, they have a clear cut preference for dividends because of uncertainty and imperfect capital markets. The payment of dividends can, therefore, be expected to affect the price of shares: a low D/P ratio may cause a decline in share prices, while a high ratio may lead to a rise in the market price of the shares.

Making a sufficient provision for financing growth can be considered a *secondary* objective of dividend policy. Without adequate funds to implement acceptable projects, the objective of wealth maximisation cannot be achieved. The firm must forecast its future needs for funds, and taking into account the external availability of funds and certain market considerations, determine *both the amount of retained earnings needed and the amount of retained earnings available after the minimum dividends have been paid.* Thus, dividend payments should not be viewed as a residual, but rather a required outlay after which any remaining funds can be reinvested in the firm.[2]

Dividend stability refers to the payment of a certain minimum amount of dividend regularly.

Stability of Dividends

The second major aspect of the dividend policy of a firm is the stability of dividends. The investors favour a stable dividend as much as they favour the payment of dividends (D/P ratio).

The term **dividend stability** refers to the *consistency or lack of variability* in the stream of dividends. In more precise terms,it means that a *certain*

minimum amount of dividend is paid out regularly. The *stability* of dividends can take any of the following three forms: **(i)** constant dividend per share, **(ii)** constant/stable D/P ratio, and **(iii)** constant dividend per share plus extra dividend.

Constant dividend per share policy is a policy of paying a certain fixed amount per share as dividend.

Constant Dividend Per Share According to this form of stable dividend policy, a company follows a policy of paying a certain fixed amount per share as dividend. For instance, on a share of face value of Rs 100, a firm may pay a fixed amount of, say Rs 15 as dividend. This amount would be paid year after year, irrespective of the level of earnings. In other words, fluctuations in earnings would not affect the dividend payments. In fact, when a company follows such a dividend policy, it will pay dividends to the shareholder even when it suffers losses. A stable dividend policy in terms of a fixed amount of dividend per share does not, however, mean that the amount of dividend is fixed for all times to come. The dividends per share are increased over the years when the earnings of the firm increase and it is expected that the new level of earnings can be maintained. Of course, if the increase is expected to be temporary, the annual dividend remains at the existing level. The relationship between the earnings per share (EPS) and dividends per share (DPS) with a constant dividend policy per year is shown in Figure 19.1.

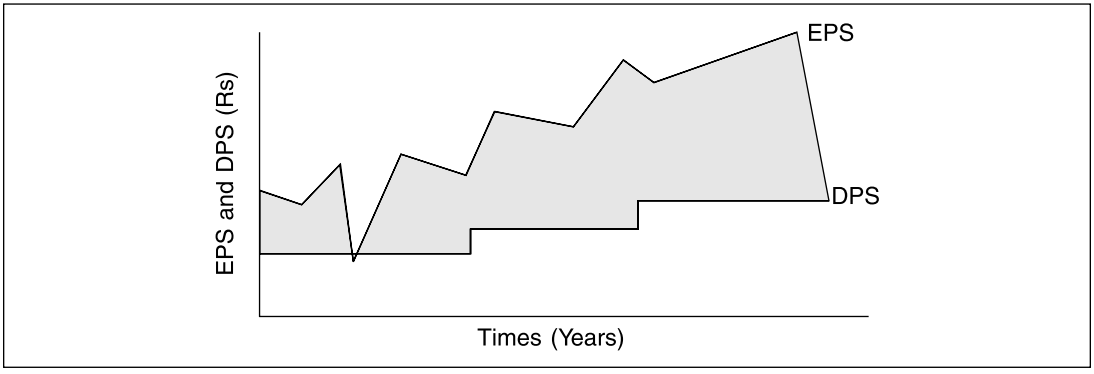

FIGURE 19.1 Stable Dividend Policy

It can, thus, be seen that while the earnings may fluctuate from year to year, the dividend per share is constant. To be able to pursue such a policy, a firm whose earnings are not stable would have to make provisions in years when earnings are higher for payment of dividends in lean years. Such firms usually create a '**reserve for dividends equalisation**'. The balance standing in this fund is normally invested in such assets as can be readily converted into cash.

Constant/target payout ratio is a policy to pay a constant percentage of net earnings as dividend to shareholders in each dividend period.

Constant Payout Ratio With constant payout ratio, a firm pays a constant percentage of net earnings as dividend to the shareholders. In other words, a stable dividend payout ratio implies that the percentage of earnings paid out each year is fixed. Accordingly, dividends would fluctuate proportionately with earnings and are likely to be highly volatile in the wake of wide fluctuations in the earnings of the company. As a result, when the earnings of a firm decline substantially or there is a loss in a given period, the dividends, according to the target payout ratio, would be low or nil. To illustrate, if a firm has a policy of 50 per cent target payout ratios, its

dividends will range between Rs 5 and zero per share on the assumption that the earnings per share are Rs 10 and zero respectively.

Stable rupee plus extra dividend is a policy based on paying a fixed dividend to shareholders supplemented by an additional dividend when earnings warrant it.

Stable Rupee Dividend Plus Extra Dividend Under this policy, a firm usually pays a fixed dividend to the shareholders and in years of marked prosperity additional or extra dividend is paid over and above the regular dividend. As soon as normal conditions return, the firm cuts the extra dividend and pays the normal dividend per share.

Evaluation An examination of the three variants of a stable dividend policy require addressing the following questions. What is their relative suitability? What are their implications to the shareholders and the firm? Which form would find favour with the investors?

The target payout ratio, as a form of stable dividend policy, commends itself insofar as it relates to the payment of actual dividend and to the ability of the firm to pay dividends: the higher the earnings, the higher is the dividend per share to the investors. It also implies that funds are automatically ploughed back to the extent of the retained earnings. It also guards against overpayment as well as underpayment of dividends[3] because management cannot pay dividends if there are no profits and it cannot withhold them when profits are earned. But from the shareholder's viewpoint, this method involves *uncertainty* and *irregularity* in regard to the expected dividends. The policy of paying sporadic dividends may not find favour with them.

The alternative to the combination of a small regular dividend and an extra dividend is suitable for companies whose earnings fluctuate widely. With this method, a firm can regularly pay a fixed, though small, amount of dividend so that there is no risk of not being able to pay dividend to the shareholders. At the same time, the investors can participate in the prosperity of the firm. By calling the amount by which the dividends exceed the normal payments as *extra*, the firm, in effect, cautions the investors–both existing as well as prospective—that they should not consider it as a permanent increase in dividends. It may, therefore, be noted that, from the investor's viewpoint, the extra dividend is of a sporadic nature.

What the investors expect is that they should get an assured fixed amount as dividends which should gradually and consistently increase over the years. The most commendable form of stable dividend policy is the constant dividend per share policy. There are several reasons why investors would prefer a stable dividend policy and pay a higher price for a firm's shares which observes stability in dividend payments.

Desire for Current Income A factor favouring a stable policy is the desire for current income by some investors. Investors such as retired persons and widows, for example, view dividends as a source of funds to meet their current living expenses. Such expenses are fairly constant from period to period. Therefore, a fall in dividend will necessitate selling shares to obtain funds to meet current expenses and, conversely, reinvestment of some of the dividend income if dividends rise significantly. For one thing, many of the income-conscious investors may not like to 'dip into their principal' for current consumption. Moreover, either of the alternatives involves, inconvenience apart, transaction costs in terms of brokerage, and other expenses. These costs are avoided if the dividend stream is stable and predictable. Obviously, such a group of investors may be willing to pay a higher share price to avoid the inconvenience of erratic dividend payments which disrupt their budgeting. They would place **positive utility on stable dividends**.

Informational Contents Another reason for pursuing a stable dividend policy is that investors are thought to use dividends and changes in dividends as a source of information about the firm's profitability. If investors know that the firm will change dividends only if the management foresees a permanent earnings change, then the level of dividends informs investors about the company's expected earnings. Accordingly, the market views the changes in the dividends of such a company as of a semi-permanent nature. A cut in dividend implies poor earnings expectation; no change, implies earnings stability; and a dividend increase, signifies the management's optimism about earnings. On the other hand, a company that pursues an erratic dividend payout policy does not provide any such information, thereby increasing the risk associated with the shares. Stability of dividends, where such dividends are based upon long-run earning power of the company, is, therefore, a means of reducing share-riskiness and consequently increasing share value to investors.[4]

Requirements of Institutional Investors A third factor encouraging stable dividend policy is the requirement of institutional investors like life insurance companies, general insurance companies, mutual funds and so on, to invest in companies which have a record of continuous and stable dividend. These financial institutions owing to the large size of their investible funds, represent a significant force in the financial markets and their demand for the company's securities can have an *enhancing effect* on its price and, thereby, on the shareholder's wealth. A stable dividend policy is a prerequisite to attract the investible funds of these institutions. One consequential impact of the purchase of shares by them is that there may be an increase in the general demand for the company's shares. Decreased **marketability risk**, coupled with decreased **financial risk**, will have a positive effect on the value of the firm's shares.

Apart from theoretical postulates for the desirability of stable dividends, there are also many empirical studies, classic among them being that of Lintner[5], to support the viewpoint that companies pursue a stable dividend policy. In other words, companies, while taking decisions on the payment of dividend, bear in mind the dividend amount paid in the previous years. There is a resistance on the part of companies to reduce dividends below the amount paid in previous years. Actually, most firms seem to favour a policy of establishing a non-decreasing *dividend per share stream* over time, but firms seem to be specially careful not to raise dividends per share above a level than cannot be safely sustained in the future. **This cautious *creep up* of dividends per share results in stable dividend per share pattern during fluctuating earnings per share periods, and a rising step-function pattern of dividends per share during increasing earning per share periods[6]**.

According to John Lintner's study, dividends are 'sticky' in the sense that they are slow to change and lag behind shifts in earnings by one or more periods. Most firms, in addition to maintaining a stable rupee amount of dividend, also have target payout ratios (long-run dividend payout ratio) which they aim at. The firms may plan a high or low long-run target payout ratio regardless of their policy towards period-to-period dividend stability. The desire to maintain the present dividend level may conflict with strict adherence to any particular target payout ratio especially when earnings per share drop off, even temporarily. To avoid the necessity of reducing the dividend because of a lean year and to maintain progress towards the target payout ratio, firms raise their dividends per share gradually, as the earnings per share rise. Thus, Lintner concludes that dividends represent the primary active decision variable in most situations. Savings or retained earnings in a given period generally are largely a by-product of dividends action, taken in terms of well-established practices and policies. Dividends are seldom the residual decision.

According to Lintner, *dividend is a function of earnings of that year, existing dividend rate, target payout ratio and speed of adjustment.* In symbolic terms,

$$D_t - D_{t-1} = a_0 + c(D_t^* - D_{t-1})$$

(19.1)

where D_t = Dividend amount under consideration,

D_{t-1} = Dividend paid in the previous year,

a_0 = A constant which may have value of zero, but never negative and generally has a positive value to reflect the greater reluctance to reduce than to raise dividends,

c = Speed of adjustment,

D_t^* = Target payout ratio (r) multiplied by profit after taxes (p) = rp, and

$D_t - D_{t-1}$ = Change in dividend payout (ΔD)

The right hand side of Equation 19.1 can be rewritten as:

$$a_0 + c(rP_t - D_{t-1}) = a_0 + crP_t - cD_{t-1}$$

Adding D_{t-1} on both sides of Eq. 19.1

$$D_t = a_0 + crP_t - cD_{t-1} + D_{t-1} = a_0 + crP_t + D_{t-1}(1 - c)$$

Let cr be represented by b_1 (short-run propensity to pay dividends) and $(1 - c)$ be represented by b_2 (long-run propensity to pay dividends), we have:

$$D_t = a_0 + b_1P_t + b_2D_{t-1} \qquad \textbf{(19.2)}$$

Thus, dividends paid by an individual company are a function of a_0 (constant), short-run propensity to pay (b_1) and long-run propensity to pay dividends (b_2).

