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**TMH OUTLINE SERIES**

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THEORY AND PROBLEMS IN  
**FINANCIAL MANAGEMENT**

**Second Edition**

## **By the Same Authors**

- **Financial Management: Text & Problems, 3/e**
- **Management Accounting**
- **Theory and Problems in Management and Cost Accounting**

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THEORY AND PROBLEMS IN  
**FINANCIAL MANAGEMENT**

**SECOND EDITION**

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# ***PREFACE TO THE FIRST EDITION***

This book has been written as a supplement to our earlier text: *Financial Management*, published by Tata McGraw-Hill Publishing Company Limited. It is designed for management, commerce, finance, and chartered and cost accountancy students. It would be especially useful to students undergoing the management courses offered by the All India Management Association and Indira Gandhi National Open University (IGNOU), and the finance courses of the Institute of Chartered Financial Analyst of India (ICFAI).

The idea of writing this volume was conceived during our long experience as teachers, wherein we realised that the basic principles and tools of financial management are best grasped by students by *actually solving problems*. In view of this, the problem-solving approach has been adopted in this book with special emphasis on the practical applications of the principles and techniques of financial management.

In the beginning of each chapter, the important formulae, equations and theories are recapitulated to help the student to quickly review the concepts. Another distinguishing feature of the volume is the inclusion of a variety of problems, some of which have been taken from professional/university examinations.

The book presents various aspects of both theory and applications in a succinct form. A large number of chapter-end review problems in the form of exercises along with their answers are given to test the reader's understanding of each topic.

We hope that the book would succeed in meeting the growing requirements of the professional students in this emerging area. Suggestions for improvement of the book are welcome.

M Y KHAN  
P K JAIN

# ***PREFACE TO THE SECOND EDITION***

The second edition of our book, *Financial Management: Text and Problems*, published by Tata McGraw-Hill, has been revised to update its contents to reflect the advances in the knowledge about the financial management discipline as well as to portray the developments in the taxation, financial and regulatory environment in the country in the post-liberalisation era and their impact on corporate financial practices. As a complementary volume, a revision of *Theory and Problems of Financial Management* is necessitated due to the same reasons.

The revised edition includes 367 real-life solved problems, some of which have also been taken from professional examinations like CA, ICWA and ICS. Ninety exercises with suggested answers have been included too. The material has also been tested with our students in the class. Another notable feature of this edition is the inclusion of a new chapter on Basic Financial Concepts covering time value of money, valuation of long-term securities, and risk and return.

Like the first edition, a bird's eye view of the basic concepts/theories/formulae are depicted in the beginning of each chapter in the form of exhibits for understanding of the subsequent problems-solutions, and exercises. A complete set of financial tables at the end of the book is also included.

We hope that the thoroughly revised and enlarged second edition will receive the same overwhelming response from the readers as the first edition. Suggestions for improvement are welcome.

AUTHORS

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# **1 STATEMENT OF CHANGES IN FINANCIAL POSITION**

## **BASIC THEORY**

### **INTRODUCTION**

The statement of changes in financial position (SCFP) is a statement of flows, that is, it measures the changes that have taken place in the financial position of a firm between two balance sheet dates. It summarises the sources and uses of the funds obtained. Drawing on the information contained in the basic financial statements, namely profit and loss account/income statement and balance sheet, it shows the sources of funds and their application to uses during the period. The changes in financial position could be related to several different concepts of funds. Accordingly, the presentation and use of the SCFP, as a tool of financial analysis, can be illustrated with reference to changes in (a) the net working capital (NWC), (b) the cash position, (c) the total resources, and (d) according to the ICAI's AS-3 (revised).

### **SCFP-WORKING CAPITAL BASIS (FUNDS FLOW STATEMENT)**

The NWC of a firm is the amount by which its current assets (CA) exceed its current liabilities (CL). The magnitude of NWC is a measure of the safety margin for the protection of short-term creditors.

The NWC may also be viewed as funds available for acquisition of non-CA, as well as to repay non-CL. Any transaction that results in an increase in NWC is a source of working capital (WC); any transaction that causes a net decrease in WC is an application of WC. Some transactions merely change the form and not the amount of the WC. Such items constitute neither source nor use of working capital.

The major sources and uses of working capital are summarised in Exhibit 1.1.

---

#### **EXHIBIT 1.1** *Sources and Uses of Working Capital*

---

##### **Sources of Working Capital**

- (a) Funds from business operations
- (b) Other incomes
- (c) Sale of non-current assets
- (d) Long-term borrowings
- (e) Issue of additional equity capital or preference share capital or debentures

##### **Uses of Working Capital**

- (a) Losses from business operations
  - (b) Purchase of non-current assets
  - (c) Redemption of debentures and/or preference shares
  - (d) Dividends to shareholders
  - (e) Repayment of long-term borrowings
- 

### **Funds from Business Operations**

The computation of funds from business operations are shown in Exhibits 1.2 and 1.3.

**EXHIBIT 1.2** *Adjustment to Profit*

- (A) **Net** income (or loss) as shown by the profit and loss account
- (B) **Add** : Depreciation  
 Amortisation of goodwill, patents and other intangible assets  
 Amortisation of discount on debentures or share issue expenses  
 Amortisation of extraordinary losses incurred in previous years  
 Loss on sale of non-current assets
- (C) **Less** : Amortisation of premium received on debentures  
 Profit on sale of non-current assets  
 Profit on revaluation of non-current assets  
 Dividends and interest on investments received (reported separately)

**[A + B – C] = Funds** from business operations

**EXHIBIT 1.3** *Adjusted Profit and Loss Account (P & L A/C)*

- (A) **Sales** revenue
- (B) **Less** : Expenses using working capital  
 Cost of goods sold (excluding depreciation)  
 Wages and salary expenses  
 Manufacturing expenses  
 Advertising expenses  
 Insurance expenses  
 Office expenses  
 Other operating expenses  
 Interest  
 Provision for income tax

**[A – B] = Funds** from business operations

Funds from business operations can also be obtained from the statement of retained earnings. In order to ascertain funds from business operations with the help of the statement of retained earnings, the following procedure should be adopted:

- Balance of retained earnings at the end of the year is taken as the base.
- The amount of transfer to the general reserve or any other reserve indicating appropriation out of profits should be added back, as these transactions merely involve the reclassification of items, and do not involve any corresponding use of the WC.
- Payment of dividends (as is shown under *uses* in Exhibit 1.1) should be added back.
- Balance of retained earnings (if any) at the beginning of the year should be deducted.

**Statement of Item-wise Changes in Working Capital**

The statement of changes in WC is shown in Exhibit 1.4.

**EXHIBIT 1.4** *Proforma Statement of Changes in Working Capital*

	Beginning of the year	End of the year	Change in WC	
			Increase (+ CA or –CL)	Decrease (–CA or + CL)
(1)	(2)	(3)	(4)	(5)
<b>(A) Current Assets</b>				
Cash				

(Contd.)

**Exhibit 1.4 (Contd.)**

	Bank balance				
	Marketable securities				
	Debtors				
	Bills receivable				
	Inventories				
	Pre-paid expenses				
Total					
<b>(B) Current Liabilities</b>					
	Sundry creditors				
	Bills payable				
	Bank overdraft				
	Provision for taxation				
	Dividends payable				
	Provision for bad/doubtful debts				
Total					
<b>[A – B] Net Working Capital (NWC)</b>					
Changes [increase (+) or					
decrease (–)] in the NWC					

**SCFP-CASH BASIS (CASH FLOW STATEMENT)**

Under the cash concept of funds, the SCFP lists the various items which cause change in cash balances between two balance sheet dates. All the items /transactions that increase /decrease cash are included, while items that have no effect on cash are excluded. Thus, the cash flow statement summarises sources of cash inflow and outflow.

The principal difference between the funds and cash flow statements lies in the amount shown as resources provided by business operations. Therefore, for preparing a cash flow statement, funds from business operations are to be adjusted to obtain cash from business operations. Most of the other items reported in the funds statement generally involve cash receipts or payments. The procedure to determine cash from business operations is summarised in Exhibit 1.5.

**EXHIBIT 1.5** *Format of Cash Flows From Business Operations*

**(A) Working Capital (WC)** from business operations (as per funds flow statement)

**(B) Adjustment** to convert to cash basis

- (i) **Add:** Decrease in WC (–CA or +CL)
  - Decrease in CA other than cash (item-wise)
  - Increase in CL (item-wise)
- (ii) **Less:** Increase in WC (+CA or –CL)
  - Increase in CA other than cash (item-wise)
  - Decrease in CL (item-wise)

**(C) Cash** inflow from business operations

**SCFP-TOTAL RESOURCES BASIS**

The SCFP based on WC as well as cash are incomplete and inadequate, to the extent that they omit some major financial and investment activities like issue of equity shares or debentures for purchase of building or plant and machinery, conversion of debentures into shares, issue of bonus shares, and so on. Such items do not affect the WC but they are significant and, therefore, need to be shown in the SCFP to include all

financing and investment activities of the firm. The SCFP prepared on the basis of total resources concept includes all these significant financial transactions. Thus, the 'total resources' concept is the best and the most comprehensive approach to disclose the changes in the financial position of the firm. Such a statement is prepared as given in Exhibit 1.6.

---

**EXHIBIT 1.6** *Statement of Changes in Financial Position (All Resources Basis)*


---

**(A) Sources: Financial Resources Provided**

- (i) Funds from business operations
  - Sales income
  - Less expenses
- (ii) Funds from other sources
  - Dividend received
  - Interest received
- (iii) Sale of non-current assets
- (iv) Long-term financing
  - For cash
  - Conversion of debentures
  - Exchange for assets purchased

Total

**(B) Uses: Financial Resources Applied**

- (i) Acquisition of non-current assets
  - Plant and equipment
  - Land and building, and also
    - (a) For cash
    - (b) Exchange for shares and debentures
- (ii) Return of long-term capital
  - Redemption of preference shares
  - Repayment of debentures
- (iii) Recurring payment to investors
  - Interest to debentureholders
  - Dividend to preference shareholders
  - Dividend to equityholders

Total

**(C) [A – B]: Increase or Decrease in WC**


---

**CASHFLOW STATEMENT— AS-3 (REVISED)**

The Institute of Chartered Accountants of India (ICAI) issued the Accounting Standard (AS-3) (revised) relating to the preparation of cash flow statements in 1998. The main items of direct and indirect methods of illustrating the cash flow statement, according to the AS-3, for a manufacturing organization are summarised in Exhibits 1.7 and 1.8 respectively. The cash flow statement for a financial enterprise is shown in Exhibit 1.9.

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**EXHIBIT 1.7** *Direct Method Cash Flow Statement*


---

**Cashflow from Operating Activities**

- Cash receipts from customers
  - Cash paid to suppliers and employees
- 

(Contd.)

**Exhibit 1.7 (Contd.)**

Cash generated from operations  
 Income tax  
 Cash flow before extraordinary item  
 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  
 Dividend 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  
 Dividend 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 1.8 Indirect Method Cash Flow Statement****Cashflow from Operating Activities**

Net profit before taxation, and extraordinary item  
 Adjustment for:  
 • Depreciation  
 • Foreign exchange loss  
 • Interest income  
 • Dividend income  
 • Interest expense

Operating profit before WC changes  
 Increase in sundry debtors  
 Decrease in inventories  
 Decrease in sundry creditors  
 Cash generated from operations  
 Income tax paid  
 Cash flow before extraordinary item  
 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  
 Dividend received

(Contd.)

**Exhibit 1.8 (Contd.)***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 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

**EXHIBIT 1.9** *Cashflow Statement for a Financial Enterprise\****Cashflows from Operating Activities**

Interest and commission receipts  
 Interest payment  
 Recoveries on loans previously written off  
 Cash payments to employees and suppliers  
 Operating profit before changes in operating assets  
*Decrease (or increase) in operating assets:*

- Short-term funds
- Deposit held for regulatory or monetary control purposes
- Funds advanced to customers
- Net increase in credit card receivables
- Other short-term securities

*Decrease (or increase) in operating liabilities:*

- Deposits from customers
- Certificates of deposit
- Net cash from operating activities before income tax
- Income taxes paid

*Net cash from operating activities***Cashflows from Investing Activities**

Dividends received  
 Interest received  
 Proceeds from sale of permanent investments  
 Purchase of permanent investments  
 Purchase of fixed assets

*Net cash from investing activities***Cashflow from Financing Activities**

Issue of shares  
 Repayment of long-term borrowings  
 Net decrease in other borrowings  
 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

\*It is illustrative only and does not form part of the accounting standard. It illustrates the application of the accounting standard and is presented using the direct method.

## SOLVED PROBLEMS

### PS 1.1

The following are the summarised balance sheets of V Ltd, as on March 31 for years 1 and 2:

<i>Liabilities</i>	<i>Year 1</i>	<i>Year 2</i>	<i>Assets</i>	<i>Year 1</i>	<i>Year 2</i>
Share capital	Rs 2,00,000	Rs 2,60,000	Goodwill	—	Rs 20,000
P & L A/c	39,690	41,220	Machinery	Rs 1,12,950	1,16,200
Reserves	50,000	50,000	Buildings	1,48,500	1,44,250
Tax provision	40,000	50,000	Stock	1,11,040	97,370
Bank overdraft	59,510	—	Sundry debtors	87,490	73,360
Bills payable	33,780	11,525	Cash	2,500	2,700
Sundry creditors	39,500	41,135			
	<u>4,62,480</u>	<u>4,53,880</u>		<u>4,62,480</u>	<u>4,53,880</u>

#### *Additional information*

The following additional information is obtained from the general ledger:

- During year 2, an interim dividend of Rs 26,000 was paid.
- The assets of another company were purchased for Rs 60,000 payable in fully paid shares of V Ltd. These assets included stock, Rs 22,000, and machinery, Rs 18,000. In addition, sundry purchases of machinery amounted to Rs 5,600.
- Income tax paid during the year amounted to Rs 25,000.
- The net profit for the year before tax was Rs 62,530.

Prepare a statement showing (i) the sources and application of funds (all resources basis) for year 2, and (ii) a schedule setting out changes in WC.

### ***Solution***

(i) *Statement of sources and application of funds (all resource basis) of V Ltd for year 2 ending on March 31.*

#### *Sources of funds*

Funds from business operations	Rs 52,130
Issue of long-term liabilities:	
Equity shares issued (purchase of machinery, goodwill and stock)	60,000
Total financial resources provided (A)	<u>1,12,130</u>

#### *Application of funds*

Purchase of non-current assets:	
Machinery (for cash)	5,600
Machinery (for equity shares)	18,000
Goodwill (for equity shares)	20,000
Recurring payments to investors:	
Interim dividend paid	26,000
Total financial resources used (B)	<u>69,600</u>
Increase in Working Capital (WC) (A – B)	<u>42,530</u>

### **Working notes**

#### *1. Funds from business operations*

Increase in P & L A/c	Rs 1,530
Add: interim dividends paid	26,000 +



depreciation on machinery	20,350 <sup>++</sup>
depreciation on buildings	4,250
Total	<u>52,130</u>

<sup>+</sup>Rs 62,530 – Rs 35,000 provision for taxation – Rs 1,530 increase in P & L A/c.

<sup>++</sup>Depreciation

## 2. Machinery account

To balance b/d	Rs 1,12,950	By depreciation (balancing figure)	Rs 20,350
To purchase: (equity shares— Rs 18,000; cash—Rs 5,600)	23,600	By balance c/d	1,16,200
	<u>1,36,550</u>		<u>1,36,550</u>

## (ii) Statement of changes in working capital

Particulars	Year 1	Year 2	Working capital	
			Increase (+)	Decrease (–)
<b>Current assets</b>				
Stock	Rs 1,11,040	Rs 97,370		Rs 13,670
Debtors	87,490	73,360		14,130
Cash	2,500	2,700	Rs 200	
	<u>2,01,030</u>	<u>1,73,430</u>		
<b>Current liabilities</b>				
Tax provision	40,000	50,000		10,000
Bank overdraft	59,510	—	59,510	
Bills payable	33,780	11,525	22,255	
Creditors	39,500	41,135		1,635
	<u>1,72,790</u>	<u>1,02,660</u>		
Net working capital (NWC)	28,240	70,770		42,530
Increase in NWC	42,530	—		
	<u>70,770</u>	<u>70,770</u>	<u>81,965</u>	<u>81,965</u>

## PS 1.2

The non-current assets and equities of Northern Tools Ltd are given at the beginning and the end of the current year as below.

	End	Beginning
Plant assets, net of depreciation	Rs 2,85,000	Rs 1,27,000
Investment in the share of North Eastern Tools Ltd	5,80,000	2,64,000
Debentures	1,40,000	5,00,000
Capital stock	8,00,000	8,00,000
Retained earnings	8,21,000	4,76,000

You are unable to obtain a complete balance sheet data or income statement for the year, but you have obtained the following information:

- Dividends paid, Rs 75,000
- A gain on sale of equipment of Rs 26,000 has been included in the net income. The gross plant assets increased by Rs 1,86,000 even though equipment costing Rs 58,000, with a net book value of Rs 38,000, was sold.

Prepare a statement of sources and uses of net working capital (NWC) from the information mentioned above.

**Solution***Statement of sources and uses of NWC of Northern Tools Ltd for the year ending on March 31***Sources of NWC**

Funds from business operations	Rs 4,42,000
Sale of non-current assets:	
Sale of equipment	64,000
Total financial resources provided	<u>5,06,000</u>

**Uses of NWC**

Purchase of non-current assets:	
Purchase of plant	2,44,000
Investments	3,16,000
Payment of long-term liabilities:	
Payment of bonds	3,60,000
Recurring payments to investors:	
Dividends paid	75,000
Total financial resources used	<u>9,95,000</u>
Decrease in NWC (uses-sources)	<u>4,89,000</u>

**Working notes***(i) Funds from business operations:*

Increase in retained earnings	Rs 3,45,000
Add dividends paid	75,000
Add depreciation on plant and equipment	48,000
Less gain on sale of equipment	<u>26,000</u>
Total	<u>4,42,000</u>

*(ii) Purchase of plant*

Net increase in gross value	1,86,000
Add gross value of plant sold	<u>58,000</u>
	<u>2,44,000</u>

*(iii) Depreciation on plant and equipment**Plant and machinery account*

To balance b/d	Rs 1,27,000	By cash	Rs 38,000
To purchases	2,44,000	By depreciation (balancing figure)	48,000
		By balance c/d	<u>2,85,000</u>
	<u>3,71,000</u>		<u>3,71,000</u>

**PS 1.3**

Prepare a funds flow statement (all resources basis) of Atlantic Business Corporation Ltd from the following information:

*Balance sheet as on April 1 and March 31, (amount in '000)*

	<i>April 1</i>	<i>March 31</i>
Cash and bank	Rs 40,000	Rs 44,400
Accounts receivable	10,000	20,700
Inventories	15,000	15,000

*(Contd.)*

**PS 1.3 (Contd.)**

Land	4,000	4,000
Business premises	20,000	16,000
Plant and equipment	15,000	17,000
Accumulated depreciation	(5,000)	(2,800)
Patents and trade marks	1,000	900
Total assets	<u>1,00,000</u>	<u>1,15,200</u>
<i>Current liabilities</i>	30,000	32,000
Bonds payable	22,000	22,000
Bonds payable discount	(2,000)	(1,800)
Capital stock	35,000	43,500
Retained earnings	15,000	19,500
Total liabilities	<u>1,00,000</u>	<u>1,15,200</u>

*Additional information*

- (a) Income for the period, Rs 10,000.
- (b) A building that costed Rs 4,000 and had a book value of Rs 1,000 was sold for Rs 1,400.
- (c) The depreciation charge for the period—Rs 800.
- (d) There was a Rs 5,000 issue of capital stock.
- (e) Cash dividends of Rs 2,000 and a stock dividend of Rs 3,500 were declared.

**Solution**

*Funds flow statement (all resources basis) of Atlantic Business Corporation Ltd for the year ending March 31*

**Sources of funds**

Funds from business operations	Rs 10,700
Sale of non-current assets:	
Business premises	1,400
Issue of long-term liabilities:	
Equity capital (including Rs 3,500 paid as bonus shares)	8,500
Total financial resources provided	<u>20,600</u>

**Application of funds**

Purchase of fixed assets:	
Plant and equipment	2,000
Recurring payments to investors:	
Dividends paid: cash	Rs 2,000
shares	3,500
Total financial resources used	<u>7,500</u>
Increase in <i>net working capital</i> (source-uses)	<u>13,100</u>

**Working notes***Funds from business operations*

Increase in retained earnings	Rs 4,500
Add: depreciation on plant and equipment	800
dividends	5,500
amortisation of discount on bonds	200
amortisation of patents and trademark	100
Less: profit on sale of buildings	400
Total	<u>10,700</u>

**PS 1.4**

Prepare a statement from the following financial information of ABC Ltd, to explain the causes of increase in WC and cash, despite the firm incurring losses.

*Income statement*

<b>Sales</b>		Rs 6,00,000
Dividends from investment in another company		2,000
		<u>6,02,000</u>
<b>Expenses</b>		
Cost of goods sold	Rs 4,00,000	
Depreciation	50,000	
Other operating expenditure	1,75,000	
Loss on sale of equipment (sale value, Rs 7,200)	3,000	
		<u>6,28,000</u>
<b>Net loss</b>		<u>(26,000)</u>

*Retained earnings*

<b>Beginning balance</b>	Rs 50,000
Net loss	(26,000)
Dividends	(16,000)
<b>Ending balance</b>	<u>8,000</u>

*Position statement*

	<i>Previous year</i>	<i>Current year</i>
Cash	Rs 18,400	Rs 43,200
Marketable securities	800	—
Sundry debtors	28,600	16,800
Inventory	33,000	22,000
Prepayments	2,200	1,800
Investments	18,000	18,000
Land	15,000	15,000
Plant assets	1,19,800	1,10,400
Accumulated depreciation	(75,200)	(78,400)
<b>Total assets</b>	<u>1,60,600</u>	<u>1,48,800</u>
Accounts payable	18,200	10,200
Accrued liabilities	1,200	2,400
Dividends payable	1,200	2,200
Debentures	12,000	16,000
Equity capital	50,000	60,000
Preference share capital	28,000	50,000
Retained earnings	50,000	8,000
<b>Total liabilities</b>	<u>1,60,600</u>	<u>1,48,800</u>

***Solution****Statement of sources and applications of net working capital of ABC Ltd for the current year**Source of net working capital*

Funds from business operations	Rs 25,000
Issue of long-term liabilities:	
Preference share capital	22,000

(Contd.)

**Solution (Contd.)**

Equity share capital	10,000
Debentures	4,000
Sale of non-current assets:	
Sale of plant	7,200
Funds from other sources:	
Dividend received	<u>2,000</u>
Total financial resources provided	<u>70,200</u>
<i>Uses of net working capital</i>	
Purchase of fixed assets:	
Plant assets	47,600
Recurring payments to investors:	
Dividends paid	<u>16,000</u>
Total financial resources used	<u>63,600</u>
Increase in <i>net working capital</i> (sources-uses)	<u>6,600</u>

**Working notes**(i) *Funds from business operations*

Sales		Rs 6,00,000
Less expenses:		
Cost of goods sold	Rs 4,00,000	
Operating expenses	1,75,000	<u>5,75,000</u>
		<u>25,000</u>

(ii) *Accumulated depreciation account*

To plant (accumulated depreciation on plant sold) (balancing figure)	Rs 46,800	By balance b/d	Rs 75,200
		By P&L A/c (depreciation of the current year)	50,000
To balance c/d	<u>78,400</u>		
	<u>1,25,200</u>		<u>1,25,200</u>

(iii) *Gross value of plant sold*

Cash A/c	Dr	Rs 7,200	
P&L A/c	Dr	3,000	
Accumulated depreciation A/c	Dr	46,800	
To plant			Rs 57,000

(iv) *Purchase of plant**Plant account*

To balance b/d	Rs 1,19,800	By cash	Rs 7,200
To plant purchased (balancing figure)	47,600	By P&L A/c	3,000
		By Accumulated depreciation A/c	46,800
		By balance c/d	<u>1,10,400</u>
	<u>1,67,400</u>		<u>1,67,400</u>

*Cash flow statement of ABC Ltd for the current year**Sources of cash*

Cash flow from business operations		Rs 43,200
Issue of long-term liabilities:		
Preference share capital	Rs 22,000	
Equity share capital	10,000	36,000
10% Debentures	4,000	

(Contd.)

**Working notes (Contd.)**

Sale of non-current assets	
Plant	7,200
Cash from other sources:	
Dividends received	2,000
Total sources	<u>88,400</u>
Uses of cash	
Purchase of fixed assets:	
Plant	47,600
Recurring payments to investors:	
Dividend paid	16,000
Total uses	<u>63,600</u>
Net increase in cash (sources-cash)	<u>24,800</u>

**Working notes***Cash from business operations*

(A) Working capital (WC) from business operations as per the statement of NWC Rs 25,000

(B) Adjustments to convert to cash basis:

(1) Add decrease in WC (– CA or + CL)

(i) Current assets:

Marketable securities	Rs 800	}	24,000
Sundry debtors	11,800		
Inventory	11,000		
Pre-payments	400		

(ii) Current liabilities:

Accrued liabilities	1,200	}	2,200
Dividends payable	1,000		

(2) Subtract increase in WC (+ CA or – CL)

    Current liabilities:

Accounts payable		8,000
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Total		<u>43,200</u>
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**PS 1.5**

ABC Ltd finds that its opening bank balance of Rs 1,80,000 as on April 1 has been converted into an overdraft of Rs 75,000 by the end of the year. From the information given below, prepare a statement to show how this happened.

	Year beginning	Year-end
Fixed assets	Rs 7,50,000	Rs 11,20,000
Stock in trade	1,90,000	3,30,000
Book debts	3,80,000	3,35,000
Trade creditors	2,70,000	3,50,000
Share capital	2,50,000	3,00,000
Share premium	—	25,000
Bills receivable	87,500	95,000

The profit before depreciation and income tax was Rs 2,40,000. During the year, income tax to the extent of Rs 1,37,500 was paid. Dividend paid were (i) final on the capital as on April 1 at 10 per cent and (ii) interim at 5 per cent on the year-end capital.

**Solution***Cash flow statement*

<b>Sources of cash</b>		
Cash from business operations		Rs 2,17,500
Issue of long-term liabilities:		
Share capital		75,000
Total cash received		<u>2,92,500</u>
<b>Uses of cash</b>		
Purchase of fixed assets		3,70,000
Recurring payments to investors:		
Interim dividends [Rs 3,00,000 × 0.05]	Rs 15,000	
Final dividends [Rs 2,50,000 × 0.10]	25,000	40,000
Miscellaneous payments:		
Income tax		<u>1,37,500</u>
Total cash paid		<u>5,47,500</u>
<b>Decrease in cash (sources-uses)</b>		<u>2,55,000</u>
That is, balance in the beginning		1,80,000
Add overdraft		75,000
		<u>2,55,000</u>

**Working notes***Cash from business operations*

Profit before depreciation and taxes		Rs 2,40,000
(a) <i>Add:</i> increase in cash (–CA or +CL):		
Trade creditors	Rs 80,000	
Book debts	<u>45,000</u>	1,25,000
(b) <i>Less:</i> decrease in cash (+CA or –CL):		
Bills receivable	7,500	
Stock	<u>1,40,000</u>	<u>1,47,500</u>
Total		<u>2,17,500</u>

**PS 1.6**

Rainbow Paints and Varnish Ltd had the following balances on April 1:

Fixed assets – cost	Rs 6,00,000	
Less depreciation	<u>2,10,000</u>	Rs 3,90,000
Bank balance		35,000
Current assets other than bank balance		2,50,000
Current liabilities		1,00,000
Equity capital (shares of Rs 100 each)		3,00,000

The company made the following estimates for the year:

- The profit would be Rs 58,000 after depreciation of Rs 60,000.
- The company would acquire fixed assets costing Rs 1,00,000, after selling one machine costing Rs 50,000 for Rs 20,000, on which depreciation provided amounted to Rs 35,000.
- Current assets and Current liabilities, other than bank balance, at the end of the year are expected to be Rs 2,95,000 and Rs 1,30,000, respectively.
- The company will pay a dividend of 10 per cent.

Ascertain the bank balance (or overdraft) of the company at the end of the year.

**Solution***Projected cash flow statement of Rainbow Paints and Varnish Ltd for the year ending March 31*

Balance as on April 1		Rs 35,000
Add estimated cash inflows:		
Cash from operations	Rs 98,000	
Sale of machine	20,000	
		<u>1,18,000</u>
Total projected receipts (A)		<u>1,53,000</u>
Less projected cash outflows:		
Purchase of fixed assets	1,00,000	
Dividends payable	30,000	
Tax payable on dividends	7,500	
		<u>1,37,500</u>
Total projected payments (B)		<u>1,37,500</u>
Projected bank balance as on March 31 (A – B)		<u>15,500</u>

**Working notes***Cash from business operations:*

Profit of the current year	Rs 58,000
Add depreciation	60,000
Less gains from the sale of machine	<u>5,000</u>

*Funds from business operations*

Add increase in cash:	
Increase in current liabilities	30,000
Less decrease in cash:	
Increase in current assets	<u>45,000</u>
	<u>98,000</u>

**PS 1.7**

The following is the condensed information of the XYZ Ltd:

	<i>Previous year</i>	<i>Current year</i>
Current assets	Rs 1,35,000	Rs 1,27,200
Investments	15,000	21,400
Land	9,000	9,000
Plant and machinery	81,000	1,05,000
(accumulated depreciation)	(24,000)	(26,000)
Patents	<u>16,200</u>	<u>12,600</u>
Total assets	<u>2,32,200</u>	<u>2,49,200</u>
Current liabilities	24,600	34,800
12% Debentures	43,400	—
14% Debentures	—	39,000
Equity share capital	90,000	1,00,000
Reserve for future loss on investments	6,000	3,600
Retained earnings	<u>68,200</u>	<u>71,800</u>
Total liabilities	<u>2,32,200</u>	<u>2,49,200</u>



*Additional information*

- (a) A reconciliation of the balances in retained earnings is as follows:

Balance on April 1, current year	Rs 68,200
Net income for the year	3,000
Award received from settlement of previous year's patent infringement case	15,600
Dividends	(15,000)
Balance on March 31, current year	<u>71,800</u>

- (b) Net income of the current year includes loss of Rs 4,800 on the sale of a part of the plant. The plant was valued at Rs 19,000 at the beginning of the year, the accumulated depreciation being Rs 6,000.
- (c) Investments of Rs 15,000 were sold during the year at a loss. The loss was charged to the reserve for future losses on investment and did not appear on the income statement.
- (d) During the current year, the 12 per cent debentures were called for redemption. Most of them were refunded through the issuance of new 14 per cent debentures and the rest were retired for cash.
- (e) The equity shares were issued in exchange for machinery. The rest of the plant and machinery was purchased for cash.

Your are required to prepare a statement of changes in financial position for the current year.

***Solution****Statement of changes in financial position of XYZ Ltd for the current year****Sources of funds***

Funds from business operations		Rs 19,400
Issue of long-term liabilities:		
Equity share capital (purchase of machinery)	Rs 10,000	
14% Debentures (for redemption of 12% Debentures)	39,000	49,000
Sale of non-current assets:		
Plant	8,200	
Investments	12,600	20,800
Miscellaneous sources:		
Award received from settlement of previous year's patent infringement case		15,600
Total financial resources provided		<u>1,04,800</u>

***Uses of financial resources***

Purchase of non-current assets:		
Plant (including Rs 10,000 purchased against the issue of equity shares)	43,000	
Investments	21,400	64,400
Recurring payments to investors:		
Dividends paid		15,000
Payment of long-term liabilities:		
12% Debentures (cash)		4,400
12% Debentures (new 14% Debentures)		39,000
Total financial resources used		<u>1,22,800</u>

***Decrease in NWC (uses-sources)***

18,000

***Working notes****Funds from business operations*

Net income for current year	Rs 3,000
Add: depreciation	8,000

(Contd.)

**Working notes (Contd.)**

amortisation of patents	3,600
loss on sale of plant	4,800
Total	<u>19,400</u>

**PS 1.8**

The following information is obtained from the records of XYZ Ltd:

*Net change in accounts balances during the year*

	<i>Debit</i>	<i>Credit</i>
Cash	Rs 17,475	
Accounts receivable	45,000	
Allowance for doubtful accounts		Rs 1,250
Stock in trade	17,525	
Equipment and machinery	75,000	
Accumulated depreciation		32,500
Goodwill		5,000
Income taxes payable		7,500
Accounts payable		2,500
14% Debentures		1,25,000
Premium on debentures		4,750
15% Preference share capital	1,20,000	
Equity share capital		52,500
Retained earnings		44,000
	<u>2,75,000</u>	<u>2,75,000</u>

*Statement of retained earnings*

Balance, April 1		Rs 6,00,000
Add: net income for the year (after amortisation of goodwill)	Rs 4,00,000	
tax refund	10,000	
		<u>4,10,000</u>
		10,10,000
Less: cash dividends	3,01,500	
bonus shares to equity holders	52,500	
premium on redemption of preference shares	12,000	
		<u>3,66,000</u>
Balance, March 31		6,44,000

Accounts receivable of Rs 10,000 were written off during the year. Equipment costing Rs 1,00,000, which was 80 per cent depreciated, was sold at carrying value, and new equipment with larger capacity was acquired.

Prepare (i) a statement of changes in financial position (WC basis), and (ii) a statement of changes in financial position (cash basis).

**Solution**

(i) *Statement of changes in financial position of XYZ Ltd (working capital basis)*

**Sources of working capital**

Funds from business operations		Rs 5,17,500
Sale of non-current assets:		
Equipment and machinery		20,000
Issue of long-term liabilities:		
14% Debentures	Rs 1,29,750	
Equity share capital (bonus shares)	52,500	
		<u>1,82,250</u>

(Contd.)

**Solution (Contd.)**

Miscellaneous sources:	
Tax refund	10,000
Total sources of funds	<u>7,29,750</u>
<i>Uses of working capital</i>	
Purchase of non-current assets:	
Equipment and machinery	1,75,000
Payment of long-term liabilities:	
Redemption of preference shares	1,32,000
Recurring payments to investors:	
Cash dividend	3,01,500
Bonus shares	52,500
Total uses of working capital	<u>6,61,000</u>
Net increase in working capital: (sources-uses)	<u>68,750</u>

**Working notes**(i) *Funds from business operations*

Net income for the year	Rs 4,00,000
Add: amortisation of goodwill	5,000
depreciation of the current year	<u>1,12,500</u>
Total	<u>5,17,500</u>

(ii) *Accumulated depreciation account*

To equipment and machinery	Rs 80,000	By balance b/d	X
To balance c/d	X + 32,500	By profit and loss A/c (depreciation)	Rs 1,12,500
	<u>1,12,500 + X</u>		<u>1,12,500 + X</u>

(ii) *Statement of changes in financial position of XYZ Ltd (cash basis)**Sources of cash*

Cash from business operations	Rs 4,66,225
Sale of non-current assets:	
Sale of plant	20,000
Issue of long-term liabilities:	
14% Debentures	1,29,750
Miscellaneous sources:	
Tax refund	10,000
Total cash receipts	<u>6,25,975</u>

*Uses of cash*

Purchase of fixed assets:	
Equipment and machinery	1,75,000
Payment of long-term liabilities:	
Redemption of preference shares	1,32,000
Recurring payment to investors:	
Dividends paid	3,01,500
Total cash payments	<u>6,08,500</u>
<i>Increase in cash (receipts-payments)</i>	<u>17,475</u>

**Working notes***Cash from business operations*

Funds from business operations

Rs 5,17,500

*Add: decrease in WC (– CA + CL):*

allowance for doubtful debts

Rs 1,250

income taxes payable

7,500

accounts payable

2,500

11,250

*Less: increase in WC (+ CA or – CL):*

accounts receivable

45,000

stock

17,525

62,525

Total cash from business operations

4,66,225

**PS 1.9**

The comparative adjusted trial balance for ABC Ltd is given below:

*Adjusted trial balance*

	<i>March 31, previous year</i>		<i>March 31, current year</i>	
	<i>Dr</i>	<i>Cr</i>	<i>Dr</i>	<i>Cr</i>
Cash	Rs 15,000		Rs 16,400	
Marketable securities	40,000		44,000	
Accounts receivable (net)	1,20,000		1,33,600	
Inventories	1,28,000		1,44,000	
Delivery van	60,000		67,000	
Machinery	30,000		35,000	
Building	1,10,000		1,10,000	
Accumulated depreciation:				
Delivery van		Rs 34,000		Rs 42,000
Machinery		17,000		21,000
Building		14,000		30,000
Land	30,000		30,000	
Accounts payable		94,000		86,000
Accrued expenses		16,000		19,000
13% debentures		1,20,000		1,10,000
Equity capital		1,30,000		1,30,000
Retained earnings		76,000		1,08,000
Sales		6,00,000		6,60,000
Cost of goods sold	4,40,000		4,90,000	
Operating expenses	96,000		1,02,000	
Income tax	32,000		34,000	
	11,01,000	11,01,000	12,06,000	12,06,000

Prepare a statement of changes in financial position (working capital basis). No schedule of changes in working capital is required.

**Solution***Statement of changes in financial position (working capital basis) of ABC Ltd**Sources of funds*

Funds from business operations

Rs 62,000

(Contd.)

**Solution (Contd.)***Uses of funds*

Purchase of fixed assets:	
Machinery	5,000
Delivery van	7,000
Payment of long-term liabilities:	
13% Debentures	10,000
Recurring payments to investors:	
Dividends paid	2,000
	<u>24,000</u>
<i>Net increases in working capital (sources-uses)</i>	<u>38,000</u>

**Working notes**(i) *Dividends paid*

Net profit		Rs 34,000
Less increase in retained earnings		<u>32,000</u>
Dividends paid (assumed)		<u>2,000</u>

(ii) *Funds from business operations*

Sales			6,60,000
Less: cost of goods sold	Rs 4,90,000	₹	
operating expenses	1,02,000	₹	
income taxes	34,000	₹	<u>6,26,000</u>
			34,000
Add depreciation on			
Delivery van	8,000	₹	
Machinery	4,000	₹	
Buildings	16,000	₹	<u>28,000</u>
			<u>62,000</u>

**PS 1.10**

Presented below are data taken from the records of XYZ Ltd:

	<i>March 31, previous year</i>	<i>March 31, current year</i>
Current assets	Rs 1,60,000	Rs 3,20,000
Long-term investments	2,40,000	40,000
Plant assets	9,60,000	15,40,000
	<u>13,60,000</u>	<u>19,00,000</u>
Accumulated depreciation	1,60,000	1,20,000
Current liabilities	1,20,000	1,40,000
14% Debentures	—	4,00,000
Equity capital	10,00,000	10,00,000
Donation	—	1,00,000
Retained earnings	80,000	1,40,000
	<u>13,60,000</u>	<u>19,00,000</u>

*Additional information*

1. Securities carried at a cost of Rs 2,00,000 on March 31 of the previous year, were sold during the current year for Rs 1,60,000. The loss (not extraordinary) was charged directly to retained earnings.

2. Plant assets which cost Rs 2,00,000, and were 60 per cent depreciated, were sold during the year for Rs 40,000. The loss (not extraordinary) was again wrongly charged directly to retained earnings.
3. Net income for the current year as reported by the income statement was Rs 2,00,000.
4. Dividends paid amounted to Rs 60,000.
5. Depreciation charged for the year was Rs 80,000.

Prepare a statement of changes in financial position (WC basis). What additional information will be required if a statement of changes in financial position is to be prepared on the basis of the all financial resources and uses concept?

### ***Solution***

(i) *Statement of change in financial position (working capital basis) of XYZ Ltd*

<b>Sources of funds</b>		
Funds from business operations		Rs 2,80,000
Sale of non-current assets:		
Investments	Rs 1,60,000	2,00,000
Plant	40,000	
Issue of long-term liabilities:		
14% Debentures		4,00,000
Miscellaneous sources:		
Donation		1,00,000
Total sources		<u>9,80,000</u>
<b>Uses of funds</b>		
Purchase of fixed assets:		
Plant		7,80,000
Recurring payments to investors:		
Dividends		60,000
Total uses		<u>8,40,000</u>
<b>Net increase in working capital (sources – uses)</b>		<u>1,40,000</u>

### **Working notes**

<b>Funds from business operations</b>		
Net income of the year		Rs 2,00,000
Add depreciation		80,000
Total		<u>2,80,000</u>

(ii) *Additional information required for all financial resources and uses concept:*

- Issue of equity shares, preference shares and debentures for purchase of fixed assets.
- Conversion of loan/debentures into equity.
- Issue of bonus shares.

### **PS 1.11**

The balance sheets of T Ltd as on March 31 for years 1 and 2 were as follows: (Rs in lakh)

<i>Liabilities</i>	<i>Year 1</i>	<i>Year 2</i>	<i>Assets</i>	<i>Year 1</i>	<i>Year 2</i>
Share capital	300.00	300.00	Freehold property (at cost)	225.00	240.00
Reserves	225.00	240.0	Plant and machinery (at cost, less depreciation)	135.00	165.00
Debentures (unsecured)	75.00	75.00	Investments in shares of companies under the same management	150.00	150.00
Mortgage on freehold property	27.00	14.25			
Creditors	45.00	45.00			
Proposed dividend	22.50	23.25	(unquoted)		

(Contd.)

**PS 1.11 (Contd.)**

Provision for taxation	21.00	37.50	Investment in shares of other companies (market value: year 2:120 lakh; Year 1:150 lakh)	112.50	112.50
Secured overdraft (by a floating charge on assets)	15.00	82.50	Stock	52.50	75.00
			Debtors	45.00	75.00
			Bank	10.50	—
Total	730.50	817.50	Total	730.50	817.50

*Additional information*

The following additional information for year 2 is relevant (amount in lakh of rupees):

(a) Credit sales	675.00
(b) Credit purchases	520.00
(c) Overheads	83.75
(d) Depreciation on plant and machinery	17.50
(e) Dividend for year 1 paid in full	
(f) Amount paid towards taxation for year 1	21.50

In view of credit squeeze, the company has been asked by the bank to reduce the overdraft substantially within 6 months, if possible by 50 per cent.

Prepare a cash flow statement. Briefly comment on the financial position of the company and suggest remedial measures to overcome the financial crisis, if any.

***Solution***

*Cash flow statement of T Ltd for the year ending March 31 (amount in lakh of rupees)*

***Sources of cash***

Cash from business operations	87.25
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***Uses of cash***

Payment of mortgage on freehold property	12.75 ₹	
Proposed dividend (year 1)	22.50	
Purchase of freehold property	15.00	
Purchase of plant and machinery	47.50 ₹	97.75
<b>Net decrease in cash (uses – sources)</b>		<b>10.50</b>

***Working notes****Cash from business operations*

Increase in reserves	15.00 ₹
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Add: depreciation on plant and machinery	17.50
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proposed dividends (year 2)	23.25 ₹
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*Funds from business operations*

55.75

Add: decrease in WC (– CA or + CL):

Bank overdraft	67.50 ₹
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Provision for taxation	16.50 ₹	84.00
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Less: increase in WC (+ CA or – CL):

Debtors	30.00 ₹
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Stock	22.50 ₹	52.50
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87.25

The liquidity position of the company is not good, as revealed by the substantial increase in bank overdraft due to wrong pattern of financing of NWC, that is, the permanent part of the working capital being financed through bank

overdraft. It must be financed by long-term sources. The company can raise more funds through the issue of additional debentures, as its debt equity ratio is very satisfactory. Alternatively, it can sell its quoted investments and pay the overdraft.