Bolten[7] has also formulated a formula based on key variables suggested by Lintner:

$$D_{t+1} = D_t + a\left[P^* - \frac{D_t}{E_t}\right]E_t \qquad \textbf{(19.3)}$$

where D_{t+1} = dividend amount under consideration,

D_t = prevailing dividend,

D_t/E_t = prevailing payout ratio,

P^* = target payout ratio,

E_t = latest earnings per share, and

a = adjustment cushion.

Equation 19.3 suggests that the increase in dividends would be less than the increase in earnings owing to the speed of adjustment.

Suppose the target payout ratio of a company is 50 per cent and the present dividend is Rs 2 per share. The firm would not immediately pay a dividend of Rs 3 share if the earnings per share rose from Rs 5 per share to Rs 6, since that would expose the firm to the necessity of reducing the dividend in the following year, if the earnings per share fell below Rs 6. Rather, the firm might decide to gradually move toward the 50 per cent target payout by declaring a Rs 2.50 per share dividend. With Rs 2.50 dividend, the firm's earnings per share could drop to Rs 5 in the following year and still be at the 50 per cent target ratio, avoiding the necessity of reducing the dividend. Thus,

$$D_{t+1} = \text{Rs } 2 + 0.50 \left[0.50 - \frac{\text{Rs } 2}{\text{Rs } 6} \right] (\text{Rs } 6) = \text{Rs } 2.50$$

In summing up, it can be commended that a company should seek a stable dividend policy which avoids occasional reduction of dividends. Investors favourably react to the price of shares of such companies and there is a **price enhancing effect** of such a policy as it resolves the uncertainty from the minds of the investors regarding the anticipated stream of dividends. Above all, it projects the image of a stable operating environment. An increase in the dividend communicates the feeling of a firm entering a new period of prosperity.

Legal, Contractual, and Internal Constraints and Restrictions

The dividend decision is also affected by certain legal, contractual, and internal requirements and constraints. The legal factors stem from certain statutory requirements, the contractual restrictions arise from certain loan covenants and the internal constraints are the result of the firm's liquidity position.

Legal Requirements Legal stipulations do not require a dividend declaration but they specify the conditions under which dividends must be paid. Such conditions pertain to **(i)** capital impairment, **(ii)** net profits and **(iii)** insolvency.

Capital Impairment Rules Legal enactments limit the amount of cash dividends that a firm may pay. A firm cannot pay dividends out of its paid-up capital, otherwise there would be a reduction in the capital adversely affecting the security of its lenders. The rationale of this rule lies in protecting the claims of preference shareholders and creditors on the firm's assets by providing a sufficient equity base since the creditors have originally relied upon such an equity base while extending credit. Any dividends that impair capital are illegal and the directors are personally held liable for the amount of illegal dividend. Therefore, the financial manager should keep in mind that payment of dividend is in order and does not violate capital impairment rules.

Net Profits The net profits requirement is essentially a corollary of the capital impairment requirement, in that it restricts the dividend to be paid out of the firm's current profits plus past accumulated retained earnings. Alternatively, a firm cannot pay cash dividends greater than the amount of current profits plus the accumulated balance of retained earnings. For instance, section 205 of the Indian Companies Act provides that dividends shall be paid only out of the current profits or past profits after providing for depreciation. The point to be recognised is that the company can count on the profits of previous years, if the current year's profits fall short of the required funds for maintaining a desired stable dividend policy. Likewise, if there are past accumulated losses, they should be first set off against current earnings before the payment of dividend.

Insolvency A firm is said to be insolvent in two situations: *first*, when its liabilities exceed the assets; and *second*, when it is unable to pay its bills. If the firm is currently insolvent in either sense, it is prohibited from paying dividends. Similarly, a firm would not pay dividends if such a payment leads to insolvency of either type. The rationale of the rule is to protect the creditors by prohibiting the liquidation of near-bankrupt firms through cash dividend payments to the equity owners.

Contractual Requirements Important restrictions on the payment of dividend may be accepted by a company when obtaining external capital either by a loan agreement, a debenture indenture, a preference share agreement, or a lease contract. Such restrictions may cause the firm to restrict the payment of cash dividends until a certain level of earnings has been achieved or limit the amount of dividends paid to a certain amount or percentage of earnings. Since the payment of dividend involves a cash outflow, firms are forced to reinvest the retained earnings within the firm. The restriction on dividends may take three forms. In the first place, firms may be prohibited from paying dividends in excess of a certain percentage, say, 12 per cent. Alternatively, a ceiling in terms of the maximum amount of profits that may be used for dividend payment may be laid down, say not more than 60 per cent of the net profits, or a given absolute amount of such profits can be paid as dividends. Finally, dividends may be restricted by insisting upon a minimum of earnings to be retained.[8] Reinvestment leads to a lower debt/equity ratio and, thus, enhances the margin of cushion (safety) for the lenders.

Therefore, contractual constraints on dividend payments are quite common. The payment of cash dividend in violation of a restriction would amount to default in the case of a loan and the entire principal would become due and payable. Keeping in view the severity of penalty, the financial manager must ensure that the amount of dividend is within the covenants already committed to lenders.

Internal Constraints Such factors are unique to a firm and include **(i)** liquid assets, **(ii)** growth prospects, **(iii)** financial requirements, **(iv)** availability of funds, **(v)** earnings stability and **(iv)** control.

Liquid Assets Once the payment of dividend is permissible on legal and contractual grounds, the next step is to ascertain whether the firm has sufficient cash funds to pay cash dividends. It may well be possible that the firm's earnings are substantial, but the firm may be short of funds. This situation is common for **(a)** growing companies; **(b)** companies which have to retire past loans as their maturity year has come; and **(c)** companies whose preference shares are to be redeemed. Such companies may not like to borrow at exorbitant rates because of the increased financial risk especially if their existing leverage ratio is already very high. Moreover, lenders may be reluctant to lend money for dividend payments since they produce no tangible or operating benefits that will help the firm to repay the loan. Thus, the firm's ability to pay cash dividends is largely restricted by the level of its liquid assets. On the other hand, if excess cash is available, the firm can have a more liberal dividend policy.

Growth Prospects Another set of factors that can influence dividend policy relates to the firm's growth prospects. The firm is required to make plans for financing its expansion programmes. In this context, the availability of external funds and its associated cost together with the need for investment funds would have a significant bearing on the firm's dividend policy.

Financial Requirements Financial requirements of a firm are directly related to its investment needs. The firm should formulate its dividends policy on the basis of its foreseeable investment needs. If a firm has abundant investment opportunities, it should prefer a low payout ratio, as it can usually reinvest earnings at a higher rate than the shareholders can. Such firms, designated as 'growth' companies, are constantly in need of funds. Their financial requirements may be charcterised as large and immediate. That retention of earnings is less costly than selling a new issue of equity needs no reiteration. Moreover, retention of earnings provides the base upon which the firm can borrow additional funds. Therefore, it provides flexibility in the company's capital structure, that is, it make room for **unused debt capacity**. The importance of creation

of debt raising potentials for a growing firm is overwhelming.

On the other hand, if the firm has little or no growth opportunities, it will probably prefer low retention and relatively high dividend payouts. This is so for two vital reasons. First, the shareholders can reinvest earnings at a higher rate than the firm can do, and, secondly, such firms may need funds largely to replace or modernise assets. In many instances, these outlays may not be required immediately but after two or three years. Therefore, the need for funds is small and periodic *vis-a-vis* large and fast growing companies. The nature of the firm's needs, therefore, is an important factor in determining the destination of the firm's fund–retention or distribution.

Availability of Funds The dividend policy is also constrained by the availability of funds and the need for additional investment. In evaluating its financial position, the firm should consider not only its ability to raise funds but also the cost involved in it and the promptness with which financing can be obtained. In general, large, mature firms have greater access to new sources for raising funds than firms which are growing rapidly. For this reason alone, the availability of external funds to the growing firms may not be sufficient to finance a large number of acceptable investment projects. Obviously, such firms have to depend on their retained earnings so as to amount of maximum number of available profitable projects. Therefore, large retentions are necessary for such firms.

Earnings Stability The stability of earnings also has a significant bearing on the dividend decision of a firm. Generally, the more stable the income stream, the higher is the dividend payout ratio. Such firms are more confident of maintaining a higher payout ratio. Public utility companies are classic examples of firms that have relatively stable earnings pattern and high dividend payout ratio. Growing firms, characterised by stable earnings, can muster debt funds at a relatively lower cost because of a smaller total risk (business and financial). This is unlike the experience of other firms which, though growing, suffer from fluctuating earnings.

However, the financial manager should remember that dividends have information value. Withholding the payment of dividends will raise the required rate of return of the investors and, therefore, depress the market price of the sharees. The increase in earnings should be such that it can offset the unfavourable effect of the increased cost of equity (k_e).

Control Dividend policy may also be strongly influenced by the shareholders' or the management's control objectives. That is to say, sometimes management employs dividend policy as an effective instrument to maintain its position of command and control. The management, in order to retain control of the company in its own hands, may be reluctant to pay substantial dividends and would prefer a smaller dividend payout ratio. This will particularly hold good for companies which require funds to finance profitable investment opportunities when an outside group is seeking to gain control of the firm. Added to this, if a controlling group of shareholders either cannot or does not wish to purchase new shares of equity, under such circumstances, by the issue of additional shares to finance investment opportunities, management may lose its existing control. Conversely, if management is securely in control, either through substantial holdings or because the shares are widely held, and the firm has a good image, it can afford to have a high dividend payout ratio. If it requires funds later, the firm can easily raise additional funds owing to its reputation.

Owner's Considerations

The dividend policy is also likely to be affected by the owner's considerations of **(a)** the tax status of the shareholders, **(b)** their opportunities of investment, and **(c)** the dilution of ownership. It is well-nigh impossible to establish a policy that will maximise each owner's wealth. The firm must aim at a dividend policy which has a beneficial effect on the wealth of the majority of the shareholders.

Taxes The dividend policy of a firm may be dictated by the income tax status of its shareholders. If a firm has a large percentage of owners who are in high tax brackets, its dividend policy should seek to have higher retentions. Such a policy will provide its owners with income in the form of capital gains as against dividends. Since capital gains are taxed at a lower rate than dividends, they are worth more, after taxes, to the individuals in a high tax bracket. On the other hand, if a firm has a majority of low income shareholders who are in a lower tax bracket, they would probably favour a higher payout of earnings because of the need for current income and the greater certainty associated with receiving the dividend now, instead of the less certain prospects of capital gains later. With effect from financial year 2003-4, dividend income from Indian corporate firms, mutual funds and Unit Trust of India is fully exempt from tax in the hands of the shareholders/investors/unit-holders.

Opportunities The firm should not retain funds if the rate of return earned by it would be less than one which could have been earned by the investors themselves from external investments of funds. Such a policy would obviously be detrimental to the interests of shareholders. It is difficult to ascertain the alternative investment oportunities of each of its shareholders and, therefore, the alternative investment opportunity rate. However, the firm should evaluate the rate of return obtainable from external investments in firms belonging to the same risk class. If evaluation shows that the owners have better opportunities out side, the firm should opt for a higher D/P ratio. On the other hand, if the firm's investment opportunities yield a higher rate than that obtained from similar external investment, a low D/P is suggested. Therefore, in formulating dividend policy, the evaluation of the external investment opportunities of owners is very significant.

Dilution of Ownership The financial manager should recognise that a high D/P ratio may result in the dilution of both control and earnings for the existing equity holders. The control aspect has already been discussed. Dilution in earnings results because low retentions may necessitate the issue of new equity shares in the future, causing an increase in the number of equity shares outstanidng and ultimately lowering earnings per share and their price in the market. By retaining a high percentage of its earnings, the firm can minimise the possibility of dilution of earnings.