### PS 1.12

A and B are carrying on business in partnership for the past two years, sharing profit and loss in the ratio of 3:2. Not all the necessary books and records have been maintained. However, the following figures have been ascertained from the available records:

	Year-end 1	Year-end 2
Drawings for the year		
A	Rs 5,000	Rs 15,000
B	10,000	10,000
Sundry creditors	24,000	27,000
Stock	30,000	50,000
Sundry debtors	28,000	48,000
Profit for the year	15,000	28,425
Purchase of machinery	25,000	15,000
Purchase of furniture	10,000	—
Bills payable	12,000	7,000
Bills receivable	8,000	6,000
Sale of furniture	—	2,000
Bank loan obtained	—	50,000
Bank loan discharged		10,000
Salaries outstanding		2,000
Prepaid insurance		500

Cash in hand and in bank amounts to Rs 7,000 on March 31, year 2. Partners have been regularly charging depreciation on machinery at the rate of 10 per cent, and on furnitures at the rate of 5 per cent, excluding sold items.

In year 1, A and B introduced further capital of Rs 10,000 and Rs 15,000 respectively (other than their initial capital). On March 31 the assets of business included cash and bank balances. The book value of furniture sold was Rs 3,000.

Prepare a statement showing sources and application of funds for the year 2 ended March 31. Show your working properly.

### Solution

#### Statement of sources and application of funds for year 2

<b>Sources of funds</b>		
Funds from business operations		Rs 33,500
Sale of non-current assets:		
Furniture		2,000
Issuance of long-term liabilities:		
Bank loan (long-term)		50,000
Total sources of funds		85,500
<b>Application of funds</b>		
Purchase of non-current assets		
Machinery		15,000
Payment of long-term liabilities:		
Bank loans		10,000

(Contd.)



**Solution (Contd.)***Recurring withdrawals by partners*

A	Rs 15,000	
B	10,000	25,000
Total application of funds		<u>50,000</u>
Increase in WC (Rs 85,500 – Rs 50,000)		<u>35,500</u>

**Working notes**1. *Funds from business operations*

Profit for the year Rs 28,425

Add expenses not involving the use of funds:

Depreciation on machinery:

(0.10 × Rs 22,500)

(0.10 × Rs 15,000)

Depreciation on furniture [0.05 × (Rs 9,500 – Rs 3,000)]

Loss on sales of furniture (Rs 3,000 – Rs 2,000)

Rs 2,250

1,500

3,750

325

1,000

33,500

2.

*Machinery account*

Year beginning			Year end		
1	To bank	Rs 25,000	1	By depreciation	Rs 2,500
				By balance c/d	22,500
		<u>25,000</u>			<u>25,000</u>
2	To balance b/d	22,500	2	By depreciation	3,750
2	To bank	15,000	2	By balance c/d	33,750
		<u>37,500</u>			<u>37,500</u>

3.

*Furniture account*

1	To bank	Rs 10,000	1	By depreciation	Rs 500
				By balance c/d	9,500
		<u>10,000</u>			<u>10,000</u>
2	To balance b/d	9,500	2	By cash	2,000
			2	By P & L A/c (loss on sale of furniture)	1,000
			2	By depreciation	325
			2	By balance c/d	6,175
		<u>9,500</u>			<u>9,500</u>

**PS 1.13**

Light and Dark are equal partners since the beginning of year 1. Their books and records showed the following balances as on March 31, year 2.

Building account	Rs 50,000
Due from customers	1,20,000
Bills receivable account	15,000
Advance for machinery (machinery delivered and installed in early October, year 2)	20,000
Due to suppliers (including Rs 2,000 for purchase of furniture in February, year 2)	90,000

(Contd.)

**PS 1.13 (Contd.)**

Bank overdraft	15,000
Stock in trade at cost	1,00,000
Bills payable account	16,000
Machinery account	75,000
Furniture and fixtures	24,000

A fire occurred towards the end of March, year 2, which destroyed a portion of the building (book value Rs 15,000) used as godown. Some of the books and records were saved, from which the following information was gathered:

- (a) The cost of machinery delivered and installed in October, year 2, was Rs 50,000 (the balance amount was paid in January).
- (b) Sales for year 2 were approximately Rs 80,000 per month, of which 10 per cent were cash sales. The firm maintained a steady gross profit rate of 30 per cent on turnover; cash purchases amounted to Rs 30,000.
- (c) Collection from debtors Rs 8,40,000  
 Payment to creditors (including the payment of liability for furniture) 5,20,000  
 Discount allowed to debtors 5,000  
 Discount received from creditors 3,000
- (d) Bills receivable  
     J Drawn and accepted 30,000  
     B/R collected 15,000  
     Dishonoured 3,000  
     Endorsed to creditors 4,000  
     n Endorsed B/R dishonoured 2,000  
     n Accepted 20,000  
     n Discharged 15,000
- (e) Bills payable  
     n Light 18,000  
     n Dark 15,000
- (f) Partners' drawings
- (g) Stock in trade as on March 31, year 2, was valued at Rs 80,000.
- (h) Cash and bank balance as on March 31, year 2, amounted to Rs 1,94,000, and there was no bank overdraft as on that date. The figure of cash and bank balance on April 1, year 2, were not readily available.
- (i) Net profits for the year may be assumed at Rs 80,000 after providing for depreciation on machinery—Rs 7,500 and on furniture—Rs 2,500.

The partners request you to prepare a funds flow statement for year 2.

**Solution***Funds flow statement for year 2*

<b>Sources of funds</b>		
Funds from business operations		Rs 1,05,000
<b>Uses of funds</b>		
Purchase of non-current assets:		
Machinery (Rs 50,000 – Rs 20,000)	Rs 30,000 {	
Furniture	2,000 {	32,000
Recurring withdrawals by partners:		
Partners' drawings: Light	18,000 {	
Dark	15,000 {	33,000
Total uses of funds		65,000
<b>Net increase in working capital</b>		<b>40,000</b>

**Working notes***Funds from business operations*

Net profits for the year	Rs 80,000
Add expenses not involving the use of WC:	
Depreciation on machinery	Rs 7,500

(Contd.)

**Working notes (Contd.)**

Depreciation on furniture	2,500	
Loss by fire	<u>15,000</u>	<u>25,000</u>
		<u>1,05,000</u>

**PS 1.14**

The following are the balance sheets of Bharat Industries Ltd. as on March 31, years 1 and 2.

	<i>Year 1</i>	<i>Year 2</i>
Share capital (face value of Rs 100 per share)	Rs 1,00,000	Rs 92,500
Reserves and surplus	80,231	80,753
Reserve for contingencies	37,500	63,600
Allowance for inventory loss	2,000	8,500
Accumulated depreciation	96,618	81,633
Allowances for loss on sundry debtors account	4,630	3,815
14% Mortgage debentures	82,000	68,500
Accrued interest, taxes, etc	12,307	21,263
Sundry creditors	79,081	81,314
	<u>4,94,367</u>	<u>5,01,878</u>
Building and machinery	1,72,778	2,07,782
Investments	1,17,500	90,000
Stock	83,164	95,438
Debtors	67,186	65,638
Advance	9,025	9,816
Cash and bank balances	40,409	30,337
Unamortised debenture discount	4,305	2,867
	<u>4,94,367</u>	<u>5,01,878</u>

The following information concerning the transactions is available:

- Net profit for year 2, as shown by profit and loss statement, was Rs 48,097.
- The share capital account as on March 31, year 1, included 15 per cent redeemable preference shares. These were redeemed during the year at Rs 111 per share. Subsequent to the redemption, a 10 per cent cash dividend was paid.
- New machinery was purchased for Rs 31,365, and machinery costing Rs 32,625 was scrapped. The scrapped machinery had accumulated depreciation of Rs 29,105 on the date of scrapping. The scrap was sold for Rs 1,000, which was credited to the profit and loss account. The remaining increase in fixed assets resulted from the construction of the building.
- The debentures mature at the rate of Rs 5,000 per year. In addition to the redemption of Rs 5,000 debentures due in year 2, the company purchased and redeemed Rs 8,500 of the debentures at Rs 103. Both the premium on redemption and the applicable discount were charged as expenses.
- The allowance for inventory loss was created by a charge to expense in each year. It was set up to reduce the inventory values of obsolete items to estimated market value.
- A sum of Rs 11,400 was debited to reserve for contingencies account during the year. It represented the amount of income tax liability of an earlier year in dispute.

You are required to prepare a statement showing the sources and application of funds for the year 2.

**Solution**

*Statement of sources and application of funds for year 2 of Bharat Industries Ltd*

**Sources of funds**

Funds from business operations	Rs 72,930
	(Contd.)

**Solution (Contd.)**

Sale of non-current assets:	
Machinery (scrap)	1,000
Investments (assumed to be long-term)	27,500
Total	<u>1,01,430</u>
<i>Application of funds</i>	
Purchase of non-current assets:	
Machinery	31,365
Construction of building	36,264
Payment of long-term liabilities:	
Redemption of preference shares [Rs 7,500 + (0.11)]	8,325
Redemption of debentures [Rs 5,000 + Rs 8,500 + Rs 255]	13,755
Recurring payment to investors:	
Payment of dividend (Rs 92,500 × 0.10)	9,250
Other items:	
Payment of income tax (claim of past years)	11,400
Total	<u>1,10,359</u>
Net increase in working capital (uses – sources)	<u>8,929</u>

**Working notes**1. *Funds from business operations*

Net profit	Rs 48,097
Add expenses not involving use of funds:	
Loss on sale of machinery	2,520
Premium on redemption of debentures (8,500 × 0.03)	255
Debenture discount written off (Rs 4,305 – 2,867)	1,438
Depreciation written off	14,120
Obsolete inventory written off	6,500
Total	<u>72,930</u>

**Note:** Allowance for loss on sundry debtors is like provision for bad and doubtful debts and, therefore, not added back to compute funds from business operations.

2. *Determination of investment in building construction:**Building and machinery account*

To balance b/d	Rs 1,72,778	By cash (sale value)	Rs 1,000
To cash (machinery purchased)	31,365	By accumulated depreciation (on machinery sold)	29,105
To cash spent on building construction (balancing figure)	36,264	By P & L A/c (loss on sale)	2,520
		By balance c/d	<u>2,07,782</u>
	<u>2,40,407</u>		<u>2,40,407</u>

*Accumulated depreciation account*

To building and machinery	Rs 29,105	By balance b/d	Rs 96,618
To balance c/d	81,633	By P & L A/c (balancing figure)	14,120
	<u>1,10,738</u>		<u>1,10,738</u>

**PS 1.15**

Given the following data (Rs thousands), prepare a statement of changes in financial position (all resources basis). Also, explain why net working capital has declined. What other sources of funds are likely to be available?

	Year 2	Year 1
<b>Liabilities</b>		
Equity share capital	Rs 3,600	Rs 3,600
Reserves	2,545	2,100
Total shareholder's equity	6,145	5,700
Debentures	16,000	16,000
<b>Current liabilities</b>		
Bills payable	3,900	2,800
Creditors	4,800	4,100
Provision for taxation	155	400
Total liabilities	31,000	29,000
<b>Assets</b>		
<b>Fixed assets</b>		
Land	300	300
Buildings, plant and machinery (net)	7,000	5,800
Total fixed assets	7,300	6,100
<b>Current assets</b>		
Bank	2,600	2,200
Inventories at cost	14,600	14,400
Investments	600	600
Debtors	5,300	5,100
Advances	600	600
Total current assets	23,700	22,900
Total assets	31,000	29,000

*Statement of income and reconciliation of retained profits for the year-end 2 (Rs thousands)*

Sales		Rs 55,000
Cost of goods sold		40,000
Gross profit on sales		15,000
<b>Other operating expenses</b>		
Selling expenses	Rs 8,900	
Administrative	2,000	
Depreciation	1,000	11,900
Operating profit		3,100
Interest charged		800
Profit before tax		2,300
Provision for taxation (0.35)		805
Profit after taxation		1,495
Dividends		1,050
Net profit retained		445
Add reserves (beginning)		2,100
Reserves (closing)		2,545

**Solution**

*SCFP (all resources basis) for the year-end 2 (Rs thousands)*

<b>Sources of funds</b>	
Funds from business operations	Rs 3,295

(Contd.)

**Solution (Contd.)***Uses of funds*

Purchase of non-current assets:	
Buildings, plant and machinery	2,200
Recurring payment to investors:	
Interest charged	800
Dividends	1,050
Total	4,050
Net decrease in working capital (uses-sources)	755

NWC has declined on account of acquisition of new plant and machinery and perhaps extension of buildings. Funds available from business operations after meeting interest liability and payment of dividend to shareholders, were Rs 11,00,000, whereas the amount spent on fresh additions to fixed assets was Rs 22,00,000; the balance accounts for the decrease in WC. Keeping in view the existing high debt-equity ratio, fresh issue of equity capital is commended. The company may not find it difficult to float new equity issues, as the dividend rate (determined with reference to face value) appears to be quite attractive (29.1 per cent).

**Working notes***(i) Funds from business operations: (Rs thousands)*

Profits after taxation	Rs 1,495
Add expenses not involving use of fund or separately shown:	
Interest charged	800
Depreciation	1,000
Total	3,295

*(ii) Building, plant and machinery account*

To balance b/d	Rs 5,800	By depreciation	Rs 1,000
To cash (purchase of fixed assets,		By balance c/d	7,000
balancing figure)	2,200		
	8,000		8,000

**PS 1.16**

Given here are the balance sheets as on March 31, years 1 and 2 for Ashoka Ltd. Sales for year 2 were Rs 2,10,000. Net income after taxes was Rs 7,000. In arriving at net profit, items deducted from sales included, among others, cost of goods sold—Rs 1,65,000; depreciation—Rs 5,000, wages and salaries—Rs 20,000; and a gain of Rs 1,000 on the sale of a plant. The plant had the cost of Rs 6,000, a depreciation of Rs 4,000 had been accumulated for it and it was sold for Rs 3,000. This was the only asset written off during the year. The company declared and paid Rs 6,000 as dividends during the year.

*Balance sheet*

	March 31, Year 1	March 31, Year 2
<b>Liabilities</b>		
Accounts payable	Rs 20,000	Rs 18,000
Accrued expenses	2,000	4,000
Income tax payable	1,000	1,100
Capital stock	30,000	37,000
Retained earnings	12,650	13,650
	65,650	73,750
<b>Assets</b>		
Cash	5,000	6,000
Accounts receivable	14,000	14,000

*(Contd.)*

**PS 1.16 (Contd.)**

Inventory	22,000	8,000
Pre-paid insurance	200	250
Pre-paid rent	150	100
Pre-paid property taxes	300	400
Land	4,000	8,000
Plant and equipment	Rs 30,000 {	Rs 48,000 {
Less accumulated depreciation	(10,000) {	(11,000) {
	<u>20,000</u>	<u>37,000</u>
	<u>65,650</u>	<u>73,750</u>

Prepare a funds flow statement and describe the most significant development revealed by this statement.

***Solution***

*Funds flow statement of Ashoka Company Ltd for year 2*

<b>Sources of funds</b>	
Funds from business operations	Rs 11,000
Sale of non-current assets:	
Plant	3,000
Issuance of long-term liabilities:	
Capital stock	7,000
<b>Total</b>	<u>21,000</u>
<b>Uses of funds</b>	
Purchase of non-current assets:	
Land	4,000
Building and equipment	24,000
Recurring payment to investors:	
Dividend paid	6,000
<b>Total uses</b>	<u>34,000</u>
<b>Net decrease in working capital (uses – sources)</b>	<u>13,000</u>

**Note:** The most significant development revealed by the funds flow statement is that the WC has been used to acquire fixed assets. This is not a sound financing policy. WC has declined from Rs 18,650 in year 1 to less than one-third, that is Rs 5,650 in year 2. As a result, current ratio has substantially decreased to 1.21 in year 2 from 1.8. The fresh issue of capital of Rs 7,000 made during the year does not seem to be planned properly, the amount of the issue should have been more, at least by Rs 13,000.

**Working notes**

(1) *Funds from business operations:*

Net income after taxes	Rs 7,000
Add depreciation	5,000
Less gain on sale of plant	(1,000)
	<u>11,000</u>

(2)

*Plant and equipment account*

To balance b/d	Rs 20,000	By cash (sale of plant)	Rs 3,000
To P & L A/c (profit on the sale of plant)	1,000	By depreciation	5,000
To cash (purchases, balancing figure)	24,000	By balance c/d	37,000
	<u>45,000</u>		<u>45,000</u>

**PS 1.17**

The following is the balance sheet of AB Ltd. as on March 31, year 1:

Capital	Rs 12,00,000	Fixed assets (at cost less depreciation)	Rs 5,00,000
Trade creditors	2,50,000	Stock	4,50,000
P & L A/c	80,000	Debtors	2,50,000
		Cash and bank balance	3,30,000
	<u>15,30,000</u>		<u>15,30,000</u>

*The management made the following estimates for the year ending March 31, year 2:*

	<i>Up to February 28, year 2</i>	<i>March 31, year 2</i>
Purchases	Rs 15,20,000	Rs 1,05,000
Sales	22,40,000	2,50,000

**Additional information**

- It has been decided to invest Rs 1,50,000 in purchase of fixed assets which are depreciated at the rate of 10 per cent.
  - The time-lag for payment of creditors and receipt from debtors is one month.
  - The business earns a gross profit of 33.33 per cent on turnover.
  - Sundry expenses against profit amount to 12 per cent of the turnover (excluding depreciation on fixed assets).
- You are required to prepare a projected funds flow statement for the year 2 ending March 31.

**Solution****Projected funds flow statement for year 2****Sources of funds**

Funds from business operations:

Net income	Rs 4,66,200	
Add depreciation	65,000	Rs 5,31,200

**Uses of funds**

Purchase of fixed assets	1,50,000
Net increase in working capital (sources – uses)	<u>3,81,200</u>

**Working notes****1. Projected income statement for year 2**

Gross profit ( $24,90,000 \div 3$ )	Rs 8,30,000
Less: sundry expenses ( $0.12 \times \text{Rs } 24,90,000$ )	2,98,800
depreciation [ $0.10 \times (\text{Rs } 5,00,000 + \text{Rs } 1,50,000)$ ]	65,000
Net income	4,66,200
Add P & L A/c (beginning balance)	80,000
P & L A/c (closing balance)	<u>5,46,200</u>

**2. Projected balance sheet**

Capital	Rs 12,00,000	Fixed assets (at cost less depreciation)	Rs 5,85,000
Creditors (March purchases)	1,05,000	Stock	4,15,000
P & L A/c	5,46,200	Debtors (March sales)	2,50,000
		Cash and bank balances	6,01,200
	<u>18,51,200</u>		<u>18,51,200</u>



3.	<i>Trading account</i>			
To opening stock	Rs 4,50,000	By sales	Rs 24,90,000	
To purchases	16,25,000	By closing stock (balancing figure)	4,15,000	
To gross profit	8,30,000			
	<u>29,05,000</u>			<u>29,05,000</u>
4.	<i>Cash and bank account</i>			
To balance b/d	Rs 3,30,000	By cash payment to creditors:		
To cash receipt from debtors:		Creditors, opening	Rs 2,50,000	
Debtors, opening	2,50,000	Purchases	15,20,000	
Sales	22,40,000	By cash expenses (0.12 × Rs 24,90,000)	2,98,800	
		By fixed assets	1,50,000	
		By balance c/d	6,01,200	
	<u>28,20,000</u>			<u>28,20,000</u>

**PS 1.18**

Nandini Ltd provides the following data:

*Comparative trial balance*

	<i>March 31 year 2</i>	<i>March 31 year 1</i>	<i>Increase (decrease)</i>
<i>Debit balance</i>			
Working capital	Rs 2,00,000	Rs 1,00,000	Rs 1,00,000
Investments	1,00,000	1,50,000	(50,000)
Building and equipment	5,00,000	4,00,000	1,00,000
Land	40,000	50,000	(10,000)
	<u>8,40,000</u>	<u>7,00,000</u>	<u>1,40,000</u>
<i>Credit balance</i>			
Accumulated depreciation	2,00,000	1,60,000	40,000
Bonds	1,00,000	50,000	50,000
Reserves	3,40,000	3,40,000	—
Equity shares	2,00,000	1,50,000	50,000
	<u>8,40,000</u>	<u>7,00,000</u>	<u>1,40,000</u>

*Income statement for the period ending March 31, year 2*

Sales		Rs 10,00,000
Cost of goods sold		<u>5,00,000</u>
		5,00,000
Selling expenses	Rs 50,000	}
Administrative expenses	50,000	
Operating income		<u>1,00,000</u>
		4,00,000
<i>Other charges and credits:</i>		
Gain on sale of building and equipment	Rs 5,000	}
Loss on sale of investments	(10,000)	
Interest	(6,000)	}
Taxes	(1,89,000)	
		<u>(2,00,000)</u>
Net income after taxes		<u>2,00,000</u>

**Notes:** (a) The depreciation charged for the year was Rs 60,000.

(b) The book value of the building and equipment disposed off was Rs 10,000.

Prepare a funds flow statement.

### ***Solution***

*Funds flow statement for the period ending March 31, year 2*

#### ***Sources of funds***

Funds from business operations:

Net income after taxes	Rs 2,00,000	
Add: depreciation	60,000	
interest (to be separately shown)	6,000	
loss on sale of investments	10,000	
Less: gain on sale of building and equipment	(5,000)	Rs 2,71,000

Issuance of long-term liabilities:

Equity shares	50,000	
Bonds	50,000	1,00,000

Sale of non-current assets:

Investments (Rs 50,000 – Rs 10,000)	40,000	
Land (Rs 50,000 – Rs 40,000)	10,000	
Building and equipment (Rs 10,000 + Rs 5,000)	15,000	65,000

Total		<u>4,36,000</u>
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#### ***Uses of funds***

Purchase of non-current assets:

Building and equipment	1,30,000
------------------------	----------

Recurring payment to investors:

Interest on bonds	6,000	
Dividend to equity shareholders	2,00,000	2,06,000

Total		<u>3,36,000</u>
-------	--	-----------------

Net increase in working capital (sources-uses)		<u>1,00,000</u>
--	--	-----------------

\*Assumed to have been sold at no profit no loss basis.

### ***Working notes***

1. *Accumulated depreciation account*

To building and equipment (depreciation on sales of building and equipment)	Rs 20,000	By balance b/d	Rs 1,60,000
		By P & L A/c (depreciation of the current year)	60,000
To balance c/d	<u>2,00,000</u>		
	2,20,000		<u>2,20,000</u>

2. *Building and equipment account*

To balance b/d	Rs 4,00,000	By cash	Rs 15,000
To P & L A/c	5,000	By accumulated depreciation	20,000
To cash (purchases)	<u>1,30,000</u>	By balance c/d	5,00,000
	5,35,000		<u>5,35,000</u>

(Contd.)

**Working notes (Contd.)**

3. <i>Reserves account</i>			
To dividends paid (balancing figure)	Rs 2,00,000	By balance c/d	Rs 3,40,000
To balance c/d	<u>3,40,000</u>	By profit of the current year	<u>2,00,000</u>
	5,40,000		5,40,000

**PS 1.19**

From the following details prepare a statement of cash receipt and payments for the current year ended March 31:

	<i>March 31, previous year</i>		<i>March 31, current year</i>	
	<i>Dr</i>	<i>Cr</i>	<i>Dr</i>	<i>Cr</i>
Cash	Rs 2,000		Rs 4,175	
Sundry debtors	4,500		6,700	
Closing stock at cost	9,000		13,000	
Prepaid insurance	250		175	
Land and building	45,000		49,000	
Accumulated depreciation on land and building		Rs 6,000		Rs 8,000
Sundry creditors (purchases)		7,750		14,050
Capital		37,500		47,500
Retained earnings		12,000		7,500
Sales		50,000		63,000
Sales returns	500		400	
Purchases (adjusted for closing stock)	43,500		50,500	
Selling and administrative expenses	4,500		7,100	
Opening stock	4,000		9,000	
	<u>1,13,250</u>	<u>1,13,250</u>	<u>1,40,050</u>	<u>1,40,050</u>

**Solution**

*Statement of cash receipts and payments for the current year ended March 31*

<i>Sources of cash receipts</i>	
Cash from business operations	Rs (3,825)
Issuance of long-term liabilities:	
Capital	<u>10,000</u>
Total	<u>6,175</u>
<i>Application of cash</i>	
Purchase of non-current assets:	
Land and building	<u>4,000</u>
Net increase in cash (sources-uses)	<u>2,175</u>

**Working notes**

1. *Determination of cash from business operations:*

Net loss during the year	Rs (6,000)
Add depreciation	<u>2,000</u>
Funds from business operations	(4,000)
<i>Add transactions other than cash:</i>	
Decrease in WC (– CA or + CL):	
Decrease in CA	
Prepaid insurance	Rs 75

(Contd.)

**Working notes (Contd.)**

Increase in current liabilities		
Sundry creditors	6,300	6,375
Less transactions other than cash:		
Increase in WC (+CA or –CL):		
Increase in current assets		
Sundry debtors	2,200	
Closing stock	4,000	(6,200)
Decrease in cash from business operations		(3,875)

2. *Trading and profit and loss account for the current year ended March 31*

To opening stock	Rs 9,000	By sales	Rs 63,000	
To purchases	50,500	Less returns	400	Rs 62,600
To gross profit	3,100			
	<u>62,600</u>			<u>62,600</u>
To depreciation	2,000	By gross profit		3,100
To selling and distribution expenses	7,100	By net loss		6,000
	<u>9,100</u>			<u>9,100</u>

**PS 1.20**

The directors of Chintamani Ltd are alarmed at the deterioration of the financial operations of the company. They find that the bank overdraft is already at the limit allowed by the bank, and they have not sufficient funds to pay their creditors on the due dates. Not being trained in accounting and financial management, they are at a loss to understand why their audited accounts revealed satisfactory profits when the trade was bought, additional capital had also been introduced since then and borrowings made. Why should there be shortage of funds then?

They present you with the balance sheets as on March 31 for 2 years, and ask you to prepare a statement which will show them what has happened to the money which had come into the business during the year:

	<i>Previous year</i>	<i>Current year</i>
<i>Authorised share capital: 15,000 shares of Rs 100 each</i>	Rs 15,00,000	Rs 15,00,000
Paid-up share capital	13,00,000	14,00,000
General reserves	60,000	40,000
Profit and loss appropriation A/c	36,000	38,000
Loan and mortgage	—	5,60,000
Bank overdraft	69,260	1,29,780
Bills payable	40,000	38,000
Sundry trade creditors	76,000	1,12,000
Proposed final dividend	78,000	72,000
	<u>16,59,260</u>	<u>23,89,780</u>
Goodwill	2,40,000	2,20,000
Freehold building	8,00,000	11,76,000
Machinery and plant	1,44,000	3,94,000
Furniture	6,000	5,500
Shares in other companies	80,000	2,34,000
Stock	2,44,000	2,38,000
Sundry debtors	1,25,600	1,04,400
Cash	1,560	1,280
Bills receivable	7,600	6,400
Pre-paid expenses	4,500	6,200
Preliminary expenses	6,000	4,000
	<u>16,59,260</u>	<u>23,89,780</u>

You are given the following additional information:

- Depreciation has been charged on freehold building at 2.5 per cent per annum on the cost of Rs 10,00,000; on machinery and plant at 8 per cent per annum on the cost of Rs 4,00,000; and on furniture at 5 per cent per annum on the cost of Rs 10,000. No depreciation has been written off on newly acquired buildings, and plant and machinery.
- Shares in other companies were purchased for Rs 1,60,000 cash, and dividends amounting to Rs 6,000 declared out of profits made prior to purchase have been received and used to write down the investment (shares).
- The proposed dividend for the previous year was duly paid and, in addition, an interim dividend of Rs 52,000 was paid in the current year.
- General reserve has been used to write off goodwill.

### ***Solution***

*Cash flow statement for the current year ended March 31*

#### ***Sources of cash:***

Cash from business operations			Rs 3,06,720
Issuance of long-term liabilities:			
Paid-up share capital	Rs 1,00,000	]	
Loan on mortgage	5,60,000	]	6,60,000
Other sources:			
Dividend received on shares (already paid in advance at the time of purchase of shares)			6,000
Total			<u>9,72,720</u>

#### ***Uses of cash:***

Purchase of fixed assets:			
Freehold building (Rs 11,76,000 – Rs 7,75,000)	4,01,000	⌈	
Machinery and plant (Rs 3,94,000 – Rs 1,12,000)	2,82,000	;	
Shares purchased (gross amount paid)	1,60,000	⌈	8,43,000
Recurring payment to investors:			
Dividend	78,000	]	
Interim dividend	52,000	]	1,30,000
Total			<u>9,73,000</u>
Decrease in cash (uses-sources)			<u>280</u>

### ***Working notes***

#### ***Cash from business operations:***

Increase in P & L appropriation A/c			Rs 2,000
Add: amortisation of preliminary expenses			2,000
proposed dividend (current year)			72,000
interim dividend paid during the year			52,000
depreciation on various fixed assets:			
Freehold building	Rs 25,000	⌈	
Machinery and plant	32,000	;	
Furniture	500	⌈	57,500
WC from operations			<u>1,85,500</u>

#### ***Add transactions other than cash decreasing WC (– CA or + CL):***

Decrease in current assets:			
Stock	Rs 6,000	⌈	
Debtors	21,200	;	
Bills receivable	1,200	⌈	28,400

*(Contd.)*

**Working notes (Contd.)**

Increase in current liabilities:		
Bank overdraft	60,520	
Trade creditors	<u>36,000</u>	96,520
Less transactions other than cash increasing WC (+ CA or – CL):		
Increase in current assets:		1,700
Prepaid expenses		
Decrease in current liabilities		
Bills payable		<u>2,000</u>
Cash from business operations		<u>3,06,720</u>

**PS 1.21**

The directors of Precision Tools Ltd are worried at the deteriorating financial position of the company. The company has utilised full overdraft facility from the bank and is still not able to pay its creditors on due dates, although the profits earned are satisfactory.

The following are the balance sheets as on March 31 for the recent 2 years.

	<i>Previous year</i>		<i>Current year</i>	
Share capital: shares of Rs 10 each fully paid	Rs 10,00,000		Rs 10,00,000	
P & L appropriation A/c	60,000		80,000	
Overdraft from bank	1,60,000		6,00,000	
Sundry creditors	2,00,000		6,00,000	
	<u>14,20,000</u>		<u>22,80,000</u>	
Land and buildings	3,00,000		5,00,000	
Plant and machinery	Rs 5,00,000		Rs 6,00,000	
Less depreciation	1,20,000	3,80,000	1,80,000	4,20,000
Vehicles	1,16,000		1,24,000	
Less depreciation	56,000	60,000	84,000	40,000
Stock		2,20,000		7,20,000
Debtors		4,60,000		6,00,000
	<u>14,20,000</u>		<u>22,80,000</u>	

During the year, a dividend of 10 per cent was distributed to the shareholders. On April 1 of the current year, a motor car, which originally cost Rs 20,000, and showed a book value of Rs 10,000, was sold for Rs 16,000.

You are required to prepare a statement which will show as to what has happened to the money which came into the business during the year. (give detailed workings).

**Solution**

*Cash flow statement for the current year ending March 31 of Precision Tools Ltd*

<b>Sources of cash</b>	
Cash from business operations	Rs 4,12,000
Sale of fixed assets:	
Motor car	<u>16,000</u>
Total	<u>4,28,000</u>
<b>Uses of cash</b>	
Purchase of fixed assets:	
Plant and machinery (Rs 6,00,000 – Rs 5,00,000)	1,00,000
Vehicles	28,000
Land and buildings (Rs 5,00,000 – Rs 3,00,000)	<u>2,00,000</u>
	(Contd.)

**Solution (Contd.)**

Recurring payments to investors:	
Dividends paid	1,00,000
Total	4,28,000
Net increase (or decrease) in cash	Nil

**Comment:** Cash has been utilised to acquire fixed assets, disregarding working capital needs.

**Working notes**1. *Cash from business operations:*

Increase in P & L A/c			Rs 20,000
Add: depreciation on plant and machinery			60,000
depreciation on vehicles			38,000
dividends paid (assumed interim)			1,00,000
Less: gain on sale of a motor car			6,000
WC from operations			2,12,000
Add transactions other than cash decreasing WC (–CA or +CL):			
Overdraft from bank	Rs 4,40,000	]	
Sundry creditors	4,00,000		8,40,000
Less transactions other than cash increasing WC (+CA or –CL):			
Stock	5,00,000	]	
Debtors	1,40,000		6,40,000
			4,12,000

2. *Accumulated depreciation (vehicles)*

To vehicle A/c	Rs 10,000	By balance b/d	Rs 56,000
To balance c/d	84,000	By P & L A/c (depreciation of the current year)	38,000
	94,000		94,000

3. *Vehicle account*

To balance b/d	Rs 1,16,000	By cash	Rs 16,000
To P & L A/c	6,000	By accumulated depreciation	10,000
To cash purchases (balancing figure)	28,000	By balance c/d	1,24,000
	1,50,000		1,50,000

**PS 1.22**

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 thousands rupees) of Charat Engineering Ltd are given below:

	March 31			March 31	
	Current year	Previous year		Current year	Previous year
Cash	2	10	Current liabilities	105	30
Receivables (net)	60	30			

(Contd.)

**PS 1.22 (Contd.)**

Inventories	100	50	Long-term debt	150	—
Plant assets (net of accumulated depreciation)	300	100	Stockholder's equity	207	160
Total assets	<u>462</u>	<u>190</u>	Total equities	<u>462</u>	<u>190</u>

Net income was Rs 54,000. Cash dividend paid were Rs 7,000. Depreciation was Rs 20,000. Fixed assets were purchased for Rs 2,20,000, Rs 1,50,000 of which was financed via the issuance of long-term debt outright for cash.

Using the SCFP with cash as basis, write a short memorandum to Mr Charatlal, explaining why there is such a squeeze for cash. Show working.

***Solution***

*Statement of change in financial position (cash basis) for the current year ending March 31*

***Source of cash***

Cash from business operations		
Net income	Rs 54,000	
Add depreciation	<u>20,000</u>	
WC from operations	74,000	
Add transaction other than cash decreasing working capital:		
Current liabilities	75,000	
Less transactions other than cash increasing working capital:		
Receivables (net)	30,000	
Inventories	<u>50,000</u>	Rs 69,000
Issuance of long-term liabilities:		
Long-term debt		<u>1,50,000</u>
Total		<u>2,19,000</u>
<b><i>Use of cash</i></b>		
Purchase of fixed assets:		
Plant assets		2,20,000
Recurring payments to investors:		
Dividend paid		<u>7,000</u>
Total		<u>2,27,000</u>
Net decrease in cash (uses-sources)		<u>(8,000)</u>

**Memorandum:** The squeeze for cash has resulted from major fixed assets expansion programme, regardless of the working capital needs. The entire cash generated from business operations and from floating long-term debt was used to finance fixed assets, entailing WC scarcity. The current ratio has declined to an alarming level of 1.54 : 1 in the current year from a highly comfortable level of 3 : 1 in the previous year and so also the acid-test ratio, the respective figures for the previous year and the current year being 2 : 1 to 0.59.

**PS 1.23**

The following are the summarised balance sheets of Ashok Ltd as on March 31 for years 1 and 2.

	Year 1	Year 2
<b><i>Liabilities:</i></b>		
Equity share capital of Rs 10 each	Rs 4,00,000	Rs 4,80,000
Share premium account	—	20,000
General reserves	60,000	1,00,000
P & L A/c	96,000	1,36,000
		<i>(Contd.)</i>



**PS 1.23 (Contd.)**

Debentures		1,00,000		—
Creditors		2,60,000		2,80,000
Proposed dividend		40,000		48,000
Total		<u>9,56,000</u>		<u>10,64,000</u>
<b>Assets:</b>				
Freehold land & building		2,10,000		2,80,000
Plant & machinery:				
Cost	Rs 5,80,000 ]		Rs 6,40,000 ]	
Less depreciation	2,80,000 ]	3,00,000	3,00,000 ]	3,40,000
Equipment:				
Cost	18,000 ]		20,000 ]	
Less depreciation	12,000 ]	6,000	8,000 ]	12,000
Inventories		2,60,000		2,10,000
Debtors		1,50,000		1,70,000
Cash		30,000		52,000
Total		<u>9,56,000</u>		<u>10,64,000</u>

**Notes:** (a) The plant and machinery, which cost Rs 40,000 and in respect of which Rs 26,000 had been written off as depreciation, was sold during the year 2 for Rs 6,000.

(b) Equipment which cost Rs 10,000, and in respect of which Rs 8,000 had been written off as depreciation, was sold for Rs 4,000 during year 2.

(c) The dividend which was declared in year 1 was paid during year 2.

(i) Prepare a statement showing the change in working capital during year 2.

(ii) Prepare a statement showing the sources and application of working capital (funds flow statement) during year 2.

**Solution**

(i) Statement showing changes in working capital for year 2

	March 31, Year 1	March 31, Year 2	Working capital	
			Increase (+)	Decrease (-)
<b>Current assets</b>				
Inventories	Rs 2,60,000	Rs 2,10,000		Rs 50,000
Debtors	1,50,000	1,70,000	Rs 20,000	
Cash	30,000	52,000	22,000	
Total	<u>4,40,000</u>	<u>4,32,000</u>		
Current liabilities: creditors	<u>2,60,000</u>	<u>2,80,000</u>		20,000
NWC (CA – CL)	<u>1,80,000</u>	<u>1,52,000</u>		
Decrease in working capital		28,000	28,000	
	<u>1,80,000</u>	<u>1,80,000</u>	<u>70,000</u>	<u>70,000</u>

(ii) Statement showing sources and application of working capital for year 2

<b>Sources of working capital</b>		
Funds from business operations		Rs 1,84,000
Sale of non-current assets:		
Plant and machinery	Rs 6,000 ]	
Equipment	4,000 ]	10,000
Issuance of long-term liabilities:		
Share capital (including premium)		1,00,000
Total		<u>2,94,000</u>

(Contd.)

**Solution (Contd.)***Uses of working capital*

Purchase of non-current assets:		
Plant and machinery	Rs 1,00,000	
Equipment	12,000	
Freehold land and building	<u>70,000</u>	Rs 1,82,000
Redemption of long-term liabilities:		
14% Debentures		1,00,000
Recurring payments to investors:		
Dividends		<u>40,000</u>
Total		<u>3,22,000</u>
Decrease in net working capital (uses-sources)		<u>(28,000)</u>

**Working notes**1. *Funds from business operations:*

Increase in P & L	Rs 40,000
Add: transfer to general reserve	40,000
proposed dividend, year 2	48,000
loss on sale of plant & machinery	8,000
depreciation (plant & machinery)	46,000
depreciation (equipment)	4,000
Less: gain on sale of equipment	<u>(2,000)</u>
	<u>1,84,000</u>

2. *Plant and machinery account (net)*

To balance b/d	Rs 3,00,000	By cash	Rs 6,000
To cash (purchases) (balancing figure)	1,00,000	By depreciation (current)	46,000
		By P & L A/c (loss)	8,000
		By balance c/d	<u>3,40,000</u>
	<u>4,00,000</u>		<u>4,00,000</u>

3. *Equipment account (net)*

To balance b/d	Rs 18,000	By cash	Rs 4,000
To P & L A/c (profit)	2,000	By accumulated depreciation	8,000
To cash (purchases) (balancing figure)	<u>12,000</u>	By balance c/d	<u>20,000</u>
	<u>32,000</u>		<u>32,000</u>

4. *Accumulated depreciation (plant and machinery) account*

To plant and machinery	Rs 26,000	By balance b/d	Rs 2,80,000
To balance c/d	3,00,000	By P&L A/c (depreciation year 2, balancing figure)	46,000
	<u>3,26,000</u>		<u>3,26,000</u>

5. *Accumulated depreciation (equipment) account*

To equipment	Rs 8,000	By balance b/d	Rs 12,000
To balance b/d	8,000	By P&L A/c (depreciation, year 2 balancing figure)	4,000
	<u>16,000</u>		<u>16,000</u>

**PS 1.24**

The comparative balance sheets of Bombay Industries Ltd as on March 31 for two years are as under (figures in lakh of rupees):

<i>Liabilities</i>	<i>Year 1</i>	<i>Year 2</i>	<i>Assets</i>	<i>Year 1</i>	<i>Year 2</i>
Current liabilities:			Current assets:		
Sundry creditors	40.40	43.30	Cash & bank	44.60	47.80
Provision for taxation	10.80	12.20	Debtors	10.80	17.00
Liabilities for expenses	3.60	1.00	Stock-in-trade	44.00	67.20
			Miscellaneous (including marketable securities)	30.20	8.00
Total	<u>53.80</u>	<u>56.40</u>	Total	<u>129.60</u>	<u>140.00</u>
Long-term liabilities:			Fixed assets:		
Mortgage loan	22.00	21.00	Plant, machinery & buildings	283.40	368.00
Total liabilities	<u>75.80</u>	<u>77.40</u>	Less total depreciation	(25.80)	(34.20)
				<u>257.60</u>	<u>333.80</u>
			Land	<u>50.00</u>	<u>50.00</u>
Owner's equity:			Total fixed assets	<u>307.60</u>	<u>383.80</u>
Paid-up capital	280.00	320.00	Long-term investments	<u>42.40</u>	<u>25.20</u>
Reserves and surpluses	140.60	163.60	Intangible assets	<u>16.80</u>	<u>12.00</u>
Total	<u>420.60</u>	<u>483.60</u>			

The income for the year amounted to Rs 57.80 lakh after charging depreciation of Rs 8.40 lakh, but before making the following adjustments (Rs in lakh):

(a) Profit on sale of land purchased and sold in year 2	15.60
(b) Loss on sale of marketable securities	2.80
(c) Write off of intangible assets	4.80
(d) Write off of long-term investments	17.20

The dividend declared and paid during the year 2 amounted to Rs 25.60 lakh.

From the above particulars prepare: (i) a statement of sources and application of funds, and (ii) a statement of changes in WC.

**Solution**

(i) *Funds flow statement (amount in lakh of rupees)*

<i>Sources of funds</i>	
Funds from business operations	63.40
Profit on sale of land	15.60
Equity capital	40.00
Total	<u>119.00</u>
<i>Uses of funds</i>	
Purchase of non-current assets:	
Plant, machinery & building	84.60
Payment of long-term liabilities:	
Mortgage loan	1.00
Recurring payments to investors:	
Dividend paid	25.60
Total	<u>111.20</u>
Net increase in working capital	<u>7.80</u>

**Working notes***Funds from business operations (Rs in lakh)*

Net income	57.80
Add depreciation	8.40
Less loss on sale of marketable securities	(2.80)
	<u>63.40</u>

*(ii) Statement of changes in WC (amount in lakh)*

	Year 1	Year 2	Working capital	
			Increase	Decrease
Current assets:				
Cash & bank	Rs 44.60	Rs 47.80	Rs 3.20	
Debtors	10.80	17.00	6.20	
Stock-in-hand	44.00	67.20	<u>23.20</u>	
Other current asset	30.20	8.00		22.20
	<u>129.60</u>	<u>140.00</u>		
Current liabilities:				
Sundry debtors	40.40	43.20		2.80
Provision for taxation	10.80	12.20		1.40
Liabilities for expenses	2.60	1.00	1.60	
	<u>53.80</u>	<u>56.40</u>		
Net working capital	75.80	83.60		7.80
Increase in net working capital	7.80			
	<u>83.60</u>	<u>83.60</u>	<u>34.20</u>	<u>34.20</u>

**PS 1.25**

The directors of Northern Traders Ltd are reviewing the company's financial requirements for the current year. The summarised balance sheet of the company as on March 31, previous year is as follows:

Liabilities	Amount	Assets	Amount
Equity share capital	Rs 40,00,000	Goodwill	Rs 6,00,000
Reserve and P & L A/c	36,20,000	Freehold warehouse	26,00,000
Trading creditors	19,80,000	Fitting & equipment	Rs 20,00,000
Bank overdraft	3,00,000	Less Depreciation	<u>8,50,000</u>
		Stock-in-trade	23,00,000
		Trade debtors	<u>32,50,000</u>
	<u>99,00,000</u>		<u>99,00,000</u>

The company's plans are based on the following expectations for the current year:

Issue for cash of 1,00,000 equity shares of Rs 10 each at a premium of Rs 5 per share in May; new equipment to be purchased for Rs 7,00,000 on April 1; goodwill to be written down by Rs 3,00,000, and stock-in-trade at the end of the year to be Rs 29,00,000.

The following financial transactions will occur at an even rate throughout the year: sales—Rs 2,40,00,000; purchases—Rs 1,86,00,000; general expenses—Rs 36,00,000; and director's remuneration—Rs 8,00,000.

The period of credit allowed to customers will be two calendar months and the period of credit taken from suppliers will be one and a half calendar months. All amounts (including debtors and creditors as on March 31 previous year) will be paid in full at the end of the year. Depreciation will be provided for @ 10 per cent per annum.

Prepare:

- (i) A statement of the sources and application of funds (funds flow statement) of the company for the current year.

- (ii) A statement showing how the following alternative assumptions would affect the cash available to the company on March 31, current year, as compared with the previously estimated position: (a) freehold warehouse revalued in accounts at Rs 34,00,000, (b) period of credit allowed to customers reduced to one and a half months, (c) period of credit taken from suppliers reduced to one month, (d) depreciation rate increased to 15 per cent on cost on equipment, and (e) goodwill completely written off.

### Solution

#### (i) Statement of sources and application of funds of a trading company

##### Sources of funds

##### Funds from business operations

Net income	Rs 11,15,000	
Add: depreciation	1,85,000	
amortisation of goodwill	3,00,000	Rs 16,00,000
Issuance of long-term liabilities:		
Equity capital		15,00,000
Total		<u>31,00,000</u>

##### Uses of funds

Purchase of fixed assets:	
Fitting & equipment	7,00,000
Net increase in WC (sources – uses)	<u>24,00,000</u>

#### (ii) Statement showing the impact of cash

	Increase	Decrease	
(a) Revaluation of freehold warehouse			No effect
(b) Credit collection period reduced to 1.5 months will increase cash collections: [Revised, Rs 2,10,00,000 (Rs 2,40,00,000 × 7/8) – Present, Rs 2,00,00,000]	Rs 10,00,000		
(c) Credit payment reduced to 1 month will decrease cash: [Present, Rs 1,70,50,000 – Revised, Rs 1,62,75,000 (Rs 1,86,00,000 × 11/12)]		Rs 7,75,000	
(d) Increase in depreciation rate to 15 per cent			No effect
(e) Goodwill completely written-off			No effect
	<u>10,00,000</u>	<u>7,75,000</u>	
Net increase in cash		<u>2,25,000</u>	
	<u>10,00,000</u>	<u>10,00,000</u>	

### Working notes

1.

#### Projected trading and P & L A/c for the current year

To opening stock	Rs 23,00,000	By sales	Rs 2,40,00,000
To purchases	1,86,00,000	By closing stock	29,00,000
To gross profit	60,00,000		
	<u>2,69,00,000</u>		<u>2,69,00,000</u>
To general expenses	36,00,000	By gross profit	60,00,000
To director's remuneration	8,00,000		
To writing off of goodwill	3,00,000		
To depreciation	1,85,000		
To net profit	11,15,000		
	<u>60,00,000</u>		<u>60,00,000</u>

2. <i>Plant and equipment A/c</i>			
To balance b/d	Rs 11,50,000	By depreciation	Rs 1,85,000
To cash purchases	7,00,000	By balance c/d	16,65,000
	<u>18,50,000</u>		<u>18,50,000</u>
3. <i>Debtors A/c</i>			
To balance b/d	Rs 32,50,000	By cash collections:	
To credit sales	2,40,00,000	(i) Rs 32,50,000	Rs 2,32,50,000
		(ii) 2,00,00,000	
		By balance c/d [Rs 2,40,00,000 ÷ 6 (debtors turnover)]	40,00,000
	<u>2,72,50,000</u>		<u>2,72,50,000</u>
4. <i>Creditors A/c</i>			
To cash paid		By balance b/d	Rs 19,80,000
(i) Rs 19,80,000		By credit purchases	1,86,00,000
(ii) <u>1,62,75,000</u>	Rs 1,82,55,000		
To balance c/d (Rs 1,86,00,000 ÷ 8)	<u>23,25,000</u>		
	<u>2,05,80,000</u>		<u>2,05,80,000</u>
5. <i>Bank A/c</i>			
To equity capital	Rs 15,00,000	By balance b/d	Rs 3,00,000
To cash from debtors	2,32,50,000	By equipment purchased	7,00,000
		By cash paid to creditors	1,82,55,000
		By general expenses	36,00,000
		By director's remuneration	8,00,000
		By balance c/d	10,95,000
	<u>2,47,50,000</u>		<u>2,47,50,000</u>
6. <i>Projected balance sheet</i>			
<i>Liabilities</i>		<i>Assets</i>	
Equity share capital	Rs 50,00,000	Goowill	Rs 3,00,000
Share premium	5,00,000	Freehold warehouse	26,00,000
Reserve and P & L balance:		Fittings and equipment	Rs 27,00,000
Opening	Rs 36,20,000	Less: depreciation	(10,35,000)
+ Current year	<u>11,15,000</u>		16,65,000
Trade creditors	23,25,000	Stock-in-trade	29,00,000
		Trade debtors	40,00,000
		Cash	10,95,000
	<u>1,25,60,000</u>		<u>1,25,60,000</u>

**PS 1.26**

The comparative balance sheet of Bharat Ltd are indicated in a condensed form as on March 31 for years 1 and 2 as under:

	Year 1		Year 2	
Fixed assets	Rs 5,20,000		Rs 4,80,000	
Less depreciation to date	1,40,000	Rs 3,80,000	1,08,000	Rs 3,72,000
Investments at cost		50,000		1,00,000
Stocks		90,500		55,600
Sundry debtors		1,67,800		1,18,300
Cash and bank balances		47,500		49,800
Preliminary expenses		—		7,200
		<u>7,35,800</u>		<u>7,02,900</u>
Share capital: Equity shares of Rs 100 each issued for cash		4,00,000		3,60,000
General reserve		60,000		1,10,000
Surplus in P & L A/c		53,450		20,450
Sundry creditors		1,75,350		1,83,650
Proposed dividend		15,000		28,800
Provision for taxation		32,000		—
		<u>7,35,800</u>		<u>7,02,900</u>

The net profit for year 2 (after providing for depreciation, Rs 40,000; writing-off preliminary expenses, Rs 7,200 and making provision for taxation, Rs 32,000) amounted to Rs 58,000.

The company sold, during year 2, old machinery costing Rs 9,000 for Rs 3,000. The accumulated depreciation on the said machinery was Rs 8,000.

A portion of the company's investments became worthless and was written-off to general reserve during year 2. The cost of such investment was Rs 50,000.

During the same year, the company paid an interim dividend of Rs 10,000 and the directors have recommended a final dividend of Rs 15,000.

Prepare (1) a statement of sources and application of funds (working capital basis) for year 2, and (2) a schedule of working capital changes.

### ***Solution***

(1) *Statement of sources and application of funds of Bharat Ltd for year 2*

<b>Sources of funds</b>	
Funds from business operations	Rs 1,03,200
Issue of long-term liabilities:	
Equity shares	40,000
Sale of non-current assets:	
Machinery	3,000
Total	<u>1,46,200</u>
<b>Uses of funds</b>	
Purchase of non-current assets:	
Fixed assets	49,000
Recurring payment to investors:	
Interim dividend	10,000
Final dividend (year 1)	28,800
Total	<u>87,800</u>
Increase in working capital	<u>58,400</u>

## (2) Schedule of WC changes

Particulars	Year 1	Year 2	Working capital	
			Increase	Decrease
<b>Current assets:</b>				
Stocks	Rs 55,600	Rs 90,500	Rs 34,900	–
Sundry debtors	1,18,300	1,67,800	49,500	–
Cash and bank balances	49,800	47,500	–	Rs 2,300
	<u>2,23,700</u>	<u>3,05,800</u>		
<b>Current liabilities:</b>				
Sundry creditors	1,83,650	1,75,350	8,300	–
Provision for taxation	–	32,000	–	32,000
	<u>1,83,650</u>	<u>2,07,350</u>		
Net working capital	40,050	98,450	–	–
Increase in net working capital	58,400	–	–	–
	<u>98,450</u>	<u>98,450</u>	<u>92,700</u>	<u>34,300</u>

**Working notes**

## (1) Funds from business operations

Net profit after taxes	Rs 58,000
Add: depreciation	40,000
amortisation of preliminary expenses	7,200
Less: profit on sale of machinery	(2,000)
	<u>1,03,200</u>

2.

*Fixed assets account*

To balance b/d	Rs 4,80,000	By cash	Rs 3,000
To P & L A/c (profit on sale)	2,000	By accumulated depreciation a/c	8,000
To plant purchased (balancing figure)	49,000	By balance c/d	5,20,000
	<u>5,31,000</u>		<u>5,31,000</u>

**PS 1.27**

The summarised balance sheet of FF Ltd as on March 31, year 1 and March 31, year 2 were as follows:

	Year 1	Year 2
<b>Sources of funds:</b>		
Share capital	Rs 6,00,000	Rs 8,00,000
General reserve	3,40,000	4,20,000
P & L A/c	20,000	50,000
15% Debentures – A series	4,00,000	–
14% Debentures – B series	–	5,00,000
Total	<u>13,60,000</u>	<u>17,70,000</u>
<b>Application of funds:</b>		
Fixed assets at cost	16,00,000	19,00,000
Less: depreciation to date	7,60,000	8,80,000
Net fixed assets (A)	<u>8,40,000</u>	<u>10,20,000</u>
Investments (B)	–	3,00,000
Sundry debtors	2,00,000	2,00,000
Less: provision for doubtful debts	20,000	50,000

(Contd.)



**PS 1.27 (Contd.)**

	1,80,000	1,50,000
Stocks	2,20,000	1,60,000
Cash and bank balances	1,80,000	2,20,000
Other current assets	72,000	96,000
Total	6,52,000	6,26,000
Less: current liabilities	1,32,000	1,76,000
Net current assets (C)	5,20,000	4,50,000
Total (A) + (B) + (C)	13,60,000	17,70,000

While going through the accounts, the following are noticed:

- (i) Fixed assets of original cost of Rs 75,000 with book value of Rs 10,000 were scrapped and sold for Rs 5,000.
- (ii) Included in CL are proposed dividend figures for Year 1: Rs 60,000; year 2: 80,000.
- (iii) During the year, an interim dividend of Rs 45,000 was paid besides the outstanding of year 1.

From the above, you are required to prepare a statement of funds flow (working capital basis) for year 2 and statement showing working capital for both the years.

**Solution***Funds flow statement of FF Ltd for year 2***Sources of funds:**

Funds from business operations	Rs 4,25,000
Issue of long-term liabilities:	
14% Debentures — B series	5,00,000
Equity share capital	2,00,000
Sale of non-current assets:	
Fixed assets	5,000
Total	11,30,000

**Uses of funds:**

Payment of long-term liabilities:	
15% Debenture — A series	4,00,000
Purchase of non-current assets:	
Fixed assets	3,75,000
Investments	3,00,000
Recurring payment to investors:	
Interim dividend	45,000
Final dividend (year 1)	60,000
Total	11,80,000
Decrease in working capital	(50,000)

*Statement of working capital*

	Year 1	Year 2
<b>Current assets:</b>		
Sundry debtors (net)	Rs 1,80,000	Rs 1,50,000
Stocks	2,20,000	1,60,000
Cash and bank balances	1,80,000	2,20,000
Other current assets	72,000	96,000
	6,52,000	6,26,000
Less: current liabilities (excluding proposed dividends)	72,000	96,000
Net working capital	5,80,000	5,30,000
Decrease in working capital		(50,000)

**Working notes***Funds from business operations*

Increase in P & L A/c	Rs 30,000
Add: transfer to general reserve	80,000
depreciation (current year)	1,85,000
loss on sale of fixed assets	5,000
interim dividend	45,000
proposed dividend	80,000
	<u>4,25,000</u>

*Fixed assets account*

To balance b/d	Rs 16,00,000	By bank	Rs 5,000
To bank (balancing figure represents purchases)	3,75,000	By accumulated depreciation a/c	65,000
		By P & L A/c	5,000
		By balance c/d	19,00,000
	<u>19,75,000</u>		<u>19,75,000</u>

*Accumulated depreciation account*

To fixed assets a/c (accumulated depreciation on fixed assets sold)	Rs 65,000	By balance b/d	Rs 7,60,000
To balance c/d	8,80,000	By P & L A/c (depreciation of current year)	1,85,000
	<u>9,45,000</u>		<u>9,45,000</u>

**PS 1.28**

From the following summarised balance sheets of a company, as on March 31, year 1 and year 2, you are required to prepare:

- a statement of changes in working capital and
- statement of sources and application of funds (working capital basis).

	Year 1	Year 2		Year 1	Year 2
Equity share capital	Rs 75,000	Rs 1,20,000	Fixed asset at cost	Rs 2,40,070	Rs 2,53,730
10% Redeemable preference share capital	1,00,000	80,000	Less depreciation	90,020	98,480
Reserve for replacement of machinery	15,000	10,000	Fixed assets (net)	1,50,050	1,55,250
Long-term loans	—	40,000	Investments	61,000	76,000
Bank overdraft	22,000	—	Stocks	98,000	1,04,000
Trade creditors	84,450	75,550	Trade debtors	88,000	85,000
Proposed dividends on equity shares	12,000	24,000	Bank	11,750	32,000
P & L A/c	1,00,350	1,02,700			
	<u>4,08,800</u>	<u>4,52,250</u>		<u>4,08,800</u>	<u>4,52,250</u>

## Additional information:

- During year 2, additional equity capital was issued to the extent of Rs 25,000 by way of bonus shares fully paid up.
- Final dividend on preference shares and interim dividend of Rs 4,000 on equity shares were paid on March 31, year 2.
- Proposed dividends for the year ended March 31, year 1, were paid in October, year 2.

- (4) Movement in reserve for replacement of machinery account represents transfer to profit and loss account.
- (5) During the year, one item of plant was upvalued by Rs 3,000 and credit for this was taken in the profit and loss account.
- (6) Rs 1,700 being expenditure on fixed assets for the year ended March 31, year 1, wrongly debited to sundry debtors then, was corrected in year 2.
- (7) Fixed assets costing Rs 6,000 (accumulated depreciation—Rs 4,800) were sold for Rs 250. Loss arising was written off.
- (8) Preference shares redeemed in year 2 (June) were out of a fresh issue of equity shares. Premium paid on redemption was 10 per cent.

### ***Solution***

#### *(i) Statement of changes in working capital*

<i>Particulars</i>	<i>Year 1</i>	<i>Year 2</i>	<i>Working capital</i>	
			<i>Increase</i>	<i>Decrease</i>
Current assets:				
Stocks	Rs 98,000	Rs 1,04,000	Rs 6,000	
Trade debtors	86,300 *	85,000	—	Rs 1,300
Bank	11,750	32,000	20,250	
	<u>1,96,050</u>	<u>2,21,000</u>		
Current liabilities:				
Bank overdraft	22,000	—	22,000	
Trade creditors	84,450	75,550	8,900	
	<u>1,06,450</u>	<u>75,550</u>		
Net working capital	89,600	1,45,450		
Increase in net working capital	55,850			55,850
	<u>1,45,450</u>	<u>1,45,450</u>	<u>57,150</u>	<u>57,150</u>

\*(Rs 88,000 – Rs 1,700 being expenditure on fixed assets).

#### *(ii) Statement of sources and application of funds for year 2*

<i>Sources of funds:</i>	
Funds from business operations	Rs 71,560
Issue of long-term liabilities:	
Equity shares	20,000
Long-term loan	40,000
Sale of non-current assets:	
Fixed assets	250
Total	<u>1,31,810</u>
<i>Uses of funds:</i>	
Repayment of long-term liabilities:	
Redemption of preference shares	22,000
Purchase of non-current assets:	
Fixed assets	14,960
Investment	15,000
Payment to investors:	
Dividend to equity shareholders	12,000
Interim dividend	4,000
Final dividend to preference shareholders	8,000
Total	<u>75,960</u>
Increase in net working capital	<u>55,850</u>

**Working notes**

1.	<i>Fixed assets account</i>			
To balance b/d	Rs 2,40,070	By bank (sale proceeds)	Rs 250	
To P & L A/c (revaluation)	3,000	By accumulated depreciation	4,800	
To debtors (rectification)	1,700	By loss on sale of machine	950	
To bank (new purchases), (balancing figure)	14,960	By balance b/d	2,53,730	
	<u>2,59,730</u>			<u>2,59,730</u>
2.	<i>Accumulated depreciation account</i>			
To fixed assets A/c	Rs 4,800	By balance b/d	Rs 90,020	
To balance c/d	98,480	By P & L A/c (depreciation of the current year)	13,260	
	<u>1,03,280</u>			<u>1,03,280</u>
3.	<i>Equity share capital account</i>			
To balance c/d	Rs 1,20,000	By balance b/d	Rs 75,000	
		By P & L A/c (bonus issue)	25,000	
		By bank A/c (issue of new shares), (balancing figure)	20,000	
	<u>1,20,000</u>			<u>1,20,000</u>
4. Funds from business operations				
Increase in P & L A/c			Rs 2,350	
Add: depreciation			13,260	
loss on disposal of fixed assets			950	
amount appropriated for bonus issue			25,000	
interim dividend on equity shares			4,000	
proposed dividend on equity shares			24,000	
final dividend on preference shares			8,000	
premium on redemption of preference shares			2,000	
Less: increased non-cash earnings due to transfer from reserve for replacement of machinery			(5,000)	
revaluation profit on fixed assets			(3,000)	
			<u>71,560</u>	

**PS 1.29**

The latest and summarised statements of Indogrowth Ltd are given below (Rs in thousand):

*Balance Sheet as at March 31, current year*

<i>Sources of funds:</i>		
Share capital		8,000
Reserve and surplus		30,000
15% term loans		<u>30,000</u>
		<u>68,000</u>
<i>Application of funds:</i>		
Fixed assets: gross block	40,500	
Less depreciation	<u>13,500</u>	<u>27,000</u>

(Contd.)

**PS 1.29 (Contd.)***Current assets:*

Inventories	24,000
Sundry debtors	30,000
Cash at bank	800
Other current assets	1,800
	<u>56,600</u>

*Less current liabilities:*

Sundry creditors	11,400
Provision for tax	2,600
Proposed dividend	1,600
	<u>15,600</u>

41,000

**Net working capital**68,000*Income statement for the current year ended March 31 (Rs in thousand)*

Sales	1,44,000
Materials	57,600
Labour	52,400
	<u>1,10,000</u>
Gross profit	34,000
Operating expenses	8,250
Depreciation	4,050
Interest	4,500
Provision for tax (0.35)	6,020
Net profit	<u>11,180</u>

*Projections for next year:*

- (i) Sales in terms of quantity is targeted to increase by 30 per cent.
- (ii) Additions to fixed assets at the beginning of the year will be Rs 2,500 thousand.
- (iii) One-fifth of term loans will be repaid at the beginning of the year.
- (iv) Raw material prices and wage rates are expected to increase by 10 per cent. No increase in selling price is contemplated. Operating expenses are expected to be maintained in terms of percentage of turnover.
- (v) 10 per cent of the year's provision of tax will be outstanding at the end of the year.
- (vi) Previous year's dividend will be paid, current year's provision will be 25 per cent.
- (vii) Sundry creditors will increase by 20 per cent. No change in other CA is anticipated.
- (viii) Depreciation will be 10 per cent of the gross block.

Assuming cash credit accommodation is available as required (interest on which may be ignored) and after calculating appropriate ratios in respect of inventory-holding and sundry debtors; prepare

- (a) Projected income statement for the next year, and
- (b) Projected balance sheet as at March 31.

***Solution****Projected income statement of Indogrowth Ltd (Rs in thousand)*

Sales revenue ( $1,44,000 \times 1.3$ )	1,87,200
Less: materials consumed ( $57,600 \times 1.3 \times 1.1$ )	82,368
labour costs ( $52,400 \times 1.3 \times 1.1$ )	<u>74,932</u>
Gross profit	29,900
Less: operating expenses ( $8,250 \times 1.3$ )	<u>10,725</u>

*(Contd.)*

**Solution (Contd.)**

depreciation $(40,500 + 2,500) \times (0.1)$	4,300
interest $(4,500 \times 0.8)$	3,600
Earnings before taxes	11,275
Less taxes $(0.35)$	3,946
Earnings after taxes	7,329
Less proposed dividend $(8,000 \times 0.25)$	2,000
Retained earnings	5,329

*Projected balance sheet as at March 31 (Rs in thousand)*

<b>Sources of funds:</b>		
Share capital		8,000
Reserve and surplus $(30,000 + 5,329)$		35,329
15% term loans $(30,000 - 6,000)$		24,000
		67,329
<b>Application of funds:</b>		
Gross block $(40,500 + 2,500)$	43,000	25,200
Less depreciation $(13,500 + 4,300)$	17,800	
<b>Current assets:</b>		
Inventories $(1,57,300 \times 24,000/1,10,000)$	34,320	
Debtors $(1,87,200 \times 30,000/1,44,000)$	39,000	
Other current assets	1,800	
	75,120	
<b>Less current liabilities:</b>		
Creditors $(11,400 \times 1.2)$	13,680	
Provision for taxes $(3,946 \times 0.1)$	395	
Proposed dividend	2,000	
Cash credit (see working note)	16,916	
	32,991	42,129
		67,329

**Working notes**

*Cash from business operations:*

Earnings after taxes	Rs 7,329	
Add depreciation	4,300	
Funds from business operations	11,629	
Less increase in inventories and debtors $(75,120 - 55,800)$	(19,320)	
Add increase in creditors and provision for taxes	75	(7,616)
Purchase of fixed assets		2,500
Repayment of loan		6,000
Dividends paid		1,600
Cash outflows		17,716
Less balance in the beginning		800
Credit requirement on cash credit		16,916

**PS 1.30**

The following are the summarised balance sheets of Sound Ltd as on March 31, for the two consecutive years 1 and 2 (Rs in thousand):

**PS 1.30 (Contd.)**

	Year 2	Year 1
<b>Assets</b>		
Plant and machinery	1,980	1,010
Land and buildings	1,000	1,000
Long-term investments	550	550
Short-term investments	470	85
Sundry debtors	2,195	2,500
Inventories	1,400	1,300
Interest receivable	100	65
Cash in hand	300	500
Cash in bank	405	300
	<u>8,400</u>	<u>7,310</u>
<b>Liabilities</b>		
Share capital	2,600	2,150
Reserve and surplus	1,460	900
15% debentures	2,000	1,800
Sundry creditors	440	650
Wages outstanding	40	20
Income-tax payable	400	450
Accumulated depreciation:		
Plant and machinery	910	840
Land and buildings	550	500
	<u>8,400</u>	<u>7,310</u>

*Income statement for the period ending March 31, year 2 (Rs in thousand)*

Sales revenue	45,300
Less: cost of sales	<u>39,000</u>
Gross profit	6,300
Less: depreciation	(540)
selling and administration expenses	(2,960)
interest paid	(300)
Add: interest income	65
dividend income (gross)	<u>95</u>
Net profit before extraordinary items	2,660
Add: insurance settlement received	<u>10</u>
	2,670
Less: provision for income-taxes	<u>550</u>
Net profit after taxes	<u>2,120</u>

*Additional information (Rs in thousand):*

- (1) 15 % Debentures of Rs 300 was redeemed during year 2.
- (2) Tax deducted at source on dividends received (included in provision for taxes) amounts to Rs 15.
- (3) A plant costing Rs 500, having accumulated depreciation of Rs 420 was sold for Rs 80.
- (4) During year 2, interim dividend of Rs 760 was paid; final dividend paid was Rs 800.
- (5) All sales and purchases are made on credit basis.

You are required to prepare cash a flow statement as per ICAI's Accounting Standard 3 (revised).

***Solution****Direct method cash flow statement (Rs in thousand)*

<i>Cash flows from operating activities:</i>		
Cash receipts from customers	45,605	
Cash paid to suppliers and employees	(42,250)	
Cash generated from operations	3,355	
Income tax paid	(585)	
Cash flow before extraordinary item	2,770	
Proceeds from insurance settlement	10	
Net cash from operating activities		2,780
<i>Cash flows from investing activities:</i>		
Purchases of plant and machinery	(1,470)	
Proceeds from sale of plant and machinery	80	
Interest received	30	
Dividends received (Rs 95 – 15)	80	
Net cash used in investing activities		(1,280)
<i>Cash flows from financing activities:</i>		
Proceeds from issuance of share capital	450	
Proceeds from issue of 15% debentures	500	
Redemption of 15% debentures	(300)	
Interest paid	(300)	
Dividends paid (interim + final)	(1,560)	
Net cash used in financing activities		(1,210)
Net increase in cash and cash-equivalent		290
Cash and cash-equivalent at beginning of year 2		885
Cash and cash-equivalents at the end of year 2		1,175

**Working notes***(figures in Rs '000)*1. *Cash receipts from customers:*

Sales	45,300
Add: sundry debtors at the beginning of year 2	2,500
	47,800
Less: sundry debtors at the end of year 2	(2,195)
	45,605

2. *Cash paid to suppliers and employees:*

Cost of sales	39,000
Add: administrative and selling expenses	2,960
sundry creditors at the beginning of year 2	650
wages outstanding at the beginning of year 2	20
inventories at the end of year 2	1,400
	44,030
Less: sundry creditors at the end of year 2	440
wages outstanding at the end of year 2	40
inventories at the end of year 1	1,300
	42,250

3. *Income tax paid (including tax deducted at source from dividends received)*

Income tax for year 2 (including tax deducted at source from dividends received)	550
Add income tax liability at the beginning of year 2	450



Less income tax liability at the end of year 2	400
	<u>600</u>
Out of Rs 600, tax deducted at source on dividend received (amounting to Rs 15) is included in cash flows from investing activities and the balance of Rs 585 is included in cash flows from operating activities.	
4. <i>Interest received</i>	
Interest income for year 2	65
Add interest receivable in the beginning of year 2	65
Less amount receivable at the end of year 2	<u>(100)</u>
	30
5. <i>Machinery purchased</i>	
Balance at the end of year 2	1,980
Add book value of machine sold	500
Less balance at the beginning of year 2	<u>(1,010)</u>
	1,470

*Indirect method cash flow statement (Amount in '000 Rs )*

*Cash flows from operating activities:*

Net profit before taxation and extraordinary items	2,660	
Adjustment for:		
Depreciation	540	
Interest income	(65)	
Dividend income	(95)	
Interest expenses	<u>300</u>	
Operating profit before working capital changes	3,740	
Decrease in sundry debtors	305	
Increase in wages outstanding	20	
Increase in inventories	(100)	
Decrease in creditors	<u>(210)</u>	
Cash generated from operations	3,355	
Income taxes paid	<u>(585)</u>	
Cash flow before extraordinary item	2,770	
Add insurance settlement	<u>10</u>	
Net cash from operating activities		2,780
<i>Cash flows from investing activities:</i>		
Purchase of plant and machinery	(1,470)	
Proceeds from sale of plant and machinery	80	
Interest received	30	
Dividends received (95 – 15)	<u>80</u>	
Net cash used in investing activities		(1,280)
<i>Cash flows from financing activities:</i>		
Proceeds from issuance of share capital	450	
Proceeds from issue of 15% debentures	500	
Redemption of 15% debentures	(300)	
Interest paid	(300)	
Dividends paid (interim + final)	<u>(1,560)</u>	
Net cash used in financing activities		(1,210)
Net increase in cash and cash-equivalent		<u>290</u>
Cash and cash-equivalents at beginning of year 2		885
Cash and cash-equivalents at the end of year 2		<u>1,175</u>

*Cash and cash-equivalents**(Figures in '000 Rs)*

	<i>Year 2</i>	<i>Year 1</i>
Cash in hand	300	500
Cash at bank	405	300
Short-term investments	470	85
	<u>1,175</u>	<u>885</u>

**EXERCISES**

**E.1.1** ABC Ltd has reported a net profit of Rs 30,000 for the current year. The following is the list of transactions having a bearing on the determination of net income.

Amortisation of premium on debentures	Rs 2,000
Depreciation expenses	15,000
Bad debts	5,000
Amortisation of goodwill (charged against general reserves)	4,000
Amortisation of patents	2,000
Amortisation of preliminary expenses	3,000
Loss on sale of plant and equipment	4,000
Extraordinary gains (transferred to capital reserves)	6,000
Amortisation of deferred 'investment tax credit'	4,000
Interest revenue accrued	1,000
Profit on revaluation of land	5,000
Share transfer fees	400
Interest on debentures	5,000
Dividends to equityholders	10,000

Determine the amount of working capital provided from business operations, assuming that the effect of non-operating transactions on working capital items is reported separately.

**E. 1.2** A statement of the retained earnings of Harish Ltd is given below.

Balance of retained earnings (beginning)	Rs 41,72,800
Add: net income after income taxes	83,26,600
tax refund	2,84,300
	<u>1,27,83,700</u>
Less: dividends	58,52,100
cost of investment in foreign subsidiary written off	12,23,000
loss on sale of plant and equipment	1,33,400
	<u>72,08,500</u>
Balance of retained earnings (closing)	55,75,200

Depreciation of Rs 7,95,200 was deducted in arriving at net income for the fiscal year.

Plant and equipment having a net book value of Rs 4,32,100 was sold in the current year.

Plant properties were increased during the fiscal year at a cost of Rs 23,19,000, and the increases were financed by issue of 14% Debentures.

Preference shares were retired for Rs 7,64,000.

Prepare a statement of the sources and uses of net working capital for the year.

**E.1.3** From the figure given below, prepare a statement showing application and sources of funds for the current year ending in March:

	<i>Previous year</i>	<i>Current year</i>
<b>Assets</b>		
Fixed assets (net)	Rs 5,10,000	Rs 6,20,000
Investments	30,000	80,000
Current assets	2,40,000	3,75,000
Discount on debentures	10,000	5,000
	<u>7,90,000</u>	<u>10,80,000</u>
<b>Liabilities and Capital</b>		
Share capital (equity)	3,00,000	3,50,000
Share capital (preference)	2,00,000	1,00,000
Debentures	1,00,000	2,00,000
Reserves	1,10,000	2,70,000
Provision for doubtful debts	10,000	15,000
Current liabilities	<u>70,000</u>	<u>1,45,000</u>
	<u>7,90,000</u>	<u>10,80,000</u>

You are informed that during the year:

- A machine costing Rs 70,000 (book value Rs 40,000), was disposed off for Rs 25,000.
- Preference share redemption was carried out at a premium of 5 per cent.
- Dividend at the rate of 15 per cent was paid on equity shares for the previous year.
- The provision for depreciation stood at the beginning at Rs 1,50,000, and at Rs 1,90,000 at the end of the current year.
- Stock valued at Rs 90,000 at the beginning of the year was written up to its cost (Rs 1,00,000) for preparing the profit and loss account for the current year.

**E.1.4** The chief executive of Premimer Plastics Ltd, reviewing the annual financial statements for the current year, is unable to determine from the balance sheet the reasons for changes in the working capital during the year. He asks you for assistance and presents the following balance sheet of the company:

	<i>March 31, previous year</i>	<i>March 31, current year</i>	<i>Increase (decrease)</i>
Goodwill	Rs 1,00,000	Nil	Rs (1,00,000)
Buildings	2,80,000	Rs 4,05,000	1,25,000
Land	75,000	70,000	(5,000)
Machinery	1,00,000	1,65,000	65,000
Tools	35,000	20,000	(15,000)
Trade investments	7,500	9,000	1,500
Inventories	1,09,000	1,05,000	(4,000)
Sundry debtors	46,000	90,000	44,000
Bills receivable	13,500	10,500	(3,000)
Cash in hand	4,500	1,000	(3,500)
Unexpired insurance	700	600	(100)
Unamortised debentures discount	1,250	1,050	(200)
	<u>7,72,450</u>	<u>8,77,150</u>	<u>1,04,700</u>
Equity share capital	2,00,000	3,50,000	1,50,000
10% Debentures	50,000	75,000	25,000
Sundry creditors	26,000	29,000	3,000
Bank overdraft	—	4,000	4,000

(Contd.)

*(Contd.)*

Bills payable	5,000	4,500	(500)
Short-term bank loans	3,400	750	(2,650)
Accrued taxes	1,500	2,500	1,000
Accrued interest	3,000	5,000	2,000
Allowances for doubtful accounts	1,150	2,250	1,100
Accumulated depreciation	90,500	1,35,600	45,100
Retained earnings	3,91,900	2,68,550	(1,23,350)
	<u>7,72,450</u>	<u>8,77,150</u>	<u>1,04,700</u>

*Additional information*

- (i) There were no purchases or sales of tools.
- (ii) Equity shares were issued at a discount of 10 per cent. The discount was charged to the goodwill account.
- (iii) Old machinery that cost Rs 2,250 was scrapped and written off the books. Accumulated depreciation on such equipment was Rs 1,650.
- (iv) The income statement for the current year was as given.

Sales (net)		Rs 6,25,000
Less: expenses:		
<i>Operating charges</i>		
Materials and supplies	Rs 1,25,000	
Director labour	1,05,000	
Manufacturing overhead	90,705	
Depreciation	61,750	
Selling expenses	1,22,500	
General expenses	1,15,000	
Interest expenses	3,750	
<i>Unusual items</i>		
Writing off of goodwill	1,15,000	
Writing off of land	5,000	
Loss on machinery	600	
Net loss		<u>7,44,350</u>
		<u>1,19,350</u>

You are required to prepare

- (i) a statement of changes in financial position using working capital approach; and
- (ii) a statement of changes in financial position using cash approach (cash-flow statement).

**E.1.5** The following schedule shows the balance sheets in condensed form of Bradstreet Manufacturing Ltd, at the beginning and end of the year.

	<i>Beginning</i>	<i>End</i>
<i>Assets</i>		
Cash and bank balances	Rs 50,000	Rs 40,000
Sundry debtors	77,000	73,000
Temporary investments	1,10,000	84,000
Pre-paid expenses	1,000	2,000
Stock in trade	92,000	1,06,000
Land and buildings	1,00,000	1,00,000
Machinery	72,000	80,000
Total	<u>5,02,000</u>	<u>4,85,000</u>
<i>Liabilities and capital</i>		
Sundry creditors	1,03,000	96,000

*(Contd.)*

*(Contd.)*

Outstanding expenses	13,000	22,000
15% Debentures	90,000	70,000
Depreciation fund	40,000	44,000
Reserve for contingencies	60,000	50,000
P & L A/c	16,000	23,000
Capital	1,80,000	1,80,000
<b>Total</b>	<b>5,02,000</b>	<b>4,85,000</b>

The following information concerning the transactions is available:

- (i) 10 per cent dividend was paid in cash.
- (ii) New machinery for Rs 20,000 was purchased but old machinery costing Rs 12,000 was sold for Rs 4,000; accumulated depreciation was Rs 6,000.
- (iii) Rs 20,000, 15% debentures were redeemed by purchase from the open market at the rate of Rs 96.
- (iv) Rs 10,000 was debited to the contingency reserves for the settlement of a previous tax liability.
- (v) Rs 26,000-worth investments were sold at book value.

Prepare a schedule of changes in the working capital, and a statement showing the source and application of funds.

**E.1.6** The following is the audited balance sheet of RC Traders as on March 31 (previous year):

<i>Liabilities</i>	<i>Amount</i>	<i>Assets</i>	<i>Amount</i>
Capital	Rs 1,62,000	Machinery	Rs 40,000
Sundry creditors for goods	30,000	Furniture	10,000
		Stock	35,000
		Debtors	90,000
		Cash on hand	6,000
		Cash at bank	11,000
	<u>1,92,000</u>		<u>1,92,000</u>

A fire occurred on the evening of March 31, current year, destroying the books of account and records. The cashier absconded with the available cash in the cash box.

The trader gives the following information:

1. Sales are effected as 20 per cent in cash, and the balance on credit. Total sales for the year ended March 31 were 20 per cent higher than in the previous year. All sales and purchases of goods were spread evenly throughout the year (as also in the last year).
2. Terms of credit: Debtors—2 months, Creditors—1 month.
3. Stock level was maintained at Rs 35,000 throughout the year.
4. A steady gross profit rate of 33.33 per cent on turnover was maintained throughout. Creditors were paid by cheques only. There was no cash purchase.
5. His private records, and bank pass books disclosed the following transactions for the year:
  - (i) Miscellaneous business expenses (of which Rs 5,000 was outstanding on March 31, previous year), Rs 1,80,000 including Rs 35,000 paid by cheque).
  - (ii) Repairs, Rs 2,500 (paid in cash)
  - (iii) Addition to machines, Rs 50,000 (paid by cheque)
  - (iv) Private drawings, Rs 36,000 (paid in cash)
  - (v) Travelling expenses, Rs 12,000 (in cash)
6. Collection from debtors (including Rs 30,000 for cash) and payments to creditors were prompt all along.
7. Depreciation is to be provided on the fixed assets at the rate of 10 per cent of the closing book value.
8. The cash stolen is to be charged to the P & L A/c.

Prepare a statement of source and application of funds for the current year ended March 31.

**E.1.7** The following are the summarised balance sheets of Well Limited as on March 31, for the two consecutive years (previous year and current year)

(amount in '000 Rs)

	Current Year	Previous Year
<b>Assets</b>		
Plant and machinery	990	505
Land and buildings	500	500
Long-term investments	275	275
Short-term investments	235	43
Sundry debtors	1,098	1,250
Inventories	700	650
Interest receivable	50	32
Cash in hand	150	250
Cash at bank	202	150
	<u>4,200</u>	<u>3,655</u>
<b>Liabilities</b>		
Share capital	1,300	1,075
Reserves and surpluses	730	450
15% Debentures	1,000	900
Sundry creditors	220	325
Wages outstanding	20	10
Income tax payable	200	225
Accumulated depreciation		
– Plant and machinery	455	420
– Land and buildings	275	250
	<u>4,200</u>	<u>3,655</u>

*Income statement for the current year, ending March 31*

Sales revenue	22,650
Less: cost of sales	<u>19,500</u>
Gross profit	3,150
Less: depreciation	(270)
selling and administration expenses	(1,480)
interest paid	(150)
Add: interest income	33
dividend income (gross)	47
Net profit before extraordinary items	<u>1,330</u>
Add: insurance settlement received	5
Net profit before taxes	<u>1,335</u>
Less: provision for income tax	<u>275</u>
Net profit after taxes	<u>1,060</u>

*Additional information:*

- (i) 15% Debentures of Rs 3,00,000 were redeemed during the current year.
- (ii) Tax deducted at source on dividends received (included in provision for taxes) amounts to Rs 7,500.
- (iii) A plant costing Rs 2,50,000, having accumulated depreciation of Rs 2,10,000 was sold for Rs 40,000 in current year.
- (iv) During the current year, interim dividend of Rs 38,000 was paid; final dividend paid was Rs 40,000.
- (v) All sales and purchases are made on credit basis.

You are required to prepare cash flow statement as per Accounting Standard 3 (Revised).

**ANSWERS**

**E. 1.1** Rs 50,600.

**E. 1.2** Increase in net working capital (NWC)—Rs 30,88,700.

**E. 1.3** Increase in NWC—Rs 45,000.

**E. 1.4** (i) Increase in NWC—Rs 25,450.

(ii) Cash from business operations, — Rs 38,000; total sources of cash—Rs 1,98,000, total uses of cash—Rs 2,01,500.

**E. 1.5** Decrease in NWC—Rs 27,000.

**E. 1.6** Decrease in NWC—Rs 18,000.

# 2 **RATIO ANALYSIS**

## **BASIC THEORY**

### **INTRODUCTION**

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 ratios 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.

Inter-firm 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. Thus, 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 a firm and comparison with standards or plans.

### **TYPES OF RATIOS**

Ratios can broadly be classified into four groups: liquidity, capital structure or leverage, profitability, and activity.

#### **Liquidity Ratios**

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 (CA) to total current liabilities (CL). A satisfactory current ratio would enable a firm to meet its obligations, even if the value of the CA declines. It is, however, a quantitative index of liquidity as it does not differentiate among the components of CA, 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 CA. It represents the ratio between quick CA, and the total CL. 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 shown in Exhibit 2.1.

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**EXHIBIT 2.1** *Summary of Liquidity Ratios*


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$$1 \text{ Net working capital (NWC)} = \text{Current assets} - \text{Current liabilities} \quad (2.1)$$

$$2 \text{ Current ratio} = \frac{\text{Current assets}}{\text{Current liabilities}} \quad (2.2)$$

$$3 \text{ Acid test or Quick ratio} = \frac{\text{Current assets} - \text{Stock} - \text{Pre-paid expenses}}{\text{Current liabilities}} \quad (2.3)$$

$$\text{or} \quad \frac{\text{Cash} + \text{Marketable securities} + \text{Debtors}}{\text{Current liabilities}} \quad (2.4)$$

$$4 \text{ Super-quick ratio} = \frac{\text{Cash} + \text{Marketable securities}}{\text{Current liabilities}} \quad (2.5)$$


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**Capital Structure or Leverage Ratios**

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.

Exhibit 2.2 summarises the main capital structure ratios.

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**EXHIBIT 2.2** *Summary of Leverage/Capital Structure Ratios*


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**(a) Debt-Equity: Assets-based**

$$1 \text{ Debt/equity ratio} = \frac{\text{Long-term debt}}{\text{Shareholders' funds (equity share capital + preference share capital + reserves and surplus)}} \quad (2.6)$$

$$\text{or} \quad \frac{\text{Total debt (long-term debt + current liabilities)}}{\text{Shareholders' funds}} \quad (2.7)$$

$$2 \text{ Debt to total capital ratio} = \frac{\text{Long-term debt}}{\text{Permanent capital (shareholders' funds + long-term debt)}} \quad (2.8)$$

$$3 \text{ Debt to total assets ratio} = \frac{\text{Total debt}}{\text{Total assets}} \quad (2.9)$$


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(Contd.)