Thus, in framing the dividend policy of a firm, consideration must be given to the requirements of equity-holders.

> Although the ultimate dividend policy depends on numerous factors, the avoidance of shareholders' discontent is important. If the shareholders become dissatisfied with the existing dividend policy, they may sell their shares, increasing the possibility that control of the firm will be seized by some outside group. The 'takeover' of a firm by outsiders is more likely when owners are dissatisfied with its dividend policy. It is the 'financial manager's responsibility to keep in touch with the owner's general attitude toward dividends.[9]

Capital Market Considerations

Yet another set of factors that can strongly affect dividend policy is the extent to which the firm has access to the capital markets. In case the firm has easy access to the capital market, either becasue it is financially strong or large in size, it can follow a liberal dividend policy. However, if the firm has only limited access to capital markets, it is likely to adopt low dividend payout ratios. Such firms are likely to rely more heavily on retained earnings as a source of financing their investments.

Firms which lean heavily on financial institutions for procuring funds, declare a minimum dividend so that they can remain on the 'eligible' list of these institutions. It is because, in general, most financial institutions are prohibited by their charter from buying shares in companies which pay no dividends. A company should be paying dividends at a certain minimum rate for at least some specified number of year (say, 5 years). Since such institutions are significant buyers of corporate securities, some firms that would otherwise have not paid any amount of dividend, would pay some dividend so that they remain on the eligible list.

Inflation

Finally, inflation is another factor which affects the firm's dividend decision. With rising prices, funds generated from depreciation may be inadequate to replace obsolete equipments. These firms have to rely upon retained earnings as a source of funds to make up the shortfall. This aspect becomes all the more important if the assets are to be replaced in the near future. Consequently, their dividend payout tends to be low during periods of inflation.

SECTION 2 BONUS SHARES (STOCK DIVIDEND) AND STOCK (SHARE) SPLITS

Bonus shares involve payment to existing owners of dividend in the form of shares.

Stock splits is a method commonly used to lower the market price of shares by increasing the number of shares belonging to each shareholder.

An integral part of dividend policy of a firm is the use of **bonus shares** and stock splits. Both involve issuing new shares on a *pro rata* basis to the current shareholders while the firm's assets, its earnings, the risk being assumed and the investors percentage ownership in the company remain unchanged. The only definite result from either a bonus share or share split is the increase in the number of shares outstanding. Table 19.1 illustrates their effect on the capitalisation of the firm. Part one of the table shows the equity of the balance sheet before the bonus issue and part two after the issue. The effect of **share splits** is shown in part three.

TABLE 19.1 Effect of Bonus Shares and Share Splits

(I) Equity portion before the bonus issue:	
Equity share capital (30,000 share of Rs 100 each)	Rs 30,00,000
Share premium (@ Rs 25 per share)	7,50,000
Retained earnings	62,50,000
Total equity	1,00,00,000

(*Contd.*)

(*Contd.*)

(II)	Equity portion after the bonus issue (1 : 2 ratio):	
	Equity share capital (45,000 shares of Rs 100 each)	45,00,000
	Share premium (45,000 shares × Rs 25)	11,25,000
	Retained earnings (Rs 62,50,000 – 15,000 shares × Rs 125)	43,75,000
	Total equity	1,00,00,000
(III)	Equity portion after the share splits (10 : 1 ratio):	
	Equity share capital (3,00,000 shares of Rs 10 each)	30,00,000
	Share premium	7,50,000
	Retained earnings	62,50,000
	Total equity	1,00,00,000

From Table 19.1 it is clear that a share split is similar to bonus issue from the economic point of view though there are some differences from the accounting point of view. In the equity portion of the firm, a bonus issue reduces the retained earnings and correspondingly increases paid-up equity and share premium, if any, whereas stock/share split has no such effect. The economic effect of both is to increase the number of equity shares outstanding.

Reverse Stock Splits

Reverse stock split reduces the number of outstanding shares.

Instead of increasing the number of shares outstanding, a company may like to reduce it through a reverse split. There is no impact of the reverse split on corporate earnings and shareholders' wealth. Reverse split reflects an aversion on the part of many companies to see the prices of their shares falling below a certain amount. Whatever be the reasons for decrease of price, it can be increased with a reverse split.[10]

In the case of **straight stock split**, the number of outstanding shares increases, but it decreases when the company chooses reverse split. The reverse split of 1:5 implies that for each five shares held by a shareholder, he would receive one share in exchange.

Rationale

As pointed out earlier, no major economic benefit results from bonus shares and share splits. Yet, certain advantages are associated with them. In the first place, the issue of bonus shares/ share splits would have the effect of bringing the market price of shares within more popular range as a result of larger number of shares outstanding. The larger number of outstanding shares will also promote more active trading in the shares due to availability of floating stock. Yet another advantage might relate to the *informational content of bonus/split* announcement. The announcement is perceived as favourable news by the investors in that with growing earnings, the company has bright prospects and the investors can reasonably look for increase in future dividends. Moreover, it enables the conservation of corporate cash. If the bonus share is an effort to conserve cash for profitable investment opportunities, the share prices will tend to rise and the shareholders benefit. However, if the move to conserve cash relates to financial difficulties within the firm, the market price will most likely react adversely. Finally, bonus/ split announcements improve the prospect of raising additional funds particularly through the issue of convertible debentures.

SECTION 3 LEGAL, PROCEDURAL AND TAX ASPECTS

Legal Aspects

The amount of dividend that can be legally distributed is governed by company law, judicial pronouncements in leading cases, and contractual restrictions.[11] The important provisions of company law pertaining to dividends are described below.

1. Companies can pay only cash dividends (with the exception of bonus shares). Apart from cash, dividend may also be remitted by cheque or by warrant. The same may also be trans-mitted electronically to shareholders after obtaining their consent in this regard to the bank account number specified by them. The step has been proposed by the Department of Company Affairs to avoid delay in the remittance of dividend.
2. Dividends can be paid only out of the profits earned during the financial year after providing for depreciation and after transferring to reserves such percentage of profits as prescribed by law. The Companies (Transfer to Reserve) Rules, 1975, provide that before dividend delcaration, a percentage of profit as specified below should be transferred to the reserves of the company.
   - **(a)** Where the dividend proposed is upto 10 per cent of the paid up capital, no amount of the current profits needs to be transferred.
   - **(b)** Where the dividend proposed exceeds 10 per cent but not 12.5 per cent of the paid-up capital, the amount to be transferred to the reserves should bot be less than 2.5 per cent of the current profits.
   - **(c)** Where the dividend proposed exceeds 12.5 per cent but not 15 per cent, the amount to be transferred to reserves should not be less than 5 per cent of the current profits.
   - **(d)** Where the dividend proposed exceeds 15 per cent but not 20 per cent, the amount to be transferred to reserves should not be less than 7.5 per cent of the current profits.
   - **(e)** Where the dividend proposed exceeds 20 per cent, the amount to be transferred to reserve should not be less 10 per cent.
   - **(f)** A company may voluntarily transfer a percentage higher than 10 per cent of the current profits to reserves in any financial year provided the following conditions are satisfied:
     - **(i)** It ensures that the dividend declared in that financial year is sufficient to maintain average rate of dividend declared by it over three years immediately preceding the financial year.
     - **(ii)** In case, it has issued bonus shares in the year in which dividend is declared or in the three years immediately preceding the financial year, it maintains the amount of dividend equal to the average amount of dividend declared over the three years immediately preceding the financial year.

       However, maintenance of such minimum rate or quantum of dividend is not necessary if the net profits after tax in a financial years are lower by 20 per cent or more than the average profits after tax of the two immediately preceding financial years.
   - **(g)** A newly incorporated company is prohibited from transferring more than ten per cent of its profits to reserves. The 'current profit' for the purpose of transfer to reserves will be profits after providing for statutory transfer to the Development Rebate Reserve and arrears of depreciation if any.

3. Due to inadequacy or absence of profits in any year, dividend may be paid out of the accumulated profits of previous years. In this context, the following conditions, as stipulated by the Companies (Declaration of Dividend out of Reserves) Rules, 1975, have to be satisfied.
   (a) The rate of the declared dividend should not exceed the average of the rates at which dividend was declared by the company in 5 years immediately preceding that year or 10 per cent of its paid-up capital, whichever is less.
   (b) The total amount to be drawn from the accumulated profits earned in previous years and transferred to the reserves[18] should not exceed an amount equal to one-tenth of the sum of its paid-up capital and free reserves and the amount so drawn should first be utilised to set off the losses incurred in the financial year before any dividend in respect of preference or equity shares is declared.
   (c) The balance of reserves after such *drawal* should not fall below 15 per cent of its paid-up capital.
4. Dividends cannot be declared for past years for which accounts have been adopted by the shareholders in the annual general meeting.
5. Dividend declared, interim or final, should be deposited in a separate bank account within 5 days from the date of declaration and dividend will be paid within 30 days from such a date.
6. Dividend including interim dividend once declared becomes a debt. While the payment of interim dividend cannot be revoked, the payment of final dividend can be revoked with the consent of the shareholders.

Procedural Aspects

Record date is the specified future date set by the Directors on which all persons whose names are recorded as shareholders receive the declared dividend.

The important events and dates in the dividend payment procedure are:

1. **Board Resoultion:** The dividend decision is the prerogative of the board of directors. Hence, the board of directors should in a formal meeting resolve to pay the dividend.
2. **Shareholder Approval:** The resolution of the board of directors to pay the dividend has to be approved by the shareholders in the annual general meeting. However, their approval is not required in the case of declaration of interim dividend. Further, it should be noted that the shareholders in the annual general meeting have neither the power to declare the dividends (if the Broad of Directors do not recommend it) nor to increase the amount of dividend. However, they can reduce the amount of the proposed dividend.
3. **Record Date:** The dividend is payable to shareholders whose names appear in the register of members as on the record date.
4. **Dividend Payment:** Once a dividend declaration has been made, dividend warrant must be posted within 30 days. Within a period of 7 days, after the expiry of 30 days, unpaid dividends must be transferred to a special account opened with a scheduled bank.

   In case the company fails to transfer the unpaid dividend to the 'unpaid dividend account' within 37 days of the declaration of dividend, an interest of 12 per cent per annum on the unpaid amount is to be paid by the company. The interest so accruing

is to be paid to the shareholders in the proportion of the dividend amount remaining unpaid to them.

The dividend will be paid to the registered shareholder or to his order or to his banker or in case a share warrant has been issued to the bearer of such a share warrant. In the case of joint-holders, the dividends should be paid to be first joint-holder.

In the case of dividend payable to non-resident shareholders, authorised dealers are empowered to remit payment of dividend. For the purpose, they are empowered to devise their own documentation to comply with Section 10(5) of FEMA 1999.

Further, as per the notification issued by the Department of Company Affairs, the payment of dividend to the shareholders involving the fraction of 50 paise and above be rounded off to the rupee and the fraction of less than 50 paise may be ignored.

In the case of dematerialised shares (i.e., the shares held in electronic form), the corporate firms are required to collect the list of members holding shares in the depository and pay them the dividend.

5. **Unpaid Dividend:** if the money transferred to the 'unpaid dividend account' in the scheduled bank remains unpaid/unclaimed for a period of 7 years from the date of such transfer, the company is required to transfer the same to the 'Investor. Education and Protection Fund' established for the purpose.

Tax Aspects

With effect from financial year 2003-4, dividend income from domestic companies and mutual funds is exempt from tax in the hands of the shareholders/investors/unit-holders. However, the domestic companies will be liable to pay dividend distribution tax at the effective rate of 16.995 per cent on dividends paid after April 1, 2007.

Summary

- The determinants of the dividend policy of a firm are dividend payout (*D*/*P*) ratio, stability of dividends, legal, contractual and internal constraints and restrictions, owners' considerations, capital market considerations and inflation.
- The *D*/*P* ratio indicates the percentage share of the net earnings distributed to the shareholders as dividends. Given the objective of wealth maximisation, the *D*/*P* ratio should be such as can maximise the wealth of its owners in the 'long-run'. In practice, investors, in general, have a clear cut preference for dividends because of uncertainty and imperfect capital markets. Therefore, a low *D*/*P* ratio may cause a decline in share prices, while a high ratio may lead to a rise in the market price of the shares.
- A stable dividend policy refers to the consistency or lack of variability in the stream of dividends, that is, a certain minimum amount of dividend is paid out regularly. Of the three forms of stability of dividend, namely, constant dividend per share, constant *D*/*P* ratio and constant dividend per share plus extra dividend, the first one is the most appropriate. The investors prefer a stable dividend policy for a number of reasons, such as, desire for current income their, informational contents, institutional requirement, and so on.
- There are many empirical studies, (e.g. Lintrer) to support the contention that companies pursue a stable dividend policy.
- According to John Lintrer's study, dividends are 'sticky' in the sense that they are slow to change and lag behind shifts in earnings by one or more periods. This leads to the pattern of stable dividend per share during the periods of fluctuating earnings per share and a rising step-function pattern of dividends per share during increasing earnings per share periods.

- A firm should seek a stable dividend policy which avoids occasional reductions in dividends. Investors favourably react to the price of shares of such companies and there is a price enhancing effect of such a policy.
- The legal restrictions on payment of dividends stipulate conditions pertaining to capital impairment, net profits, insolvency and illegal accumulation of excess profits. The contractual restrictions on payment of dividends are imposed by loan agreements. The internal constraints impinging on the dividend restrictions relate to growth prospects, availability of funds, earnings stability and control. The dividend policy is also likely to be affected by the owners' consideration of **(a)** tax status of the shareholders, **(b)** their opportunities for investment and **(c)** dilution of ownership.
- While a firm which has easy access to the capital market can follow a liberal dividend policy, a firm having only limited access to the capital markets is likely to adopt low dividend payout ratio as they are likely to rely, to a greater extent, on retained earnings as a source of financing their investments.
- With rising prices, funds generated from depreciation may be inadequate to replace obsolete equipments. As a result, the *D*/*P* ratio tends to be low during periods of inflation.
- Apart from cash dividend, a firm can also reward its investors by paying bonus shares. The bonus shares/share splits do not have any economic impact on the firm in that its assets, earnings and investors' proportionate ownership remain unchanged. As a result, the number of shares outstanding increases. The increased number of shares outstanding tends to bring the market price of shares within more popular range and promote more active trading in shares. Moreover, bonus/split announcements have informational content to the investors. It will also enable the conservation of corporate cash and further enable a firm to raise additional funds particularly through the issue of convertible securities.
- With effect from financial year 2003-4, dividend income from domestic companies, mutual funds and UTI is exempt from tax in the hands of the shareholders/investors/unitholders. However, the domestic companies will be liable to pay dividend distribution tax.
- While the number of shares outstanding increases in the case of normal split, the reverse split decreases it. Like the normal split, there is no economic impact of the reverse split on **(i)** corporate earnings and **(ii)** shareholders' wealth.

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11. In addition, the provisions of the Income tax Act are also relevant, certain rebates and penalties depend on certain appropriations from profits and the amount of dividend.

12. Profits earned by a company in previous years and transferred to reserves mean the total amount of net profits after taxes, profits transferred to reserves as at the beginning of the year for which the dividend is to be decleared and in computing the said amount, and the appropriations out of the amount transferred from the Developments Rebate Reserve at the expiry of the period specified under the Income Tax Act, 1961 (43 of1961 should be included and all items of capital) reserves including reserves created by revlauation of assets shall be excluded.

Practical Problems

P.19.1 Royal Industries has for many years enjoyed a moderate but stable growth in sales and earnings. In recent years, it is facing a stiff competition in its plastic product line and, consequently, its sales have been declining. Apprehending further decline in its sales, its management is planning to move eventually out of plastic business altogether and develop new diversified product line in growth-oriented industries. To execute the proposed investment plan of this year, a capital outlay of Rs 12 crore is necessary to purchase new facilities to start manufacturing a new product; the estimated rate of return on fresh investment is 20 per cent.

The company has been paying a dividend of Rs 1.50 per share on 4 crore outstanding equity shares. The dividend policy has been to maintain a stable rupee dividend, raising it only when it appears that earnings have reached a new, permanently higher level. The directors may change such a policy if there are compelling reasons to do so. Total earnings of the current year are Rs 10 crore. The current market price of the equity share is Rs 15 and the firm's current leverage ratio (debt/assets) is 40 per cent. Current costs of various forms of financing are:

Debentures, 13 per cent
New equity shares sold at Rs 15 to yield, Rs 14.
Required rate of return on equity, 10 per cent

(a) What would be an appropriate dividend policy for Royal Industries?

(b) What assumptions, if any, do you make in your answer about investors' preference for dividends versus capital gains?

Solution **(a)** The management of Royal Industries should recognise that it will be in constant need of more funds owing to its intended policy of moving into new diversified product lines in growth-oriented industries. This could be done immediately by reducing the current dividend, or by, over time, maintaining the current dividends as earnings rise. To the extent the shareholders have strong expectations about maintenance of the current dividend, the current policy (of maintaning current dividend at Rs 1.50 per share) might be appropriate.

The company through advertisement should make the investors aware of the new growth prospects and the greater investment opportunities ahead. Such an announcement would help to prevent the share prices from falling on reduction of the dividend paid, if the company adopts a policy of immediate dividend cut. A better policy, perhaps, would be to maintain the current dividend of Rs 1.50 per share and not allow to increase until earnings are so much higher that Rs 1.50 represents a lower percentage of earnings.

(b) As discussed in part (a), it might perhaps be appropriate for the management to reduce its dividend payout ratio. This would tend to decrease the dividend yield (D_1/P_0) component of the investors' required rate of return in relation to the growth component. This assumes that the shareholders are basically indifferent between returns earned by them either in the form of dividend or capital gains. However, the investors are not indifferent between payment of dividends or retentions; they have a preference for current dividends as dividends are totally exempt from tax; the equity capitalisation rate would go up if current dividends are reduced.

P.19.2 *X* Cement Ltd requires you, as their financial consultant, to advise them with respect to the dividend policy they have to follow for the current year. The cement industry has been through a very trying period in the last five years and the constraints on operations have been removed in the early part of the year. The company hopes to improve its position in the years to come and has plans to put up an additional plant in the neighbourhood of the present factory. The increased profits, due to expansion in capacity, are expected to be 25 per cent of the additional capital investment after meeting interest charges but before depreciation on the additional plant installed. The shares of X Cement Ltd are widely held and there is a large majority of holdings in the hands of middle class invesotrs whose average holdings do not exceed 500 shares. The following further data is also made available to you:

Particulars	*Last 5 years*					*Current year*
	1	*2*	*3*	*4*	*5*	*6*
Earnings per share (Rs)	6.00	5.0	4.5	4.5	4.0	17.5
Cash availability per share (Rs)	7.50	6.0	5.0	4.0	4.0	20.0
Dividend/share (Rs)	3.00	3.0	3.0	2.0	Nil	?
Pay out ratio	50	60	67	45	—	?
Average market price (face value of Rs 100)	80	70	70	70	60	140
P/E ratio	13.33:1	14:1	15.6:1	15.6:1	15:1	8:1

What recommendations would you make? Give reasons for your answers.

Solution The company appears to be following a stable dividend policy, that is, a policy of maintaining a stable rupee dividend, decreasing it only when it appears that earnings have reached a new, permanently low level or *vice-versa* in that although the EPS has declined from Rs 6 in Year 1 to Rs 4.50 in Year 3, no corresponding decrease was effected in the DPS. However, when the declining trend of earnings continued in subsequent years too, the dividends had been lowered inasmuch as no dividends were paid in year 5. Consequently, its share prices fell from Rs 80 in Year 1 to Rs 60 in Year 5. The decline in market prices is less pronounced in the context of much distressing profitability and dividend record of the company during the period as a whole. The rate of return of 6 per cent on equity capital in Year 1 was the maximum. Even this modest amount consistently declined to eventually a very low figure of 4 per cent by current year; the dividend yield was still smaller. The only off-setting factor was the stable dividend policy.

Given the improved record of earnings in the current year and the trend which is likely to continue in future years, coupled with favourable liquidity position, a rise in dividend is commended for the undermentioned reasons.

(a) The investors would receive dividend income free of tax, especially if this category of investors includes retired persons who need the current income for living expenses and do not wish to sell even a small portion of their shares either because of transaction costs involved or because they are reluctant to 'eating their own capital'.

(b) The investors must be expecting a substantial rise in dividend in the light of the current market price of Rs 140 compared to Rs 60 last year. Failure to pay dividend commensurate to the shareholder's expectation will have an adverse effect on share prices.

(c) Cement industry with stable sales and earnings can afford high leverage ratios. The company is not likely to encounter any major difficulty in raising funds to finance an additional plant due to bright future prospects.

(d) The payment of dividend resolves uncertainty; investors in general are risk averters; they prefer *current* dividends to larger *deferred* dividends.

The payment was 50 per cent in Year 1; the payment of 60 per cent is recommeded this year, assuming that target dividend payout ratio is 75 per cent. Moreover, the company through advertisements should make the investors aware of the growth prospects and the investment opportunities ahead which would have a positive effect on share prices.

P.19.3 *X* and *Y* are two fast growing companies in the engineering industry. They are close competitors and their assets composition, capital structure, and profitability records have been very similar for several years. The primary difference between them from a financial management perspective is their dividend policy. The company *X* tries to maintain a non-decreasing dividend per share, while the company *Y* maintains a constant dividend payout ratio. Their recent earnings per share (EPS), dividend per share (DPS), and share price (P) history are as follows:

Year	Company X			Company Y		
	EPS	DPS	P (range)	EPS	DPS	P (range)
1	Rs 9.30	Rs 2	Rs 75-90	Rs 9.50	Rs 1.90	Rs 60-80
2	7.40	2	55-80	7.00	1.40	25-65
3	10.50	2	70-110	10.50	2.10	35-80
4	12.75	2.25	85-135	12.25	2.45	80-120
5	20.00	2.50	135-200	20.25	4.05	110-225
6	16.00	2.50	150-190	17.00	3.40	140-180
7	19.00	2.50	155-210	20.00	4.00	130-190

In all calculations below that require a share price, use the average of the two prices given in the share price range.

(a) Determine the dividend payout ratio (D/P) and price to earnings (P/E) ratio for both companies for all the years.

(b) Determine the average D/P and P/E for both the companies over the period 1 through 7.

(c) The management of Company *Y* is puzzled as to why their share prices are lower than those of Comapny *X*, in spite of the better profitability record particularly of the past three years. As a financial consultant, how would you explain the situation?

Solution

(a) and **(b)** **Determination of D/P and P/E Ratios**

	Company X					Company Y				
Year	EPS	DPS	D/P ratio (DPS÷EPS)	P	P/E ratio (P÷EPS) (Number of times)	EPS	DPS	D/P ratio	P	P/E ratio (P÷EPS) (Number of times)
1	Rs 9.30	Rs 2.00	21.5	Rs 82.50	8.87	Rs 9.50	Rs 1.90	20	Rs 70	7.37
2	7.40	2.00	27.0	67.50	9.12	7.00	1.40	20	45	6.43
3	10.50	2.00	19.0	90.00	8.57	10.50	2.10	20	57.50	5.48
4	12.75	2.25	17.6	110.00	8.63	12.25	2.45	20	100.00	8.16
5	20.00	2.50	12.5	167.50	8.37	20.25	4.05	20	167.50	8.27
6	16.00	2.50	15.6	170.00	10.62	17.00	3.40	20	160.00	9.41
7	19.00	2.50	13.2	182.50	9.6	20.00	4.00	20	160.00	8.00
	94.95	15.75	16.6	870.00	9.16	96.50	19.30	20	760.00	7.88

(c) Company X is following a stable dividend policy whereas company Y is following a stable dividend payout ratio. In the latter type of policy, sporadic dividend payments occur which make its owners very uncertain about the returns they can expect from their investment in the firm and, therefore, generally depress the share prices. It is probably for this reason that the company X's average price per share exhibited a consistent increase compared to company Y, volatile pattern of earnings of both companies (during the last three years) notwithstanding. Company Y is advised to follow a stable dividend policy.