**Exhibit 2.2 (Contd.)**

$$4 \text{ Proprietary ratio} = \frac{\text{Owner's funds}}{\text{Total assets}} \quad (2.10)$$

$$5 \text{ Capital gearing ratio} = \frac{\text{Preference share capital} + \text{Debentures} + \text{Other borrowed funds}}{\text{Equity funds (net worth)}} \quad (2.11)$$

**(b) Coverage Ratios: Income-based**

$$6 \text{ Interest coverage ratio} = \frac{\text{Earnings before interest and taxes (EBIT)}}{\text{Interest (times-interest earned)}} \quad (2.12)$$

$$7 \text{ Dividend coverage ratio} = \frac{\text{Earnings after taxes (EAT)}}{\text{Preference dividend } (D_p)} \quad (2.13)$$

$$8 \text{ Total coverage ratio} = \frac{\text{EBIT} + \text{Lease payment}}{\text{Interest} + \text{Lease payment} + \frac{D_p}{t} I + \frac{\text{Instalment of principal}}{(1-t)}} \quad (2.14)$$

$$9 \text{ Cash flow coverage ratio} = \frac{\text{EBIT} + \text{Lease payment} + \text{Depreciation}}{\text{Interest} + \text{Lease payment} + \frac{D_p}{t} I + \frac{\text{Instalment of principal}}{(1-t)}} \quad (2.15)$$

$$10 \text{ Debt service coverage ratio} = \frac{\sum_{t=1}^n \text{EAT}_t + \text{Depreciation}_t + \text{Interest}_t + \text{Other non-cash expenses}_t}{\sum_{t=1}^n \text{Principal}_t + \text{interest}_t} \quad (2.16)$$

**Profitability Ratios**

The profitability of a firm can be measured by the profitability ratios. Such ratios can be computed either from sales or investments.

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 meet financial and 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 overall profitability (earning power) is measured by the return on investment, which is computed as a combined product of net profit margin and investment turnover. It is a central measure of the earning power and operating efficiency of a firm.

The profitability ratios are shown in Exhibit 2.3.

**EXHIBIT 2.3** *Summary of Profitability Ratios***(a) Related to Sales**

$$1 \text{ Gross profit ratio/margin} = \frac{\text{Gross profit (sales - cost of goods sold)}}{\text{Net sales}} \quad (2.17)$$

$$2 \text{ Operating profit ratio/margin} = \frac{\text{EBIT}}{\text{Net sales}} \quad (2.18)$$

$$3 \text{ Net profit ratio/margin} = \frac{\text{Earnings after taxes (EAT)}}{\text{Net sales}} \quad (2.19)$$

$$4 \text{ Cost of goods sold ratio} = \frac{\text{Cost of goods sold}}{\text{Net sales}} \quad (2.20)$$

$$5 \text{ Operating expenses ratio} = \frac{\text{Administrative expenses + Selling expenses}}{\text{Net sales}} \quad (2.21)$$

$$6 \text{ Administrative expenses ratio} = \frac{\text{Administrative expenses}}{\text{Net sales}} \quad (2.22)$$

$$7 \text{ Selling expenses ratio} = \frac{\text{Selling expenses}}{\text{Net sales}} \quad (2.23)$$

$$8 \text{ Operating ratio} = \frac{\text{Cost of goods sold + Operating expenses}}{\text{Net sales}} \quad (2.24)$$

**(b) Related to Total Investments**

$$1 \text{ Return on total assets} = (i) \frac{\text{EAT + Interest}}{\text{Average total assets}} \quad (2.25)$$

$$(ii) \frac{\text{EAT + Interest - Tax advantage on interest}}{\text{Average total assets}} \quad (2.26)$$

$$2 \text{ Return on capital employed} = (i) \frac{\text{EAT + Interest}}{\text{Average total capital employed}} \quad (2.27)$$

$$(ii) \frac{\text{EAT + Interest - Tax advantage on interest}}{\text{Average total capital employed}} \quad (2.28)$$

$$3 \text{ Return on shareholders' equity} = \frac{\text{EAT}}{\text{Average total shareholders' equity}} \quad (2.29)$$

**(c) Related to Equity Funds**

$$1 \text{ Return on equity funds} = \frac{\text{EAT - Preference dividend}}{\text{Average ordinary shareholders' equity (net worth)}} \quad (2.30)$$

$$2 \text{ Earnings per share (EPS)} = \frac{\text{Net profit available to equity shareholders' (EAT - } D_p)^*}{\text{Number of ordinary shares outstanding (N)}} \quad (2.31)$$

$$3 \text{ Dividends per share (DPS)} = \frac{\text{Dividend paid to ordinary shareholders}}{\text{Number of ordinary shares outstanding (N)}} \quad (2.32)$$

(Contd.)

**Exhibit 2.3 (Contd.)**

$$4 \text{ Earnings yield} = \frac{\text{EPS}}{\text{Market price per share}} \quad (2.33)$$

$$5 \text{ Dividend yield} = \frac{\text{DPS}}{\text{Market price per share}} \quad (2.34)$$

$$6 \text{ Dividend payment/payout (D/P) ratio} = \frac{\text{DPS}}{\text{EPS}} \quad (2.35)$$

$$7 \text{ Price-earnings (P/E) ratio} = \frac{\text{Market price of a share}}{\text{EPS}} \quad (2.36)$$

$$8 \text{ Book value per share} = \frac{\text{Ordinary shareholders' equity}}{\text{Number of equity shares outstanding}} \quad (2.37)$$

**(d) Overall Profitability/Earning Power**

$$\text{Rate of return on investment (ROI)} = \frac{\text{EAT}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Total assets}} \quad (2.38)$$

$$\text{or} \quad \frac{\text{EAT}}{\text{Total assets}} \quad (2.39)$$

\* Inclusive of dividend payment tax, if any.

**Activity/Turnover/Efficiency Ratios**

The last category of ratios is the activity ratios. They are also known as efficiency or turnover ratios. Such 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 utilising the total assets.

Such ratios are enumerated in Exhibit 2.4.

**EXHIBIT 2.4 Summary of Activity/Turnover/Efficiency Ratios**

$$1 \text{ Raw material turnover} = \frac{\text{Cost of raw materials used}}{\text{Average raw materials inventory}} \quad (2.40)$$

$$2 \text{ Work-in-process turnover} = \frac{\text{Cost of goods manufactured}}{\text{Average work-in-process inventory}} \quad (2.41)$$

(Contd.)

**Exhibit 2.4 (Contd.)**

$$3 \text{ Finished goods inventory turnover} = \frac{\text{Cost goods sold}^*}{\text{Average finished goods inventory}} \quad (2.42)$$

$$4 \text{ Debtors turnover ratio} = \frac{\text{Total credit sales}}{\text{Average Debtors} + \text{Averages bills receivable}} \quad (2.43)$$

$$5 \text{ Average collection period} = \frac{\text{Months (days) in year}}{\text{Debtors turnover ratio}} \quad (2.44)$$

$$6 \text{ Total assets turnover} = \frac{\text{Cost of goods sold}^*}{\text{Average total assets}} \quad (2.45)$$

$$7 \text{ Fixed assets turnover} = \frac{\text{Cost of goods sold}^*}{\text{Average fixed assets}} \quad (2.46)$$

$$8 \text{ Current assets turnover} = \frac{\text{Cost of goods sold}^*}{\text{Average current assets}} \quad (2.47)$$

$$9 \text{ Working capital turnover ratio} = \frac{\text{Cost of goods sold}^*}{\text{Average net working capital}} \quad (2.48)$$

\*If data about cost of goods sold are not available, sales figures are used in the numerator.

## SOLVED PROBLEMS

### PS 2.1

You have been furnished with the financial information of Aditya Mills Limited as under:

*Balance sheet as on March 31*

<i>Liabilities</i>		<i>Assets</i>	
Equity share capital (Rs 100 each)	Rs 10,00,000	Plant and equipment	Rs 6,40,000
Retained earnings	3,68,000	Land and building	80,000
Sundry creditors	1,04,000	Cash	1,60,000
Bills payable	2,00,000	Sundry debtors	Rs 3,60,000
Other current liabilities	20,000	Less allowances	40,000
		Stock	4,80,000
		Pre-paid insurance	12,000
	<u>16,92,000</u>		<u>16,92,000</u>

*Statement of profit for the year ended March 31*

Sales	Rs 40,00,000
Less cost of goods sold	<u>30,80,000</u>
Gross profit on sales	9,20,000
Less operating expenses	<u>6,80,000</u>
Net profit	2,40,000
Less taxes (0.35)	<u>84,000</u>
Net profit after taxes	<u>1,56,000</u>

Sundry debtors and stock at the beginning of the year were Rs 3,00,000 and Rs 4,00,000, respectively.

- (i) Determine the following ratios of Aditya Mills Ltd:
- (a) Current ratio, (b) Acid test ratio, (c) Stock turnover, (d) Debtors' turnover, (e) Gross profit ratio, (f) Net profit ratio, (g) Operating ratio, (h) Earnings per share (EPS), (i) Rate of return on equity capital, and (j) Market value of the share if price earnings (P/E) ratio is 10 times.
- (ii) Indicate for each of the following transactions whether the transaction would improve, weaken or have no effect on the current ratio of the company (assume current ratio as 2):
- (a) Sell additional equity shares, (b) Sell 15 per cent debentures, (c) Pay bills payable, (d) Collect 40 per cent sundry debtors, (e) Purchase additional plant, (f) Issue bills payable to creditors, (g) Collect bills receivable from debtors, (h) Purchase treasury bills, and (i) Write off bad debts.

### Solution

- (i) (a) Current ratio =  $(\text{Cash} + \text{Debtors} + \text{Stock} + \text{Pre-paid insurance}) / (\text{Creditors} + \text{Bills payable} + \text{Other current liabilities}) = (\text{Rs } 1,60,000 + \text{Rs } 3,20,000 + \text{Rs } 4,80,000 + \text{Rs } 12,000) / (\text{Rs } 1,04,000 + \text{Rs } 2,00,000 + \text{Rs } 20,000) = 3 : 1.$
- (b) Acid test ratio =  $(\text{Current assets} - \text{Stock} - \text{Pre-paid insurance}) / \text{Current liabilities} = (\text{Rs } 9,72,000 - \text{Rs } 4,92,000) / \text{Rs } 3,24,000 = 1.48 : 1.$
- (c) Stock turnover =  $\text{Cost of goods sold} / \text{Average stock} = \text{Rs } 30,80,000 / \text{Rs } 4,40,000 = 7 \text{ times}.$
- (d) Debtors' turnover =  $\text{Cost of goods sold} / \text{Average debtors} = \text{Rs } 40,00,000 / \text{Rs } 3,30,000 = 12.12 \text{ times}.$
- (e) Gross profit ratio =  $(\text{Gross profit} / \text{Sales}) \times 100 = (\text{Rs } 9,20,000 / \text{Rs } 40,00,000) \times 100 = 23 \text{ per cent}.$
- (f) Net profit ratio =  $(\text{Net profit} / \text{Sales}) \times 100 = (\text{Rs } 1,56,000 / \text{Rs } 40,00,000) \times 100 = 3.9 \text{ per cent}.$
- (g) Operating ratio =  $[(\text{Cost of goods sold} + \text{Operating Expenses}) / \text{Sales}] \times 100 = [(\text{Rs } 30,80,000 + \text{Rs } 6,80,000) / \text{Rs } 40,00,000] \times 100 = 94 \text{ per cent}.$
- (h) Earnings per share (EPS) =  $\text{Earning available to equityholders} / \text{Number of equity shares} = \text{Rs } 1,56,000 / 10,000 = \text{Rs } 15.6.$
- (i) Rate of return on equity capital =  $(\text{Rs } 1,56,000 / \text{Rs } 13,68,000) \times 100 = 11.4 \text{ per cent}.$
- (j) Market value of the share =  $\text{EPS} \times \text{P/E ratio} = \text{Rs } 15.6 \times 10 \text{ times} = \text{Rs } 156.$
- (ii) *Effect of the transactions on current ratio:* (a) Improve, (b) Improve, (c) Improve, (d) No effect, (e) Weaken, (f) No effect, (g) No effect, (h) No effect, and (i) Weaken.

### PS 2.2

The following data are extracted from the published accounts of two companies, ABC Ltd and XYZ Ltd, in an industry.

Particulars	ABC Ltd	XYZ Ltd
Sales	Rs 32,00,000	Rs 30,00,000
Net profit after tax	1,23,000	1,58,000
Equity capital (Rs 10 per share fully paid)	10,00,000	8,00,000
General reserves	2,32,000	6,42,000
Long-term debt	8,00,000	5,60,000
Creditors	3,82,000	5,49,000
Bank credit (short-term)	60,000	2,00,000
Fixed assets	15,99,000	15,90,000
Inventories	3,31,000	8,09,000
Other current assets	5,44,000	4,52,000

Prepare a statement of comparative ratios showing liquidity, profitability, activity and financial position of the two companies.

**Solution***Statement of comparative ratios of ABC Ltd and XYZ Ltd*

	ABC Ltd	XYZ Ltd
<b>(i) Liquidity Ratios</b>		
(a) Current ratio (CA ÷ CL)	$\frac{\text{Rs } 8,75,000}{\text{Rs } 4,42,000} = 1.98$	$\frac{\text{Rs } 12,61,000}{\text{Rs } 7,49,000} = 1.68$
(b) Acid test ratio (QA ÷ CL)	$\frac{\text{Rs } 5,44,000}{\text{Rs } 4,42,000} = 1.23$	$\frac{\text{Rs } 4,52,000}{\text{Rs } 7,49,000} = 0.60$
<b>(ii) Profitability Ratios</b>		
(a) Net profit ratio (NP ÷ Sales) × 100 =	$\frac{\text{Rs } 1,23,000}{\text{Rs } 32,00,000} \times 100 = 3.84\%$	$\frac{\text{Rs } 1,58,000}{\text{Rs } 30,00,000} \times 100 = 5.27\%$
(b) ROR on total assets (NP ÷ Total assets) × 100	$\frac{\text{Rs } 1,23,000}{\text{Rs } 24,74,000} \times 100 = 4.97\%$	$\frac{\text{Rs } 1,58,000}{\text{Rs } 28,51,000} \times 100 = 5.54\%$
(c) ROR on owners' funds (NP ÷ Equity funds) × 100	$\frac{\text{Rs } 1,23,000}{\text{Rs } 12,32,000} \times 100 = 9.98\%$	$\frac{\text{Rs } 1,58,000}{\text{Rs } 14,42,000} \times 100 = 10.96\%$
(d) EPS (NP ÷ Number of shares)	$\frac{\text{Rs } 1,23,000}{\text{Rs } 1,00,000} = \text{Rs } 1.23$	$\frac{\text{Rs } 1,58,000}{\text{Rs } 80,000} = \text{Rs } 1.97$
<b>(iii) Activity Ratios</b>		
(a) Stock turnover (Sales ÷ Closing stock)	$\frac{\text{Rs } 32,00,000}{\text{Rs } 3,31,000} = 9.7 \text{ times}$	$\frac{\text{Rs } 30,00,000}{\text{Rs } 8,09,000} = 3.71 \text{ times}$
(b) Fixed assets turnover (Sales ÷ Fixed assets) <sup>1</sup>	$\frac{\text{Rs } 32,00,000}{\text{Rs } 15,99,000} = 2 \text{ times}$	$\frac{\text{Rs } 30,00,000}{\text{Rs } 15,90,000} = 1.89 \text{ times}$
(c) Current assets turnover (Sales ÷ Current assets) <sup>1</sup>	$\frac{\text{Rs } 32,00,000}{\text{Rs } 8,75,000} = 3.66 \text{ times}$	$\frac{\text{Rs } 30,00,000}{\text{Rs } 12,61,000} = 2.38 \text{ times}$
(d) Total assets turnover (Sales ÷ Total assets) <sup>1</sup>	$\frac{\text{Rs } 32,00,000}{\text{Rs } 24,74,000} = 1.29 \text{ times}$	$\frac{\text{Rs } 30,00,000}{\text{Rs } 28,51,000} = 1.05 \text{ times}$
<b>(iv) Solvency Ratios (to show financial position)</b>		
<b>(a) Debt-equity ratios</b>		
(i) $\frac{\text{External funds}}{\text{Internal funds}}$	$\frac{\text{Rs } 12,42,000}{\text{Rs } 12,32,000} = 1.01 \text{ times}$	$\frac{\text{Rs } 13,09,000}{\text{Rs } 14,42,000} = 0.91 \text{ times}$
(ii) $\frac{\text{Long-term debts}}{\text{Internal funds}}$	$\frac{\text{Rs } 8,00,000}{\text{Rs } 12,32,000} = 0.65 \text{ times}$	$\frac{\text{Rs } 5,60,000}{\text{Rs } 14,42,000} = 0.39 \text{ times}$
(b) Interest coverage ratio	Not possible to determine	Not possible to determine

**Working notes**

- 1 Theoretically, activity ratios should have been determined by relating a particular category of asset (current or fixed) with cost of goods sold.
- 2 In the absence of information of gross profit, GP ratio and debtors, cost of goods sold could not be determined. ABC Ltd is better placed than XYZ Ltd in respect of liquidity, activity and solvency ratios, the primary factor being the accumulation of stocks with XYZ Ltd. It is reflected in its inventory turnover ratio which is only 3.71 times *vis-a-vis* 9.66 times of ABC Ltd. However, XYZ Ltd has an edge over ABC Ltd in respect of profitability ratios.

**PS 2.3**

Presently, the current assets and current liabilities of a company are Rs 16 lakh and Rs 8 lakh respectively. Calculate the effect of each of the following transactions individually and totally on the current ratio of the company.

- (i) Cash purchase of new machinery for Rs 5 lakh.
- (ii) Purchase of new machinery for Rs 10 lakh on a medium-term loan from the bank, with 20 per cent margin.
- (iii) Payment of dividend of Rs 2 lakh.
- (iv) Receipt of a shipment of new materials at landed cost of Rs 5 lakh, against which the bank finance obtained is Rs 3 lakh.

**Solution**

Existing current ratio (CR) = Rs 16 lakh/Rs 8 lakh = 2.

The effect of various transactions individually on the CR will be as under:

- (i) The CR will decrease, that is CR = Rs 11 lakh/Rs 8 lakh = 1.38
- (ii) CR = Rs 14 lakh/Rs 8 lakh = 1.75 (decrease)
- (iii) CR = Rs 14 lakh/Rs 6 lakh = 2.33 (increase)
- (iv) Current assets will increase, Rs 16 lakh + Rs 5 lakh + Rs 2 lakh = Rs 19 lakh.  
Current liabilities will increase : Rs 8 lakh + Rs 3 lakh = Rs 11 lakh  
CR = Rs 19 lakh/Rs 11 lakh = 1.73 (decrease)

Total effect on CR:

(a) <i>Current assets</i>	Rs 16 lakh
Less: cash (purchase of machinery)	5
cash (paid for machinery purchased)	2
cash (payment of dividend)	2
cash (paid for inventory purchased)	2
Add: inventory (purchased)	5
	10
(b) <i>Current liabilities</i> (present)	8
Less: dividend payable	2
Add: bank overdraft	3
	9

The current ratio after these changes would be Rs 10 lakh/Rs 9 lakh = 1.11

**PS 2.4**

XYZ Ltd's financial statements contain the following information.

	<i>Previous year</i>	<i>Current year</i>
Cash	Rs 2,00,000	Rs 1,60,000
Sundry debtors	3,20,000	4,00,000
Temporary investments	2,00,000	3,20,000
Stock	18,40,000	21,60,000
Pre-paid expenses	28,000	12,000

(Contd.)



**PS 2.4 (Contd.)**

Total current assets	25,88,000	30,52,000
Total assets	56,00,000	64,00,000
Current liabilities	6,40,000	8,00,000
10% Debentures	16,00,000	16,00,000
Equity share capital	20,00,000	20,00,000
Retained earnings	4,68,000	9,04,000

*Statement of profit for the current year*

Sales	Rs 40,00,000
Less: cost of goods sold	28,00,000
interest	1,60,000
Net profit	10,40,000
Less taxes (0.35)	3,64,000
Profit after taxes	6,76,000
Dividends declared on equity shares	2,20,000

From the above, appraise the financial position of the company from the point of view of (i) liquidity, (ii) solvency, (iii) profitability, and (iv) activity.

**Solution***(i) Liquidity ratios*

- (a) Current ratio = CA/CL = Rs 25,88,000/Rs 6,40,000 = 4.04 : 1 (previous year); Rs 30,52,000/Rs 8,00,000 = 3.82 : 1 (current year)
- (b) Acid test ratio = (Rs 25,88,000 – Rs 18,68,000)/Rs 6,40,000 = 1.125 : 1 (previous year); (Rs 30,52,000 – Rs 21,72,000)/Rs 8,00,000 = 1.1 : 1 (current year)

*(ii) Solvency ratios**(a) Debt-equity ratios*

- (1) Total outside debts/Equity funds = Rs 22,40,000/ Rs 24,68,000 = 0.91 (previous year) : Rs 24,00,000/ Rs 28,12,000 = 0.85 (current year)
- (2) Long-term debts/Equity funds = Rs 16,00,000/ Rs 24,68,000 = 0.65 (previous year); Rs 16,00,000/ Rs 28,12,000 = 0.57 (current year)

*(b) Interest coverage ratio*

$$= \text{EBIT} / \text{Interest charges} = \text{Rs } 12,00,000 / \text{Rs } 1,60,000 = 7.5 \text{ times (current year)}$$

*(iii) Profitability ratios (current year)*

- (a) Gross profit ratio = (Gross profit/Sales)  $\times$  100 = (Rs 12,00,000/Rs 40,00,000)  $\times$  100 = 30 per cent
- (b) Net profit ratio = (Net profit/Sales)  $\times$  100 = (Rs 6,76,000/Rs 40,00,000)  $\times$  100 = 16.9 per cent.
- (c) Return on total resources = [(EAT + Interest – Tax savings on interest)/Total assets]  $\times$  100 = [(Rs 6,76,000 + Rs 1,60,000 – Rs 56,000)/Rs 64,00,000]  $\times$  100 = 12.2 per cent.
- (d) Return on capital employed = [(EAT + Interest – Tax savings on interest)/Total capital employed]  $\times$  100 = [(Rs 6,76,000 + Rs 1,60,000 – Rs 56,000)/44,12,000]  $\times$  100 = 17.7 per cent.
- (e) Return on equity funds = (Net profit after taxes/Equity funds)  $\times$  100 = (Rs 6,76,000/Rs 28,12,000)  $\times$  100 = 24 per cent.

Notes: Ratios (c), (d) and (e) can also be determined by taking average total assets/capital employed/equity funds.

*(iv) Activity ratios*

- (a) Debtors turnover = Rs 40,00,000/Rs 3,60,000 = 11.1 times
- (b) Stock turnover = Rs 28,00,000/Rs 20,00,000 = 1.4 times
- (c) Total assets turnover = Rs 28,00,000/Rs 64,00,000 = 0.44 times

The company's position is quite sound from the point of view of liquidity, solvency and profitability. However, its activity ratios, particularly in term of the utilisation of total assets and holding of stocks, do not seem to be satisfactory.

**PS 2.5**

As credit manager of the Central Bank of India, you have been approached by two companies for a loan of Rs 1,00,000 for 6 months, with no collateral offered. Since the bank has almost exhausted its quota for loans of this type, only one of these requests can be granted. The relevant information supplied to you by the two companies is presented below.

<i>Particulars</i>	<i>Company X</i>	<i>Company Y</i>
<b>Assets</b>		
Cash	Rs 1,70,000	Rs 3,00,000
Sundry debtors	2,74,000	4,24,000
Stock	9,00,000	13,50,000
Total current assets	13,44,000	20,74,000
Other assets	10,00,000	10,20,000
	<u>23,44,000</u>	<u>30,94,000</u>
<b>Liabilities and capital</b>		
Current liabilities	5,00,000	6,40,000
Long-term loans	8,00,000	10,00,000
Equity share capital	8,00,000	12,00,000
Retained earnings	2,44,000	2,54,000
	<u>23,44,000</u>	<u>30,94,000</u>

*Additional information:*

Sales	24,00,000	17,00,000
Rate of gross profit on sales	0.30	0.40

Considering the above data, specify the company which should be granted the credit. Explain your answer with reasons.

***Solution***

The decision to grant credit by the bank would depend upon the liquidity ratios of the two firms.

- (a) Current ratio = Rs 13,44,000/Rs 5,00,000 = 2.69 (Company X)  
                       = Rs 20,74,000/Rs 6,40,000 = 3.24 (Company Y)
- (b) Acid test ratio = Rs 4,44,000/Rs 5,00,000 = 0.89 (Company X)  
                       = Rs 7,24,000/Rs 6,00,000 = 1.21 (Company Y)

Therefore, Company Y is recommended for being granted the loan as its liquidity ratios are better than those of Company X.

**PS 2.6**

A partial list of trend and common-size percentages for ABC Ltd is given below.

	<i>March, current year</i>	<i>March, previous year</i>
<b>Trend percentages:</b>		
Sales (net)	120	100
Cost of goods sold	?	100
Gross profit on sales	?	100
Operating expenses and income taxes	?	100
Net income	?	100
<b>Common-size percentages:</b>		
Sales (net)	100	100

(Contd.)

**PS 2.6 (Contd.)**

Cost of goods sold	<u>?</u>	<u>?</u>
Gross profit on sales	40	?
Operating expenses and income taxes	<u>20</u>	<u>25</u>
Net income	20	10
		= (Rs 20,000)

(i) Determine the missing trend and common-size percentages.

(ii) Compute the net income for the current year.

**Solution**

(i) *Determination of common-size percentages and missing trends*

Particulars	Common-size percentages		Trend percentages	
	March current year	March previous year	March current year	March previous year
Sales (net)	100	100	120	100
Cost of goods sold	<u>60</u>	<u>65</u>	<u>110.76</u>	<u>100</u>
Gross profit on sales	40	35	137.14	100
Operating expenses and income taxes	<u>20</u>	<u>25</u>	<u>96</u>	<u>100</u>
Net income	20	10	240	100

(ii) *Determination of net income for current year*

Sales (net)	Rs 2,40,000
Less cost of goods sold (0.60 × sales)	<u>1,44,000</u>
Gross profit on sales	96,000
Less operating expenses and income taxes	<u>48,000</u>
Net income	48,000

Sales in previous year = Rs 20,000/0.10 = Rs 2,00,000

Sales in current year = 1.20 × Rs 2,00,000 = Rs 2,40,000.

On the basis of other common-size percentages (given), the figures of cost of goods sold, gross profit, operating expenses, and so on, have been determined.

**PS 2.7**

Selected statistics for Best Ltd for 3 years are given below.

	Year 1	Year 2	Year 3
Gross profit (per cent)	36	33.33	30
Stock turnover (times)	20	25	14
Average stock (Rs)	38,400	36,000	70,000
Average debtors (Rs)	87,500	1,68,750	2,00,000
Income tax rate	50	50	50
Net income after tax as per cent of sales	6	7	12
Maximum credit period allowed to customers (days)	60	60	30

You are required to:

- prepare a statement of profits in comparative form of all the 3 years; and
- evaluate the position of the company regarding profitability and liquidity on the basis of information supplied to you.
- What additional information will you require to evaluate fully the position of the company on the liquidity front?

**Solution**(i) *Statement of profit of Best Ltd, for the years 1-3*

Particulars	Year 1	Year 2	Year 3
Sales	Rs 12,00,000	Rs 13,50,000	Rs 14,00,000
Less cost of goods sold	7,68,000	9,00,000	9,80,000
Gross profit	4,32,000	4,50,000	4,20,000
Less operating expenses	2,88,000	2,61,000	84,000
Profit before taxes	1,44,000	1,89,000	3,36,000
Less taxes	72,000	94,500	1,68,000
Net profit	72,000	94,500	1,68,000

**Working notes** (for year 3)

Cost of goods sold = Stock turnover  $\times$  Average stock

$$\text{Rs } 9,80,000 = 14 \times \text{Rs } 70,000 = (\text{Rs } 9,80,000 \times 100)/70 = \text{Rs } 14,00,000$$

$$\text{Net income} = 0.12 \times \text{Rs } 14,00,000 = \text{Rs } 1,68,000$$

Net income before tax would be 24 per cent of sales, as income tax rate is 50 per cent, that is  $= 0.24 \times \text{Rs } 14,00,000 = \text{Rs } 3,36,000$ .

Likewise, the figures for year 1 and year 2 have been determined.

(ii) The firm's profitability is consistently improving. Its liquidity position, judged in terms of debtors and stock turnover ratios, can be said to be very satisfactory - the stock turnover ratio being as high as 20 times. The debtors ratios for 3 consecutive years are also very high.

$$\begin{array}{lll} \text{For year 1} = \text{Rs } 12,00,000 \div \text{Rs } 87,500 = 13.7 \text{ times} \\ 2 \quad 13,50,000 \quad 1,68,750 = 8 \\ 3 \quad 14,00,000 \quad 2,00,000 = 7 \end{array}$$

(iii) The amounts of current liabilities and current assets, other than debtors and stock, are required to evaluate the position of the company on the liquidity front.

**PS 2.8**

The following is the summary of the financial ratios of a company relating to its liquidity position:

	Year 1	Year 2	Year 3
Current ratio	2	2.13	2.28
Acid test ratio	1.20	1.10	0.90
Debtors turnover	10	8	7
Stock turnover	6	5	4

The current ratio is increasing, while the acid-test ratio is decreasing. Explain the contributing factor(s) for this apparently divergent trend.

**Solution**

The contributing factor for the divergent trend is the accumulation of stocks with the company over the years. It is clearly manifested in the stock turnover ratio, which has come down from 6 times in year 1 to 4 times in year 3.

**PS 2.9**

The information below is taken from the records of two companies in the same industry. The companies are X Ltd and Y Ltd; and the data is as follows:

	<i>X Ltd</i>	<i>Y Ltd</i>
Cash	Rs 2,10,000	Rs 3,20,000
Debtors	3,30,000	6,30,000
Stock	12,30,000	9,50,000
Plant and equipment	16,95,000	24,00,000
Total assets	34,65,000	43,00,000
Sundry creditors	9,00,000	10,50,000
8% Debentures	5,00,000	10,00,000
Equity share capital	11,00,000	17,50,000
Retained earnings	9,65,000	5,00,000
Total liabilities	34,65,000	43,00,000
Sales	56,00,000	82,00,000
Cost of goods sold	40,00,000	64,80,000
Other operating expenses	8,00,000	8,60,000
Interest expenses	40,000	80,000
Income taxes	2,66,000	2,73,000
Dividends	1,00,000	1,80,000

Answer each of the following questions by making a comparison of one, or more, relevant ratios.

- Which company is using the equity shareholders' money more profitably?
- Which company is better able to meet its current debts?
- If you were to purchase the debentures of one company, which company's debentures would you buy?
- Which company collects its receivables faster, assuming all sales to be credit sales?
- Which company is extended credit for a longer period by the creditors, assuming all purchases (equivalent to cost of goods sold) to be credit purchases?
- How long does it take each company to convert an investment in stock to cash?
- Which company retains the larger proportion of income in the business?

***Solution***

- (i) *Rate of return (ROR) on shareholders' funds*

$$= (\text{Rs } 4,94,000^*/\text{Rs } 20,65,000^{**}) \times 100 = 23.9 \text{ per cent (X Ltd)}$$

$$= (\text{Rs } 5,07,000^{**}/\text{Rs } 22,50,000) \times 100 = 22.5 \text{ per cent (Y Ltd)}$$

X Ltd is using the shareholders' money more profitably.

- (ii) (a) *Current ratio* = Rs 17,70,000/Rs 9,00,000 = 1.97 (X), Rs 19,00,000/ Rs 10,50,000 = 1.81 (Y)

(b) *Acid test ratio* = Rs 5,40,000/Rs 9,00,000 = 0.6 (X), Rs 9,50,000/ Rs 10,50,000 = 0.9 (Y)

Y Ltd is better able to meet its current debts.

- (iii) (a) *Debt-equity ratio* = Rs 14,00,000/Rs 20,65,000 = 0.68 (X), Rs 20,50,000/ Rs 22,50,000 = 0.91 (Y)

(b) *Interest coverage ratio* = Rs 8,00,000/Rs 40,000 = 20 times (X), Rs 8,60,000/ Rs 80,000 = 10.75 times (Y)

The debentures of X Ltd should be bought.

(Contd.)

**Solution (Contd.)**

- (iv) *Debtors collection period* =  $(360 \times \text{Rs } 3,30,000) / \text{Rs } 56,00,000 = 21$  days (X Ltd),  $(360 \times \text{Rs } 6,30,000) / \text{Rs } 82,00,000 = 28$  days (Y Ltd)

X Ltd collects its receivables faster.

- (v) *Creditors payment period* =  $(360 \times \text{Rs } 9,00,000) / \text{Rs } 40,00,000 = 81$  days (X Ltd),  $(360 \times \text{Rs } 10,50,000) / \text{Rs } 64,80,000 = 58$  days (Y Ltd)

X Ltd is extended credit for a longer period by the creditors.

- (vi) *Stock turnover ratio* =  $\text{Rs } 40,00,000 / \text{Rs } 12,30,000 = 3.25$  times (X),  $\text{Rs } 64,80,000 / \text{Rs } 9,50,000 = 6.82$  times (Y)

=  $360 \text{ days} / 3.25 = 111$  days (X),  $360 \text{ days} / 6.82 = 53$  days (Y)

Length of time required for conversion of investment in stock to cash:

$111 \text{ days} + 21 \text{ days} = 132$  days (X)

$53 \text{ days} + 28 \text{ days} = 81$  days (Y)

- (vii) *Dividend payout ratio* =  $\text{Rs } 1,00,000 / \text{Rs } 4,94,000 = 20.2$  per cent (X),  $\text{Rs } 1,80,000 / \text{Rs } 5,07,000 = 35.5$  per cent (Y)

Retention ratio =  $100 - 20.2 = 79.8$  per cent (X),  $100 - 35.5 = 64.5$  per cent (Y)

X Ltd retains the larger proportion of its income in the business

\* Rs 56,00,000 – Rs 51,06,000

\*\* Rs 82,00,000 – Rs 76,93,000

**PS 2.10**

From the following information, prepare a summarised balance sheet as on March 31.

(i) Working capital	Rs 1,20,000
(ii) Reserves and surplus	80,000
(iii) Bank overdraft	20,000
(iv) Assets (fixed) to Proprietary ratio	0.75
(v) Current ratio	2.5
(vi) Liquidity ratio	1.5

**Solution***Summarised balance sheet as on 31 March*

Liabilities	Amount	Assets	Amount
Share capital	Rs 4,00,000	Fixed assets	Rs 3,60,000
Reserves and surplus	80,000	Stock	80,000
Bank overdraft	20,000	Current assets (other than stock)	1,20,000
Sundry creditors	60,000		
	<u>5,60,000</u>		<u>5,60,000</u>

**Working notes**

1.  $CA - CL = WC$  (Rs 1,20,000)

$CA - 2.5CL = 0$

or  $1.5 CL = \text{Rs } 1,20,000$  or  $CL = \text{Rs } 80,000$

- CL – Bank overdraft, Rs 20,000 = Other current liabilities, Rs 60,000 (assumed to be creditors)  
 CA = Rs 2,00,000 (Rs 80,000  $\times$  2.5 CL)
2. Liquid assets (LA) – 1.5 CL = 0  
 or LA = Rs 80,000  $\times$  1.5 = Rs 1,20,000  
 Stock = CA – LA = Rs 2,00,000 – Rs 1,20,000 = Rs 80,000
3. Fixed assets (FA)/Proprietary funds = 0.75. In other words, net CA (WC) to proprietary funds = 0.25  
 or Rs 1,20,000/Proprietary funds (PF) = 0.25 or Rs 4,80,000 = PF  
 Capital = PF – Reserves and surplus = Rs 4,80,000 – Rs 80,000 = Rs 4,00,000
4. Fixed assets/Rs 4,80,000 = 0.75  
 Fixed assets = 0.75  $\times$  Rs 4,80,000 = Rs 3,60,000

### PS 2.11

Using the following data, complete the balance sheet given below.

Gross profit (0.20 $\times$ sales)	Rs 60,000
Shareholders' equity	50,000
Credit sales to total assets	0.80
Total assets turnover(times)	3
Inventory turnover to cost of sales (times)	8
Average collection period (360-day year) (days)	18
Current ratio	1.6
Long-term debt to equity	0.40

#### Balance sheet

Creditors	.....	Cash	.....
Long-term debt	.....	Debtors	.....
Shareholders' equity	.....	Fixed assets	.....
	.....		.....

### Solution

#### Balance sheet as on...

Creditors	Rs 30,000	Cash	Rs 6,000
Long-term debts	20,000	Debtors	12,000
Shareholders' equity	50,000	Inventory	30,000
		Fixed assets	52,000
	<u>1,00,000</u>		<u>1,00,000</u>

### Working notes

- Gross profit ratio = (Gross profit/sales)  $\times$  100  
 Sales = Rs 60,000/0.20 = Rs 3,00,000  
 Credit sales = 0.80  $\times$  Rs 3,00,000 = Rs 2,40,000  
 Cost of sales = Rs 3,00,000 – Rs 60,000 = Rs 2,40,000
- Inventory turnover ratio = Cost of goods sold/Inventory = 8; Inventory = Rs 2,40,000/8 = Rs 30,000
- Debtors turnover ratio = Credit sales/Debtors = 360 days/Average collection period = 360 days/18 days = 20 times; Debtors = Rs 2,40,000/20 = Rs 12,000
- Total assets turnover = Sales/Total assets = 3 = Rs 3,00,000/3 = Rs 1,00,000, total assets = total liabilities = Rs 1,00,000

- 5 Debt-equity ratio = 0.40  
 Long-term debt =  $0.40 \times \text{Rs } 50,000 = \text{Rs } 20,000$
- 6 Creditors = (Total liabilities – Equity – Long-term debt) = (Rs 1,00,000 – Rs 50,000 – Rs 20,000)  
 = Rs 30,000
- 7 Current ratio = CA/CL (creditors)  
 $1.6 = \text{CA}/\text{Rs } 30,000 = \text{Rs } 48,000 \text{ (CA)}$
- 8 Fixed assets = Rs 1,00,000 – Rs 48,000 = Rs 52,000
- 9 Cash = CA – Inventory – Debtors = Rs 48,000 – Rs 30,000 – Rs 12,000 = Rs 6,000

### PS 2.12

Develop a proforma income statement for the month of July, August and September for AB Ltd from the following information:

- Sales are projected at Rs 2,25,000, Rs 2,40,000 and Rs 2,15,000 for July, August and September respectively.
- Cost of goods sold is Rs 50,000 plus 30 per cent of selling price per month.
- Selling expenses are 3 per cent of sales.
- Rent is Rs per 7,500 month, administrative expenses for July are expected to be Rs 60,000, and are expected to rise by 1 per cent per month over the previous month's expenses.
- The company has Rs 3,00,000 of 8 per cent loan, interest payable monthly.
- Corporate tax rate is 35 per cent.

### Solution

*Proforma income statement for the month of July, August and September*

Particulars	July	August	September
Sales	Rs 2,25,000	Rs 2,40,000	Rs 2,15,000
Less cost of goods sold	1,17,500	1,22,000	1,14,500
Gross profit	1,07,500	1,18,000	1,00,500
Less operating expenses			
Selling expenses	6,750	7,200	6,450
Rent	7,500	7,500	7,500
Administrative expenses	60,000	60,600	61,206
Operating profit (EBIT)	33,250	42,700	25,344
Less interest	2,000	2,000	2,000
Profit before tax	31,250	40,700	23,344
Less tax (0.35)	10,938	14,245	8,170
Profit after tax	20,312	26,455	15,174

### Working notes

1. *Determination of cost of goods sold*

	July	August	September
Fixed cost	Rs 50,000	Rs 50,000	Rs 50,000
Add 30 percent of selling price	67,500	72,000	64,500
	1,17,500	1,22,000	1,14,500



## 2. Administrative expenses

July	= Rs 60,000
August	= Rs 60,000 + $[0.01 \times \text{Rs } 60,000]$ = Rs 60,600
September	= Rs 60,600 + $[0.01 \times \text{Rs } 60,600]$ = Rs 61,206

**PS 2.13**

Given below are the summarised income statement and balance sheet of PQR Ltd.

*Income statement for the current year ended on March 31 (Rs in thousand)*

Sales	1,600
Less cost of goods sold	1,310
Gross margin	290
Less selling and administrative expenses	40
Net operating income (EBIT)	250
Less interest expense	45
Earnings before tax	205
Tax paid	82
Net income after tax	123

Earnings per share (EPS), Rs 3.07

*Balance sheet as on March 31 (Rs in thousand)*

<i>Liabilities</i>		<i>Assets</i>	
Paid-up capital (40,000 shares of Rs 10 each fully paid)	400	Net fixed assets	800
Retained earnings	120	Inventory	400
Debentures	700	Debtors	175
Creditors	180	Marketable securities	75
Bills payable	20	Cash	50
Other current liabilities	80		
Total	1,500	Total	1,500

Price per share, Rs 15

Industry's average ratios are:

Current ratio	2.4
Quick ratio	1.5
Sales to inventory	8
Average collection period (days)	36
Price per share/book value of the share	1.6
Debt to assets ratio	0.4
Time interest earned	6
Profit margin	0.07
Price to earnings ratio	15
Return to total assets	0.11

- PQR Ltd would like to borrow Rs 5,00,000 from a bank for less than a year. Evaluate the firm's current financial position by calculating ratios that you feel would be useful for the bank's evaluation.
- What are problem areas suggested by your ratio analysis? What are the possible reasons for them?
- Do you think the bank should grant the loan?
- If PQR Ltd's inventory utilisation ratio (sales to inventory) and average collection period were reduced to industry average, what amount of funds would be generated?

**Solution**

(i) The relevant ratios for the banks' evaluation are current ratio, quick ratio, average collection period and inventory turnover ratios, EBIT/Interest ratio and debts to assets ratio.

The relevant ratios of the PQR *vis-a-vis* industry are:

Ratio	PQR's	Industry
(a) Current ratio	2.5	2.4
(b) Quick ratio	1.07	1.5
(c) Sales to inventory	4	8
(d) Average collection period (days)	40	36
(e) Debt to assets ratio	0.467	0.4
(f) Times interest earned	5.56	6

(ii) PQR's position both in terms of liquidity ratios (a to d), and solvency ratios (e to f) is almost at par with industry average. Its ratios *per se* are also very satisfactory inasmuch as current ratio is more than the desired norm of 2; quick ratio is also slightly more than the desired norm of 1. More than half of the total assets are financed out of owned funds, signifying satisfactory level of debt financing.

The major problem area suggested by the analysis is low inventory turnover, only 4 times compared to the industry average of 8. There is accumulation of stock with the company presumably due to holding of obsolete/unsaleable goods.

(iii) The bank should grant the loan to the company because (a) its current and quick ratios are very satisfactory, (b) its interest coverage ratio is almost at par with industry average and the company is not likely to face any difficulty in meeting the interest liability; (c) its debt-equity ratio is not high. However, the bank should probe deep about the causes of high investment in inventory.

(iv) *Amount of funds generated (Amount in thousand of rupees)*

	Investment on the basis of industry average	Current investment	Funds generated [Col. (3) – (2)]
1	2	3	4
(A) Sales to inventory (Industry ratio 8)	200*	400	200
(B) Investment (average daily sales × industry average collection period)	158.4**	175	16.6
	358.4	575	216.6

\*1,600/8 = 200; \*\*4.4 × 36 = 158.4

**PS 2.14**

Using the information and the form given below, compute the balance sheet items for a firm having a sale of Rs 36 lakh.

Sales/Total assets	3
Sales/Fixed assets	5
Sales/Current assets	7.5
Sales/Inventories	20
Sales/Debtors	15
Current ratio	2
Total assets/Net worth	2.5
Debt/Equity	1

(Contd.)