P.19.4 The shareholders' funds of XYZ Ltd for the year ending March 31 are as follows:
The earnings available for equity shareholders from this period's operations are Rs 1,50,000, which have been included as part of the Rs 3,00,000 retained earnings.

12% Preference share capital	Rs 1,00,000
Equity share capital (Rs 100 each)	4,00,000
Share premium	40,000
Retained earnings	3,00,000
	8,40,000

(i) What is the maximum dividend per share (DPS) the firm can pay?
(ii) If the firm has Rs 60,000 in cash, what is the largest DPS it can pay without borrowing?
(iii) Indicate what accounts, if any, will be affected if the firm pays the dividends indicated in (ii) above?

Solution

(i) Maximum DPS = Total distributable profits/Number of equity shares outstanding = Rs 3,00,000/4,000 (Rs 4,00,000 ∏ 100) = Rs 75
(ii) Maximum DPS (without borrowing) = Cash available/Number of equity shares outstanding = Rs 60,000/4,000 = Rs 15
(iii) Accounts relating to retained earnings and cash will be affected. Retained earnings balance will decline by Rs 60,000, that is the amount of dividend paid. Cash will be reduced to zero.

Note: It is assumed that preference share dividends have been paid in full.

P.19.5 Following is the EPS record of AB Ltd over the past 10 years:

Year	*EPS*	*Year*	*EPS*
10	Rs 20	5	Rs 12
9	19	4	6
8	16	3	9
7	15	2	(2)
6	16	1	1

(i) Determine the annual dividend paid each year in the following cases:
(a) If the firm's dividend policy is based on a constant dividend payout ratio of 50 per cent for all years.
(b) If the firm pays dividend at Rs 8 per share, and increases it to Rs 10 per share when earnings exceed Rs 14 per share for the previous two consecutive years.
(c) If the firm pays dividend at Rs 7 per share each year except when EPS exceeds Rs 14 per share, when an extra dividend equal to 80 per cent of earnings beyond Rs 14 would be paid.
(ii) Which type of dividend policy will you recommend to the company and why?

Solution

(i) (a) **Dividend per share, DPS paid in years, 10 – 1**

Year	*EPS*	*DPS*	*Year*	*EPS*	*DPS*
10	Rs 20	Rs 10	5	Rs 12	Rs 6
9	19	9.5	4	6	3
8	16	8	3	9	4.5
7	15	7.5	2	(2)	Nil
6	16	8	1	1	0.5

(b) **Dividend per share, DPS, years 10 – 1**

Year	*EPS*	*DPS*	*Year*	*EPS*	*DPS*
10	Rs 20	Rs 10	5	Rs 12	Rs 8
9	19	10	4	6	8
8	16	10	3	9	8
7	15	8	2	(2)	8*
6	16	8	1	1	8

* It is assumed that the company has past accumulated earnings which are not only enough to write-off current year's losses, but also can meet the dividend payment needs (number of equity shares outstanding Rs 8) of this year.

(c) **Dividend per share, DPS, years 10 – 1**

Years	*EPS*	*DPS*	*Year*	*EPS*	*DPS*
10	Rs 20	Rs 11.8	5	Rs 12	Rs 7
9	19	11	4	6	7
8	16	8.6	3	9	7
7	15	7.8	2	(2)	7
6	16	8.6	1	1	7

(ii) What the investors expect is that they should get an assured fixed amount as dividend which should gradually and consistently increase over the years, that is, a stable dividend.

Stable dividend policy [(i) (b) above] is commended. There are several reasons why investors would prefer a stable dividend, and pay a higher price for firm's shares which observes stability in dividend payments.

Dividend policy on pattern [(i) (a)] involves uncertainty and irregularity in regard to the expected dividends. The policy of paying sporadic dividends may not find favour with them.

Likewise, dividend policy on pattern [(i) (c)] has some element of uncertainty. By calling the amount by which the dividends exceed the normal payments as extra, the firm, in effect, cautions the investors, both existing as well as prospective, that they should not consider it as a permanent increase in dividends. Obviously, such increase in dividends will not have much price-enhancing effect.

In the light of these facts, the dividend policy [(i) (b)] is the most appropriate among all the alternatives.

Review Questions

RQ.19.1 Give appropriate answer for the following:

(i) In a stock split, the par value of the share is _____ (reduced/increased) and the number of shares is proportionately _____ (reduced/increased).

(ii) _____ involves payment to existing owners of dividend in the form of shares.

(iii) Dividends can only be paid out of the current years earnings (True/False)

(iv) A company is free to choose whatever dividends it must pay. It does not have restrictions from any of the stakeholders. (True/False)

(v) Stock repurchases increase during boom times when firms accumulate excess cash. (True/False)

(vi) The effective wealth of shareholders does not change with the issue of bonus shares. (True/False)

(vii) An optimum dividend policy should strike a balance between _____ and _____ in order to maximize the wealth of the shareholders.

(viii) A new firm can pay dividends to its shareholders out of its paid-up capital as it may not have enough profits to pay dividends but has strong growth prospects in the future. (True/False)

(ix) A firm cannot pay dividends out of its accumulated balance of retained earnings. (True/False)

(x) Firms with more stable income streams generally tend to retain a majority of their earnings so as not to impair the stability of their income (True/False)

(xi) Share splits tend to dilute the ownership of the firm as more shares are offered to shareholders. (True/False)

[Answers: (i) Reduced, Increased (ii) Bonus shares (iii) False (iv) False (v) False (vi) True (vii) Current dividends, Future growth (viii) False (ix) False (x) False (xi) False]

RQ.19.2 What do you think are the determinants of the dividend policy of corporate enterprises? Also,explain the terms bonus shares and share splits. What is their rationale?

RQ.19.3 What are the factors that determine the dividend policy of a company? Do you believe it will be justifiable for a company to obtain a short-term loan from a bank to allow payment of a dividend?

RQ.19.4 To what extent are firms able to establish definite long-run dividend policies? What factors would affect these policies? To what extent might these policies affect market value of a firm's securities? Explain.

RQ.19.5 What is stable dividend policy? Why should a firm follow such a policy?

Examination Questions

Theory Questions

19.1 Explain briefly main determinants of dividend policy of a firm. (*Delhi University, 2006, 2011*)

19.2 What factors determine the dividend policy of a firm. (*Bangalore University and Calcutta University, 2006, 2008, 2010*)

19.3 Write short note on bonus shares. (*Gujarat University, 2010*)

19.4 Write short note on constant dividend policy. (*Pune University, 2010*)

19.5 What is a stock split? (*Madras University, 2010*)

19.6 What is meant by stability of dividend? (*Madras University, 2010*)

19.7 What do you mean by good dividend policy? Discuss the various factors which influence dividend policy of a firm? (*Punjab University, 2010*)

19.8 State the methods of maintaining stability in the payment of dividends. (*Delhi University, 2009*)

19.9 How can stability of dividend policy be maintained? (*Calcutta University, 2009*)

19.10 Discuss in detail the merits and limitations of capitalisation of reserves. (*Pune University, 2009*)

19.11 Discuss in detail the various factors affecting the dividend policy of a company. (*Pune University, 2009*)

19.12 What do you mean by stability of dividends? Explain the relevance of stable dividend policy. (*Delhi University, 2005, 2008*)

19.13 What is "informational contents" of a dividend payment? Explain how does it affect share value. (*Delhi University, 2008*)

19.14 Describe the various forms of stable dividend and its advantages. (*Bangalore University*)

19.15 What do you mean by dividend policy. (*Bangalore University*)

19.16 Write in brief the different forms of dividend. (*Bangalore University*)

19.17 Explain the determinants of dividend policy of a firm. Also differentiate between bonus shares and stock split. (*Delhi University, 2007*)

19.18 Explain the various factors which influence dividend decision of a firm. (*Punjab University, 2007*)

19.19 Explain the various determinants of dividend policy. (*Bangalore University, 2006*)

19.20 Explain the various factors which influence on paying dividends. *(Periyar University, Oct./Nov. 2004)*

19.21 "The dividend policy of a firm has no effect on the value of the firm." Do you agree with the statement? Give reasons. *(Delhi University, 2003)*

19.22 Explain the factors influencing payment of dividend. *(Gujarat University, March-April 2003)*

19.23 Why do companies pay dividends? *(Delhi University, 2002)*

19.24 Explain briefly 'stability of dividend'. *(Delhi University, 2001)*

19.25 (a) What is stock dividend?

(b) Explain the classification on forms of dividends.

(c) Examine the factors that determine the dividend policy of a firm.

(d) Choose the best answer

Retired persons may prefer

(a) regular cash dividends to capital gains.

(b) capital gains to regular cash dividends.

(c) bonus share issues to regular cash dividend.

(d) irregular high dividends to regular ? dividends. *(Bharatiyar University, April 2001)*

19.26 Explain briefly the factors which influence the dividend policy of a firm. *(Delhi University, 1999)*

19.27 Enumerate the factors which have a bearing on the dividend policy of a company. *(Delhi University, 1998)*

19.28 Why do firms follow a policy of stable dividends? *(Delhi University, 1997)*

Numerical Questions

19.1 The earning per share of Dig Ltd. for the past 10 years is given below:

Years	*EPS*
2002	Rs 40
2001	38
2000	24
1999	30
1998	32
1997	24
1996	12
1995	38
1994	(–4)
1993	2

You are required to determine the annual dividend paid each year if the company pays dividend at Rs 16 per share and increases it to Rs 20 per share when the earnings per share exceed Rs 28 per share for the two consecutive previous years. *(Delhi University, 2002)*

Solution

Dividend per Share (DPS) Paid in Years 1993-2002

Years	*EPS*	*DPS*	*Remarks*
2002	Rs 40	16	
2001	38	16	
2000	24	20	(EPS exceeds Rs 28 in 1998 & 1999)
1999	30	16	
1998	32	16	
1997	24	16	
1996	12	16	
1995	38	16	
1994	(–4)	16*	*(Company has adequate free reserves to pay higher dividends in these two years)
1993	2	16*	