**PS 2.14 (Contd.)***Balance sheet*

<i>Liabilities</i>	<i>Amount</i>	<i>Assets</i>	<i>Amount</i>
Net worth	.....	Fixed assets	.....
Long-term debt	.....	Total current assets:	
Current liabilities	.....	Inventories	
		Debtors	
		Liquid assets	.....
Total	.....	Total	.....

**Solution***Balance sheet as on .....*

<i>Liabilities</i>	<i>Amount</i>	<i>Assets</i>	<i>Amount</i>
Net worth	Rs 4,80,000	Fixed assets	Rs 7,20,000
Long-term debt	4,80,000	Total current assets	
Current liabilities	2,40,000	Inventories	Rs 1,80,000
		Debtors	2,40,000
		Liquid assets	60,000
Total	12,00,000	Total	12,00,000

**Working notes**

- 1 Sales/Total assets = 3 or Total assets = Rs 36 lakh/3 = Rs 12 lakh
- 2 Sales/Fixed assets = 5 or Fixed assets = Rs 36 lakh/5 = Rs 7.2 lakh
- 3 Sales/CA = 7.5 or CA = Rs 36 lakh/7.5 = Rs 4.8 lakh
- 4 Sales/Inventories = 20 or Inventories = Rs 36 lakh/20 = Rs 1.8 lakh
- 5 Sales/Debtors = 15 or Debtors = Rs 36 lakh/15 = Rs 2.4 lakh
- 6 CA/CL = 2 or CL = Rs 4.8 lakh/2 = Rs 2.4 lakh
- 7 Total assets/Net worth (NW) = 2.5 or NW = Rs 12 lakh/2.5 = Rs 4.8 lakh
- 8 Debt/Equity (NW) = 1 or Debt = NW = Rs 4.8 lakh
- 9 Liquid assets = (Rs 4,80,000 – Rs 4,20,000) = Rs 60,000.

**PS 2.15**

The following information was taken from the financial statements of XYZ Ltd (*amount in thousand of rupees*)

<i>Particulars</i>	<i>Year 1</i>	<i>Year 2</i>	<i>Year 3</i>
Total assets	750	850	860
Credit sales	420	520	550
Cost of goods sold	450	595	645
Cash	50	60	55
Debtors	150	165	180
Inventory	130	160	170
Net fixed assets	120	260	250
Creditors	75	85	100
Short-term debt	125	175	170
Long-term debt	125	185	175
Equity	125	200	210

Calculate those ratios which indicate the efficient use of assets and discuss potential sources of trouble.

### ***Solution***

The efficient use of assets is indicated by the following key ratios: (a) Current assets turnover, (b) Debtors' turnover, (c) Inventory turnover, (d) Fixed assets turnover, and (e) Total assets turnover.

#### *Computation of ratios*

	<i>Year 1</i>	<i>Year 2</i>	<i>Year 3</i>
(a) Current assets turnover ratio (cost of goods sold ÷ total current assets)	1.36	1.55	1.59
(b) Debtors' turnover (credit sales ÷ average debtors)	2.8*	3.30	3.19
(c) Inventory turnover (cost of goods sold ÷ average inventory)	3.46*	4.10	3.91
(d) Fixed assets turnover (cost of goods sold ÷ fixed assets)	3.75	2.29	2.58
(e) Total assets turnover (cost of goods sold ÷ total assets)	1.00	0.92	0.98

\*Based on debtors and inventory at the end, as their opening balances are not available.

**Comments:** The first three ratios indicate the efficiency of current assets usage, and the latter two, namely, fixed assets turnover and total assets turnover ratio, show the efficacy of utilisation of these. Current assets utilisation appears to be very satisfactory as reflected in the first three types of ratios. No major change is noticeable in their values over a period of time, which is presumably indicative of consistency in debtors collection period and inventory turnover. There does not seem to be any significant problem regarding utilisation of current assets.

However, it appears that fixed assets are not being fully utilised. Investments in fixed assets have more than doubled during years 2 and 3. The fixed assets turnover ratio has sharply fallen to 2.58 in year 3 from 3.75 in year 1. Thus, investments in fixed assets are either excessive, or the capacity of the additional plant is under-utilised. This is corroborated by the fact that sales in the latter 2 years have increased by around 15 per cent. Therefore, the remedy lies in utilising the plant capacity by increasing production and sales.

### **PS 2.16**

Given the following information for ABC Ltd at the end of the current year, determine (i) balances for the income statement and (ii) the balance sheet.

Net sales	Rs 1,00,000
Debtors' turnover ratio (based on net sales)	2
Inventory turnover ratio	1.25
Fixed assets turnover ratio	0.8
Debt assets ratio	0.6
Net profit margin	0.065
Gross profit margin	0.250
Return on investment	0.025

#### *Income statement for the year ending on March 31*

Sales	Rs 1,00,000
Cost of goods sold	...
Gross profit	...
Other expenses	...
Earnings before tax	...
Taxes (0.35)	...
Earnings after tax	...

(Contd.)

**PS 2.17 (Contd.)***Balance sheet as on March 31*

<i>Liabilities</i>	<i>Amount</i>	<i>Assets</i>	<i>Amount</i>
Equity	...	Net fixed assets	...
Long-term debt	...	Inventory	...
Short-term debt	Rs 50,000	Debtors	...
		Cash	...
Total	...	Total	...

**Solution***(i) Income statement for the current year ending March 31*

Sales	Rs 1,00,000
Cost of goods sold (0.75 or 1.00 – 0.25, gross profit margin)	75,000
Gross profit	25,000
Other expenses	15,000 *
Earnings before tax	10,000
Taxes (0.35)	3,500
Earnings after tax	6,500 *

**Working notes**

\*Earnings after tax = Net profit margin (0.065 × Rs 1,00,000) = Rs 6,500. Hence, earnings before tax must be Rs 6,500 ÷ (1 – tax factor) = Rs 6,500 ÷ 0.65 = Rs 10,000. Therefore, other expenses would be = Rs 15,000 (Gross profit, Rs 25,000 – Earnings before tax, Rs 10,000).

*(ii) Balance sheet as on March 31*

<i>Liabilities</i>	<i>Amount</i>	<i>Assets</i>	<i>Amount</i>
Equity	Rs 1,00,000	Net fixed assets	Rs 93,750
Long-term debt	1,00,000	Inventory	60,000
Short-term debt	50,000	Debtors	50,000
		Cash (balancing figure)	46,250
	2,50,000		2,50,000

**Working notes**

- Debtors = Net sales/Debtors' turnover ratio = Rs 1,00,000/2 = Rs 50,000.
- Inventory = Cost of goods sold/Inventory turnover ratio = Rs 75,000/1.25 = Rs 60,000.
- Net fixed assets (based on cost of goods sold) = Cost of goods sold/Fixed assets turnover = Rs 75,000/0.8 = Rs 93,750.
- Return on investment = [Net profit after taxes/Total investment (assets)] × 100  
Total investment = (Rs 6,250/2.5) × 100 = Rs 2,50,000.
- Debt/Asset ratio = 0.6, Debt = 0.6 × Rs 2,50,000 = Rs 1,50,000.
- Total investment – Total debt = Equity = Rs 2,50,000 – Rs 1,50,000 = Rs 1,00,000.
- Long-term debt = Total debt – Short-term debt = Rs 1,50,000 – Rs 50,000 = Rs 1,00,000.

**PS 2.17**

You have been supplied data for Royal Plastic Company Ltd and its industry averages. (i) Determine the indicated ratios for the company; (ii) Indicate its strengths and weaknesses in terms of liquidity, solvency and profitability as revealed by your analysis.

*Balance sheet as on March 31*

<i>Liabilities</i>		<i>Assets</i>	
Equity share capital	Rs 1,00,000	Plant and equipment	Rs 1,51,000
10% Preference share capital	40,000	Cash	12,300
Retained earnings	27,400	Debtors	36,000
Long-term debt	34,000	Stock	60,800
Sundry creditors	31,500		
Outstanding expenses	1,200		
Other current liabilities	26,000		
	<u>2,60,100</u>		<u>2,60,100</u>

*Statement of profit for the year ending March 31*

Sales (net)		Rs 2,25,000
Less: cost of goods sold	Rs 1,52,500	
selling expenses	29,500	
administrative expenses	14,800	
research and development	6,500	
interest	<u>2,900</u>	
Earnings before taxes		<u>18,800</u>
Less income taxes (0.35)		<u>6,580</u>
Net income		<u>12,220</u>
Dividends paid to equityholders		<u>5,000</u>

*Financial ratios of industry*

(a) Current ratio	2.2
(b) Stock turnover (times)	2.8
(c) Collection period (days)	56
(d) Total debt/Shareholders' equity	0.45
(e) Fixed charge coverage before tax (times)	10
(f) Turnover of assets (times)	1.35
(g) Income before tax/Sales	0.119
(h) Rate of return on equity funds	0.15

***Solution***

- (i) (a) Current ratio = Rs 1,09,100/Rs 58,700 = 1.86  
 (b) Stock turnover = Rs 1,52,500/Rs 60,800 = 2.51 times  
 (c) Collection period =  $(360 \times \text{Rs } 36,000) / \text{Rs } 2,25,000 = 58$  days  
 (d) Total debt/Shareholders' equity =  $(\text{Rs } 92,700 / \text{Rs } 1,67,400) \times 100 = 55$  per cent.  
 (e) Fixed charge cover before tax =  $\text{EBIT} / \text{Interest} + \text{Dividend on preference shares} = \text{Rs } 21,700 / \text{Rs } 6,900 = 3.14$  times.  
 (f) Turnover of assets =  $\text{Rs } 1,52,500 / \text{Rs } 2,60,100 = 0.59$  times  
 (g) Income before tax/Sales =  $(\text{Rs } 18,800 / \text{Rs } 2,25,100) \times 100 = 8.36$  per cent.  
 (h) Rate of return on shareholders' equity =  $(\text{Rs } 12,220 / \text{Rs } 1,27,400) \times 100 = 9.6$  per cent.

(ii)

<i>Financial ratios</i>	<i>Industry</i>	<i>Company</i>
(a) Current ratio	2.2	1.86
(b) Stock turnover (times)	2.8	2.51
(c) Collection period (days)	56	58
(d) Total debt/Shareholders' equity	0.45	0.55
(e) Fixed charge coverage before tax (times)	10	3.14
(f) Turnover assets (times)	1.35	0.59
(g) Income before tax/Sales	0.119	0.0836
(h) Rate of return on equity funds	0.15	0.096

The financial position of Royal Plastics Ltd *vis-a-vis* industry is weaker both in terms of profitability and solvency. It is indicated by lower profitability ratios (g and h). The higher debt-equity ratio and lower fixed charge coverage before tax are indicative of weakness from the point of view of its solvency. Its liquidity position also does not seem to be very satisfactory. The acid test ratio is likely to be much below one as stock turnover ratio is very low.

### PS 2.18

Given below are the selected ratios for two companies, A and B, in the same industry, along with industry average:

<i>Ratio</i>	<i>A</i>	<i>B</i>	<i>Industry</i>
Current ratio (%)	221	561	241
Acid test ratio (%)	121	301	131
Debt to assets ratio (%)	36	5	35
Operating expenses ratio (%)	18	17.5	20
Number of times interest paid	6	12	5
Stock turnover	8.5	6.5	7
Debtors turnover	11	15	11.4
Rate of return on total assets (%)	17	10	13

Can we say, on the basis of the above ratios and information, that B is better than company A because its ratios are better in six out of eight areas (all except stock turnover and rate of return on total assets)? Company B is also better than the industry average in the same six categories.

### Solution

B need not necessarily be better than A only because its ratios are better in six out of eight areas for the following reasons:

- Profitability ratios of A are better than those of B. In fact, the rate of return on total assets of B is lower than that of the industry.
- Liquidity ratios of B cannot be considered to be better than those of A, merely on the ground that they are very high. In fact, these ratios reflect the excessive investment of the former in current assets, depressing its rate of return. After all, working capital investment involves cost. This is true particularly in the case of stock. Low stock turnover ratio reflects excessive investment in stock.
- Low debt-asset ratio and, consequently, higher interest coverage ratio may be indicative of B not availing of debt for enhancing the rate of return to the equityholders.
- Higher debtors' turnover ratio of B may be indicative of its rigorous credit sales as well as rigorous credit collection policy leading to low credit sales, eventually leading to low profits. The low operating ratio certainly goes to the credit of B.

**PS 2.19**

Given below are selected ratios (percentages) for three years ending March 31 for Worst Ltd.

<i>Ratio</i>	<i>Year 1</i>	<i>Year 2</i>	<i>Year 3</i>
Current ratio	200	500	150
Acid test ratio	110	320	80
Debt-equity ratio	15	40	55
Operating expenses ratio	24	25	32
Number of times interest earned	6	6	(1)
Stock turnover (times)	5	4	3
Debtors' turnover (times)	12	10	6
Rate of return on total assets	15	10	5

Outline the possible explanations for the drastic changes in some of the ratios from year 1 to year 2 and 2 to 3.

**Solution**

The company has made additional borrowings through the issue of debentures or by taking long-term loans in year 2, entailing an increase in the debt-equity ratio from 15 to 40 per cent in year 2. The amounts so obtained could have been invested either in stock, or remained in the form of idle cash balance with the company. This is likely to have resulted in higher current ratio, higher acid-test ratio, higher debt-equity ratio and low stock turnover. As a possible consequence, the rate of return on total assets has declined from 15 in year 1 to 10 per cent in year 2.

In year 3, the situation appears to have become worse. The reasons may be: (a) high operating expenses ratio not being matched by increase in sales price; (b) excessive interest cost due to large amount of borrowings; (c) higher inventory cost; (d) liberal grant of credit, as revealed by lower debtors' turnover ratio, resulting in bad debts.

**PS 2.20**

From the following details, prepare a statement of proprietary funds with as many details as possible.

(a) Stock velocity	6
(b) Capital turnover ratio	2
(c) Fixed assets turnover ratio	4
(d) Gross profit turnover ratio	0.20
(e) Debtor velocity (months)	2
(f) Creditors velocity (days)	73

The gross profit was Rs 60,000; reserves and surplus amounted to Rs 20,000; closing stock was Rs 5,000 in excess of opening stock.

**Solution***Statement of proprietary funds*

<i>Fixed assets</i>		Rs 60,000
<i>Net working capital:</i>		
<i>Current assets:</i>		
Stock	Rs 42,500	
Debtors	50,000	
Cash	16,500	
	<u>1,09,000</u>	

(Contd.)



**Solution (Contd.)**

Less Current liabilities	49,000	60,000
Proprietary funds		1,20,000
Share capital		1,00,000
Reserves and surplus		20,000

**Working notes**

$0.20 = (\text{Gross profit}/\text{Sales}) \times 100 = \text{Sales} = (\text{Rs } 60,000 \times 100)/20 = \text{Rs } 3,00,000$

$\text{Cost of goods sold} = \text{Sales} - \text{Gross profit} = \text{Rs } 3,00,000 - 60,000 = \text{Rs } 2,40,000$

$\text{Average stock} = \text{Rs } 2,40,000/6 = \text{Rs } 40,000$

$\text{Opening stock} + \text{Closing stock} = \text{Rs } 80,000$

$\text{Closing stock} - \text{Opening stock} = \text{Rs } 5,000$

$\text{Closing stock} = \text{Rs } 42,500$

$\text{Debtors} = \text{Rs } 3,00,000/6((12 \div 2 \text{ months})) = \text{Rs } 50,000$

$\text{Fixed assets} = \text{Rs } 2,40,000 \div 4 = \text{Rs } 60,000$

$\text{Creditors} = \text{Credit purchases}/\text{Creditors turnover} = \text{Rs } 2,45,000/5 = \text{Rs } 49,000$

$\text{Capital} = \text{Rs } 2,40,000 \div 2 = \text{Rs } 1,20,000$

$\text{Reserves and surplus} = \text{Rs } 20,000$

$\text{Share capital} = \text{Rs } 1,00,000 (\text{Rs } 1,20,000 - \text{Rs } 20,000)$

$\text{Net working capital} = \text{Rs } 1,20,000 - \text{Rs } 60,000 = \text{Rs } 60,000$

$\text{Stock} + \text{Debtors} + \text{Cash} - \text{Creditors} = \text{Rs } 60,000$

$\text{Rs } 42,500 + \text{Rs } 50,000 + \text{Cash} - \text{Rs } 49,000 = \text{Rs } 60,000$

$\text{Cash} = \text{Rs } 16,500$

**PS 2.21**

Hypothetical Industries Ltd (HIL) has submitted the following projections. (Rs lakh) You are required to determine yearly debt service coverage ratio (DSCR) and the average DSCR and comment.

Year	EAT	Interest on loan	Repayment of term loan
1	20	19	11
2	35	17	18
3	40	15	18
4	20	12	18
5	18	10	18
6	18	7	8
7	16	5	8
8	16	2	8

The net profit (EAT) has been arrived at after charging depreciation of Rs 20 lakh every year.

**Solution***Determination of debt service coverage ratio (amount in lakh of rupees)*

Year	EAT	Depreciation	Interest	Cash available (Col. 2 + 3 + 4)	Principal instalment	Debt obligations	DSCR (Col. 5 ÷ Col. 7)
1	2	3	4	5	6	7	8
1	20	20	19	59	11	30	1.97
2	35	20	17	72	18	35	2.06
3	40	20	15	75	18	33	2.27
4	20	20	12	52	18	30	1.73
5	18	20	10	48	18	28	1.71
6	18	20	7	45	8	15	3.00
7	16	20	5	41	8	13	3.15
8	16	20	2	38	8	10	3.80
Average DSCR ( $\Sigma \text{DSCR}/8$ ) = 19.69/8 =							2.46

**Comment:** The DSCR of HIL is very satisfactory.**PS 2.22**

The following is the balance sheet of Bharat Industries Ltd as on March 31 of the current year with the corresponding figures of previous year.

	Current year	Previous year
<b>Assets</b>		
Fixed assets:		
Land and building less depreciation	Rs 3,70,000	Rs 3,94,000
Plant and machinery less depreciation	50,000	29,680
Current assets:		
Stock in trade	2,20,000	1,52,500
Sundry debtors	1,66,000	1,56,000
Bills receivable	34,000	18,500
Advance payments to contractors	10,000	2,600
Cash with bank	20,000	10,000
	<u>8,70,000</u>	<u>7,63,280</u>
<b>Liabilities</b>		
Issued share capital (3,500 equity shares of Rs 100 each)	3,50,000	3,50,000
Reserves and surplus:		
General reserve	1,74,000	1,10,000
P & L A/c	80,000	70,000
Secured loans from banks		
Current liabilities:		
Sundry creditors	1,90,000	1,87,280
Bills payable	60,000	46,000
	<u>8,70,000</u>	<u>7,63,280</u>

You are required to prepare a schedule showing the following:

- Item-wise change in working capital and
- Liquidity and proprietary ratios.

**Solution***(i) Schedule of changes in working capital*

	<i>Previous year</i>	<i>Current year</i>	<i>Increase</i>	<i>Decrease</i>
<b>Current assets:</b>				
Stock	Rs 1,52,500	Rs 2,20,000	Rs 67,500	
Debtors	1,56,000	1,66,000	10,000	
Bills receivable	18,500	34,000	15,500	
Advance payment to contractors	2,600	10,000	7,400	
Cash with bank	10,000	20,000	10,000	
	<u>3,39,600</u>	<u>4,50,000</u>		
<b>Current liabilities:</b>				
Creditors	1,87,280	1,90,000		Rs 2,720
Bills payable	46,000	60,000		14,000
	<u>2,33,280</u>	<u>2,50,000</u>		
<b>Net working capital</b>	<u>1,06,320</u>	<u>2,00,000</u>	<u>1,10,400</u>	<u>16,720</u>
<b>Increase</b>	<u>93,680</u>	<u>2,00,000</u>	<u>1,10,400</u>	<u>93,680</u>
	<u>2,00,000</u>	<u>2,00,000</u>	<u>1,10,400</u>	<u>1,10,400</u>

*(ii) Liquidity ratios*

	<i>Previous year</i>	<i>Current year</i>
CR = $\frac{\text{Rs } 3,39,600}{\text{Rs } 2,33,280} = 1.46$		$\frac{\text{Rs } 4,50,000}{\text{Rs } 2,50,000} = 1.80$
ATR = $\frac{\text{Rs } 1,84,500}{\text{Rs } 2,33,280} = 0.79$		$\frac{\text{Rs } 2,20,000}{\text{Rs } 2,50,000} = 0.88$
(iii) <i>Proprietary ratios</i>	$\frac{\text{Rs } 5,30,000}{\text{Rs } 7,63,280} \times 100 = 0.694$	$\frac{\text{Rs } 6,04,000}{\text{Rs } 8,70,000} \times 100 = 0.694$

**PS 2.23**

From the following information of a textile company, complete the proforma balance sheet if its sales are Rs 32,00,000.

Sales to net worth (times)	2.3
Current debt to net worth (%)	42
Total debt to net worth (%)	75
Current ratio (times)	2.9
Net sales to inventory (times)	4.7
Average collection period (days)	64
Fixed assets to net worth (%)	53.2

*Proforma balance sheet*

Net worth	...	Fixed assets	...
Long-term debt	...	Cash	...
Current debt	...	Stock	...
	...	Sundry debtors	...
	...		...

**Solution***Proforma balance sheet of the textile company*

<i>Liabilities</i>	<i>Amount</i>	<i>Assets</i>	<i>Amount</i>
Net worth	Rs 13,91,304	Fixed assets	Rs 7,40,173
Long-term debt	4,59,130	Cash	4,44,869
Current debt	5,84,348	Stock	6,80,851
		Sundry debtors	5,68,889
	<u>24,34,782</u>		<u>24,34,782</u>

**Working notes**

- 1 Net worth = Rs 32,00,000 ÷ 2.3 = Rs 13,91,304
- 2 Current debt = (Rs 13,91,304/100) × 42 = Rs 5,84,348
- 3 Total debt = (Rs 13,91,304/100) × 75 = Rs 10,43,478
- 4 Long-term debt = Rs 10,43,478 – Rs 5,84,348 = Rs 4,59,130
- 5 Fixed assets = (Rs 13,91,304/1,000) × 532 = Rs 7,40,173
- 6 Current assets = Rs 5,84,348 × 2.9 = Rs 16,94,609
- 7 Inventory = Rs 32,00,000 ÷ 4.7 = Rs 6,80,851
- 8 Debtors = (Rs 32,00,000/360) × 64 = Rs 5,68,889
- 9 Cash = Rs 16,94,609 – (Rs 6,80,851 + Rs 5,68,889) = Rs 4,44,869

**PS 2.24**

Given below are summarised accounts of Alok Ltd for the years 1 and 2.

*Balance sheet (Rs in lakh)*

	<i>Year 1</i>	<i>Year 2</i>
<b>Liabilities:</b>		
Share capital	250	250
General reserves	100	172
Debentures	180	150
Term loan	30	30
Creditors	70	56
	<u>630</u>	<u>658</u>
<b>Assets:</b>		
Fixed assets (at cost)	500	500
Less accumulated depreciation	<u>80</u>	<u>115</u>
Net fixed assets	420	385
Cash	55	85
Debtors	65	75
Inventories	90	113
	<u>630</u>	<u>658</u>

*Income statement (Rs in lakh)*

	<i>Year 1</i>	<i>Year 2</i>
Net sales	350	450
Less cost of material	90	113

*(Contd.)*

**PS 2.24 (Contd.)**

Less wages	70	70
Gross profit	190	267
Less selling, general and administrative costs	50	60
Earnings before depreciation, interest and tax	140	207
Less depreciation	30	35
Earnings before interest and tax	110	172
Less interest	25	27
Earnings before tax	85	145
Less tax	15	48
Earnings after tax	70	97
Less dividend	25	25
Retained earnings	45	72

Compute the (i) liquidity, (ii) leverage, (iii) activity and (iv) profitability ratios, and comment.

**Solution**

Ratios	Year 1	Year 2
<b>(i) Liquidity Ratios</b>		
(a) Current ratio (CA ÷ CL)	$= \frac{\text{Rs } 210}{\text{Rs } 70} = 3$	$= \frac{\text{Rs } 273}{\text{Rs } 56} = 4.87$
(b) Acid test ratio (QA ÷ CL)	$= \frac{\text{Rs } 120}{\text{Rs } 70} = 1.71$	$= \frac{\text{Rs } 160}{\text{Rs } 56} = 2.86$
<b>(ii) Leverage Ratios</b>		
(a) Debt-equity ratios		
(1) $\frac{\text{Total debts}}{\text{Equity funds}}$	$= \frac{\text{Rs } 280}{\text{Rs } 350} = 0.80$	$= \frac{\text{Rs } 236}{\text{Rs } 422} = 0.56$
(2) $\frac{\text{Long-term debts}}{\text{Equity funds}}$	$= \frac{\text{Rs } 210}{\text{Rs } 350} = 0.60$	$= \frac{\text{Rs } 180}{\text{Rs } 422} = 0.43$
(b) Interest coverage ratio		
EBIT/Interest charges	$= \frac{\text{Rs } 110}{\text{Rs } 25} = 4.4 \text{ times}$	$= \frac{\text{Rs } 172}{\text{Rs } 27} = 6.4 \text{ times}$
<b>(iii) Activity Ratios</b>		
(a) Debtors' turnover (assuming all sales as credit sales)	$= \frac{\text{Rs } 350}{\text{Rs } 65} = 5.38 \text{ times}$	$= \frac{\text{Rs } 450}{\text{Rs } 75} = 6 \text{ times}$
Credit collection period	67 days	60 days
(b) Stock turnover		
$\frac{\text{Cost of goods sold}}{\text{Average stock}}$	$= \frac{\text{Rs } 160}{\text{Rs } 90} = 1.78 \text{ times}$	$= \frac{\text{Rs } 183}{\text{Rs } 113} = 1.62 \text{ times}$

(Contd.)

**Solution (Contd.)**

(c) Fixed assets turnover		
$\frac{\text{Cost of goods sold}}{\text{Fixed assets}}$	$= \frac{\text{Rs } 160}{\text{Rs } 420} = 0.38 \text{ times}$	$\frac{\text{Rs } 183}{\text{Rs } 385} = 0.48 \text{ times}$
(d) Current assets turnover		
$\frac{\text{Cost of goods sold}}{\text{Current assets}}$	$= \frac{\text{Rs } 160}{\text{Rs } 210} = 0.76 \text{ times}$	$\frac{\text{Rs } 183}{\text{Rs } 273} = 0.67 \text{ times}$
(e) Total assets turnover		
$\frac{\text{Cost of goods sold}}{\text{Total assets}}$	$= \frac{\text{Rs } 160}{\text{Rs } 630} = 0.25 \text{ times}$	$\frac{\text{Rs } 183}{\text{Rs } 658} = 0.28 \text{ times}$
(iv) <i>Profitability Ratios</i>		
(a) Gross profit ratio		
$(\text{Gross profit} \div \text{Sales}) \times 100$	$= \frac{\text{Rs } 190}{\text{Rs } 350} \times 100 = 54.3\%$	$\frac{\text{Rs } 267}{\text{Rs } 450} \times 100 = 59.3\%$
(b) Operating profit ratio		
$(\text{Operating profit} \div \text{Sales}) \times 100$	$= \frac{\text{Rs } 110}{\text{Rs } 350} \times 100 = 31.4\%$	$\frac{\text{Rs } 172}{\text{Rs } 450} \times 100 = 38.2\%$
(c) Net profit ratio		
$(\text{Net profit} \div \text{Sales}) \times 100$	$= \frac{\text{Rs } 70}{\text{Rs } 350} \times 100 = 20\%$	$\frac{\text{Rs } 97}{\text{Rs } 459} \times 100 = 21.5\%$
(d) Return on total assets		
$(\text{Net profit} \div \text{Total assets}) \times 100$	$= \frac{\text{Rs } 95}{\text{Rs } 630} \times 100 = 15.1\%$	$\frac{\text{Rs } 124}{\text{Rs } 658} \times 100 = 18.8\%$
(e) Return on capital employed		
$\frac{\text{Net profit after tax + interest}}{\text{Total capital employed}} \times 100$	$= \frac{\text{Rs } 95}{\text{Rs } 560} \times 100 = 16.9\%$	$\frac{\text{Rs } 124}{\text{Rs } 602} \times 100 = 20.6\%$
(f) Return on owner's funds		
$\frac{\text{Net profit after tax}}{\text{Equity funds}} \times 100$	$= \frac{\text{Rs } 70}{\text{Rs } 350} \times 100 = 20\%$	$\frac{\text{Rs } 97}{\text{Rs } 422} \times 100 = 23\%$

The company's position is quite sound from the point of view of liquidity, solvency and profitability. However, its activity ratios, particularly in terms of utilisation of fixed assets and stock, do not seem to be very satisfactory. The firm has excess liquidity than desired.

**PS 2.25**

The clients of an accounting firm wherein you are employed are concerned about the fall in dividends from a company whose shares they hold as investment. The abridged profit and loss account and balance sheet of the company for 2 years are given as follows:

*Abridged P & L A/c (year ended March 31) (Rs in lakh)*

	<i>Current year</i>	<i>Previous year</i>
<i>Income:</i>		
Sales and other income	19,200	15,500
<i>Expenditure:</i>		
Operating and other expenses	15,600	11,900
Depreciation	700	650
Interest	1,850	1,750
	<u>18,150</u>	<u>14,300</u>
Profit for the year	1,050	1,200
Taxes	500	200
Profit after taxes	550	1,000
Proposed dividend	200	400

*Abridged balance sheet (as on March 31, Rs in lakh)*

	<i>Current year</i>	<i>Previous year</i>
<i>Sources of funds:</i>		
Share capital (of Rs 10 each)	4,200	2,600
Reserves and surplus	7,550	1,200
Convertible portion of 12.5% Debentures	—	500
<i>Loan funds:</i>		
Secured loans (16%)	10,100	8,700
Unsecured loans (15%)	1,000	3,300
Total	<u>22,850</u>	<u>16,300</u>
<i>Application of funds:</i>		
<i>Fixed assets:</i>		
Cost	14,800	11,200
Less depreciation	2,700	2,000
	<u>12,100</u>	<u>9,200</u>
Advances on capital A/c and capital work-in-progress	1,000	200
	<u>13,100</u>	<u>9,400</u>
<i>Current assets, loans and advances:</i>		
Inventories	8,600	7,100
Sundry debtors	1,400	550
Cash and bank balances	850	680
Loans and advances	3,000	1,600
	<u>13,850</u>	<u>9,930</u>
Less: Current liabilities	4,100	3,030
	<u>9,750</u>	<u>6,900</u>
Total	<u>22,850</u>	<u>16,300</u>

You are required to:

- Compute the following: interest cover, return on net worth, earnings per share, dividend cover.
- State whether the shares are to be disposed of or to be retained as investment. Indicate the justification for your opinion.

**Solution**(a) *Abridged P&L A/c (year-ended March 31) (Amount in lakh of rupees)*

Particulars	Current year	Previous year
Sales and other income	19,200	15,500
Less: operating and other expenses	15,600	11,900
depreciation	700	650
Earnings before interest and taxes (EBIT)	2,900	2,950
Less interest	1,850	1,750
Earnings before taxes	1,050	1,200
Less taxes	500	200
Earnings after taxes (EAT)	550	1,000
Proposed dividend ( $D_p$ )	200	400
Interest coverage ratio (EBIT/Interest)	1.57	1.69
Return on net worth (EAT/Net worth)*	0.047	0.263
Earnings per share (EAT/Number of shares)**	1.31	3.85
Dividend cover (EAT/ $D_p$ )	2.75	2.50

\*Net worth: previous year = Rs 3,800 (Rs 2,600 + Rs 1,200); current year = Rs 11,750 (Rs 4,200 + Rs 7,550)

\*\*Number of shares: previous year = 260 lakh; current year = 420 lakh.

(b) As regards disposal or retention of shares, the aspects of the operations of the accounting firm having a bearing on the decision are characterised by sharp decline in the current year *vis-a-vis* the previous year: return on net worth, earnings per share, dividend per share and the profitability ratios. There appears to be a *prima facie* case for disposal of the shares.

However, the firm has raised additional funds (equity and secured loan) during the current year which have been invested in fixed assets or blocked in capital work-in-progress. The firm seems to be at a growing stage and the expansion programme may yield additional profits with a positive impact on EPS and DPS. As growth shares, it may be a judicious decision to presently hold the shares of the firm.

**PS 2.26**

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:

	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
Debenture interest		—		2,000
		49,000		59,000
Net profit		15,000		17,000
Fixed assets ( <i>less</i> depreciation)		30,000		40,000
Current assets:				
Stock	60,000		94,000	

(Contd.)



**PS 2.26 (Contd.)**

Debtors	50,000		82,000	
Cash	<u>10,000</u>	1,20,000	<u>7,000</u>	1,83,000
Less: current liabilities (trade creditors)		<u>50,000</u>		<u>76,000</u>
Net current assets		<u>70,000</u>		<u>1,07,000</u>
		<u>1,00,000</u>		<u>1,47,000</u>
Share capital		<u>75,000</u>		<u>75,000</u>
Reserves and undistributed profit		25,000		42,000
Debentures		<u>—</u>		<u>30,000</u>
		<u>1,00,000</u>		<u>1,47,000</u>

You are informed 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.

## PS 2.27

In connection with a proposal to secure additional finance for meeting its expansion as well as the working capital requirements, the following figures have been projected to a bank by a borrower. The figures have been adjusted for borrowal, debt redemption and interest payments.

Year		1	2	3	4	5	6	7
Current ratio	Borrower	2.0	2.0	2.5	2.2	2.0	2.5	2.0
	Industry's average	1.8	1.8	2.0	2.0	2.5	2.5	2.5
Debt equity ratio	Borrower	1.8	1.8	1.6	1.6	1.5	1.5	1.2
	Industry's average	1.5	1.5	1.8	1.8	1.8	1.6	1.8
Return on investment	Borrower	20	20	18	18	15	15	18
	Industry's average	18	18	20	20	18	18	18

You are required to ascertain the trend (base year = 1) and interpret the result. Kindly indicate how the bank would react to the proposal of financing put forward by the borrower.

## Solution

*Trend statement (base = year 1)*

Year	Current ratio		Debt equity ratio		Return on investment	
	Borrower	Industry	Borrower	Industry	Borrower	Industry
1	100	100	100	100	100	100
2	100	100	100	100	100	100

(Contd.)

**Solution (Contd.)**

3	125	111	89	120	90	111
4	110	111	89	120	90	111
5	100	139	83	120	75	100
6	125	139	83	107	75	100
7	100	139	67	120	90	100

**Interpretation**

- (i) *Current ratio*: While the projected industry trend is steadily upward (from 100 in base year 1 to 111 in years 3-4 and to 139 in years 5-7), it is likely to witness a fluctuating trend in the case of the borrower. In spite of oscillating position, however, the borrower's current ratio are not likely to decrease below 2:1. The borrower is not likely to encounter any major problems in meeting his short-term debt obligations.
- (ii) *Debt-equity (D/E) ratio*: The D/E ratio of the borrower is likely to decrease at a steady pace by one-third over the projected 6-year period. In absolute terms also, D/E ratio of 1.5 or 1.2:1 is satisfactory. In contrast, the industry's D/E ratio is marked by an upward trend. The long-term solvency position of the borrower is stronger *vis-a-vis* industry. The margin of safety to the bank seems to be adequate.
- (iii) *Return on investment (ROI)*: As per the projected trend, the industry figures appear to be better. The ROI is the lowest in years 5 and 6 (15 per cent) and is the highest in years 1 and 2 in the case of the borrower. In contrast, it is maximum (20 per cent) for the industry in years 3-4 and 18 per cent in all other years. The only positive feature for the borrower is that while industry trend reflects decline from year 4 onwards, it is upward for the former from year 7.

Thus, as the current ratios of the borrower are satisfactory in spite of decline, it is safe for the bank to lend for working capital requirements of the borrower. In the case of long-term (expansion) requirements, the bank can seek additional data to determine debt-service coverage ratio, (more appropriate measure), as the projected D/E ratios are satisfactory.

## EXERCISES

**E.2.1** Z Ltd purchased a retail store and commenced business on April 1, last year. From the following information, you are required to prepare, in as much detail as possible, a trading and P & L A/c for the year ended June, 30 and a balance sheet as on that date.

Capital introduced on April 1	Rs 47,000
Drawings during the year	5,000
Net working capital on March 31	23,000
Depreciation of fixed assets during the year, based on a rate of 10% per annum on cost (the fixed assets were all purchased on April 1)	3,000
Ratio of annual sales to year-end values of fixed assets plus working capital	2 : 1
Ratio of current assets to current liabilities at the end of the year	2 : 1
Ratio of liquid assets (cash plus debtors) to current liabilities on March 31	5 : 4
Debtors at the year-end are equal to 12 per cent of annual sales	
General expenses (excluding depreciation) are equal to 20 per cent of annual sales	

The current assets consist of stock (which are unchanged throughout the year), debtors and cash. Stocks are turned over four times during the year. The current liabilities consist only of creditors.

**E.2.2** You are presented with the following figures prepared from the audited balanced sheet of Fair Dealings Ltd:

	Year 1	Year 2	Year 3
<b>Assets</b>			
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

(Contd.)

(Contd.)

Buildings	10,000	10,000	10,000
	<u>1,02,000</u>	<u>1,25,000</u>	<u>1,60,000</u>
<b>Liabilities</b>			
Bank	11,000	26,000	39,000
Trade creditors	25,000	30,000	50,000
P & L A/c	10,000	13,000	15,000
Paid-up capital (Rs 10 per share, Rs 7.50 paid)	56,000	56,000	56,000
	<u>1,02,000</u>	<u>1,25,000</u>	<u>1,60,000</u>
<b>Sales</b>	<u>1,00,000</u>	<u>1,50,000</u>	<u>1,50,000</u>
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 the year 1 was Rs 4,000. You are required to compute, in respect of each year, the key ratios and comment on the changes in the profitability, liquidity and financial position of the company.

**E.2.3** From the ratios and other data set forth below for Auto Assessors Ltd, indicate your interpretation of the company's financial position.

	Year 3	Year 2	Year 1
Current ratio (%)	302	278	265
Acid test ratio (%)	99	110	155
Working capital turnover (times)	3.25	3	2.75
Receivables turnover	7.20	8.41	9.83
Average collection period (days)	50	43	37
Inventory to working capital (%)	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 (%)	7	8.5	11.07
Operating expenses to net sales (%)	25	23	22
Sales increase during the year (%)	23	16	10
Cost of goods sold to net sales (%)	73	71	70
Dividend per share (Rs)	3	3	3
Fixed assets to net worth (%)	22.7	18	16.4
Net profit on net sales (%)	2	5.09	7.03

**E.2.4** The balance sheet of Best Ltd as on March 31 of the current year is given below.

Liabilities		Assets	
Equity share capital	Rs 20,00,000	Fixed assets	Rs 50,00,000
7.5% Preference share capital	10,00,000	Depreciation write off	<u>16,00,000</u>
General reserve	4,00,000	Net fixed assets	34,00,000
6% Debentures	6,00,000	Stock	6,00,000
Sundry creditors	10,00,000	Sundry debtors	8,00,000
		Cash	2,00,000
	<u>50,00,000</u>		<u>50,00,000</u>

The following information is also available:

1. Fixed assets costing Rs 10,00,000 to be installed on April 1 would become operative on that date, payment to be made on March 31 of the next year.
2. Fixed assets turnover ratio (on the cost of the fixed assets) would be 1.5.
3. Stock turnover ratio would be 14.4 (calculated on the basis of the average of the opening and closing stocks).

4. Break-up of cost and profit would be as follows (per cent):

Material	40
Labour	25
Manufacturing expenses	10
Office and selling expenses	10
Depreciation	5
Profit	10
Sales	100

The profit is subject to debenture interest and taxation @ 50 per cent.

5. Debtors would be 1/9 of sales.

6. Creditors would be 1/5 of materials consumed.

7. In March next year, a dividend of 10 per cent on equity capital would be paid.

8. Rs 5,00,000, six percent debentures would be issued on April 1 next year.

Prepare the forecast balance sheet as on March 31 next year, and calculate the resultant (a) Current ratio, (b) Fixed assets/net worth ratio, and (c) Debit-equity ratio.

**E.2.5** You have been supplied the following data for Supreme Plastic Ltd and its industry averages.

*Balance sheet as on March 31*

<i>Liabilities</i>		<i>Assets</i>	
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 CL	1,10,000		
	19,25,000		19,25,000

*Statement of profit for the year ending March 31*

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
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 (0.50)		57,750
Net profit		57,750

*Ratios*

Current assets/Current liabilities	2.4
Sales/Debtors	8.0
Sales/Stock	9.8
Sales/Total assets	2.0
Net profit/Sales (%)	3.3
Net profit/Total assets (%)	6.6
Net profit/Net worth (%)	10.7
Total debt/Total assets (%)	63.5

- (i) Determine the indicated ratios for Supreme Plastic Company.
- (ii) Indicate the company's strengths and weaknesses as shown by your analysis.

## ANSWERS

- E.2.1** Gross profit, Rs 31,000, Net profit, Rs 8,000, Balance sheet total, Rs 73,000, Current assets, Rs 46,000, Fixed assets, Rs 30,000, Sales Rs 1,00,000, Debtors, Rs 12,000, Cash, Rs 16,750, and Stock, Rs 17,250.
- E.2.2** CR 2.22 (year 1), 1.80 (year 2), 1.46 (year 3);  
DTR 3.33 (year 1), 3.75 (year 2), 2.73 (year 3);  
STR 2.78 (year 1), 2.40 (year 2), 2.08 (year 3);  
GPR 25% (year 1), 20% (year 2), 16.7% (year 3);  
NPR 5% (year 1), 4.7% (year 2), 3.3% (year 3);  
ATR 0.83 (year 1), 0.90 (year 2), 0.67 (year 3);  
D/E ratio 54.5% (year 1), 81.2% (year 2), 125.4% (year 3).
- E.2.3** (i) Profitability ratios are declining  
(ii) Liquidity position appears to be satisfactory  
(iii) Investments in fixed assets and working capital are excessive.
- E.2.4** (a) CR 1.61, (b) FA/NW ratio, 1.12, (c) D/E ratio 0.63. Total of balance sheet, Rs 57,79,000.
- E.2.5** (i) CR 2.67, Sales/debtors, 10, Sales/stock, 3.33, Sales/total assets, 1.43, Net profit/sales, 2.1%, Net profit/total assets, 3.0%, NP/NW, 4.8% and TD/TA, 37.7%.  
(ii) Excessive investment in inventory.

# 3 **BASIC FINANCIAL CONCEPTS**

## BASIC THEORY

### INTRODUCTION

This chapter is devoted to a discussion of the basic financial concepts, namely, time value of money, valuation of securities and return and risk. They are a critical consideration in financial and investment decisions. The chapter discusses the concepts, calculations and their applications.

### TIME VALUE OF MONEY

Time value of money is a critical input in long-term investment decision. It has two aspects, (i) future values/compounding and (ii) present values/discounting.

#### Compounding: Future Values

Compounding means that a rupee in hand today has more value than a rupee to be received in future (later) because of the interest that could be earned on it by investing, that is, it earns interest. The compounding can be yearly (annual) and intrayear.

**Yearly Compounding:** Symbolically,

$$F_n = P(1 + i)^n = P \times \text{FVIF}_{i, n} \quad (3.1)$$

where,

$F_n$  = future value = amount at the end of the year  $n$

$P$  = principal

$i$  = annual interest rate

$n$  = number of years

$\text{FVIF}_{i, n}$  = future value interest factor for  $n$ th year compounded at  $i$  per cent (can be found in Table A-1 in Appendix A).

**Intrayear Compounding:** means compounding of interest more than once a year: semi-annual, quarterly, monthly, daily and even continuously. Symbolically, if interest is compounded  $m$  times a year,

$$F_n = P(1 + i/m)^{n \cdot m} = P \times \text{FVIF}_{i/m, n \cdot m} \quad (3.2)$$

Equation 3.2 represents more frequent compounding ( $n \cdot m$ ) at a lower or smaller interest rate period ( $i/m$ ). For various intrayear compoundings, the Eq. 3.2 would become:

(i) **Semi-annual compounding ( $m = 2$ ):**

$$F_n = P(1 + i/2)^{n \cdot 2} = P \times \text{FVIF}_{i/2, n \cdot 2} \quad (3.2.1)$$

(ii) **Quarterly compounding ( $m = 4$ ):**

$$F_n = P(1 + i/4)^{n \cdot 4} = P \times \text{FVIF}_{i/4, n \cdot 4} \quad (3.2.2)$$

(iii) **Monthly compounding ( $m = 12$ ):**

$$F_n = P(1 + i/12)^{n \cdot 12} = P \times \text{FVIF}_{i/12, n \cdot 12} \quad (3.2.3)$$

**(iv) Continuous compounding ( $e^{i.n}$ ):**

As  $m$  approaches infinity, the term  $(1 + i/m)^{n.m}$  approaches  $e^{i.n}$ , where  $e$  is 2.71828:

$$F_n = P \times e^{i.n} \quad (3.2.4)$$

**Future Value of an Annuity:** Symbolically,

$$S_n = A \sum_{t=1}^n (1+i)^t = A \times \text{FVIFA}_{i,n} \quad (3.3)$$

where

$S_n$  = future value of an  $n$ -year annuity

$A$  = amount of annuity

$\text{FVIFA}_{i,n}$  = future value factor for an  $n$ -year annuity compounded at  $i$  per cent (available in Table A-2 in Appendix A).

**Discounting: Present Values**

A rupee to be received in future/later has lower (present or discounted) value than a rupee in hand today. Thus, present or discounted value is the present worth of future sums of money. The interest rate is called the discount rate. Symbolically,

$$P = F_n / (1+i)^n = F_n [1/(1+i)^n] = F_n \times \text{PVIF}_{i,n} \quad (3.4)$$

where

$P$  = present value

$i$  = discount/interest

$F_n$  = future sum received

$\text{PVIF}_{i,n}$  = present value interest factor (available in Table A-3 in Appendix A)

**Mixed Streams of Cashflows:** The present value of a series of unequal and mixed receipts or payments is the sum of the present value of each individual receipt or payment. Symbolically,

$$P = F_n \times \text{PVIF}_{i,n} \quad (3.4.1)$$

**Present Value of Annuity:** Symbolically, the present value of an annuity,

$$P_n = A \sum_{t=1}^n 1/(1+i)^t = A \times \text{PVIFA}_{i,n} \quad (3.5)$$

where

$\text{PVIFA}_{i,n}$  = appropriate value for the present value interest factor for annuity discounted at  $i$  per cent for  $n$  years (available in Table A-4 in Appendix A)

**Perpetuities:** Annuities which go on forever are perpetuities (dividend on perpetual preference shares). The present value of a perpetuity is

$$= A/i \quad (3.6)$$

where

$A$  = receipt

$i$  = discount rate

**Future and Present Values: Applications**

Future and present values have applications in several financial and investment decisions. The important applications are (i) sinking fund investment, (ii) loan amortisation, (iii) annual percentage rate and (iv) rate of growth.



**Sinking Fund:** is the future sum by depositing a periodic or annual amount. The deposits to accumulate a future sum (sinking fund),

$$A = \frac{S_n}{\text{PVIFA}_{i,n}} \quad (3.7)$$

**Loan Amortisation:** repayment of loan in equal periodic amounts. Each loan payment consists of interest and principal components. The interest component is high in early years while the principal component is smaller in early years and vice versa. The periodic payment (amount of loan),

$$A = P_n / \text{PVIFA}_{i,n} \quad (3.8)$$

**Annual Percentage Rate (APR):** Also called effective annual rate (EAR) and is calculated to compare investments with different compounding periods: semi-annual, quarterly, monthly and so on. Symbolically,

$$\text{APR} = [1 + r/m]^m - 1.0$$

where

$r$  = stated/nominal/quoted interest rate

$m$  = number of compounding periods per year

**Rate of Growth:** refers to the compound annual interest rate associated with a stream of earnings. Symbolically,

$$\begin{aligned} F_n &= P \times \text{FVIF}_{i,n} \\ \text{FVIF}_{i,n} &= F_n / P \end{aligned} \quad (3.10)$$

or

## VALUATION OF SECURITIES

The compound and present values can also be applied to determine the values of different types of securities. The value of a security is viewed as the present value of the cashflow streams provided to an investor, discounted at a required rate of return appropriate for the risk involved. We illustrate below the basic security valuation model, the bond valuation models and share valuation models.

### Basic Security Valuation Model

Mathematically, the basic valuation model is defined as

$$V = \sum_{t=1}^n C_t / (1 + r)^t \quad (3.11)$$

where

$V$  = intrinsic/present value of an asset/security

$C_t$  = expected future cashflow stream in period,  $t = 1 - n$

$r$  = required rate of return

### Valuation of Bonds

The value of a bond is the present value of the cashflows in terms of periodic interest payments and repayment of loan. Depending on the interest payment, the value of a bond can be computed by using different versions of the model.

**Yearly or Annual Interest Payment:** If interest payments are made annually,

$$V = \sum_{t=1}^n \frac{1}{(1 + r)^t} + \frac{M}{(1 + r)^n} = I (\text{PVIFA}_{r,n}) + M(\text{PVIF}_{r,n}) \quad (3.12)$$

where,

$I$  = interest payment each year = coupon rate  $\times$  par value

$M$  = Maturity or par value

$r$  = required rate of return

$n$  = term of loan or number of years to maturity

**Semi-annual Interest Payment:** If interest is paid semi-annually/six monthly,

$$V = \sum_{t=1}^{2n} \frac{I/2}{(1 + r/2)^t} + \frac{M}{(1 + r/2)^{2n}} = \frac{I}{2} (\text{PVIFA}_{r/2, 2n}) + M(\text{PVIF}_{r/2, 2n}) \quad (3.13)$$

Similarly, the values can be computed for quarterly and monthly interest payments and so on.

**Yield to Maturity:** The expected rate of return on a bond is called yield to maturity. It is computed by solving Equation 3.12 for  $r$ . It involves trial and error. However, the approximate yield to maturity on bond can be computed by using Equation 3.14.

$$\text{Yield} = \frac{I + (M - V)/n}{(M + V)/2} \quad (3.14)$$

where

$I$  = interest payments per year

$M$  = par value

$V$  = bond value

$n$  = number of years to maturity

### Valuation of Equity Shares

The value of equity shares is the present value of all future cash inflows expected to be received by the investors. They consist of dividends and the future price at the time of sale of the shares. Since shares are held for many years and have no maturity date, their value is determined by a multiperiod model. Equation 3.15 provides a general model for share valuation.

$$P_0 = \sum_{t=1}^{\infty} \frac{D_t}{(1 + r)^t} \quad (3.15)$$

where

$P_0$  = value of shares

$D_t$  = dividend received in different years

$r$  = required rate of return of investors

The valuation of shares is affected by the growth in dividends: (i) zero growth, (ii) constant growth and (iii) non-constant or super-normal growth.

**Zero Growth Dividend Model:** The share valuation is determined by Eq. 3.16.

$$P_0 = \frac{D_1}{r}, \quad \text{where } D_1 = D_2 \dots = D_{\infty} \quad (3.16)$$

**Constant (Gordon) Growth Dividend Model:** Assuming dividends grow at a constant rate of  $g$  every year

$$[D_t = D_0 (1 + g)^t], \text{ the value of shares, } P_0 = \frac{D_1}{r - g}. \quad (3.17)$$

**Non-constant or Super-normal Dividend Growth Model:** Here, the growth in dividends is faster during certain period after which it falls sharply. The value of shares = present value of dividends during the period

of super-normal growth + present value of the price of the shares at the end of the period of super-normal growth. Symbolically,

$$\text{PV of dividends} = \frac{D_1}{(1+r)} + \frac{D_2}{(1+r)^2} + \dots + \frac{D_n}{(1+r)^n} \quad (3.18)$$

$$\text{PV of shares price, } P_n - 1, = \frac{D_n}{r - g} \quad (3.18.1)$$

**Expected Rate of Return on Shares:** Assuming a constant growth in dividend, the multiperiod expected rate of return on shares is given by Eq. 3.19.

$$r = \frac{D_1}{P_0} + g \quad (3.19)$$

## RISK and RETURN

The two key determinants of value of securities are return and risk. Risk refers to the variability of expected return associated with a given investment, asset or security. The risk associated with a single asset as well as with a portfolio of assets is discussed first. A brief description of capital asset pricing model (CAPM) which provides the key link between risk and return is also presented.

### Risk and Return of a Single Asset

Probabilities are used to measure return and risk. The probability of an event happening is defined as the chance that the event will occur, that is., the percentage chance of a given outcome.

**Expected Rate of Return:** It is the weighted average of possible returns from a given asset, weights being probabilities. Symbolically,

$$\bar{r} = \sum_{i=1}^n r_i p_i \quad (3.20)$$

where

$\bar{r}$  = expected rate of return

$r_i$  =  $i$ th possible return

$p_i$  = probability of the  $i$ th return

$n$  = number of possible returns

**Measurement of Risk:** Risk defined as the variability of expected return, can be measured (i) in absolute terms by standard deviation ( $\sigma$ ) which is a measure of dispersion of probability distribution and (ii) coefficient of variation as a measure of relative risk. Symbolically,

$$\sigma = \sqrt{\sum_{i=1}^n (r_i - \bar{r})^2 p_i} \quad (3.21)$$

$$\text{Coefficient of variation} = \frac{\sigma}{\bar{r}} \quad (3.22)$$

### Portfolio Return and Risk

Portfolio refers to the collection or combination of assets to diversify investments.

**Portfolio Return:** The expected return on a portfolio is the weighted average return of the individual assets in the portfolio, the weights being the proportion or fraction of total investments in individual assets. Symbolically,

$$r_p = W_1 r_1 + W_2 r_2 + \dots + W_n r_n = \sum_{j=1}^n w_j r_j \quad (3.23)$$

where

$r_p$  = expected return on a portfolio  
 $W_j$  = proportion for each respective asset investment  
 $n$  = number of assets in the portfolio

$$\sum_{j=1}^n = 1.0 \quad (3.23.1)$$

**Portfolio Risk:** The portfolio risk is dependent on the correlation coefficients of its assets. The correlation coefficient reflects the degree of covariance of two variables, that is, the extent to which two variables move together and ranges between numerical values from  $-1.0$  (minus 1) to  $+1.0$  (plus 1). In a two-asset ( $A$  and  $B$ ) portfolio, the portfolio risk,

$$\sigma_p = \sqrt{W_A^2 \sigma_A^2 + W_B^2 \sigma_B^2 + 2W_A W_B \times P_{AB} \sigma_A \sigma_B} \quad (3.24)$$

where

$\sigma_A$  and  $\sigma_B$  = standard deviation of assets  $A$  and  $B$  respectively  
 $W_A$  and  $W_B$  = weights (proportion) of total funds invested in assets  $A$  and  $B$   
 $P_{AB}$  = correlation coefficient between assets  $A$  and  $B$

### Capital Asset Pricing Model (CAPM)

The CAPM provides the key link between portfolio risk and return. It relates the risk measured by beta coefficient to the level of expected or required rate of return on a security. Symbolically,

$$r_j = r_f + b(r_m - r_f) \quad (3.25)$$

where

$r_j$  = required return on security  
 $r_f$  = return on risk-free security  
 $r_m$  = expected return on market portfolio  
 $b$  = beta, an index of non-diversifiable or systematic risk

## SOLVED PROBLEMS

### PS 3.1

Compute the future values of (1) an initial Rs 100 compounded annually for 10 years at 10 per cent and (2) an annuity of Rs 100 for 10 years at 10 per cent.

### Solution

- (1) The future value of an investment compounded annually =  $F_n = P(1 + i)^n = P \times FVIF_{i,n} = F_{10} = \text{Rs } 100 (1 + 0.10)^{10} = \text{Rs } 100 (2.5937) = \text{Rs } 259.4$
- (2) The future value of an annuity =  $S_n = A \times FVIFA_{i,n} = \text{Rs } 100 \times 15.937 = \text{Rs } 1,593.7$ .

**PS 3.2**

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 ( $m = 1$ ):  $F_5 = \text{Rs } 100 (1 + 0.08/1)^5 = \text{Rs } 100 (1.4693) = \text{Rs } 146.93$   
 (b) Semi-annual compounding ( $m = 2$ ):  $F_5 = \text{Rs } 100 (1 + 0.08/2)^{5 \times 2} = P \times \text{FVIF}_{4,10} = \text{Rs } 100 (1.4802) = \text{Rs } 148.02$   
 (c) Quarterly compounding ( $m = 4$ ):  $F_5 = \text{Rs } 100 (1 + 0.08/4)^{5 \times 4} = P \times \text{FVIF}_{2,20} = \text{Rs } 100 (1.4859) = \text{Rs } 148.59$   
 (d) Continuous compounding:  $F_n = P \times e^{i \times n} = F_5 = \text{Rs } 100 (2.71828)^{0.08 \times 5} = \text{Rs } 100 (2.71828)^{0.4} = \text{Rs } 100 (1.4918) = \text{Rs } 149.18$

**PS 3.3**

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 =  $\text{Rs } 100 [1/(1.10)^1] = \text{Rs } 100 \times \text{PVIF}_{10,1} = \text{Rs } 100 \times 0.9091 = \text{Rs } 90.91$ .  
 (b) Rs 100 at the end of year 4 =  $\text{Rs } 100 [1/(1.10)^4] = \text{Rs } 100 \times \text{PVIF}_{10,4} = \text{Rs } 100 \times 0.683 = \text{Rs } 68.3$   
 (c) Rs 100 at the end of (i) year 3 and (ii) year 5 =  $\text{Rs } 100 [1/(1.10)^3] + \text{Rs } 100 [1/(1.10)^5] = (\text{Rs } 100 \times \text{PVIF}_{10,3}) + (\text{Rs } 100 \times \text{PVIF}_{10,5}) = (\text{Rs } 100 \times 0.7513) + (\text{Rs } 100 \times 0.6209) = \text{Rs } 75.13 + \text{Rs } 62.09 = \text{Rs } 137.22$ .  
 (d) Rs 100 for the next 10 years (annuity)

$$P_n = A \times \text{PVIFA}_{i, n} = \text{Rs } 100 \times \text{PVIFA}_{10, 10} = \text{Rs } 100(6.1446) = \text{Rs } 614.46$$

**PS 3.4**

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)  $P = \text{Rs } 100(\text{PVIFA}_{10,10}) - \text{Rs } 100(\text{PVIFA}_{10,4}) = \text{Rs } 100(6.1446) - \text{Rs } 100(3.1699) = \text{Rs } 614.46 - \text{Rs } 316.99 = \text{Rs } 297.47$ .  
 (b)  $P = \text{Rs } 100(\text{PVIFA}_{10,3}) + [\text{Rs } 100(\text{PVIFA}_{10,10}) - \text{Rs } 100(\text{PVIFA}_{10,5})] = (\text{Rs } 100 \times 2.4869) + [(\text{Rs } 100 \times 6.1446) - (\text{Rs } 100 \times 3.7908)] = \text{Rs } 248.69 + (\text{Rs } 614.46 - \text{Rs } 379.08) = \text{Rs } 248.69 + \text{Rs } 235.38 = \text{Rs } 484.07$ .

**PS 3.5**

An investor has two options to choose from: (a) Rs 6,000 after 1 year; (b) Rs 9,000 after 4 years. Assuming a discount rate of (i) 10 per cent and (ii) 20 per cent, which alternative should he opt for?

**Solution**

(i) (a) Rs 6,000 after 1 year at 10 per cent discount =  $P = \text{Rs } 6,000(0.9091) = \text{Rs } 5,454.6$ .

(i) (b) Rs 9,000 after 4 years at 10 per cent discount =  $P = \text{Rs } 9,000(0.6830) = \text{Rs } 6,147$ .

At 10 per cent required rate, the investor should choose Rs 9,000 after 4 years.

(ii) (a) Rs 6,000 after 1 year at 20 per cent discount =  $P = \text{Rs } 6,000(0.8333) = \text{Rs } 4,999.8$ .

(ii) (b) Rs 9,000 after 4 years at 20 per cent discount =  $P = \text{Rs } 9,000(0.4823) = \text{Rs } 4,340.7$ .

At 20 per cent required rate, the investor should choose Rs 6,000 after 1 year.

**PS 3.6**

An investor is 50 years of age today. He will retire at the age of 60. In order to receive Rs 2,00,000 annually for 10 years after retirement, how much amount should he have at the time of retirement? Assume the required rate of return is 10 per cent.

**Solution**

$P_n(\text{present value of annuity}) = A \times \text{PVIFA}_{i,n} = P_{10} = \text{Rs } 2,00,000 (6.1446) = \text{Rs } 12,28,920$ .

**PS 3.7**

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**

$P_n = A \times \text{PVIFA}_{i,n} = P_{10} = \text{Rs } 2,50,000(\text{PVIFA}_{10,10}) = \text{Rs } 2,50,000(6.1446) = \text{Rs } 15,36,150$ .

Since the lumpsum of Rs 20,00,000 is worth more now, the executive should opt for it.

**PS 3.8**

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 =  $A/i = \text{Rs } 100/0.10 = \text{Rs } 1,000$ .

**PS 3.9**

A person would need Rs 100, 5 years from now. How much amount should he deposit each year in his bank account, if the yearly interest rate is 10 per cent?

**Solution**

$S_n = A \times \text{FVIFA}_{i,n}$  or  $A = S_n / \text{FVIFA}_{i,n} = \text{Rs } 100/6.1051 = \text{Rs } 16.38$

**PS 3.10**

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***

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

**PS 3.11**

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***

$$P_n = A \times PVIFA_{i, n}$$

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

**PS 3.12**

X has taken a 20-month car loan of Rs 6,00,000. The rate of interest is 12 per cent per annum. What will be the amount of monthly loan amortisation?

***Solution***

$$A = \text{Rs } 6,00,000 / PVIFA_{1, 20} = \text{Rs } 6,00,000 / 18.0456 = \text{Rs } 33,249.1. \text{ Monthly interest} = 12 \text{ per cent} / 12 = 1 \text{ per cent}.$$

**PS 3.13**

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

***Solution***

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

**PS 3.14**

ABC Ltd has borrowed Rs 1,000 to be repaid in equal instalments at the end of each of the next 3 years. The interest rate is 15 per cent. Prepare a amortisation schedule.

***Solution***

$$\text{Amount of equal instalment, } A = P_n / PVIFA_{i, n} = \text{Rs } 1,000 / 2.2832 = \text{Rs } 437.98$$

*Amortisation schedule*

<i>Year</i>	<i>Payment</i>	<i>Interest*</i>	<i>Repayment of principal</i>	<i>Balance outstanding</i>
1	Rs 437.98	Rs 150.00	Rs 287.98	Rs 712.02
2	437.98	106.80	331.18	380.84
3	437.98	57.13	380.85	

\*= Loan balance at the beginning of the year  $\times$  interest rate, e.g., year 1 = (Rs 1,000  $\times$  0.15) = Rs 150.

**PS 3.15**

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 ( $m = 1$ ):

$$AP/ER = (1 + 0.12/1)^1 - 1.0 = 1.12 - 1.0 = 0.12 = 12 \text{ per cent}$$

- (b) Interest paid at the end of each 6-month period ( $m = 2$ ):

$$AP/ER = (1 + 0.12/2)^2 - 1.0 = (1.06)^2 - 1.0 = 1.1236 - 1.0 = 0.1236 = 12.36 \text{ per cent.}$$

- (c) Interest paid at the end of each quarter ( $m = 4$ ):

$$AP/ER = (1 + 0.12/4)^4 - 1.0 = (1.03)^4 - 1.0 = 1.1255 - 1.0 = 0.1255 = 12.55 \text{ per cent.}$$

- (d) Interest paid at the end of each month ( $m = 12$ ):

$$AP/ER = (1 + 0.12/12)^{12} - 1.0 = (1.01)^{12} - 1.0 = 1.1268 - 1.0 = 0.1268 = 12.68 \text{ per cent.}$$

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

**PS 3.16**

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***

$$F_n = P \times FVIF_{i,n}$$

$$FVIF_{i,n} = F_n/P$$

$$FVIF_{i,10} = \text{Rs } 4.02/\text{Rs } 3 = 1.340$$

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.

**PS 3.17**

ABC Ltd has borrowed Rs 1,000 to be repaid in 12 monthly instalments of Rs 94.56. Compute the annual interest.

***Solution***

$$P_n = A \times PVIFA_{i,n}$$

$$PVIFA_{i,n} = P_n/A = \text{Rs } 1,000/\text{Rs } 94.56 = 10.5753$$

According to Table A-4 (Appendix), a PVIFA of 10.5753 for 12 periods at interest ( $i$ ) = 2 per cent. The annual interest rate is therefore  $0.02 \times 12 = 24$  per cent.



**PS 3.18**

The face value of a 10-year, 10 per cent bond (with 10 per cent coupon rate) is Rs 1,000. The interest is payable semi-annually. Assuming 12 per cent required rate of return of investors, compute the value of the bond. What price would an investor be willing to pay, if the interest is payable annually.

***Solution***

*Interest paid semi-annually:*

$$\begin{aligned} V &= I (\text{PVIFA}_{r,n}) + M(\text{PVIF}_{r,n}) \\ &= \text{Rs } 50(\text{PVIFA}_{6,20}) + \text{Rs } 1,000(\text{PVIF}_{6,20}) = (\text{Rs } 50 \times 11.4699) + (\text{Rs } 1,000 \times 0.3118) = \text{Rs } 885.3 \end{aligned}$$

**Note:**  $I = \text{Rs } 100/2 = \text{Rs } 50$ ;  $n = 10 \text{ years} \times 2 = 20$ ;  $r = 12 \text{ per cent}/2 = 6 \text{ per cent}$ .

*Interest paid annually:*

$$\begin{aligned} V &= \text{Rs } 100(\text{PVIFA}_{12,10}) + \text{Rs } 1,000(\text{PVIF}_{12,10}) = (\text{Rs } 100 \times 5.6502) + (\text{Rs } 1,000 \times 0.3220) = \text{Rs } 887.02 \\ \text{The investor would be willing to pay Rs } 887.02 \text{ for the bond.} \end{aligned}$$

**PS 3.19**

An investor is considering the purchase of a share of ABC Ltd at the beginning of the year. If his required rate of return is 10 per cent, the year-end expected dividend is Rs 4 and year-end price is expected to be Rs 26, compute the value of the share.

***Solution***

The expected price ( $P_0$ ) =  $[D_1/(1+r)] + [P_1/(1+r)] = [\text{Rs } 4/(1.10)] + [\text{Rs } 26/(1.10)] = (\text{Rs } 4 \times 0.9091) + (\text{Rs } 26 \times 0.9091) = \text{Rs } 3.64 + \text{Rs } 23.64 = \text{Rs } 27.28$ .

**PS 3.20**

ABC Ltd paid a dividend of Rs 4 per share at the end of the year. It is expected to grow by 8 per cent each year for the next 4 years. The market price of the shares is expected to be Rs 60 at the end of 4 years. Assuming 12 per cent required rate of return of investors, at what price should the shares of ABC Ltd sell?

***Solution***

$$\begin{aligned} \text{Expected price } (P_0) &= \sum_{t=1}^4 \frac{D_t}{(1+r)^t} + \frac{P_4}{(1+r)^4} \\ &= D_1/(1.12) + D_2/(1.12)^2 + D_3/(1.12)^3 + D_4/(1.12)^4 + \text{Rs } 60/(1.12)^4 \\ &= \text{Rs } 4.32(0.893) + \text{Rs } 4.67(0.797) + \text{Rs } 5.04(0.712) + \text{Rs } 5.44(0.567) = \text{Rs } 3.86 + \text{Rs } 3.72 + \text{Rs } 3.59 + \text{Rs } 3.09 + \text{Rs } 34.02 = \text{Rs } 48.28. \end{aligned}$$

The shares of ABC Ltd should sell for Rs 48.28.

**Working notes**

Dividends:

$$\text{Present } (D_0) = \text{Rs } 4$$

$$D_1 = \text{Rs } 4(1.08) = \text{Rs } 4.32$$

$$D_2 = \text{Rs } 4(1.08)^2 = \text{Rs } 4.67$$

$$D_3 = \text{Rs } 4(1.08)^3 = \text{Rs } 5.04$$

$$D_4 = \text{Rs } 4(1.08)^4 = \text{Rs } 5.44$$

**PS 3.21**

An investor has invested in the shares of ABC Ltd which expects no (zero) growth in dividends. ABC Ltd has paid a dividend of Rs 3 per share. If the required rate of return is 14 per cent, what would be the value of the share?

**Solution**

$$P_0 = D/r = \text{Rs } 3/0.14 = \text{Rs } 21.43.$$

**PS 3.22**

The required rate of return of investors is 14 per cent. Assume the  $D_1$  (next expected dividend) is Rs 2.50. Compute the price at which the shares will sell if the investors expect the earnings/dividends to grow, (i) at 12 per cent, (ii) 14 per cent and (iii) at 16 per cent.

**Solution**

$$P_0 = D_1 / (r - g)$$

- (i) Growth in dividends, 12 per cent:  $P_0 = \text{Rs } 2.5/(0.14 - 0.12) = \text{Rs } 125.$
- (ii) Growth in dividends, 14 per cent:  $P_0 = \text{Rs } 2.5/(0.14 - 0.14) =$  (the formula is invalid since a necessary condition is  $r > g$ ).
- (iii) Growth in dividends, 16 per cent:  $P_0 = \text{Rs } 2.5/(0.14 - 0.16) =$  undefined.

**PS 3.23**

The following facts are available:

- Risk-free rate, 9 per cent
- Required rate of return, 18 per cent
- Beta coefficient of the shares of ABC Ltd, 1.5
- Expected dividend during the next year, Rs 3
- Growth rate in dividends/earnings, 8 per cent

Compute the price at which the shares of ABC Ltd should sell?

**Solution**

$$P_0 = D_1/(r - g) = \text{Rs } 3/(0.225 - 0.08) = \text{Rs } 3/0.145 = \text{Rs } 20.7$$

**Working notes**

$$r = r_f + b(r_m - r_f) = 0.09 + 1.5(0.18 - 0.09) = 0.225$$

**PS 3.24**

The required rate of return of investors is 15 per cent. ABC Ltd declared and paid annual dividend of Rs 4 per share. It is expected to grow @20 per cent for the next 2 years and at 10 per cent thereafter. Compute the price at which the shares should sell?

**Solution**

$$P_0 = [D_1(1 + r) + D_2/(1 + r)^2] + [D_3/(r - g)]$$

- (a) Present value of dividends for the first 2 years:  $(\text{Rs } 4.8 \times \text{PVIF}_{15,1}) + (\text{Rs } 5.76 \times \text{PVIF}_{15,2}) = (\text{Rs } 4.8 \times 0.8696) + \text{Rs } 5.76 \times 0.7561 = \text{Rs } 4.17 + \text{Rs } 4.355 = \text{Rs } 8.53.$

(b) Present value of price after 2 years ( $P_2$ ) =  $(D_3/r - g) \times (\text{PVIF}_{15,2}) = \text{Rs } 6.34/(0.15 - 0.10) = \text{Rs } 106.8 \times 0.7561 = \text{Rs } 80.75$

$$P_0 = (a) + (b) = \text{Rs } 89.28.$$

### Working notes

Dividends:

$$D_0 \text{ (present)} = \text{Rs } 4$$

$$D_1 = \text{Rs } 4(1.2)^1 = \text{Rs } 4.8$$

$$D_2 = \text{Rs } 4(1.2)^2 = \text{Rs } 5.76$$

$$D_3 = \text{Rs } 5.76(1.10) = \text{Rs } 6.34$$

### PS 3.25

The closing price of the shares of ABC Ltd on December 31, previous year, was Rs 25. It paid a year-end dividend as detailed below:

Year 1	Rs 2	Year 4	Rs 2.50
2	Rs 2	5	Rs 2.50
3	Rs 2.20		

At what price should an investor sell his shares at the end of year 5 to earn a compound rate of return of 15 per cent on the initial investment (of Rs 25). Ignore commission and taxes.

### Solution

$$P_0 = \sum_{t=1}^n \frac{D_t}{(1+r)^t} + \frac{P_5}{(1+r)^5}$$

$$\text{Rs } 25 = \sum_{t=1}^5 \frac{D_t}{(1+0.15)^t} + \frac{P_5}{(1+0.15)^5}$$

$$(a) \text{ Present value of dividends, years 1 - 5 } = \sum_{t=1}^5 \frac{D_t}{(1+0.15)^t} = \text{Rs } 2(0.8696) + \text{Rs } 2(0.7561) + \text{Rs } 2.20(0.6575) +$$

$$\text{Rs } 2.50(0.5718) + \text{Rs } 2.50(0.4972) = \text{Rs } 1.74 + \text{Rs } 1.51 + \text{Rs } 1.45 + \text{Rs } 1.43 + \text{Rs } 1.24 = \text{Rs } 7.73$$

$$(b) \text{ Therefore, } \text{Rs } 25 = \text{Rs } 7.37 + P_5/(1.15)^5$$

$$\text{Rs } 25 = \text{Rs } 7.37 + P_5(0.4972)$$

$$P_5(0.4972) = \text{Rs } 25 - \text{Rs } 7.37$$

$$P_5 = \text{Rs } 17.63/0.4972 = \text{Rs } 35.46$$

### PS 3.26

A bond has 3 years remaining until maturity. It has a par value of Rs 1,000. The coupon interest rate on the bond is 10 per cent. Compute the yield to maturity at current market price of (i) Rs 1,100 (ii) Rs 1,000 and (iii) Rs 900, assuming interest is paid annually.

### Solution

(i) Market price (above par or at premium) Rs 1,100:

$$\text{Yield to maturity} = [(I + (M - V)/n)/(M + V)]/2 = [\text{Rs } 100 + (\text{Rs } 1,000 - \text{Rs } 1,100)/3]/(\text{Rs } 1,000 + \text{Rs } 1,100)/2 \\ = \text{Rs } 66.67/\text{Rs } 1,050 = 0.063 = 6.3 \text{ per cent}$$

- (ii) Market price (at par), Rs 1,000:  
Yield to maturity =  $[\text{Rs } 100 + (\text{Rs } 1,000 - \text{Rs } 1,000/3)] / (\text{Rs } 1,000 + \text{Rs } 1,000)/2 = \text{Rs } 100/\text{Rs } 1,000 = 0.10 = 10$  per cent.
- (iii) Market price (below par or at discount), Rs 900:  
Yield to maturity =  $[\text{Rs } 100 + (\text{Rs } 1,000 - \text{Rs } 900/3)] / (\text{Rs } 1,000 + \text{Rs } 900)/2 = \text{Rs } 133.33/\text{Rs } 950 = 0.1403 = 14.03$  per cent.

**PS 3.27**

A note (secured premium note) is available for Rs 1,400. It offers, including one immediate payment, 10 annual payments of Rs 210. Compute the rate of return (yield) on the note.

**Solution**

$$\begin{aligned}
 V &= \sum_{t=1}^n \frac{C_t}{(1+r)^t} \\
 &= \text{Rs } 1,400 = \text{Rs } 210(1 + \text{PVIFA}_{r,9}) \\
 (1 + \text{PVIFA}_{r,9}) &= \text{Rs } 1,400/\text{Rs } 210 = 6.67 \\
 \text{PVIFA}_{r,9} &= 6.67 - 1 = 5.67
 \end{aligned}$$

From Table A-4 (Appendix), the closet values are 5.7590 (0.10) and 5.3282 (0.11). By interpolation,  $r = 10.2$  per cent.

**PS 3.28**

A share is selling for Rs 50 on which a dividend of Rs 3 per share is expected at the end of the year. The expected market price after the dividend declaration is to be Rs 60. Compute (i) the return on investment (r) in shares, (ii) dividend yield and (iii) capital gain yield.

**Solution**

- (i)  $r = [D_1 + (P_1 - P_0)]/P_0 = [\text{Rs } 3 + (\text{Rs } 60 - \text{Rs } 50)]/\text{Rs } 50 = 0.26 = 26$  per cent.  
Alternatively,  $\text{Rs } 50 = \text{Rs } 3/(1+r) + \text{Rs } 60/(1+r)$   
 $r = 50(1+r) = \text{Rs } 3 + \text{Rs } 60$   
 $1+r = (\text{Rs } 3 + \text{Rs } 60)/\text{Rs } 50$   
 $r = [(\text{Rs } 3 + \text{Rs } 60)/\text{Rs } 50] - 1 = 1.26 - 1 = 0.26 = 26$  per cent.
- (ii) Dividend yield =  $D_1/P_0 = \text{Rs } 3/\text{Rs } 50 = 0.06 = 6$  per cent
- (iii) Capital gain yield =  $(P_1 - P_0)/P_0 = \text{Rs } 10/\text{Rs } 50 = 0.20 = 20$  per cent.

**PS 3.29**

The shares of ABC Ltd are currently selling for Rs 100 on which the expected dividend is Rs 4. Compute the total return on the shares if the earnings or dividends are likely to grow at (a) 5 per cent (b) 10 per cent and (c) 0 (zero) per cent (no growth).

**Solution**

$$r = (D_1/P_0) + g$$

- (a) Rate of growth, 5 per cent:  
 $r = (\text{Rs } 4/\text{Rs } 100) + 0.05 = 0.04 + 0.05 = 9$  per cent
- (b) Rate of growth, 10 per cent:  
 $r = (\text{Rs } 4/\text{Rs } 100) + 0.10 = 14$  per cent

(c) Rate of growth, 0 (zero) per cent (no growth):

$$r = \text{Rs } 4/\text{Rs } 100 = 4 \text{ per cent.}$$

### PS 3.30

ABC Ltd paid a dividend of Rs 2 per share last year ( $D_0$ ), which is expected to grow at 10 per cent. If the current market price is Rs 40 and the required rate of return is 18 per cent, compute the expected dividend yield and capital gains yield next year.

### Solution

Dividend yield =  $[\text{Rs } 2(1 + 0.10)]/\text{Rs } 40 = \text{Rs } 2.20/\text{Rs } 40 = 0.055 = 5.5 \text{ per cent.}$

Capital gain yield = rate of return – dividend yield =  $0.18 - 0.055 = 12.5 \text{ per cent.}$

### PS 3.31

The probability distribution of expected future returns are as follows:

Probability	Return on shares (percentage)	
	X	Y
0.1	(16)	(18)
0.2	2	12
0.4	8	18
0.2	12	32
0.1	20	40

Compute the (a) standard deviation of expected returns of each share, (b) coefficient of variation. Which share is more risky? Why?

### Solution

(a) Computation of standard deviation of shares, X and Y

$r_i(\%)$	$P_i$	$r_i P_i(\%)$	$(r_i - \bar{r})(\%)$	$(r_i - \bar{r})^2$	$(r_i - \bar{r})^2 P_i(\%)$
(1)	(2)	(3)	(4)	(5)	(6)
Share X:					
(16)	0.1	(1.6)	(22.4)	501.8	50.2
2	0.2	0.4	(4.4)	19.4	3.9
8	0.4	3.2	1.6	2.6	1.0
12	0.2	2.4	5.6	31.4	6.3
20	0.1	2	13.6	185.0	18.5
				$\sigma^2 = 6.4$	$\sigma^2 = 79.9$
Since $\sigma^2 = 80$ , $\sigma = \sqrt{80} = 8.94 \text{ per cent}$					
Share Y:					
(18)	0.1	(1.8)	(36.2)	1,310.4	131.04
12	0.2	2.4	(6.2)	38.4	7.68
18	0.4	7.2	(0.2)	0.04	0.02
32	0.2	6.4	13.8	190.4	38.08
40	0.1	4	21.8	475.2	47.52
				$\sigma = 18.2$	$\sigma^2 = 224.34$
Since $\sigma^2 = 224.34$ , $\sigma = \sqrt{224.34} = 14.98 \text{ per cent}$					

(b) Coefficient of variation:

$$\text{Share X} = 8.94/6.4 = 1.4$$

$$\text{Share Y} = 14.98/18.2 = 0.82$$

Share X is more risky since it has larger coefficient of variation (a measure of relative risk).

### PS 3.32

The expected return ( $\bar{r}$ ) and standard deviation ( $\sigma$ ) of shares of X Ltd and Y Ltd are:

	$\bar{r}$	$\sigma$
X Ltd	0.14	0.20
Y Ltd	0.09	0.30

Required:

If the expected correlation between the two shares ( $p_{xy}$ ) is (a) 0.1, (b) -1, compute the return and risk for each of the following portfolios:

(i) X, 100 per cent, (ii) Y, 100 per cent, (iii) X, 50 per cent - Y, 50 per cent.

### Solution

(a)  $p_{xy} = 0.1$

(i) X, 100 per cent:  $\sigma/\bar{r} = 0.20/0.14 = 1.43$

(ii) Y, 100 per cent:  $\sigma/\bar{r} = 0.30/0.09 = 3.33$

(iii) X, 50 per cent; Y, 50 per cent:

$$\bar{r}_p = w_x \bar{r}_x + w_y \bar{r}_y = (0.5)(0.14) + (0.5)(0.09) = 11.5 \text{ per cent}$$

$$\begin{aligned} \sigma_p &= \sqrt{w_x^2 \sigma_x^2 + w_y^2 \sigma_y^2 + 2 w_x w_y p_{xy} \sigma_x \sigma_y} \\ &= \sqrt{(0.5)^2 (0.2)^2 + (0.5)^2 (0.3)^2 + 2(0.5)(0.5) p_{xy} (0.2)(0.3)} \\ &= \sqrt{0.01 + 0.0225 + 0.03 p_{xy}} = \sqrt{0.035 + 0.03 p_{xy}} \\ &= \sqrt{0.0325 + 0.03(0.1)} = \sqrt{0.0355} = 0.1884 = 18.84 \text{ per cent} \end{aligned}$$

(b)  $p_{xy} = -1$

(i) and (ii) same as in (a) (i) and (ii).

(iii)  $r_p = 11.5$  per cent

$$r_p = \sqrt{0.0325 + 0.03(-1)} = \sqrt{0.0025} = 0.05 = 5 \text{ per cent}$$

### PS 3.33

The rate on T-bill (risk-free return,  $r_f$ ) is currently 7.75 per cent, while the expected market return ( $r_m$ ) is 14.25 per cent. Compute the required rate of return of each security listed below:

Security	Beta
$X_1$	1.5
$X_2$	1.2
$X_3$	1.00
$X_4$	0.90

**Solution**

Security	Risk-free return ( $r_f$ ) (per cent)	+ $b[r_m - r_f] =$ (per cent)	$r$ (per cent)
(1)	(2)	(3)	(4)
$X_1$	7.75	$1.5(14.25 - 7.75 = 6.5)$	17.50
$X_2$	7.75	$1.2(14.25 - 7.75 = 6.5)$	15.55
$X_3$	7.75	$1.0(14.25 - 7.75 = 6.5)$	14.25
$X_4$	7.75	$0.9(14.25 - 7.75 = 6.5)$	13.60

**PS 3.34**

Assume the following facts:

- Risk-free return,  $r_f$ , 7.75 per cent
- Beta, 2
- Expected return of investors,  $r$ , 16 per cent

Applying CAPM, compute the expected market return ( $r_m$ ).

**Solution**

$$r = r_f + b(r_m - r_f)$$

$$0.16 = 0.0775 + 2(r_m - 0.0775)$$

$$0.16 = 0.0775 + 2r_m - 0.155$$

$$0.2375 = 2r_m$$

$$r_m = 0.11875 = 11.87 \text{ per cent.}$$

**PS 3.35**

The following facts are available:

- $r_m = 0.14$
- $r_f = 0.0825$
- $r = 0.18$

Compute the beta coefficient (b).

**Solution**

$$r = r_f + b(r_m - r_f)$$

$$0.18 = 0.0825 + b(0.14 - 0.0825)$$

$$0.18 = 0.0825 + b(0.0575)$$

$$0.0975 = b(0.0575)$$

$$b = 1.7$$

**PS 3.36**

The aggregate average  $r_f$  and  $r_m$  for a 3-year period are 10 per cent and 18 per cent respectively. The results for four portfolios during the same period are summarised as follows:

<i>Portfolio</i>	<i>Average return (per cent)</i>	<i>Beta</i>
X <sub>1</sub>	18	0.90
X <sub>2</sub>	18	1.12
X <sub>3</sub>	24	1.50
X <sub>4</sub>	16	0.95

Using the CAPM, compute the expected return for each portfolio and compare the actual and expected returns. Which portfolio has performed the best?

### ***Solution***

#### *Expected returns*

<i>Portfolio</i>	<i>Expected return (per cent)</i>	<i>Actual return (per cent)</i>	<i>Difference between actual and expected returns (per cent)</i>
X <sub>1</sub>	$0.10 + 0.90 (0.18 - 0.10) = 17.2$	18	0.8
X <sub>2</sub>	$0.10 + 1.12 (0.18 - 0.10) = 19.0$	18	(1)
X <sub>3</sub>	$0.10 + 1.50 (0.18 - 0.10) = 22.0$	24	2
X <sub>4</sub>	$0.10 + 0.95 (0.18 - 0.10) = 17.6$	16	(1.6)

Portfolios X<sub>1</sub> and X<sub>3</sub> have been better than expected. The performance of X<sub>1</sub> has exceeded the expected return by 4.65 per cent ( $0.8 \div 17.2$ ), while the performance of X<sub>3</sub> has exceeded the expected return by 9.1 per cent ( $2 \div 22$ ). Thus, portfolio X<sub>3</sub> has shown the best performance.

## **EXERCISES**

**E.3.1** The required rate of investors is 10 per cent. ABC Ltd paid a dividend of Rs 2 per share. It is expected to grow by 15 per cent for the next 3 years and 7 per cent thereafter.

Required:

- Present value of projected dividends, year 1–4,
- Present value of projected price at the end of year 4 ( $P_4$ )
- Value of shares,  $P_0$

**E.3.2** Shares A and B have the following probability distribution of possible future returns:

<i>Probability</i>	<i>Return (per cent)</i>	
	<i>A</i>	<i>B</i>
0.2	(5)	10
0.6	20	15
0.2	40	20

Which share is more risky?

**E.3.3** Assume the following facts:

<i>Asset</i>	<i>r (per cent)</i>	<i>W</i>
X	20	1/3
Y	10	2/3

Compute the portfolio risk ( $r_p$ ) if correlation coefficient between X and Y is (a) (perfectly positive), (b) 0 (lack of correlation) and (c) –1 (perfectly negative).



**E. 3.4** ABC Ltd has borrowed Rs 2,000 to be repaid in 3 equal instalments at the end of the next 3 years. The interest is at 12 per cent. Prepare a loan amortisation schedule.