TABLE A-1 The Compound Sum of One Rupee

Year	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
1	1.010	1.020	1.030	1.040	1.050	1.060	1.070	1.080	1.090	1.100
2	1.020	1.040	1.061	1.082	1.102	1.124	1.145	1.166	1.188	1.210
3	1.030	1.061	1.093	1.125	1.158	1.191	1.225	1.260	1.295	1.331
4	1.041	1.082	1.126	1.170	1.216	1.262	1.311	1.360	1.412	1.464
5	1.051	1.104	1.159	1.217	1.276	1.338	1.403	1.469	1.539	1.611
6	1.062	1.126	1.194	1.265	1.340	1.419	1.501	1.587	1.677	1.772
7	1.072	1.149	1.230	1.316	1.407	1.504	1.606	1.714	1.828	1.949
8	1.083	1.172	1.267	1.369	1.477	1.594	1.718	1.851	1.993	2.144
9	1.094	1.195	1.305	1.423	1.551	1.689	1.838	1.999	2.172	2.358
10	1.105	1.219	1.344	1.480	1.629	1.791	1.967	2.159	2.367	2.594
11	1.116	1.243	1.384	1.539	1.710	1.898	2.105	2.332	2.580	2.853
12	1.127	1.268	1.426	1.601	1.796	2.012	2.252	2.518	2.813	3.138
13	1.138	1.294	1.469	1.665	1.886	2.133	2.410	2.720	3.066	3.452
14	1.149	1.319	1.513	1.732	1.980	2.261	2.579	2.937	3.342	3.797
15	1.161	1.346	1.558	1.801	2.079	2.397	2.759	3.172	3.642	4.177
16	1.173	1.373	1.605	1.873	2.183	2.540	2.952	3.426	3.970	4.595
17	1.184	1.400	1.653	1.948	2.292	2.693	3.159	3.700	4.328	5.054
18	1.196	1.428	1.702	2.026	2.407	2.854	3.380	3.996	4.717	5.560
19	1.208	1.457	1.753	2.107	2.527	3.026	3.616	4.316	5.142	6.116
20	1.220	1.486	1.806	2.191	2.653	3.207	3.870	4.661	5.604	6.727
21	1.232	1.516	1.860	2.279	2.786	3.399	4.140	5.034	6.109	7.400
22	1.245	1.546	1.916	2.370	2.925	3.603	4.430	5.436	6.658	8.140
23	1.257	1.577	1.974	2.465	3.071	3.820	4.740	5.871	7.258	8.954
24	1.270	1.608	2.033	2.563	3.225	4.049	5.072	6.341	7.911	9.850
25	1.282	1.641	2.094	2.666	3.386	4.292	5.427	6.848	8.623	10.834
30	1.348	1.811	2.427	3.243	4.322	5.743	7.612	10.062	13.267	17.449
35	1.417	2.000	2.814	3.946	5.516	7.686	10.676	14.785	20.413	28.102
40	1.489	2.208	3.262	4.801	7.040	10.285	14.974	21.724	31.408	45.258
45	1.565	2.438	3.781	5.841	8.985	13.764	21.002	31.920	48.325	72.888
50	1.645	2.691	4.384	7.106	11.467	18.419	29.456	46.900	74.354	117.386

TABLE A-1 The Compound Sum of One Rupeee (*Contd.*)

Year	*11%*	*12%*	*13%*	*14%*	*15%*	*16%*	*17%*	*18%*	*19%*	*20%*
1	1.110	1.120	1.130	1.140	1.150	1.160	1.170	1.180	1.190	1.200
2	1.232	1.254	1.277	1.300	1.322	1.346	1.369	1.392	1.416	1.440
3	1.368	1.405	1.443	1.482	1.521	1.561	1.602	1.643	1.685	1.728
4	1.518	1.574	1.630	1.689	1.749	1.811	1.874	1.939	2.005	2.074
5	1.685	1.762	1.842	1.925	2.011	2.100	2.192	2.288	2.386	2.488
6	1.870	1.974	2.082	2.195	2.313	2.436	2.565	2.700	2.840	2.986
7	2.076	2.211	2.353	2.502	2.660	2.826	3.001	3.185	3.379	3.583
8	2.305	2.476	2.658	2.853	3.059	3.278	3.511	3.759	4.021	4.300
9	2.558	2.773	3.004	3.252	3.518	3.803	4.108	4.435	4.785	5.160
10	2.839	3.106	3.395	3.707	4.046	4.411	4.807	5.234	5.695	6.192
11	3.152	3.479	3.836	4.226	4.652	5.117	5.624	6.176	6.777	7.430
12	3.498	3.896	4.334	4.818	5.350	5.936	6.580	7.288	8.064	8.916
13	3.883	4.363	4.898	5.492	6.153	6.886	7.699	8.599	9.596	10.699
14	4.310	4.887	5.535	6.261	7.076	7.987	9.007	10.147	11.420	12.839
15	4.785	5.474	6.254	7.138	8.137	9.265	10.539	11.974	13.589	15.407
16	5.311	6.130	7.067	8.137	9.358	10.748	12.330	14.129	16.171	18.488
17	5.895	6.866	7.986	9.276	10.761	12.468	14.426	16.672	19.244	22.186
18	6.543	7.690	9.024	10.575	12.375	14.462	16.879	19.673	22.900	26.623
19	7.263	8.613	10.197	12.055	14.232	16.776	19.748	23.214	27.251	31.948
20	8.062	9.646	11.523	13.743	16.366	19.461	23.105	27.393	32.429	38.337
21	8.949	10.804	13.021	15.667	18.821	22.574	27.033	32.323	38.591	237.373
22	9.933	12.100	14.713	17.861	21.644	26.186	31.629	38.141	45.923	55.205
23	11.026	12.552	16.626	20.361	24.891	30.376	37.005	45.007	54.648	66.247
24	12.239	15.178	18.788	23.212	28.625	35.236	43.296	53.108	65.031	79.496
25	13.585	17.000	21.230	26.461	32.918	40.874	50.656	62.667	77.387	95.395
30	22.892	29.960	39.115	50.949	66.210	85.849	111.061	143.367	184.672	237.373
35	38.574	52.799	72.066	98.097	133.172	180.311	243.495	327.988	440.691	590.657
40	64.999	93.049	132.776	188.876	267.856	378.715	533.846	750.353	1051.642	1469.740
45	109.527	163.985	244.629	363.662	538.752	795.429	1170.425	1716.619	2509.583	3657.176
50	184.559	288.996	450.711	700.197	1083.619	1670.669	2566.080	3927.189	5988.730	9100.191

TABLE A-2 The Compound Value of an Annuity of One rupee

Year	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
1	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2	2.010	2.020	2.030	2.040	2.050	2.060	2.070	2.080	2.090	2.100
3	3.030	3.060	3.091	3.122	3.152	3.184	3.215	3.246	3.278	3.310
4	4.060	4.122	4.184	4.246	4.310	4.375	4.440	4.506	4.573	4.641
5	5.101	5.204	5.309	5.416	5.526	5.637	5.751	5.867	5.985	6.105
6	6.152	6.308	6.468	6.633	6.802	6.975	7.153	7.336	7.523	7.716
7	7.214	7.434	7.662	7.898	8.142	8.394	8.654	8.923	9.200	9.487
8	8.286	8.583	8.892	9.214	9.549	9.897	10.260	10.637	11.028	11.436
9	9.368	9.755	10.159	10.583	11.027	11.491	11.978	12.488	13.021	13.579
10	10.462	10.950	11.464	12.006	12.578	13.181	13.816	14.487	15.193	15.937
11	11.567	12.169	12.808	13.486	14.207	14.972	15.784	16.645	17.560	18.531
12	12.682	13.412	14.192	15.026	15.917	16.870	17.888	18.977	20.141	21.384
13	13.809	14.680	15.618	16.627	17.713	18.882	20.141	21.495	22.953	24.523
14	14.947	15.974	17.086	18.292	19.598	21.015	22.550	24.215	26.019	27.975
15	16.097	17.293	18.599	20.023	21.578	23.276	25.129	27.152	29.361	31.772
16	17.258	18.639	20.157	21.824	23.657	25.672	27.888	30.324	33.003	35.949
17	18.430	20.012	21.761	23.697	25.840	28.213	30.840	33.750	36.973	40.544
18	19.614	21.412	23.414	25.645	28.132	30.905	33.999	37.540	41.301	45.599
19	20.811	21.840	25.117	27.671	30.539	33.760	37.379	41.446	46.018	51.158
20	22.019	24.297	26.870	29.778	33.066	36.785	40.995	45.762	51.169	57.274
21	23.239	25.783	28.676	31.969	35.719	39.992	44.865	50.422	56.754	65.002
22	24.471	27.299	30.536	34.248	38.505	43.392	49.005	55.456	62.872	71.402
23	25.716	28.845	32.452	36.618	41.340	46.995	53.435	60.893	69.531	79.542
24	26.973	30.421	34.426	39.082	44.501	50.815	58.176	66.764	76.789	88.496
25	28.243	32.030	36.459	41.645	47.726	54.864	63.248	73.105	84.699	98.346
30	34.784	40.567	47.575	56.084	66.438	79.057	95.459	113.282	136.305	164.491
35	41.659	49.994	50.461	73.651	90.318	11.432	138.234	172.314	215.705	271.018
40	48.885	60.401	75.400	95.024	120.797	154.758	199.630	259.052	337.872	442.580
45	56.479	71.891	92.718	121.027	159.695	212.737	285.741	386.497	525.840	718.881
50	64.461	84.577	112.794	152.664	209.341	290.325	406.516	573.756	815.051	1163.865

TABLE A-2 The Compound Value of an Annuity of One Rupee (*Contd.*)

Year	*11%*	*12%*	*13%*	*14%*	*15%*	*16%*	*17%*	*18%*	*19%*	*20%*
1	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2	2.110	2.120	2.130	2.140	2.150	2.160	2.170	2.180	2.190	2.200
3	3.342	3.374	3.407	3.440	3.472	3.506	3.539	3.572	3.606	3.640
4	4.710	4.779	4.850	4.921	4.993	5.066	5.141	5.215	5.291	5.338
5	6.228	6.353	6.480	6.610	6.742	6.877	7.014	7.154	7.297	7.442
6	7.913	8.115	8.323	8.535	8.754	9.897	9.207	9.442	9.683	9.930
7	9.783	10.089	10.405	10.730	11.067	11.414	11.772	12.141	12.523	12.916
8	11.859	12.300	12.757	13.233	13.727	14.240	14.773	15.327	15.902	16.499
9	14.164	14.776	15.416	16.085	16.786	17.518	18.285	19.086	19.923	20.799
10	16.722	17.549	18.420	19.337	20.304	21.321	22.393	23.521	24.709	25.959
11	19.561	20.655	21.814	23.044	24.349	25.733	27.200	28.755	30.403	32.150
12	22.713	24.133	25.650	27.271	29.001	30.850	32.824	34.931	37.180	39.580
13	26.211	28.029	29.984	32.088	34.352	36.786	39.404	42.218	45.244	48.496
14	30.095	32.392	34.882	37.581	40.504	43.672	47.102	50.818	54.841	59.196
15	34.405	37.280	40.417	43.842	47.580	51.659	56.109	60.965	66.260	72.035
16	39.190	42.753	46.671	50.980	55.717	60.925	66.648	72.938	79.850	87.442
17	44.500	48.883	53.738	59.117	65.075	71.673	78.978	87.067	96.021	105.930
18	50.396	55.749	61.724	68.393	75.836	84.140	93.404	103.739	115.265	128.116
19	56.939	63.439	70.748	78.968	88.211	98.603	110.283	123.412	138.165	154.739
20	64.202	72.052	80.946	91.024	102.443	115.379	130.031	146.626	165.417	186.687
21	72.264	81.968	92.468	104.767	118.809	134.840	153.136	174.019	197.846	225.024
22	81.213	92.502	105.489	120.434	137.630	157.414	180.169	206.342	236.436	217.028
23	91.147	104.602	120.203	138.295	159.274	183.600	211.798	244.483	282.359	326.234
24	102.173	118.154	136.829	158.656	184.166	213.976	248.803	289.490	337.007	392.480
25	114.412	133.333	155.616	181.867	212.790	249.212	292.099	342.598	402.038	471.976
30	199.018	241.330	293.192	356.778	434.738	530.306	647.423	790.932	966.698	1181.865
35	341.583	431.658	546.663	693.552	881.152	1120.699	1426.448	1816.607	2314.173	2948.294
40	581.812	767.080	1013.667	1341.979	1779.048	2360.724	3134.412	4163.094	5529.711	7343.715
45	986.613	1358.208	1874.086	2590.464	3585.031	4965.191	6879.008	9531.258	13203.105	18280.914
50	1668.732	2399.975	3459.344	4994.301	7217.488	10435.449	15088.805	21812.273	31514.492	45496.094