## ANSWERS

**E.3.1.** (a) PV of dividends, Rs 8.97

(b) PV of  $P_4$ , Rs 91.98

(c)  $P_0$  = Rs 100.95.

**E.3.2.** Share A is more risky as it has larger coefficient of variation (0.75) compared to Share B (0.21): [ $r_A$  = 19 per cent,  $r_B$  = 15 per cent;  $r_A$  = 14.28 per cent,  $r_B$  = 3.16 per cent].

**E.3.3.** (a)  $r_p$  = 13.34 per cent

(b)  $r_p$  = 9.43 per cent

(c)  $r_p$  = Zero.

**E.3.4.**

<i>Year</i>	<i>Payment</i>	<i>Interest</i>	<i>Principal repayment</i>
1	Rs 832.71	Rs 240.00	Rs 592.71
2	832.71	168.88	663.83
3	832.68	89.22	743.46

# 4 *COST OF CAPITAL*

## BASIC THEORY

### INTRODUCTION

The cost of capital is an important input in the capital budgeting decision. Conceptually, it refers to the discount rate that would be used in determining the present value of estimated future benefits associated with capital projects. In operational terms, it is defined as the weighted average of the cost of each type of capital. It is visualised as being composed of several elements, the elements being the cost of each component of the capital. The term component means the different sources from which funds are received by a firm. The major long-term sources of funds are (i) debt, (ii) preference shares, (iii) equity capital, and (iv) retained earnings. Each source of fund or component of capital has its cost, called the specific cost of capital. When these are combined to arrive at the overall cost of capital, it results in the weighted or average or combined cost of capital.

Therefore, the computation of the cost of capital, involves two steps: (i) calculation of the specific cost of each type of capital—debt, preference shares, ordinary or equity shares and retained earnings, and (ii) calculation of the weighted average cost of capital by combining the specific costs.

The weights may be historical or marginal. Historical weights are based on the existing capital structure. Two types of historical weights can be used—book value (BV) and market value (MV). Marginal weights are based on the nature of additional funds to be raised by the firm.

### SPECIFIC COSTS OF CAPITAL

The specific costs of capital are summarised in Exhibits 4.1 to 4.4.

#### **EXHIBIT 4.1** *Cost of Debt*

##### **(i) Perpetual Debt**

$$K_i = \frac{I}{SV} \quad (4.1)$$

$$K_d = \frac{I}{SV} (1 - t) \quad (4.2)$$

where,

$K_i$  = Cost of debt before tax

$K_d$  = Cost of debt after tax

$I$  = Annual interest payment

$SV$  = Amount of debt/net sale proceeds of debentures (bonds)

$t$  = Tax rate

##### **(ii) (a) Redeemable Debt (Bullet or Lumpsum Repayment of Principal)**

$$CI_0 = \sum_{t=1}^n \frac{COI_t}{(1 + k_d)^t} + \frac{COP_n}{(1 + k_d)^n} \quad (4.3)$$

(Contd.)

**Exhibit 4.1 (Contd.)**

where,  $Cl_0$  = Net cash proceeds from debt or debentures  
 $COI_t$  = After tax interest payment in different periods  
 $COP_n$  = Principal repayment in year of maturity

$$\text{Alternatively, } k_d = \frac{I(1+t) + (f + d + p_r - p_i)/N_m}{(RV + SV)/2} \quad (4.4)$$

where,  $RV$  = Redeemable value of debt  
 $N_m$  = Term of debt  
 $f$  = Flotation costs  
 $d$  = Discount on debt or debentures  
 $p_i$  = Premium on issue of debt or debentures  
 $p_r$  = Premium on redemption of debt or debentures

**(ii) (b) Redeemable Debt (Repayment of Principal in Instalments)**

$$Cl_0 = \sum_{t=1}^n \frac{COI_t}{(1+K_d)^t} (1-t) + \frac{COP_t}{(1+K_d)^t} \quad (4.5)$$

**EXHIBIT 4.2 Cost of Preference Shares****(i) Irredeemable**

$$K_p = \frac{D_p (1 + D_t)}{P_0 (1 - f)} \quad (4.6)$$

where,  $K_p$  = Cost of preference share capital  
 $D_p$  = Annual dividend  
 $P_0$  = Sale price  
 $f$  = Flotation cost  
 $D_t$  = Dividend tax

**(ii) (a) Redeemable (Bullet or Lump sum Repayment of Principal)**

$$P_0 (1 - f) = \sum_{t=1}^n \frac{D_p}{(1+K_p)^t} + \frac{P_n}{(1+K_p)^n} \quad (4.7)$$

where,  $P_n$  = Repayment of principal

**(ii) (b) Redeemable (Repayment of Principal in Instalments)**

$$P_0 (1 - f) = \sum_{t=1}^n \frac{D_p}{(1+K_p)^t} + \frac{P_t}{(1+K_p)^t} \quad (4.8)$$

**EXHIBIT 4.3 Cost of Equity Capital****(i) Dividend Valuation Approach**

$$K_e = \frac{D_1}{P_0 (1 - f)} + g \quad (4.9)$$

(Contd.)

**Exhibit 4.3 (Contd.)**

where,  $K_e$  = Cost of equity capital  
 $D_1$  = Expected dividend per share at the end of the year  
 $P_0$  = Current market price  
 $f$  = Flotation cost  
 $g$  = Growth in expected dividends\*

\*As a result of the imposition of 10 per cent tax on dividends declared or distributed or paid after June 1997 under the provision of Section 115(O/P/Q) of the Income tax Act, 1961,  $g$  will be reduced or lower as shown below:

$g = b.r.$ , where  $b$  = retention rate and  $r$  = rate of return

$$b = 1 - \frac{DPS(1+D_t)}{EPS} \quad \text{and} \quad r = \frac{EPS - DPS(1+D_t)}{P_0}$$

where  $D_t$  = Dividend tax  
 $r = EPS/P_0$

Therefore,

$$g = b.r = \frac{EPS}{P_0} \times \frac{EPS - DPS(1+D_t)}{EPS}$$

$$= \frac{EPS - DPS(1+D_t)}{P_0}$$

Obviously,  $g$  with  $D_t$  would be lower.

**(ii) Capital Asset Pricing Model (CAPM) Approach**

$$K_e = R_f + b(K_m - R_f) \quad (4.10)$$

where,  $R_f$  = Required rate of return on risk-free investment  
 $b$  = Beta coefficient\*\*  
 $K_m$  = Required rate of return on market portfolio, that is, the average rate of return on all assets

$$** = \frac{\sum MJ - N \bar{M} \bar{J}}{\sum M^2 - (N \bar{M})^2}, \text{ where}$$

$M$  = Excess in market return over risk-free rate

$J$  = Excess in security returns over risk-free rate

$MJ$  = Cross product of  $M$  and  $J$

$N$  = Number of years

**EXHIBIT 4.4 Cost of Retained Earnings**

$$K_r = K_e \quad (4.11)$$

where,  $K_r$  = Cost of retained earnings  
 $K_e$  = Cost of equity capital

**WEIGHTED AVERAGE COST OF CAPITAL**

The computation of the weighted average cost of capital is shown in Exhibit 4.5.

**EXHIBIT 4.5** *Weighted Average Cost of Capital*

$$K_0 = K_d W_d + K_p W_p + K_e W_e + K_r W_r \quad (4.12)$$

where,

 $K_0$  = Overall cost of capital $W_d$  = Percentage of debt to total capital $W_p$  = Percentage of preference shares to total capital $W_e$  = Percentage of external equity to total capital $W_r$  = Percentage of retained earnings to total capital**SOLVED PROBLEMS****PS 4.1**

ABC Ltd had sold Rs 1,000, 12% Debentures 10 years ago. Interest rates have risen since then, so that debentures of this company are now selling at 15 per cent yield basis.

- Determine the current indicated and expected market price of the debentures. Would you buy the debentures for Rs 700?
- Assume that the debentures of the company are selling at Rs 825 and have 8 years to run to maturity, compute the approximate effective yield an investor would earn on his investment?

**Solution**

(i) Current expected market price of debenture ( $V_d$ ) = Interest on debenture/Current interest rate = Rs 120/0.15 = Rs 800.

Yes, I would buy the debenture for Rs 700.

$$(ii) \text{ Rs } 825 = \sum_{t=1}^8 \frac{\text{Rs } 120}{(1 + K_d)^t} + \frac{\text{Rs } 1,000}{(1 + K_d)^8}$$

Using trial and error approach and discount rates of 15 and 16 per cent:

Years	Cash flow	PV factor at		Total PV at	
		0.15	0.16	0.15	0.16
1-8	Rs 120	4.487	4.344	Rs 538.44	Rs 521.28
8	1,000	0.327	0.305	327.00	305.00
				865.44	826.28

$K_d = 0.16$ . Thus, an investor would earn an effective yield of 16 per cent.

**PS 4.2**

- XYZ Ltd has issued 15% Preference shares of the face value of Rs 100 each to be redeemed after 10 years. Flotation cost is expected to be 4 per cent. Determine the cost of preferences shares.
- Equity shares of XYZ Ltd are currently selling for Rs 125 per share. The company expects to pay Rs 15 per share as dividend at the end of the coming year, and the estimated growth rate in dividends is 6 per cent. It is expected that new equity shares can be sold at Rs 123; the company expects to incur Rs 3 per share as flotation cost. What is the cost of equity capital?

**Solution**

$$(i) \text{ Cost of preference shares } (K_p) \text{ is: } \text{Rs } 96 = \sum_{t=1}^{10} \frac{\text{Rs } 15}{(1 + K_p)^t} + \frac{\text{Rs } 100}{(1 + K_p)^{10}}$$

$K_p$  is likely to lie between 15 and 16 per cent as the rate of dividend is 15 per cent. Solving the equation at these two rates,

Years	Cash flow	PV factor at		Total PV at	
		0.15	0.16	0.15	0.16
1–10	Rs 15	5.019	4.833	Rs 75.28	Rs 72.50
10	100	0.247	0.227	24.70	22.70
				99.98	95.20

Using interpolation,  $K_p = 0.16 - \frac{0.8}{4.78} = 15.8$  per cent

$$(ii) K_e = \frac{D_1}{P_0(1-f)} + g = (\text{Rs } 15/\text{Rs } 120) + 0.06 = 18.5 \text{ per cent}$$

### PS 4.3

The Fincon Ltd is planning an equity issue in the current year. It has an earning per share (EPS) of Rs 25 and proposes to pay a dividend of Rs 15 per share at the current year-end. With a P/E ratio of 8, it wants to offer the issue at market price. The flotation cost is expected to be 10 per cent of the issue price.

Determine the required rate of return for equity shares (cost of equity) before issue and after the issue.

### Solution

(A) *Cost of equity (before issue):*

$$\begin{aligned} K_e &= \text{Reciprocal of P/E ratio} = 1/8 \text{ or } 12.5 \text{ per cent} \\ \text{Alternatively, } K_e &= D_1/P_0 + g, \quad g = br = (\text{EPS} - \text{DPS})/P_0, \quad P_0 = \text{EPS} \times \text{P/E ratio} \\ P_0 &= \text{Rs } 25 \times 8 = \text{Rs } 200 \\ g &= (\text{Rs } 25 - \text{Rs } 15)/\text{Rs } 200 = 5 \text{ per cent} \\ K_e &= (\text{Rs } 15/\text{Rs } 200) + 0.05 = 12.5 \text{ per cent} \end{aligned}$$

(B) *Cost of new equity (after issue):*

$$\begin{aligned} D_1/P_0(1-f) + g, \quad g &= (\text{EPS} - \text{DPS})/P_0(1-f) \text{ or } g = \text{Rs } 10/\text{Rs } 180 = 5.6 \text{ per cent} \\ K_e &= (\text{Rs } 15/\text{Rs } 180) + 0.056 = 13.9 \text{ per cent.} \end{aligned}$$

### PS 4.4

Determine cost of equity before and after the issue, assuming dividend tax of 10 per for data in **PS 4.3**.

### Solution

*Cost of present equity:*

As a result of payment of taxes on dividends paid, retained earnings will be lower which, in turn, will reduce 'g'.

$$\begin{aligned} g &= [\text{EPS} - \text{DPS}(1 + D_t)]/P_0 = (\text{Rs } 25 - \text{Rs } 16.5)/\text{Rs } 200 = 4.3 \text{ per cent.} \\ K_e &= (\text{Rs } 15/\text{Rs } 200) + 0.043 = 11.8 \text{ per cent} \end{aligned}$$

*Cost of new equity:*

$$\begin{aligned} g &= [\text{EPS} - \text{DPS}(1 + D_t)]/P_0(1-f) = (\text{Rs } 25 - \text{Rs } 16.5)/180 = 4.7 \text{ per cent.} \\ K_e &= (\text{Rs } 15/\text{Rs } 180) + 0.047 = 13 \text{ per cent.} \end{aligned}$$

**PS 4.5**

Assuming the corporate tax rate of 35 per cent, compute the after tax cost of capital in the following situations:

- Perpetual 15% Debentures of Rs 1,000, sold at a premium of 10 per cent with no flotation costs.
- 10-year 14% Debentures of Rs 2,000, redeemable at par, with 5 per cent flotation costs.
- 10-year 14% Preference shares of Rs 100, redeemable at premium of 5 per cent with 5 per cent flotation costs. Dividend tax is 10 per cent.
- An equity share selling at Rs 50 and paying a dividend of Rs 6 per share, which is expected to continue indefinitely.
- The above equity share if dividends are expected to grow at the rate of 5 per cent.
- An equity share of a company is selling at Rs 120 per share. The earnings per share is Rs 20 of which 50 per cent is paid in dividends. The shareholders expect the company to earn a constant after tax rate of 10 per cent on its investment of retained earnings.

**Solution**

- $K_d = [\text{Interest } (I)/\text{Sale value of debentures}] (1 - t) = [\text{Rs } 150/\text{Rs } 1,100] (1 - 0.35) = 8.9 \text{ per cent.}$
- $K_d = [I(1 - t) + (RV - SV)/N_m] \div (RV + SV)/2 = [\text{Rs } 280 (0.65) + (\text{Rs } 2,000 - \text{Rs } 1,900)/10] \div \text{Rs } 1,950 = 9.85 \text{ per cent.}$
- $K_p = D_p(1 + D_t) + (RV - SV)/N_m \div (RV + SV)/2 = [\text{Rs } 14 (1 + 0.1) + (\text{Rs } 105 - \text{Rs } 95)/10] \times 100 = 16.4 \text{ per cent}$
- $K_e = D_t/P = \text{Rs } 6/50 = 12 \text{ per cent}$
- $K_e = 0.12 + g = 0.12 + 0.05\% = 17 \text{ per cent}$
- $K_e = [E(1 - b)/P_0] + br = [(\text{Rs } 20 (1 - 0.5)/\text{Rs } 120)] + 0.5 \times 0.1 = 13.33 \text{ per cent.}$

**PS 4.6**

Northwest Company Ltd is planning for an issue of 15% Preference shares of Rs 100 each, redeemable at par after 8 years. They are expected to be sold at a premium of 5 per cent. The likely flotation cost is 9 per cent.

Determine the cost of preference share capital, assuming 35 per cent corporate tax and dividend tax of 10 per cent. Calculate cost of preference shares, using both the methods.

**Solution**

$$K_p = [D_p(1 + D_t) + (RV - SV)/N] \div (RV + SV)/2 = [\text{Rs } 15 (1.1) + (\text{Rs } 100 - \text{Rs } 96)/8] \div \text{Rs } 98 = 17.4 \text{ per cent.}$$

Alternatively,

$$CI_0 = \sum_{t=1}^n \frac{\text{COD}_t}{(1 + K_p)^t} + \frac{\text{COP}_n}{(1 + K_p)^n}$$

$$\text{Rs } 96 = \sum_{t=1}^8 \frac{\text{Rs } 16.5}{(1 + K_p)^t} + \frac{\text{Rs } 100}{(1 + K_p)^8}$$

Year	COAT	PVIF at		Total PV	
		0.17	0.18	0.17	0.18
1 – 8	Rs 16.5	4.207	4.078	Rs 69.42	Rs 67.29
8	100	0.285	0.266	28.50	26.60
				97.92	93.89

By interpolation,  $D_t = 0.17 + (\text{Rs } 1.92/4.03 = 0.5) = 17.5 \text{ per cent.}$

**PS 4.7**

Excellent Properties Limited (EPL) is planning to purchase suitable land for an apartment project for which it requires Rs 100 lakh. The construction costs will be met by the payment from the allottees from time to time as per requirement. In order to raise Rs 100 lakh, it is proposed to float 15% Debentures of the face value of Rs 100, redeemable at par at the end of 5 years, flotation cost being 10 per cent. The corporate tax rate is 35 per cent.

Calculate  $K_d$  using both the methods.

**Solution**

$$K_d = [I(1 - t) + (RV - SV)/N] \div (RV + SV)/2 = [Rs\ 15(1 - 0.35) + (Rs\ 100 - Rs\ 90)/5] \div Rs\ 95 = 12.4 \text{ per cent.}$$

Alternatively,

$$CI_0 = \sum_{t=1}^n \frac{COD_t}{(1 + K_d)^t} + \frac{COP_n}{(1 + K_d)^n}$$

$$Rs\ 90 \text{ lakh} = \sum_{t=1}^5 \frac{Rs\ 9.75 \text{ lakh}}{(1 + K_d)^t} + \frac{Rs\ 100 \text{ lakh}}{(1 + K_d)^5}$$

(Amount in lakh)

Year	COAT	PVIF at		Total PV	
		0.13	0.12	0.13	0.12
1 – 5	Rs 9.75	3.517	3.605	Rs 34.29	Rs 35.14
5	100	0.543	0.567	54.30	56.70
				88.59	91.84

By interpolation,  $K_d = 0.12 + (Rs\ 1.84/3.25 = 0.57) = 12.6 \text{ per cent.}$

**PS 4.8**

For facts in **PS 4.7**, assume the company agrees to redeem 20 per cent of debentures each year starting at the end of year 1. Calculate the explicit cost of debt.

**Solution**

Value of debentures = Rs 100 lakh

Annual instalment of redemption Rs 100 lakh  $\times$  0.20 = Rs 20 lakh

Cash inflows = Rs 90 lakh.

Year	Cash outflows	PVIF at		Total PV	
		0.14	0.13	0.14	0.13
1	Rs 29.75*	0.877	0.885	Rs 26.09	Rs 26.33
2	27.80**	0.769	0.783	21.38	21.77
3	25.85	0.675	0.693	17.45	17.91
4	23.90	0.592	0.613	14.15	14.65
5	21.95	0.519	0.543	11.39	11.92
				90.46	92.58

Cost of debt = 14 per cent

\*Rs 20 lakh + Interest, Rs 15 lakh  $(1 - 0.35) = Rs\ 29.75 \text{ lakh}$

\*\*Rs 20 lakh + Rs 12 lakh  $(1 - 0.35) = Rs\ 27.80 \text{ lakh}$



**PS 4.9**

For the EPL in **PS 4.7**, assume the company agrees to redeem debentures in 5 equated annual instalments, commencing from the year-end 1. Calculate the explicit cost of debt.

**Solution**

Equated annual instalment = Rs 100 lakh/PVIF (5, 15 = 3.353) = Rs 29.83 lakh

*Schedule of redemption of debentures (Amount in Rs lakh)*

Year-end	Instalment	Debentures at year-beginning	Payment		Debentures outstanding at year-end (3 – 5)
			Interest (3 × 0.15)	Principal (2 – 4)	
1	2	3	4	5	6
1	29.83	100	15	14.83	85.17
2	29.83	85.17	12.78	17.05	68.12
3	29.83	68.12	10.22	19.61	48.51
4	29.83	48.51	7.28	22.55	25.96
5	29.83	25.96	3.87	25.96	Nil

$$\text{Determination of explicit cost of debt: Rs 90 lakh} = \sum_{t=1}^n \frac{\text{COAT}}{(1 + K_d)^t}$$

where COAT = Cost outflows after taxes, that is, Loan instalment – Tax advantage on interest.

(Rs in lakh)

Year	Instal- ment	Tax advantage on interest (interest × tax rate)	COAT	PV factor at		Total PV at	
				0.13	0.14	0.13	0.14
1	29.83	5.25	24.58	0.885	0.877	21.75	21.56
2	29.83	4.47	25.36	0.783	0.769	19.86	19.50
3	29.83	3.58	26.25	0.693	0.675	18.19	17.72
4	29.83	2.55	27.28	0.613	0.592	16.72	16.15
5	29.83	1.35	28.48	0.543	0.519	15.46	14.79
						91.98	89.72

By using interpolation,  $K_d = 0.14 - (0.28/2.26 = 0.12) = 13.9$  per cent.

**PS 4.10**

The following facts relate to Hypothetical Ltd:

- Risk-free interest in the market is 10 per cent.
- The firm's beta coefficient,  $b$ , is 1.5.

Determine the cost of equity capital using the capital asset pricing model, assuming an expected return on the market of 14 per cent for next year. What would be the  $K_e$ , if the  $b$  (a) rises to 2, (b) falls to 1.

**Solution**

When  $b$  is 1.50,  $K_e = R_f + b(K_m - R_f) = 0.10 + 1.5 (0.14 - 0.10) = 16$  per cent.

$K_e$  When  $b = 2$ ,  $= 0.10 + 2 (0.14 - 0.10) = 18$  per cent.

$K_e$  When  $b = 1$ ,  $= 0.10 + 1 (0.14 - 0.10) = 14$  per cent.

**PS 4.11**

A financial consultant of Hypothetical Ltd recommends that the firm should estimate its cost of equity capital by applying the capital asset pricing model rather than the dividend yield plus growth model. He has assembled the following facts:

- (i) Systematic risk of the firm is 1.4.
- (ii) 182-days treasury bills currently yield, 8 per cent.
- (iii) Expected yield on the market portfolio of assets is 13 per cent.

Determine the cost of equity capital based on the above data

**Solution**

$$K_e = R_f + b(K_m - R_f) = 0.08 + 1.4(0.13 - 0.08) = 15 \text{ per cent.}$$

**Note:** Yield on treasury bills is taken as a proxy for risk-free required rate of return.

**PS 4.12**

Consider the following figures pertaining to risk-free rate, market rate and return rate of a security of Premier Ltd during the last 6 years.

Year	Risk-free rate ( $R_f$ )	Market rate ( $K_m$ )	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 information, you are required to determine the cost of equity capital in the context of CAPM. Past data may be taken as a proxy for 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	0.0306
4	0.08	0.26	0.18	0.0324	0.25	0.17	0.0308
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/values.

$$b = \frac{\sum MJ - N \bar{M} \bar{J}}{\sum M^2 - (N \bar{M})^2} = \frac{0.0618 - 6(0.06 \times 0.07)}{0.0640 - (6 \times 0.06)^2} = 0.863$$

$$K_e = R_f + b(K_m - R_f) = 0.07 + 0.863(0.13 - 0.07) = 12.2 \text{ per cent.}$$

**PS 4.13**

The shares of Century Textile Ltd are selling at Rs 20 per share. It had paid Rs 2 per share dividend last year. The estimated growth of the company is approximately 5 per cent per year.

- (i) Determine the cost of equity capital of the company.
- (ii) Determine the estimated market price of the equity shares if the anticipated growth rate (a) rises to 8 per cent, and (b) falls to 3 per cent. Ignore dividend tax.
- (iii) Determine the market price of the shares, assuming the growth rate of 20 per cent. Are you satisfied with your calculations?

**Solution**

- (i)  $K_e = (D_1/P_0) + g = (\text{Rs } 2.10/\text{Rs } 20) + 0.05 = 15.5 \text{ per cent.}$
- (ii) (a)  $\text{Rs } 2.16/0.155 - 0.08 = \text{Rs } 28.80$   
(b)  $\text{Rs } 2.06/0.155 - 0.03 = \text{Rs } 16.48$
- (iii)  $P_0 = \text{Rs } 2.40/0.155 - 0.20 = - \text{Rs } 53.33$

In situation (iii), the formula does not give the correct results as it is developed on the assumption that  $K_e > g$  while in the present situation,  $g > K_e$ .

**PS 4.14**

Hypothetical Ltd is planning to raise Rs 20,00,000 additional long-term funds to finance its additional capital budget of the current year. The debentures of the company are to be sold on a 14 per cent net yield basis to the company, and equity shares to be sold at Rs 50 per share net to the company, are the alternatives being considered by the company. It expects to pay dividend of Rs 5 per share at the end of coming year. The expansion is expected to carry the company to a new, higher risk class. The required rate of return expected from the point of view of the investment community is 16 per cent.

- (i) Determine the growth rate of the company which the market is anticipating.
- (ii) On the basis of 8 per cent growth, at what price should the equity share be sold by the company? Ignore dividend tax.
- (iii) Assuming that the management is anticipating growth rate of only 4 per cent per year, what form of financing would you recommend?

**Solution**

- (i)  $K_e = 0.16 = (\text{Rs } 5/\text{Rs } 50) + g$ ,  $0.16 = 0.10 + g$  or  $g = 0.16 - 0.10 = 6 \text{ per cent}$
- (ii)  $P_0 = D_1/(K_e - g) = \text{Rs } 5/(0.16 - 0.08) = \text{Rs } 62.50$
- (iii)  $P_0 = \text{Rs } 5/(0.16 - 0.04) = \text{Rs } 41.67$

We shall recommend to the company debt financing as the equity financing alternative would depress the market value of shares of the company.

**PS 4.15**

The Alfa Ltd is considering raising of Rs 500 lakh by one of the two alternative methods, namely, 16 per cent institutional term loan and non-convertible debentures, issued at par. While the institutional loan would not involve any flotation costs, issue of debentures would involve 1 per cent of issue price. The debentures would be issued at a discount of 4 per cent.

Advise the company as to the better option based on the effective cost of debt in each case. Assume corporate tax rate of 35 per cent and perpetual debt.

**Solution**

- (i) *Cost of 16% institutional term loan:* Rs 80 lakh  $(1 - 0.35)/\text{Rs } 500 \text{ lakh} = 10.4 \text{ per cent.}$   
 (ii) *Cost of 15% non-convertible debentures:* Rs 75 lakh  $(1 - 0.35)/\text{Rs } 475 \text{ lakh}^* = 10.3 \text{ per cent.}$   
 (\*Rs 500 lakh – Rs 20 lakh discount – Rs 5 lakh flotation cost.)

**Recommendation:** Raising of funds through non-convertible debentures is a better option.

**PS 4.16**

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,  $\text{Rs } 10.50(1 + r)^2 = 11.575 = (1 + r)^2 = 11.575 \div 10.50 = 1.1024$   
 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*  $(D_y) = \text{Expected dividend}/\text{Current price} = \text{Rs } 10.50/210 = 5 \text{ per cent.}$   
 (iii) *Required rate of return*  $(K_e) = (D_1/P_0) + g$ , i.e.,  $\text{Rs } 10.50/210 + 0.05 = 10 \text{ per cent.}$

**PS 4.17**

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 ( $D_0 = \text{Rs } 3$ ). 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 advantage by buying at  $t = 0$ , or in any of the subsequent four years, assuming all other things remain unchanged?

**Solution**

Year	$D_0(1 + g)^t - D_t$	PV factor (0.12)	Total PV
1	$\text{Rs } 3(1 + 0.18)^1 = \text{Rs } 3.54$	0.893	$\text{Rs } 3.161$
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	3.7
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  $\text{Rs } 102.76 \times 0.636$  (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	$D_2 = \text{Rs } 4.176$	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:  $\text{Rs } 102.76 \times 0.712$  (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	$D_3 = \text{Rs } 4.929$	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 =  $\text{Rs } 102.76 \times 0.797$  (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	$D_4 = \text{Rs } 5.817$	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.

### PS 4.18

- If current earnings are Rs 2.76 a share, while 10 years earlier, they were Rs 2, what has been the rate of growth in earnings?
- 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?
- 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 <sup>1</sup>
(ii)	5	1.20**	1.217 <sup>2</sup>

\*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)  $P = C/i = \text{Dividend cash flows}/\text{Appropriate discount rate} = \text{Rs } 12/0.10 = \text{Rs } 120$ .

### PS 4.19

Your company's share is quoted in the market at Rs 20 currently. The company pays a dividend of Re 1 per share and the investors expect a growth rate of 5 per cent per year.

- (i) Compute the company's cost of equity capital.
- (ii) If the anticipated annual growth rate is 6 per cent, calculate the indicated market price per share.
- (iii) If the company's cost of capital is 8 per cent and the anticipated annual growth rate is 5 per cent, calculate the indicated market price, if the dividend of Re 1 per share is to be maintained.

### Solution

- (i)  $K_e = (\text{Re } 1/\text{Rs } 20) + 0.05 = 10 \text{ per cent.}$
- (ii)  $P_0 = \text{Re } 1/(0.10 - 0.06) = \text{Rs } 25.$
- (iii)  $P_0 = \text{Re } 1/(0.08 - 0.05) = \text{Rs } 33.33.$

### PS 4.20

An investor has invested in Fast Growth Ltd company which is growing at an above average rate, translated to an annual increase in dividends of 20 per cent for 10 years. Thereafter, dividend growth returns to an average rate of 6 per cent. The current dividend per equity share is Rs 10. Assuming no dividend tax and equity capitalisation rate of 15 per cent, determine the value of equity shares.

### Solution

The value of equity share will be the sum of (i) PV of dividend payment during 1 – 10 years and (ii) PV of expected market price at the end of the 10th year, based on growth of six per cent.

*Present value of dividends, years 1 – 10*

Years	Dividend	PVIF (0.15)	Total PV
1	Rs 12	0.870	Rs 10.44
2	14.4	0.756	10.88
3	17.28	0.658	11.37
4	20.74	0.572	11.86
5	24.88	0.497	12.37
6	29.86	0.432	12.90
7	35.83	0.376	13.47
8	43.00	0.327	14.06
9	51.60	0.284	14.65
10	61.92	0.247	15.29
			<u>127.29</u>

$$P_{10} = D_{11}/(K_e - g) = [\text{Rs } 61.92(1.06)]/(0.15 - 0.06) = \text{Rs } 729.3$$

$$\text{PV of Rs } 729.3 \text{ at } t = 0 = \text{Rs } 729.3 \times 0.247 = \text{Rs } 180.13$$

$$\text{Value of equity share} = \text{Rs } 127.29 + \text{Rs } 180.13 = \text{Rs } 307.42.$$

### PS 4.21

Hypothetical Ltd is foreseeing a growth rate of 15 per cent per annum in the next 3 years. It is likely to fall to 12 per cent in the fourth year. After that, the growth rate is expected to stabilise at 7 per cent per annum. If the last dividend was Rs 10 per share and the investors required rate of return is 20 per cent, find out the maximum price at which you will be prepared to buy the company's shares as of date.

### Solution

Maximum price of the share will be the sum of (i) PV of dividends payment during 1 – 4 years and (ii) PV of expected market price at the end of fourth year based on constant growth of 7 per cent.

*Present value of dividends, year 1 – 4*

<i>Years</i>	<i>Dividend</i>	<i>PVIF (0.20)</i>	<i>Total PV</i>
1	Rs 11.50	0.833	Rs 9.58
2	13.225	0.694	9.18
3	15.209	0.579	8.81
4	17.034	0.482	8.21
			<u>35.78</u>

$$P_4 = D_5 / (K_e - g) = [Rs\ 17.034(1.07)](0.20 - 0.07) = Rs\ 140.20.$$

$$PV\ of\ Rs\ 140.20 = Rs\ 140.20 \times 0.482 = Rs\ 67.58$$

$$\text{Maximum price of share} = Rs\ 35.78 + Rs\ 67.58 = Rs\ 103.36.$$

### PS 4.22

The Well Established Ltd is contemplating a preference issue on the following terms:

Face value per share	: Rs 100
Terms of maturity (years)	: 8
Yearly coupon rate of dividend (%)	
Year 1 – 2	: 12
3 – 5	: 14
6 – 8	: 16

The current market rate of dividend on similar preference shares is 17 per cent per annum. The company proposes to price the issue so as to yield a (compounded) return of 18 per cent per annum to attract the investors.

Determine the issue price. Assume redemption of preference share at a premium of 10 per cent on the face value.

### Solution

The issue price of preference share will be sum of (i) PV of preference dividend payments during 1 – 8 years and (ii) PV of maturity value of preference shares in the eighth year, the discount rate being 18 per cent.

Determination of issue price of preference share

<i>Years</i>	<i>Cash outflows</i>	<i>PVIF (0.18)</i>	<i>Total PV</i>
1	Rs 12	0.847	Rs 10.16
2	12	0.718	8.62
3	14	0.609	8.53
4	14	0.516	7.22
5	14	0.437	6.12
6	16	0.370	5.92
7	16	0.314	5.02
8	126*	0.266	33.52
Issue price			<u>85.11</u>

\*Inclusive of Rs 110 maturity value of preference shares.

### PS 4.23

For the firm in **PS 4.22**, assume the security to be issued is debenture instead of preference shares. Will your answer be different (regarding determination of issue price), assuming corporate tax rate of 35 per cent.

**Solution**

The answer will remain unchanged at Rs 85.11 per debenture as the return is to be viewed from the perspective of investor for whom corporate tax rate is irrelevant.

**PS 4.24**

ABC Ltd is planning for the most desirable capital structure. The cost of debt (after tax) and equity capital at various levels of debt-equity mix are estimated as follows:

<i>Debt as % of total capital employed</i>	<i>Cost of debt (%)</i>	<i>Cost of equity (%)</i>
0	10	15
20	10	15
40	12	16
50	13	18
60	14	20

Determine the composite cost of capital for each level of debt. Identify the optimal debt-equity mix.

**Solution**

*Determination of composite cost of capital*

$K_d$ (per cent)	$K_e$ (per cent)	Weights of debt ( $W_d$ )	Weights of equity ( $W_e$ )	Overall cost of capital ( $K_o$ ) ( $K_d W_d + K_e W_e$ ) (per cent)
10	15	0	1.0	15
10	15	0.2	0.8	14
12	16	0.4	0.6	14.4
13	18	0.5	0.5	15.5
14	20	0.6	0.4	16.4

Use of 20 per cent debt and 80 per cent equity constitutes optimal debt-equity mix.

**PS 4.25**

The CMD Ltd has the following specific cost of capital along with the indicated book and market value weights:

<i>Type of capital</i>	<i>Cost</i>	<i>Book value weights</i>	<i>Market value weights</i>
Equity	0.18	0.50	0.58
Preference shares	0.15	0.20	0.17
Long-term debt	0.07	0.30	0.25
		1.00	1.00

- Calculate the weighted cost of capital, using book and market value weights.
- Calculate the weighted average cost of capital, using marginal weights, if the company intends to raise the needed funds using 50 per cent long-term debt, 35 per cent preference shares and 15 per cent retained earnings.



**Solution**(i)  $K_o$  based on book value (BV) weights and market value (MV) weights

Sources of capital	Weights		Cost	Total cost	
	BV	MV		(BV × K)	(MV × K)
Equity funds	0.50	0.58	0.18	0.090	0.1044
Preference shares	0.20	0.17	0.15	0.030	0.0255
Long-term debt	0.30	0.25	0.07	0.021	0.0175
				<u>0.141</u>	<u>0.1474</u>

 $K_o$  based on BV weights—14.1 per cent. $K_o$  based on MV weights—14.7 per cent.(ii)  $K_o$  using marginal weights

Sources of capital	Weights (W)	Cost (K)	Total cost (W × K)
Long-term debt	0.50	0.07	0.0350
Preference shares	0.35	0.15	0.0525
Retained earnings	0.15	0.18	0.0270
			<u>0.1145</u>

 $K_o = 11.45$  per cent**PS 4.26**

Avon Transport Ltd is interested in measuring its cost of specific types of capital, as well as its overall cost. The finance department of the company indicates that the following costs would be associated with the sale of debentures, preference shares and equity shares. The corporate tax rate is 35 per cent.

**Debentures:** The company can sell 15-year 14 % Debentures of the face value of Rs 1,000 for Rs 970. In addition, an underwriting fee of 1.5 per cent of the face value would be incurred in the process.

**Preference shares:** 15 % Preference shares, having a face value of Rs 100, can be sold at a premium of 10 per cent. An underwriting fee of Rs 2 per share is to be paid to the underwriters.

**Equity shares:** The company's equity shares are currently selling for Rs 125 per share. It has to pay Rs 15 per share at the end of the coming year. Its dividend payments over the past 6 years per share are given below:

Year	Dividend
1	Rs 10.60
2	11.24
3	11.91
4	12.62
5	13.38
6	14.19

It is expected that the new equity shares can be sold at Rs 123 per share. The company must also pay Rs 3 per share as underwriting fee.

Market value (MV) and book value (BV) for each type of capital are as follows:

	Book value	Market value
Long-term debt	Rs 18,00,000	Rs 19,30,000
Preference shares	4,50,000	5,20,000
Equity shares	60,00,000	
Retained earnings	15,00,000	100,00,000
	<u>97,50,000</u>	<u>124,50,000</u>

- (i) Calculate the specific cost of each source of financing.  
(ii) Determine the weighted average cost of capital using (a) BV weights, and (b) MV weights.

### Solution

- (i) *Determination of specific costs*

$$K_d = \text{Rs } 140(0.65) + (\text{Rs } 1,000 - \text{Rs } 955)/15 \div (\text{Rs } 1,000 + \text{Rs } 955)/2 = 9.62 \text{ per cent.}$$

$$K_p = \text{Rs } 15/108 = 13.89 \text{ per cent.}$$

$$K_e = D_1/P_0(1-f) + g, g = \text{Rs } 10.6(1+r)^5 = 14.19 = (1+r)^5 = \text{Rs } 14.19/10.60 = 1.3386$$

Table A-1 suggests that Re 1 compounds to Rs 1.3386 in 5 years at 6 per cent rate of interest, that is, growth rate is 6 per cent.

$$K_e = (\text{Rs } 15/120) + 0.06 = 18.5 \text{ per cent}$$

$$K_r = (\text{Rs } 15/123) + 0.06 = 18.2 \text{ per cent}$$

$K_0$  based on BV and MV weights

Source of capital	Weights		Specific cost (K)	Total costs	
	Book value (BV)	Market value (MV)		(BV × K)	(MV × K)
Equity capital	Rs 60,00,000	Rs 80,00,000	0.185	Rs 11,10,000	Rs 14,80,000
Retained earnings	15,00,000	20,00,000	0.182	2,73,000	3,64,000
Preference shares	4,50,000	5,20,000	0.1389	62,505	72,228
Long-term debts	18,00,000	19,30,000	0.0962	1,73,160	1,85,666
	97,50,000	1,24,50,000		16,18,665	21,01,894

$K_0$  based on BV weights =  $(\text{Rs } 16,18,665/97,50,000) \times 100 = 16.6 \text{ per cent.}$

$K_0$  based on MV weights =  $(\text{Rs } 21,01,894/1,24,50,000) \times 100 = 16.9 \text{ per cent.}$

### PS 4.27

Avon Electricals Ltd wishes to determine the weighted average cost of capital for evaluating capital budgeting projects. You have been supplied with the following information to calculate the value of  $K_0$  for the company:

#### Balance sheet as on March 31

Liabilities		Assets	
Current liabilities	Rs 9,00,000	Sundry assets	Rs 39,00,000
Debentures	9,00,000		
Preference shares	4,50,000		
Equity shares	12,00,000		
Retained earnings	4,50,000		
	Rs 39,00,000		39,00,000

*Anticipated external financing information:*

- (i) 20 years, 8 % Debentures of Rs 2,500 face value, redeemable at 5 per cent premium, sold at par, 2 per cent flotation costs.  
(ii) 10 % Preference shares: Sale price Rs 100 per share, 2 per cent flotation costs.  
(iii) Equity shares: Sale price Rs 115 per share; flotation costs would be Rs 5 per share.  
(iv) The corporate tax rate is 35 per cent and expected equity dividend growth is 5 per cent per year. The expected dividend at the end of the current financial year is Rs 11 per share. Assume that the company is satisfied with its present capital structure and intends to maintain it.

**Solution**

$$K_d = \text{Rs } 200(1 - 0.35) + (\text{Rs } 2,625 - \text{Rs } 2,450)/20 \div (\text{Rs } 2,625 + \text{Rs } 2,450)/2 = 5.47 \text{ per cent.}$$

$$K_p = \text{Rs } 10 \div (\text{Rs } 100 + \text{Rs } 98)/2 = 10.1 \text{ per cent.}$$

$$K_e = (\text{Rs } 11 \div \text{Rs } 110) + 0.05 = 15 \text{ per cent.}$$

$$K_r = (\text{Rs } 11 \div \text{Rs } 115) + 0.05 = 14.57 \text{ per cent.}$$

Determination of weighted average cost of capital

Sources of funds	Amount	Cost	Total costs
Debentures	Rs 9,00,000	0.0547	Rs 49,230
Preference shares	4,50,000	0.1010	45,450
Equity shares	12,00,000	0.15	1,80,000
Retained earnings	4,50,000	0.1457	65,565
	<u>30,00,000</u>		<u>3,40,245</u>

$$K_o = (\text{Rs } 3,40,245/30,00,000) \times 100 = 11.34 \text{ per cent.}$$

**PS 4.28**

From the following information, determine the appropriate weighted average cost of capital, relevant for evaluating long-term investment projects of the company.

Cost of equity	0.18
After tax cost of long-term debt	0.08
After tax cost of short-term debt	0.09

Sources of capital	Book value (BV)	Market value (MV)
Equity	Rs 5,00,000	Rs 7,50,000
Long-term debt	4,00,000	3,75,000
Short-term debt	<u>1,00,000</u>	<u>1,00,000</u>
	10,00,000	12,25,000

**Solution**

Determination of weighted average cost of capital

Sources of capital	Market value	Specific cost (K)	Total costs (MV × K)
Equity	Rs 7,50,000	0.18	Rs 1,35,000
Long-term debt	<u>3,75,000</u>	<u>0.08</u>	<u>30,000</u>
	11,25,000		1,65,000

$$K_o = (\text{Rs } 1,65,000/11,25,000) \times 100 = 14.7 \text{ per cent.}$$

**PS 4.29**

Determine the cost of capital for Hindustan Paper Ltd using the book (BV) and market value (MV) weights from the following information:

Equity shares:	Rs 1,20,00,000 (Rs 2,00,00,000, MV)
Retained earnings:	Rs 30,00,000
Preference shares:	Rs 9,00,000 (Rs 10,40,000, MV)
Debentures:	Rs 36,00,000 (Rs 33,75,000, MV).

*Additional information:*

- (i) *Equity*: Equity shares are quoted at Rs 130 per share and a new issue priced at Rs 125 will be fully subscribed; flotation costs will be Rs 5 per share.
- (ii) *Dividend*: During the previous 5 years, dividends have steadily grown from Rs 10.60 to Rs 14.19. Dividend at the current year-end is expected to be Rs 15 per share.
- (iii) *Preference shares*: 15 % Preference shares with face value of Rs 100 would realise Rs 105 per share.
- (iv) *Debentures*: The company proposes to issue 11-year 15 % Debentures but the yield on debentures of similar maturity and risk class is 16 per cent; flotation cost is, 2 per cent.
- (v) *Tax*: Corporate tax rate is 35 per cent. Shareholders are in tax slab of 25 per cent. Ignore dividend tax.