TABLE A-3 The Present Value of One Rupee

Year	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
1	.990	.980	.971	.962	.952	.943	.935	.926	.917	.909
2	.980	.961	.943	.925	.907	.890	.873	.857	.842	.826
3	.971	.942	.915	.889	.864	.840	.816	.794	.772	.751
4	.961	.924	.888	.855	.823	.792	.763	.735	.708	.683
5	.951	.906	.863	.822	.784	.747	.713	.681	.650	.621
6	.942	.888	.837	.790	.746	.705	.666	.630	.596	.564
7	.933	.871	.813	.760	.711	.665	.623	.583	.547	.513
8	.923	.853	.789	.731	.677	.627	.582	.540	.502	.467
9	.914	.837	.766	.703	.645	.592	.544	.500	.460	.424
10	.905	.820	.744	.676	.614	.558	.508	.463	.422	.386
11	.896	.804	.722	.650	.585	.527	.475	.429	.388	.350
12	.887	.789	.701	.625	.557	.497	.444	.397	.356	.319
13	.879	.773	.681	.601	.530	.469	.415	.368	.326	.290
14	.870	.758	.661	.577	.505	.442	.388	.340	.299	.263
15	.861	.743	.642	.555	.481	.417	.362	.315	.275	.239
16	.853	.728	.623	.534	.458	.394	.339	.292	.252	.218
17	.844	.714	.605	.513	.436	.371	.317	.270	.231	.198
18	.836	.700	.587	.494	.416	.350	.296	.250	.212	.180
19	.828	.686	.570	.475	.396	.331	.227	.232	.194	.164
20	.820	.673	.554	.456	.377	.312	.258	.215	.178	.149
21	.811	.660	.538	.439	.359	.294	.242	.199	.164	.135
22	.803	.647	.522	.422	.342	.278	.226	.184	.150	.123
23	.795	.634	.507	.406	.326	.262	.211	.170	.138	.112
24	.788	.622	.492	.390	.310	.247	.197	.158	.126	.102
25	.780	.610	.478	.375	.295	.233	.184	.146	.116	.092
30	.742	.552	.412	.308	.231	.174	.131	.099	.075	.057
35	.706	.500	.355	.253	.181	.130	.094	.068	.049	.036
40	.672	.453	.307	.208	.142	.097	.067	.046	.032	.022
45	639	.410	.264	.171	.111	.073	.048	.031	.021	.014
50	.608	.372	.228	.141	.087	.054	.034	.021	.013	.009

TABLE A-3 The Present Value of One Rupee (*Contd.*)

Year	*11%*	*12%*	*13%*	*14%*	*15%*	*16%*	*17%*	*18%*	*19%*	*20%*
1	.901	.893	.885	.877	.870	.862	.855	.847	.840	.833
2	.812	.797	.783	.769	.756	.743	.731	.718	.706	.694
3	.731	.712	.693	.675	.658	.641	.624	.609	.593	.579
4	.659	.636	.613	.592	.572	.552	.534	.516	.499	.482
5	.593	.567	.543	.519	.497	.476	.456	.437	.419	.402
6	.535	.507	.480	.456	.432	.410	.390	.370	.352	.335
7	.482	.452	.425	.400	.376	.354	.333	.314	.296	.279
8	.434	.404	.376	.351	.327	.305	.285	.266	.249	.233
9	.391	.361	.333	.308	.284	.263	.243	.225	.209	.194
10	.352	.322	.295	.270	.247	.227	.208	.191	.176	.162
11	.317	.287	.261	.237	.215	.195	.178	.162	.148	.135
12	.286	.257	.231	.208	.187	.168	.152	.137	.124	.112
13	.258	.229	.204	.182	.163	.145	.130	.116	.104	.093
14	.232	.205	.181	.160	.141	.125	.111	.099	.088	.078
15	.209	.183	.160	.140	.123	.108	.095	.084	.074	.065
16	.188	.163	.141	.123	.107	.093	.081	.071	.062	.054
17	.170	.146	.125	.108	.093	.080	.069	.060	.052	.045
18	.153	.130	.111	.095	.081	.069	.059	.051	.044	.038
19	.138	.116	.098	.083	.070	.060	.051	.043	.037	.031
20	.124	.104	.087	.073	.061	.051	.043	.037	.031	.026
21	.112	.093	.077	.064	.053	.044	.037	.031	.026	.022
22	.101	.083	.068	.056	.046	.038	.032	.026	.022	.018
23	.091	.074	.060	.049	.040	.033	.027	.022	.018	.015
24	.082	.066	.053	.043	.035	.028	.023	.019	.015	.013
25	.074	.059	.047	.038	.030	.024	.020	.016	.013	.010
30	.044	.033	.026	.020	.015	.012	.009	.007	.005	.004
35	.026	.019	.014	.010	.008	.006	.004	.003	.002	.002
40	.015	.011	.008	.005	.004	.003	.002	.001	.001	.001
45	.009	.006	.004	.003	.002	.001	.001	.001	.000	.000
50	.005	.003	.002	.001	.001	.001	.000	.000	.000	.000

TABLE A-3 The Present Value of One Rupee (*Contd.*)

Year	21%	22%	23%	24%	25%	26%	27%	28%	29%	30%
1	.826	.820	.813	.806	.800	.794	.787	.781	.775	.769
2	.683	.672	.661	.650	.640	.630	.620	.610	.601	.592
3	.564	.551	.537	.524	.512	.500	.488	.477	.466	.455
4	.467	.451	.437	.423	.410	.397	.384	.373	.361	.350
5	.386	.370	.355	.341	.328	.315	.303	.291	.280	.269
6	.319	.303	.289	.275	.262	.250	.238	.227	.217	.207
7	.263	.249	.235	.222	.210	.198	.188	.178	.168	.159
8	.218	.204	.191	.179	.168	.157	.148	.139	.130	.123
9	.180	.167	.155	.144	.134	.125	.116	.108	.101	.094
10	.149	.137	.126	.116	.107	.099	.092	.085	.078	.073
11	.123	.112	.103	.094	.086	.079	.072	.066	.061	.056
12	.102	.092	.083	.076	.069	.062	.057	.052	.047	.043
13	.084	.075	.068	.061	.055	.050	.045	.040	.037	.033
14	.069	.062	.055	.049	.044	.039	.035	.032	.028	.025
15	.057	.051	.045	.040	.035	.031	.028	.025	.022	.020
16	.047	.042	.036	.032	.028	.025	.022	.019	.017	.015
17	.039	.034	.030	.026	.023	.020	.017	.015	.013	.012
18	.032	.028	.024	.021	.018	.016	.014	.012	.010	.009
19	.027	.023	.020	.017	.014	.012	.011	.009	.008	.007
20	.022	.019	.016	.014	.012	.010	.008	.007	.006	.005
21	.018	.015	.013	.011	.009	.008	.007	.006	.005	.004
22	.015	.013	.011	.009	.007	.006	.005	.004	.004	.003
23	.012	.010	.009	.007	.006	.005	.004	.003	.003	.002
24	.010	.008	.007	.006	.005	.004	.003	.003	.002	.002
25	.009	.007	.006	.005	.004	.003	.003	.002	.002	.001
30	.003	.003	.002	.002	.001	.001	.001	.001	.000	.000
35	.001	.001	.001	.001	.000	.000	.000	.000	.000	.000
40	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
45	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
50	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

TABLE A-3 The Present Value of One Rupee (*Contd.*)

Year	31%	32%	33%	34%	35%	36%	37%	38%	39%	40%
1	.763	.758	.752	.746	.741	.735	.730	.725	.719	.714
2	.583	.574	.565	.557	.549	.541	.533	.525	.518	.510
3	.445	.435	.425	.416	.406	.398	.389	.381	.372	.364
4	.340	.329	.320	.310	.301	.292	.284	.276	.268	.260
5	.259	.250	.240	.231	.223	.215	.207	.200	.193	.186
6	.198	.189	.181	.173	.165	.158	.151	.145	.139	.133
7	.151	.143	.136	.129	.122	.116	.110	.105	.100	.095
8	.115	.108	.102	.096	.091	.085	.081	.076	.072	.068
9	.088	.082	.077	.072	.067	.063	.059	.055	.052	.048
10	.067	.062	.058	.054	.050	.046	.043	.040	.037	.035
11	.051	.047	.043	.040	.037	.034	.031	.029	.027	.025
12	.039	.036	.033	.030	.027	.025	.023	.021	.019	.018
13	.030	.027	.025	.022	.020	.018	.017	.015	.014	.013
14	.023	.021	.018	.017	.015	.014	.012	.011	.010	.009
15	.017	.016	.014	.012	.011	.010	.009	.008	.007	.006
16	.013	.012	.010	.009	.008	.007	.006	.006	.005	.005
17	.010	.009	.008	.007	.006	.005	.005	.004	.004	.003
18	.008	.007	.006	.005	.005	.004	.003	.003	.003	.002
19	.006	.005	.004	.004	.003	.003	.003	.002	.002	.002
20	.005	.004	.003	.003	.002	.002	.002	.002	.001	.001
21	.003	.003	.003	.002	.002	.002	.001	.001	.001	.001
22	.003	.002	.002	.002	.001	.001	.001	.001	.001	.001
23	.002	.002	.001	.001	.001	.001	.001	.001	.001	.000
24	.002	.001	.001	.001	.001	.001	.001	.000	.000	.000
25	.001	.001	.001	.001	.001	.000	.000	.000	.000	.000
30	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
35	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
40	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
45	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
50	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

TABLE A-4 The Present Value of an Annuity of one Rupee

Year	*1%*	*2%*	*3%*	*4%*	*5%*	*6%*	*7%*	*8%*	*9%*	*10%*
1	.990	.980	.971	.962	.952	.943	.935	.926	.917	.909
2	1.970	1.942	1.913	1.886	1.859	1.833	1.808	1.783	1.759	1.736
3	2.941	2.884	2.829	2.775	2.723	2.673	2.624	2.577	2.531	2.487
4	3.902	3.808	3.717	3.630	3.546	3.465	3.387	3.312	3.240	3.170
5	4.853	4.713	4.580	4.452	4.329	4.212	4.100	3.993	3.890	3.791
6	5.795	5.601	5.417	5.242	5.076	4.917	4.767	4.623	4.486	4.355
7	6.728	6.472	6.230	6.002	5.786	5.582	5.389	5.206	5.033	4.868
8	7.652	7.326	7.020	6.733	6.463	6.210	5.971	5.747	5.535	5.335
9	8.566	8.162	7.786	7.435	7.108	6.802	6.515	6.247	5.995	5.759
10	9.471	8.983	8.530	8.111	7.722	7.360	7.024	6.710	6.418	6.145
11	10.368	9.787	9.253	8.760	8.306	7.887	7.499	7.139	6.805	6.495
12	11.255	10.575	9.954	9.385	8.863	8.384	7.943	7.536	7.161	6.814
13	12.134	11.348	10.635	9.986	9.394	8.853	8.358	7.904	7.487	7.103
14	13.004	12.106	11.296	10.563	9.899	9.295	8.746	8.244	7.786	7.367
15	13.865	12.849	11.938	11.118	10.380	9.712	9.108	8.560	8.061	7.606
16	14.718	13.578	12.561	11.652	10.838	10.106	9.447	8.851	8.313	7.824
17	15.562	14.292	13.166	12.166	11.274	10.477	9.763	9.122	8.544	8.022
18	16.398	14.992	13.754	12.659	11.690	10.828	10.059	9.372	8.756	8.201
19	17.226	15.679	14.324	13.134	12.085	11.158	10.336	9.604	8.950	8.365
20	18.046	16.352	14.878	13.590	12.462	11.470	10.594	9.818	9.129	8.514
21	18.857	17.011	15.415	14.029	12.821	11.764	10.836	10.017	9.292	8.649
22	19.661	17.658	15.937	14.451	13.163	12.042	11.061	10.201	9.442	8.772
23	20.456	18.292	16.444	14.857	13.489	12.303	11.272	10.371	9.580	8.883
24	21.244	18.914	16.936	15.247	13.799	12.550	11.469	10.529	9.707	8.985
25	22.023	19.524	17.413	15.622	14.094	12.783	11.654	10.675	9.823	9.077
30	25.808	22.397	19.601	17.292	15.373	13.765	12.409	11.258	10.274	9.427
35	29.409	24.999	21.487	18.665	16.374	14.498	12.948	11.655	10.567	9.644
40	32.835	27.356	23.115	19.793	17.159	15.046	12.332	11.925	10.757	9.779
45	36.095	29.490	24.519	20.720	17.774	15.456	13.606	12.108	10.881	9.863
50	39.197	31.424	25.730	21.482	18.256	15.762	13.801	12.234	10.962	9.915

TABLE A-4 The Present Value of an Annuity of One Rupee (*Contd.*)

Year	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%
1	.901	.893	.885	.877	.870	.862	.855	.847	.850	.833
2	1.713	1.690	1.668	1.647	1.626	1.605	1.585	1.566	1.547	1.528
3	2.444	2.402	2.361	2.322	2.283	2.246	2.210	2.174	2.140	2.106
4	3.102	3.037	2.974	2.914	2.855	2.798	2.743	2.690	2.639	2.589
5	3.696	3.605	3.517	3.433	3.352	3.274	3.199	3.127	3.058	2.991
6	4.231	4.111	3.998	3.889	3.784	3.685	3.589	3.498	3.410	3.326
7	4.712	4.564	4.423	4.288	4.160	4.039	3.922	3.812	3.706	3.605
8	5.146	4.968	4.799	4.639	4.487	4.344	4.207	4.078	3.954	3.837
9	5.537	5.328	5.132	4.946	4.772	4.607	4.451	4.303	4.163	4.031
10	5.889	5.650	5.426	5.216	5.019	4.833	4.659	4.494	4.339	4.192
11	6.207	5.938	5.687	5.453	5.234	5.029	4.836	4.656	4.487	4.327
12	6.492	6.194	5.918	5.660	5.421	5.197	4.988	4.793	4.611	4.439
13	6.750	6.424	6.122	5.842	5.583	5.342	5.118	4.910	4.715	4.533
14	6.982	6.628	5.303	6.002	5.724	5.468	5.229	5.008	4.802	4.611
15	7.191	6.811	6.462	6.142	5.847	5.575	5.324	5.092	4.876	4.675
16	7.379	6.974	6.604	6.265	5.954	5.669	5.405	5.162	4.938	4.730
17	7.549	7.120	6.729	6.373	6.047	5.749	5.475	5.222	4.990	4.775
18	7.702	7.250	6.840	6.467	6.128	5.818	5.534	5.273	5.033	4.812
19	7.839	7.366	6.938	6.550	6.198	5.877	5.585	5.316	5.070	4.843
20	7.963	7.469	7.024	6.623	6.259	5.929	5.628	5.353	5.101	4.870
21	8.075	7.562	7.102	6.687	6.312	5.973	5.665	5.384	5.127	4.891
22	8.176	7.645	7.170	6.743	6.359	6.011	5.696	5.410	5.149	4.909
23	8.266	7.718	7.230	6.792	6.399	6.044	6.723	5.432	5.167	4.925
24	8.348	7.784	7.283	6.835	6.434	6.073	5.747	5.451	5.182	4.937
25	8.422	7.843	7.330	6.873	6.464	6.097	5.766	5.467	5.195	4.948
30	8.694	8.055	7.496	7.003	6.566	6.177	5.829	5.517	5.235	4.979
35	8.855	8.176	7.586	7.070	6.617	6.215	5.858	5.539	5.251	4.992
40	8.951	8.244	7.634	7.105	6.642	6.233	5.871	5.548	5.258	4.997
45	9.008	8.283	7.661	7.123	6.654	6.242	5.877	5.552	5.261	4.999
50	9.042	8.305	7.675	7.133	6.661	6.246	5.880	5.554	5.262	4.999

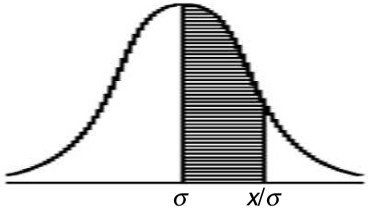
TABLE A-4 The Present Value of an Annuity of One Rupee (*Contd.*)

Year	*21%*	*22%*	*23%*	*24%*	*25%*	*26%*	*27%*	*28%*	*29%*	*30%*
1	8.26	.820	.813	.806	.800	.794	.787	.781	.775	.769
2	1.509	1.492	1.474	1.457	1.440	1.424	1.407	1.392	1.376	1.361
3	2.074	2.042	2.011	1.981	1.952	1.923	1.896	1.868	1.842	1.816
4	2.540	2.494	2.448	2.404	2.362	2.320	2.280	2.241	2.203	2.166
5	2.926	2.864	2.803	2.745	2.689	2.635	2.583	2.532	2.483	2.436
6	3.245	3.167	3.092	3.020	2.951	2.885	2.821	2.759	2.700	2.643
7	3.508	3.416	3.327	3.242	3.161	3.083	3.009	2.937	2.868	2.802
8	3.726	3.619	3.518	3.421	3.329	3.241	3.156	3.076	2.999	2.925
9	3.905	3.786	3.673	3.566	3.463	3.366	3.273	3.184	3.100	3.019
10	4.054	3.923	3.799	3.682	3.570	3.465	3.364	3.269	3.178	3.092
11	4.177	4.035	4.902	3.776	3.656	3.544	3.437	3.335	3.239	3.147
12	4.278	4.127	3.985	3.851	3.752	3.606	3.493	3.387	3.286	3.190
13	4.362	4.203	4.053	3.912	3.780	3.656	3.538	3.427	3.322	3.223
14	4.432	4.265	4.108	3.962	3.824	3.695	3.573	3.459	3.351	3.249
15	4.489	4.315	4.153	4.001	3.859	3.726	3.601	3.483	3.373	3.268
16	4.536	4.357	4.189	4.033	3.887	3.751	3.623	3.503	3.390	3.283
17	4.576	4.391	4.219	4.059	3.910	3.771	3.640	3.518	3.403	3.295
18	4.608	4.419	4.243	4.080	3.928	3.786	3.654	3.529	3.413	3.304
19	4.635	4.442	4.263	4.097	3.942	3.799	3.664	3.539	3.421	3.311
20	4.657	4.460	4.279	4.110	3.954	3.808	3.673	3.546	3.427	3.316
21	4.675	4.476	4.292	4.121	3.963	3.816	3.679	3.551	3.432	3.320
22	4.690	4.488	4.302	4.130	3.970	3.822	3.684	3.556	3.436	3.323
23	4.703	4.499	4.311	4.137	3.976	3.827	3.689	3.559	3.438	3.325
24	4.713	4.507	4.318	4.143	3.981	3.831	3.692	3.562	3.441	3.327
25	4.721	4.514	4.323	4.147	3.985	3.834	3.694	3.564	3.442	3.329
30	4.746	4.534	4.339	4.160	3.995	3.842	3.701	3.569	3.447	3.332
35	4.756	4.541	4.345	4.164	3.998	3.845	3.703	3.571	3.448	3.333
40	4.760	4.544	4.347	4.166	3.999	3.846	3.703	3.571	3.448	3.333
45	4.761	4.545	4.347	4.166	4.000	3.846	3.704	3.571	3.448	3.333
50	4.762	4.545	4.348	4.167	4.000	3.846	3.704	3.571	3.448	3.333

TABLE A-4 The Present Value of an Annuity of One Rupee (*Contd.*)

Year	31%	32%	33%	34%	35%	36%	37%	38%	39%	40%
1	.763	.758	.752	.746	.741	.735	.730	.725	.719	.714
2	1.346	1.331	1.317	1.303	1.289	1.276	1.263	1.250	1.237	1.224
3	1.791	1.766	1.742	1.719	1.696	1.673	1.652	1.630	1.609	1.589
4	2.130	2.096	2.062	2.029	1.997	1.966	1.935	1.906	1.877	1.849
5	2.390	2.345	2.302	2.260	2.220	2.181	2.143	2.106	2.070	2.035
6	2.588	2.534	2.483	2.433	2.385	2.339	2.294	2.251	2.209	2.168
7	2.739	2.677	2.619	2.562	2.508	2.455	2.404	2.355	2.308	2.263
8	2.854	2.786	2.721	2.658	2.598	2.540	2.485	2.432	2.380	2.331
9	2.942	2.868	2.798	2.730	2.665	2.603	2.544	2.487	2.432	2.379
10	3.009	2.930	2.855	2.784	2.715	2.649	2.587	2.527	2.469	2.414
11	3.060	2.978	2.899	2.824	2.752	2.683	2.618	2.555	2.496	2.438
12	3.100	3.013	2.931	2.853	2.779	2.708	2.641	2.576	2.515	2.456
13	3.129	3.040	2.956	2.876	2.799	2.727	2.658	2.592	2.529	2.469
14	3.152	3.061	2.974	2.892	2.814	2.740	2.670	2.603	2.539	2.477
15	3.170	3.076	2.988	2.905	2.825	2.750	2.679	2.611	2.546	2.484
16	3.183	3.088	2.999	2.914	2.834	2.757	2.685	2.616	2.551	2.489
17	3.193	3.097	3.007	2.921	2.840	2.763	2.690	2.621	2.555	2.492
18	3.201	3.104	3.012	2.926	2.844	2.767	2.693	2.624	2.557	2.494
19	3.207	3.109	3.017	2.930	2.848	2.770	2.696	2.626	2.559	2.496
20	3.211	3.113	3.020	2.933	2.850	2.772	2.698	2.627	2.561	2.497
21	3.215	3.116	3.023	2.935	2.852	2.773	2.699	2.629	2.562	2.498
22	3.217	3.118	3.025	2.936	2.853	2.775	2.700	2.629	2.562	2.498
23	3.219	3.120	3.026	2.938	2.854	2.775	2.701	2.630	2.563	2.499
24	3.221	3.121	3.027	2.939	2.855	2.776	2.701	2.630	2.563	2.499
25	3.222	3.122	3.028	2.939	2.856	2.776	2.702	2.631	2.563	2.499
30	3.225	3.124	3.030	2.941	2.857	2.777	2.702	2.631	2.564	2.500
35	3.226	3.125	3.030	2.941	2.857	2.778	2.703	2.632	2.564	2.500
40	3.226	3.125	3.030	2.941	2.857	2.778	2.703	2.632	2.564	2.500
45	3.226	3.125	3.030	2.941	2.857	2.778	2.703	2.632	2.564	2.500
50	3.226	3.125	3.030	2.941	2.857	2.778	2.703	2.632	2.564	2.500

TABLE A-5 Z-Table Values of the Standard Normal Distribution Function



x/σ	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1020	.1064	.1103	.1133
0.3	.1179	.1217	.1255	.1293	.1331	.1363	.1406	.1443	.1480	.1515
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1570
0.5	.1915	.1950	.1935	.2019	.2054	.2088	.2123	.2157	.2190	.2324
0.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2518	.2549
0.7	.2580	.2612	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2892
0.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3185
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3648	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4305	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4750	.4761	.4767

TABLE A-5 Z-Table Values of the Standard Normal Distribution Function (*Contd.*)

x/σ	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4803	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.49865	.4987	.4987	.4988	.4988	.4989	.4989	.4889	.4990	.4990
3.1	.49903	.4991	.4991	.4991	.4992	.4992	.4992	.4992	.4993	.4993
3.2	.4993129	.4993	.4994	.4994	.4994	.4994	.4994	.4995	.4995	.4995
3.3	.4995166	.4995	.4996	.4996	.4996	.4996	.4996	.4996	.4996	.4997
3.4	.4996631	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4998	.4998
3.5	.4997674	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998
3.6	.4998409	.4998	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999
3.7	.4998922	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999
3.8	.4999277	.4999	.4999	.4999	.4999	.4999	.4999	.5000	.5000	.5000
3.9	.4999519	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000
4.0	.4999683									
4.5	.4999966									
5.0	.4999997133									

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