**Solution***Determination of cost of specific sources of capital:*

$$K_e = [D_1/P_0(1-f)] + g, \quad g = \text{Rs } 10.16 (1+r)^5 = \text{Rs } 14.19.$$

Table A-1 suggests that Re 1 compounds to Rs 1.338 in 5 years at the compound rate of 6 per cent. Therefore,  $g$  is 6 per cent.

$$K_e = (\text{Rs } 15/\text{Rs } 120) + 0.06 = 18.5 \text{ per cent.}$$

$$K_r = (D_1/P_0) + g = (\text{Rs } 15/125) + 0.06 = 18 \text{ per cent.}$$

$$K_p = D_1/P_0(1-f) = \text{Rs } 15/105 = 14.3 \text{ per cent.}$$

$$K_d = [I(1-t) + (RV - SV)/n] \div (RV + SV)/2 = [\text{Rs } 15(0.65) + \text{Rs } 100 - 91.75^*/11] \div (\text{Rs } 100 + \text{Rs } 91.75)/2 = 11 \text{ per cent}$$

\*Since yield on similar type of debentures is 16 per cent, the company would be required to offer debentures at discount.

Market price of debentures = Coupon rate  $\div$  Market rate of interest = Rs 15/0.16 = Rs 93.75.

Sale proceeds from debentures = Rs 93.75 – Rs 2, flotation cost = Rs 91.75

*Cost of capital [BV weights and MV weights] (amount in lakh of rupees)*

Source of capital	Weights		Specific cost	Total cost	
	BV	MV		(BV $\times$ K)	(MV $\times$ K)
Equity	120	160*	0.185	22.2	29.6
Retained earnings	30	40*	0.18	5.4	7.2
Preference shares	9	10.4	0.143	1.29	1.49
Debentures	36	33.75	0.11	3.96	3.71
	195	244.15		32.85	42.00

\*MV of equity has been apportioned in the ratio of BV of equity and retained earnings.

$$K_0 \text{ (BV weights)} = (\text{Rs } 32.85/195) \times 100 = 16.85 \text{ per cent.}$$

$$K_0 \text{ (MV weights)} = (\text{Rs } 42/244.15) \times 100 = 17.20 \text{ per cent.}$$

**PS 4.30**

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 16 per cent.
- (iii) Pre-tax cost of debentures—15.5 per cent.
- (iv) Interest on bank loan—15 per cent (long-term) and 14 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.

**Solution***Determination of cost of specific sources:*

- (i) *Equity (existing):*  $g = [\text{EPS} - \text{DPS} (1 + t)]/P_0 = [\text{Rs } 8 - \text{Rs } 5(1 + 0.1)]/\text{Rs } 40 = 6.25 \text{ per cent.}$   
 $k_e = (D_1/P_0) + g = (\text{Rs } 5/40) + 0.0625 = 18.75 \text{ per cent.}$   
*Equity (new issue)*  $= (\text{Rs } 5/35) + 0.0625 = 20.54 \text{ per cent.}$
- (ii) *Cost of debentures*  $= 0.155 (1 - 0.35) = 10.1 \text{ per cent.}$
- (iii) *Cost of bank loan*  $= 0.15 (1 - 0.35) = 9.75 \text{ per cent.}$
- (iv) *Cost of preference shares*  $= (\text{Total dividends on preference shares} + \text{Dividend tax}) \div \text{Market value of preference shares}$   
 $= (\text{Rs } 1,28,000 + \text{Rs } 12,800)/\text{Rs } 8,50,000 = 16.56 \text{ per cent.}$

*Determination of overall cost of capital (based on market value, MV weights)*

Sources of capital	MV	Cost (per cent)	Total cost
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	0.1656	1,40,760
Debentures	50,00,000	0.101	5,05,000
Long-term bank loan	18,00,000	0.0975	1,75,500
	<u>1,14,50,000</u>		<u>15,58,820</u>

$$K_0 = \text{Rs } 15,58,820/1,14,50,000 = 13.61 \text{ per cent.}$$

**EXERCISES**

**E.4.1** For each of the following historical patterns of four companies, X, Y, Z and W, calculate the dividend growth rate to the nearest whole percentage point.

*Dividend pattern (per share)*

Year	X	Y	Z	W
1	Rs 3.03	Rs 44.00	Rs 10.80	Rs 5.55
2	3.06	48.40	11.66	6.16
3	3.09	53.24	12.60	6.84
4	3.12	58.56	13.60	7.59
5	3.15	64.44	14.69	8.43

**E.4.2** XYZ Ltd has the following capital structure on March 31.

11% Debentures	Rs 5,00,000
10% Preference shares	1,00,000
4,000 Equity shares of Rs 100 each	4,00,000
<b>Total</b>	<b>10,00,000</b>

Equity shares are quoted at Rs 102, and it is expected that the company will declare a dividend of Rs 10 per share at the end of the current year. The dividend is expected to grow at 10 per cent for the next 5 years. The company's tax rate is 35 per cent.

- Calculate from the foregoing data the cost of equity capital and weighted average cost of capital. Ignore dividend tax.
- Assuming the company can raise additional debentures aggregating to Rs 3 lakh at 12 per cent, calculate the revised weighted average cost of capital, if the resultant changes are: (i) Increase in dividend rate from 10 to 12 per cent, (ii) Reduction in growth rate from 10 to 8 per cent, and (iii) Fall in the market price of shares from Rs 108 to Rs 92.

- E.4.3** (i) 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?
- (ii) What would happen to the market price of the debentures if interest rate rises to (a) 12 per cent, and (b) drops to 6 per cent?
- (iii) What would the market price of the debentures be if it is assumed that debentures are originally having a 15-year maturity period which is 4 years away from now?

**E.4.4** The Hypothetical Ltd has on its book the following amounts and specific costs of each type of capital

Type of capital	Book value (BV )	Market value (MV)	Specific cost (%)
Debt	Rs 4,00,000	Rs 3,80,000	5
Preference	1,00,000	1,10,000	8
Equity	6,00,000		
Retained earnings	2,00,000	12,00,000	13
	<u>13,00,000</u>	<u>16,90,000</u>	

Determine the weighted average cost of capital using (a) BV weights and (b) MV 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?

**E.4.5** A fast growing company wants to expand its total assets by 50 per cent by the end of the year. You have been given below 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
	<u>10,00,000</u>

New debentures would be sold at 14 per cent coupon rate at par. Preference shares will have a 15 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 12 per cent, consisting of a dividend yield of 4 per cent and an expected growth rate of 8 per cent. Retained earnings for the year are estimated to be Rs 50,000 (ignore depreciation). The corporate tax rate is 35 per cent. You are required to calculate the following:

- Assuming that all assets expansion (gross expenditure for fixed assets plus related WC) is included in the capital budget, what is the required amount of capital budget?
- How much of the capital budget must be financed by external equity (ie, issue of new equity shares) to maintain the optimal capital structure?
- The cost of new equity capital.
- The weighted average cost of capital, using marginal weights.

**E.4.6** SP Industries Ltd has been growing at the rate of 15 per cent per year and this trend is expected to continue for 5 more years. Thereafter, it is likely to grow at the rate of 8 per cent, which is the industry average.

The investors expect a return of 12 per cent. The dividend paid per share for last year ( $D_0$ ) corresponding to period 0 ( $t = 0$ ) is Rs 5.

Determine at what price would an investor at period  $t = 0$  be ready to buy the shares of the company at the end of period  $t = 0$  (now), and at  $t_1, t_2, t_3, t_4$  and  $t_5$ .

**E.4.7** The capital structure of Swan Ltd, comprising 9.25% Debentures, 9% Preference shares and equity shares of Rs 100 each, is in the proportion of 3:2:5.

The company is contemplating introduction of further capital to meet the expansion needs by seeking 10.75 per cent term loan from financial institutions. As a result of this proposal, the proportions of debentures, preference shares and equity would get reduced by 1/10, 1/15 and 1/6, respectively. In the light of above proposal, calculate the impact on weighted average cost of capital, assuming 35 per cent tax rate, expected dividend of Rs 9 per share at the end of the year, and growth rate of dividends at 5 per cent. No change in the dividend, dividend growth rate and market price of share is expected after availing of the proposed term loan.

**E.4.8** Aries Limited wishes to raise additional finance of Rs 10 lakh for meeting its investment plans. It has Rs 2,10,000 in the form of retained earnings available for investment purposes. The following are the further details:

- (i) Debt-equity mix, 30:70
- (ii) Cost of debt: Up to Rs 1,80,000, 0.10 (before tax)  
Beyond Rs 1,80,000, 0.16 (before tax)
- (iii) Earnings per share, Rs 4
- (iv) Dividend payout, 50 per cent of earnings
- (v) Expected growth rate in dividend, 10 per cent
- (vi) Current market price per share, Rs 44
- (vii) Tax rate, 35 per cent

You are required:

- (a) To determine the pattern for raising the additional finance, assuming the firm intends to maintain existing debt-equity mix.
- (b) To determine the post-tax average cost of additional debt.
- (c) To determine the cost of retained earnings and cost of equity. Ignore dividend tax.
- (d) Compute the overall  $K_0$  of additional finance.

## ANSWERS

**E.4.1** 1% (X), 10% (Y), 8% (Z), 11% (W).

**E.4.2** (a)  $K_e = 19.8\%$ ,  $K_0 = 12.5\%$ .

(b)  $K_e = 20.2\%$ ,  $K_0 = 11.53\%$ .

**E.4.3** (i) Rs 80,

(ii) (a) Rs 133.33

(b) Rs 66.67

(iii) Rs 93.66.

**E.4.4** (a)  $K_0 = 10.15\%$ .

(b) 10.88%.

**E.4.5** (a) Rs 5,00,000.

(b) Rs 2,00,000.

(c)  $K_e = 17.5\%$ ,  $K_r = 17\%$ .

(d)  $K_0 = 13.84\%$ .

**E.4.6** Investor would be prepared to buy the share at a price of less than Rs 181 (at  $t = 0$ ), Rs 197.25 ( $t = 1$ ), Rs 214.23 ( $t = 2$ ), Rs 232.2 ( $t = 3$ ), Rs 251.42 ( $t = 4$ ), and Rs 271.50 ( $t = 5$ ).

**E.4.7** Weighted average cost of capital will decrease from 10.5% to 9.3%.

**E.4.8** (a) Debt: Rs 3,00,000, retained earnings: Rs 2,10,000, equity: Rs 4,90,000

(b) 8.1%

(c)  $K_e = 15\%$ ,  $K_r = 15\%$

(d) 12.92%.



# 5 *CAPITAL BUDGETING*

## BASIC THEORY

### INTRODUCTION

Capital budgeting is of paramount importance as the framework of future development, and the major determinant of efficiency and competitive power of a firm. It relates to fixed or long-term assets, which are defined as assets that are in operation and yield returns over a period of time. It, therefore, involves a current outlay in return for a series of anticipated future benefits.

Thus, the system of capital budgeting is employed to evaluate decisions that involve a current outlay, but are likely to produce benefits over a period of time. Such decisions may be classified into (i) income-expansive, that is, those affecting revenues; (ii) those affecting cost reduction; (iii) mutually exclusive; and (iv) capital rationing (a situation in which more investment opportunities are available than the available finance).

The data requirement for capital budgeting is incremental after tax cash flows. The cash flow approach for measuring benefits is superior to the accounting profit basis because it (a) avoids the ambiguities of the accounting profit concept, (b) measures the total benefits, and (c) takes cognizance of the time value of money. The accounting profit is useful as a performance measure, but cash flow is useful as a decision criterion. The major difference between the cash flow and the accounting profit approaches relates to the treatment of depreciation, which is ignored as an item of cost of computation under the cash flow approach.

### DETERMINATION OF RELEVANT CASH FLOWS

The data requirement for capital budgeting are cash flows—outflows and inflows. The cash inflows can be (a) operating, and (b) terminal, comprising salvage value and recovery of working capital. Their computation depends on the nature of the proposal. Capital projects can be categorised into (a) a single proposal, (b) a replacement situation, and (c) a mutually exclusive situation. The computation of cash inflows and outflows with reference to these are illustrated below.

#### Cash Flows: Single Proposal

Cash outflows, comprising cash outlays required to carry out the proposed capital expenditure, are depicted in Exhibit 5.1, while the computation of the cash inflows after taxes (CFAT) is shown in Exhibit 5.2.

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#### **EXHIBIT 5.1** *Cash Outflows of a New Project [Beginning of the Period at Zero Time ( $t = 0$ )]*

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- Cost of new project (to purchase land, building, plant and equipment)
  - + Installation cost of plant and equipment
  - ± Working capital requirements
-

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**EXHIBIT 5.2** *Determination of Cash Inflows [Revenue-expanding Single Investment Proposal ( $t = 1 - N$ )]*


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	Years					
	1	2	3	4	...	N
Cash sales revenue						
Less cash operating cost						
Cash inflows before taxes (CFBT)						
– Depreciation						
Taxable income						
– Tax						
Earnings after taxes						
+ Depreciation						
Cash inflows after tax (CFAT)						
+ Salvage value (in $n$ th year)						
+ Recovery of working capital (in $n$ th year)						

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**Cash flows: Replacement Situation**

In the case of replacement of an existing asset by a new one, the relevant cash outflows are incremental after tax cash flows. If a new asset is intended to replace an existing asset(s) which is (are) being sold, the proceeds so obtained from its (their) sale reduce cash outflows required to purchase a new asset and, hence, form part of relevant cash flows.

The calculation of incremental after tax cash outflows and inflows are illustrated in Exhibits 5.3 and 5.4, respectively.

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**EXHIBIT 5.3** *Incremental Cash Outflows in Replacement Situation*


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- Cost of new machine
  - + Installation cost
  - $\pm$  Working capital
  - – Sales proceeds of existing asset
- 

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**EXHIBIT 5.4** *Determination of Incremental CFAT in Replacement Situation*


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	Years					
	1	2	3	4	...	N
Cash flows before taxes (CFBT) (Sales revenue – Cash operating cost)						
Proposed/New – Existing/Old						
Surplus (deficiency)						
Less taxes						
Incremental CFAT (a)						
Depreciation						
Proposed/New						
– Existing/Old						
Incremental/excess depreciation						
Tax savings on excess depreciation (b)						
Incremental CFAT (a + b)						

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(Contd.)

(Contd.)

- + Working capital recovery in the terminal ( $n$ th) year
- + Salvage value in the terminal year
- + Tax advantage on short-term capital loss on sale of asset in terminal year (if block of assets ceases to exist)
- Tax on short-term capital gain

### CASH FLOWS: MUTUALLY EXCLUSIVE SITUATIONS

In the case of mutually exclusive proposals, the selection of one proposal precludes the selection of the other(s). The calculation of the cash outflows and inflows are on similar lines to the replacement situations.

### EVALUATION TECHNIQUES

The available capital budgeting techniques are: (i) Traditional techniques, comprising (a) average or accounting rate of return (ARR), and (b) pay back period; (ii) Discounted cash flow (DCF) or time adjusted cash flow, consisting of (a) net present value (NPV), (b) internal rate of return (IRR), and (c) profitability index (PI).

#### Traditional Techniques

The computation of ARR and pay back period is summarised in Exhibit 5.5.

#### **EXHIBIT 5.5** *Traditional Techniques*

<i>Average Rate of Return (ARR):</i> Annual average profits after taxes/Average investments	(5.1)
Average investment = $1/2$ (initial cost – salvage value) + salvage value + net working capital	(5.1.1)
Annual average profits after taxes = Total expected after tax profits/Number of years	(5.1.2)
<i>Pay Back Period (PB)</i>	
<i>Annuity Cash Flows:</i> $PB = \text{Initial investment}/\text{Annual CFAT}$	(5.2)
<i>Mixed Cash Flows:</i> PB is calculated by cumulating cashinflows till the cumulative cash flows equal the initial investment.	(5.3)

#### Discounted Cash Flow Techniques

The computation of NPV, IRR and PI is summarised in Exhibits 5.6 to 5.8.

#### **EXHIBIT 5.6** *Net Present Value (NPV) Method*

$NPV = PV \text{ of cash inflows} - C$	(5.4)
$C = \text{Initial outlay}$	
$PV \text{ of cash inflows} = \text{Present value interest factor (PVIF)} \times CFAT$ . PVIF is available in the Appendix. If NPV is positive, accept the proposal, otherwise reject it.	

#### **EXHIBIT 5.7** *Internal Rate of Return (IRR) Method*

The IRR is the discount rate which equates the aggregate present value of CFAT with the aggregate present value of cash outflows of a project. The project will be accepted only if IRR exceeds the required rate of return.

*Annuity CFAT:* The following steps are taken in determining IRR when CFAT is annuity:

1. Determine the pay back period of the proposed investment.
2. In Table A-4 (present value of an annuity), look for the year row equal to the life of the project.

(Contd.)

**EXHIBIT 5.7** (Contd.)

3. Find the PV factor or discount factor ( $DF_p$ ) closest to the PB period.
4. From the top row of the table, note the interest rates ( $r$ ) corresponding to these PB values ( $DF_p$ ).
5. Determine the actual IRR by interpolation. This can be done either directly by using Equation 5.5, or indirectly by finding the present values of annuity (Equation 5.6).

$$IRR = r - (PB - DF_p) / (DF_{rL} - DF_{rH}) \quad (5.5)$$

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

$r$  = Either of the two interest rates used in the formula

Alternatively,

$$IRR = [r - (PV_{CO} - PV_{CFAT}) / \Delta PV] \times \Delta r \quad (5.6)$$

where

$PV_{CO}$  = Present value of cash outlay

$PV_{CFAT}$  = Present value of cash inflows (=  $DF_r \times$  annuity) for interest rate,  $r$ .

$r$  = Either of the two interest rates used in the formula

$\Delta r$  = Difference in interest rates

$\Delta PV$  = Difference in calculated present values of finflows

**Mixed CFAT:** 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. The following procedure is useful in calculating IRR.

1. Calculate the average annual cash inflow to get assumed or “fake annuity”.
2. Determine assumed “fake pay back period” by dividing the initial outlay by the average annual CFAT (assumed annuity) 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 very 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 inflow (as per step 1) to the actual mixed stream of cash flows. If the actual cash flow stream happens to be higher in the initial years of the project's life than the average stream, adjust the IRR upwards by a few percentage points. Conversely, if in the early years, the actual cash inflows are below average, adjust the IRR downwards by a few percentage points. If the average cash flow pattern seems fairly close to the actual pattern, no adjustment is to be made.
5. Find out the present value of the mixed cash flows, taking the IRR as the discount rate as estimated in step 4. (Table A-3 is to be used and not Table A-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 cause the NPV to be closest to zero, is the IRR to the nearest per cent.
7. The actual value can be ascertained by the method of interpolation as in the case of an annuity.

**EXHIBIT 5.8** Profitability Index (PI) Method/Benefit-Cost (BC) Ratio

$$PI/BC = \text{Present value of cash inflows} / \text{Present value of cash outflows} \quad (5.7)$$

The proposal is worth accepting if the PI exceeds one.

**CAPITAL RATIONING**

Capital rationing is concerned with the problem of selecting the mix of acceptable projects that provide the

highest overall NPV when there are budget constraints. The ranking of project competing for limited funds can either be on the basis of the profitability index or IRR.

## SOLVED PROBLEMS

### PS 5.1

The Hypothetical Ltd is considering investment in a new product. The information for one year is given as follows:

(a) Sales	Rs 1,00,000
(b) Manufacturing cost of sales (including Rs 10,000 of depreciation)	40,000
(c) Selling and administrative expenses (directly associated with the product)	20,000
(d) Decrease in contribution of other products	2,000
(e) Increase in accounts receivable	7,000
(f) Increase in inventories	10,000
(g) Increase in current liabilities	15,000
(h) Income taxes associated with product income	6,000

You are required to compute the relevant cash flows of the year to be considered in evaluating this investment proposal.

### Solution

#### Relevant cash flows

(i) <i>Incremental cash inflows</i>		
Sales		Rs 1,00,000
(ii) <i>Incremental cash outflows</i>		
Manufacturing cost of sales	Rs 30,000	
Selling and administrative expenses	20,000	
Decrease in contribution of other products	2,000	
Income taxes associated with product income	6,000	58,000
Net cash inflows (CFAT) for one year		42,000
(iii) <i>Cash outflows due to additional working capital requirement in the beginning of the year</i>		
Increase in accounts receivable	7,000	
Plus increase in inventories	10,000	
Less increase in current liabilities	15,000	2,000
Net increase in working capital		2,000

### PS 5.2

ABC Ltd is considering investing in a project that costs Rs 5,00,000. The estimated salvage value is zero; tax rate is 35 per cent. The company uses straight line depreciation for tax purposes and the proposed project has cash flows before tax (CFBT) as follows:

Year	CFBT
1	Rs 1,00,000
2	1,00,000
3	1,50,000
4	1,50,000
5	2,50,000

Determine the following: (i) Pay back period, and (ii) Average rate of return.

**Solution***Cash inflows*

Year	CFBT	Depreciation	Taxable earnings	Tax	EAT	CFAT [Col 2 – 5]	Cumulative CFAT
1	2	3	4	5	6	7	8
1	Rs 1,00,000	Rs 1,00,000	—	—	—	Rs 1,00,000	Rs 1,00,000
2	1,00,000	1,00,000	—	—	—	1,00,000	2,00,000
3	1,50,000	1,00,000	Rs 50,000	Rs 17,500	Rs 32,500	1,32,500	3,32,500
4	1,50,000	1,00,000	50,000	17,500	32,500	1,32,500	4,65,000
5	2,50,000	1,00,000	1,50,000	52,500	97,500	1,97,500	6,62,500
			2,50,000		1,62,500	6,62,500	

(i) *Pay back period*

The pay back period is four years plus a fraction of the fifth year. The fraction value will be equal to 0.18, that is, Rs 35,000 ÷ Rs 1,97,500. The payback period is 4.18 years.

(ii) *Average rate of return (ARR)*

(a)  $ARR = (\text{Average income} / \text{Average investment}) \times 100 = (\text{Rs } 32,500 / 2,50,000) \times 100 = 13 \text{ per cent}$

\*Rs 1,62,500, EAT/5 years = Rs 32,500.

(b)  $ARR = (\text{Average cash flow} / \text{Average investment}) \times 100 = (\text{Rs } 1,32,500 / 2,50,000) \times 100 = 53 \text{ per cent.}$

**PS 5.3**

The investment data for a new product are as follows:

Capital outlay: Rs 2,00,000

Depreciation: 25 per cent per annum on written down value basis.

Forecasted annual income before charging depreciation, but after all other charges, are as follows:

Year 1	Rs 1,00,000
2	1,00,000
3	80,000
4	80,000
5	40,000
	4,00,000

On the basis of available data, set out calculations, illustrating and comparing the following methods of evaluating capital budgeting decisions: (a) PB method, (b) Rate of return on original investment, and (c) Discounted cash flow. State clearly any assumptions you make. Ignore taxation.

**Solution**

(a) *PB period = Rs 1 lakh, year 1 + Rs 1 lakh, year 2 = 2 years*

(b) *Rate of return on original investment*

Year	CFAT (Earnings before depreciation)	Depreciation	Net income
1	Rs 1,00,000	Rs 50,000	Rs 50,000
2	1,00,000	37,500	62,500

(Contd.)

**Solution (Contd.)**

3	80,000	28,125	51,875
4	80,000	21,094	58,096
5	40,000	15,820	24,180
			<u>2,46,651</u>

= (Average income/Average investment)  $\times$  100 = [Rs 49,330 (Rs 2,46,651  $\div$  5 years)/Rs 2,00,000]  $\times$  100 = 24.7 per cent

**(c) Discounted cash flow (IRR)**

Pay back period (value) = Rs 2,00,000/Rs 80,000 = 2.500.

Factor closest to fake PB value (as per Table A-4) corresponding to 5 years (life of the project) is 2.436 (30 per cent). Since the actual cash flow stream is higher in initial years than average cash flows, higher discount rate of 33 per cent is also tried along with 30 per cent.

Year	CFAT	PV factor at		Total PV at	
		0.30	0.33	0.30	0.33
1	Rs 1,00,000	0.769	0.752	Rs 76,900	Rs 75,200
2	1,00,000	0.592	0.565	59,200	56,600
3	80,000	0.455	0.425	36,400	34,000
4	80,000	0.350	0.320	28,800	25,600
5	40,000	0.269	0.240	10,760	9,600
				<u>2,11,260</u>	<u>2,00,900</u>

The IRR is 33 per cent.

**PS 5.4**

XYZ Ltd, whose cost of capital is 10 per cent, is considering two mutually exclusive projects, X and Y, the details of which are:

	Project X	Project Y
Investment	Rs 70,000	Rs 70,000
Cash inflow: year 1	10,000	50,000
2	20,000	40,000
3	30,000	20,000
4	45,000	10,000
5	60,000	10,000
	<u>1,65,000</u>	<u>1,30,000</u>

Compute the NPV, profitability index, and IRR for the two projects.

**Solution****Determination of NPV**

Year	CFAT		PV factor (at 0.10)	Total PV	
	X	Y		X	Y
1	Rs 10,000	Rs 50,000	0.909	Rs 9,090	Rs 45,450
2	20,000	40,000	0.826	16,520	33,040
3	30,000	20,000	0.751	22,530	15,020
4	45,000	10,000	0.683	30,735	6,830
5	60,000	10,000	0.621	37,260	6,210
Total				<u>1,16,135</u>	<u>1,06,550</u>

(Contd.)

**Solution (Contd.)**

Less cash outflows	70,000	70,000
NPV	46,135	36,550
PI = Gross PV of CFAT/PV of cash outlays	1.659	1.522

*Determination of IRR:*

Fake pay back value = Initial cash outlays/Average cash inflows

Project X = Rs 70,000/33,000 = 2.121

Project Y = Rs 70,000/26,000 = 2.692

Total A-4 indicates that the PV factor closet to 2.121 against 5 years is 2.143 at 37 per cent (project X) and to 2.692 is 2.689 at 25 per cent (project Y). In the case of project X, since CFATs in the initial years are considerably smaller than the average cash flows, the IRR is likely to be much smaller than 37 per cent. Let us try 27 and 28 per cent. In the case of project Y, CFATs in the initial years are considerably larger than the average cash flows, the IRR is likely to be much higher than 25 per cent. Let us try 36 and 37 per cent.

*Project X*

Year	CFAT	PV factor at		Total PV at	
		(0.27)	(0.28)	(0.27)	(0.28)
1	Rs 10,000	0.787	0.781	Rs 7,870	Rs 7,810
2	20,000	0.620	0.610	12,400	12,200
3	30,000	0.488	0.477	14,640	14,310
4	45,000	0.384	0.373	17,280	16,785
5	60,000	0.303	0.291	18,180	17,460
				70,370	68,565

IRR = 0.27 + (Rs 370/Rs 1,805) = 27.2 per cent.

*Project Y*

Year	CFAT	PV factor at		Total PV at	
		(0.36)	(0.37)	(0.36)	(0.37)
1	Rs 50,000	0.735	0.730	Rs 36,750	Rs 36,500
2	40,000	0.541	0.533	21,640	21,320
3	20,000	0.398	0.389	7,960	7,780
4	10,000	0.292	0.284	2,920	2,840
5	10,000	0.215	0.207	2,150	2,070
				71,420	70,510

IRR = 37 per cent.

**PS 5.5**

AB Ltd wants to purchase a plant for its expanding operations. The desired plant is available at Rs 3,00,000 in cash or Rs 4,50,000 to be paid in five equal annual instalments (of Rs 90,000 each) due at the end of each year. Assuming the required rate of return of 15 per cent, which option should the company exercise? Ignore taxes.

**Solution***Present value of instalments*

Instalment sum	Rs 90,000
(x) PV factor of annuity for 5 years at 0.15 (PVIFA <sub>15,5</sub> )	(x) 3.353
Total PV of cash outflows	3,01,770



**Recommendation:** Since the PV of cash outflows is lower (at Rs 3,00,000), the company should purchase the plant on cash basis.

### PS 5.6

Hypothetical Ltd is contemplating the introduction of a new machine. From the following information given to you, determine the profitability of the project, assuming 10 per cent as the cost of capital:

Year	0	1	2	3	4	5
Cash outflows (at year-end)	Rs 40,000	–	–	Rs 30,000	–	–
Net cash inflows (at year-end)	–	Rs 20,000	Rs 20,000	–	Rs 40,000	Rs 80,000

### Solution

#### Determination of NPV

Year	Cashflows	PV factor at 0.10	Total PV
0	Rs (40,000)	1.000	Rs (40,000)
1	20,000	0.909	18,180
2	20,000	0.826	16,520
3	(30,000)	0.751	(22,530)
4	40,000	0.683	27,320
5	80,000	0.621	49,680
NPV			49,170

### PS 5.7

FAIF Ltd is considering two mutually exclusive investments. Both projects involve a cash outlay of Rs 50,000. The estimated after tax net cash inflows of project X are Rs 10,000 per year for 10 years; and of project Y, Rs 16,209.44 per year for 5 years.

- Which project should be acceptable to the company at 10 per cent cost of capital?
- Would your decision be affected if (a) cost of capital rises to 12 per cent, or (b) falls to 8 per cent?

### Solution

#### (i) Determination of NPV of projects X and Y

	Project X (years 1 – 10)	Project Y (years 1 – 5)
CFAT	Rs 10,000	Rs 16,209.44
(×) PVIFA	(×) 6.145	(×) 3.791
Total PV	61,450	61,450
Less cash outflows	50,000	50,000
NPV	11,450	11,450

Both projects are equally acceptable.

(ii) *Determination of NPV of projects X and Y at 12 per cent and 8 per cent.*

	Years	CFAT	PV factor at		Total PV at		NPV at	
			0.12	0.08	0.12	0.08	0.12	0.08
Project X	1 – 10	Rs 10,000	5.650	6.710	Rs 56,500	Rs 67,100	Rs 6,500	Rs 17,100
Project Y	1 – 5	16,209.44	3.605	3.993	58,435	64,724	8,435	14,724

Yes, at 12 per cent, Y is better while X is superior at 8 per cent.

### PS 5.8

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 inflow (if machine is sold)*

Selling price of the old machine	Rs 80,000
Add tax savings ( $0.35 \times \text{Rs } 30,000$ , short-term capital loss)	10,500
	90,600

*Present value of cash outflows saved if machine is not sold (PV of keeping machine)*

	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 (x) PVIFA <sub>15,5</sub>		40,300
		(x) 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.

### PS 5.9

Fill in the blanks for each of the following independent cases. Assume in all cases that there are no salvage values for the investments, and income taxes are to be ignored.

Case	Life of the project (years)	Annual cash inflows	Initial investment	Cost of capital	IRR	NPV	Profitability index
	1	2	3	4	5	6	7
A	10	Rs 1,00,000	—	—	0.20	—	1.1089
B	13	—	Rs 3,00,000	0.16	—	Rs 60,000	—
C	—	80,000	3,51,000	0.12	—	—	1.125

### Solution

**Case A** (3) Investment = [Annual cash flows  $\times$  PV factor at 20, 10 (Table A-4)] = Rs 1,00,000  $\times$  4.192 = Rs 4,19,200.

Investment	Rs 4,19,200
( $\times$ ) Profitability index	( $\times$ ) 1.1089
Total PV of cash inflows	4,64,850.90
Less initial investment	4,19,200.00
NPV	45,650.90

(4) PV factor = PV of cash inflows/Annual cash flows = Rs 4,64,850.90/1,00,000.00 = 4.6485. As per Table A-4, the PV factor closest to 4.6485 is 4.659 at 17 per cent against 10 years. The *cost of capital* is 17 per cent.

**Case B** (7) PI = PV of cash inflows (PV of cash outflows + NPV)/PV of cash inflows = (Rs 3,00,000 + Rs 60,000)/Rs 3,00,000 = 1.2

(2) PV of future cash inflows/PV factor for 16 (r) and 13 (n) = Annual cash flows = Rs 3,60,000/5.342 = Rs 67,390.5

(5) PV factor = Initial investment/Annual cash inflows = Rs 3,00,000/Rs 67,390.5 = 4.4516. The PV factors closest to 4.4516 are 4.533 (20 per cent) and 4.362 (21 per cent) corresponding to 13 year period. By interpolation IRR = 20.5 per cent.

**Case C** (6)

Investment	Rs 3,61,600
$\times$ Profitability index	( $\times$ ) 1.25
PV of future cash flows	4,52,000
Less initial investment	3,61,600
NPV	90,400

(1) PV factor = PV of future cash flows/Annual cash inflows

= Rs 4,52,000/80,000 = 5.65. Table A-4 indicates PV factor 5.65 at 12 per cent cost of capital is associated with the 10-year project life.

(5) PV factor = Initial investment/Annual cash inflows = Rs 3,61,600/80,000 = 4.52. PV factor closest to 4.52 corresponding to a 10-year project life is 4.494 (at 18 per cent). IRR = 18 per cent.

### PS 5.10

A machine costing Rs 110 lakh has a life of 10 years, at the end of which its scrap value is likely to be Rs 10 lakh. The firm's cut-off rate is 12 per cent. The machine is expected to yield an annual profit after tax of Rs 10 lakh, depreciation being reckoned on straight line basis for tax purposes. At 12 per cent, the PV of the rupee received annually for 10 years is 5.650, and the value of one rupee received at the end of the tenth year is 0.322.

Ascertain the NPV of the project.

**Solution***Net present value*

1. Profit after tax	Rs 10,00,000
2. Add depreciation (Rs 100,00,000 ÷ 10 years)	10,00,000
3. CFAT (1 + 2) for years 1-10	20,00,000
4. PV factor (annuity) for 10 years (at 0.12)	× 5.650
5. Total PV (3 × 4)	1,13,00,000
6. (a) CFAT in year 10 = Rs 10,00,000 (b) Relevant PV factor = 0.322 (c) Additional PV in year 10 (a × b)	3,22,000
7. Total PV (5 + 6)	1,16,22,000
8. project cost (t = 0)	1,10,00,000
9. NPV (7 – 8)	6,22,000

**PS 5.11**

ABC Ltd is planning to purchase a machine to meet the increased demand for its product in the market. The machine costs Rs 50,000 and has no salvage value. The expected life of the machine is 5 years, and the company employs the straight line method of depreciation. The estimated earnings after taxes are Rs 5,000 each year for 5 years. The after tax required rate of return of the company is 12 per cent.

Determine the IRR. Also, find the pay back period and obtain the IRR from it. How do you compare the IRR with the one directly estimated? What are the reasons for the differences between the two IRRs so estimated?

**Solution**

Earnings after taxes (EAT)	Rs 5,000
Add depreciation (D)	10,000
CFAT	15,000

PB period =  $3.333$  (Rs 50,000 ÷ Rs 15,000). The PV factors closest to 3.333 as per Table A-4 are 3.373 (0.15) and 3.274 (0.16) against five years.

IRR =  $0.15 + (0.040/0.099) = 15.4$  per cent.

*Determination of IRR with the help of PB period:*

IRR =  $1.000/3.333 = 0.30 = 30$  per cent.

The reciprocal of the PB period is a good approximation of IRR if (a) the life of the project is large or at least twice the PB period, and (b) the project generates equal annual cash inflows. In this case, the former condition is not satisfied. Therefore, the value of the IRR determined with the help of PB period is nowhere near the actual value of IRR, 15.4 per cent.

**PS 5.12**

One project of XYZ Ltd is doing poorly and is being considered for replacement. Three mutually exclusive projects A, B and C have been proposed. The projects are expected to require Rs 2,00,000 each, and have an estimated life of 5 years, 4 years and 3 years, respectively, and have no salvage value. The company's required rate of return is 10 per cent. The anticipated cash inflows after taxes (CFAT) for the three projects are as follows:

Year	CFAT		
	A	B	C
1	Rs 50,000	Rs 80,000	Rs 1,00,000
2	50,000	80,000	1,00,000

(Contd.)

**PS 5.12 (Contd.)**

3	50,000	80,000	10,000
4	50,000	30,000	—
5	1,90,000	—	—

- (i) Rank each project applying the methods of PB, NPV, IRR and profitability index.  
(ii) What would the profitability index be if the IRR equalled the required return on investment? What is the significance of a profitability index less than one?  
(iii) Recommend the project to be adopted and give reasons.

**Solution**

(i) *Ranking of projects*

Year	CFAT			PV factor (at 0.10)	Total PV		
	A	B	C		A	B	C
1	Rs 50,000	Rs 80,000	Rs 1,00,000	0.909	Rs 45,450	Rs 72,720	Rs 90,900
2	50,000	80,000	1,00,000	0.826	41,300	66,080	82,600
3	50,000	80,000	10,000	0.751	37,550	60,080	7,510
4	50,000	30,000	—	0.683	34,150	20,490	—
5	1,90,000	—	—	0.621	1,17,990	—	—
	3,90,000	2,70,000	2,10,000		2,76,440	2,19,370	1,81,010

NPV (Gross present value – Cash outflows):

(A) (Rs 2,76,440 – Rs 2,00,000) = Rs 76,440

(B) (Rs 2,19,370 – Rs 2,00,000) = Rs 19,370

(C) (Rs 1,81,010 – Rs 2,00,000) = Rs (18,990)

Pay back period: Project A = 4 years  
Project B = 2.5 years  
Project C = 2 years

Internal rate of return (IRR):

	A	B	C
Fake pay back value	2.564	2.963	2.857
Factors closest to payback period (as per Table A-4)	2.532(0.28)	2.974(0.13)	2.829(0.03)
corresponding to the varying lives of the project	2.583(0.27)	2.914(0.14)	2.884(0.02)

*Project A:* In Project A, CFAT in the initial years are substantially smaller than the average CFAT; therefore, lower discount rates of 21 and 20 per cent are applied.

*Project A*

Year	CFAT	PV factor at		Total PVat	
		(0.21)	(0.20)	(0.21)	(0.20)
1	Rs 50,000	0.826	0.833	Rs 41,300	Rs 41,650
2	50,000	0.683	0.694	34,150	34,700
3	50,000	0.564	0.579	28,200	28,950
4	50,000	0.467	0.482	23,350	24,100
5	1,90,000	0.386	0.402	73,340	76,380
IRR <sub>(A)</sub> = 21 per cent				2,00,340	2,05,780

*Project B*

Year	CFAT	PV factor at		Total PV at	
		(0.14)	(0.15)	(0.14)	(0.15)
1	Rs 80,000	0.877	0.870	Rs 70,160	Rs 69,600
2	80,000	0.769	0.756	61,520	60,480
3	80,000	0.675	0.658	54,000	52,640
4	30,000	0.592	0.572	17,760	17,160
				2,03,440	1,99,880

IRR<sub>(B)</sub> = 15 per cent

*Project C*

Year	CFAT	PV factor (at 0.03)	Total PV
1	Rs 1,00,000	0.971	Rs 97,100
2	1,00,000	0.943	94,300
3	10,000	0.915	9,150
			2,00,550

IRR<sub>(C)</sub> = 3 per cent

*Ranking of the projects*

Name of the method	A	B	C
PB	3	2	1
NPV	1	2	No rank
IRR	1	2	No rank

(ii) The profitability index (PI) would be 1 if the IRR equalled the required return on investment. The significance of a PI less than 1 is that NPV is negative and the project should not be undertaken.

(iii) Project A should be adopted because its NPV is the highest among all the projects.

**PS 5.13**

To meet the growing demand for electricity, Mumbai Suburban Electric Supply Ltd has decided to expand its generating capacity. The required capacity can be provided by constructing two thermal plants (Alternative I), or one hydro plant (Alternative II). The following information has been compiled for analysis (amount in crore of rupees):

	Alternative I	Alternative II
Initial investment	680	900
Yearly operating costs (excluding depreciation)		
Operations	160	80
Maintenance	40	20
Transmission	60	50
Cost to dismantle plant at the end of useful life of 20 years	10	30

What alternative should the firm select? Its cost of funds is estimated at 10 per cent. Ignore taxes and assume a written down value method of depreciation at 10 per cent.

**Solution**

*Present value of cash outflows of proposed alternatives (Rs in crore)*

Particulars	Year	Cash outflows under		PV factor (at 0.10)	Total PV of cash outflows	
		Alternative I	Alternative II		Alternative I	Alternative II
Initial investment	$t = 0$	680	900	1.000	680	900
Yearly operating costs						
Operations		160 }	80 }			
Maintenance	$t = 1-20$	40 }	20 }	8.514	2,213.64	1,277.10
Transmission		60 }	50 }			
Dismantling cost	$t = 20$	10	30	0.149	1.49	4.47
Total cost					2,895.13	2,181.57

**Note:** Depreciation is ignored as it is relevant only for tax shield purposes.

**Recommendation:** The firm is advised to adopt Alternative II as its total effective cash outflows during the 20-year life period is lower.

**PS 5.14**

Sagar Industries Ltd is planning to introduce a new product with a projected life of 8 years. The project, to be set up in a backward region, qualifies for a one-time (at its starting) tax-free subsidy from the Government of Rs 20,00,000. Initial equipment cost will be Rs 1,40,00,000 and additional equipment costing Rs 10,00,000 will be needed at the beginning of the third year. At the end of 8 years, the original equipment will have no resale value, but the supplementary equipment can be sold for Rs 1,00,000. A working capital of Rs 15 lakh will be needed. The sales volume (units) over the 8-year period have been forecast as follows:

Year 1	80,000
2	1,20,000
3 – 5	3,00,000
6 – 8	2,00,000

A sale price of Rs 100 per unit is expected, and variable expenses will amount to 40 per cent of sales revenue. Fixed cash operating costs will amount to Rs 16,00,000 per year. In addition, an extensive advertising campaign will be implemented, requiring annual outlays as follows:

Year 1	Rs 30,00,000
2	15,00,000
3 – 5	10,00,000
6 – 8	4,00,000

The company is subject to 35 per cent tax rate and considers 12 per cent to be appropriate after tax cost of capital rate for this type of project. The company follows the straight line method of depreciation and the same is accepted for tax purposes.

Should the project be accepted? Assume that the company has enough income from its existing products.

***Solution****Cash outflows (amount in Rs lakh)*

<i>Particulars</i>	<i>Year</i>	<i>Amount</i>	<i>PV factor (at 0.12)</i>	<i>Total PV</i>
Cost of equipment	$t = 0$	140	1.000	140
Additional equipment	$t = 2$	10	0.797	7.97
Working capital	$t = 0$	15	1.000	15
Less subsidy	$t = 0$	20	1.000	20
				<u>142.97</u>

*Cash inflows-operating (Rs in lakh)*

<i>Particulars</i>	<i>Year 1</i>	<i>Year 2</i>	<i>Year 3-5</i>	<i>Year 6-8</i>
Sales revenue	80	120	300	200
Less cost:				
Variable expenses (0.40)	32	48	120	80
Fixed operating cost	16	16	16	16
Advertisement	30	15	10	4
Depreciation				
Original equipment	17.5	17.5	17.5	17.5
Additional equipment	—	—	1.5	1.5
Earnings (losses) before taxes	(15.5)	23.5	135	81
Less taxes (0.35)	(5.425)	8.225	47.25	28.35
Earnings after taxes	(10.075)	15.275	87.75	52.65
Add depreciation	17.50	17.50	19.0	19.0
CFAT	7.425	32.775	106.75	71.65

*Determination of NPV (Rs in lakh)*

<i>Year</i>	<i>CFAT</i>	<i>PV factor (at 0.12)</i>	<i>Total PV</i>
0	Rs (142.97)	1.000	Rs (142.97)
1	7.425	0.893	6.63
2	32.775	0.797	26.12
3	106.75	0.712	76.01
4	106.75	0.636	67.89
5	106.75	0.567	60.53
6	71.65	0.507	36.33
7	71.65	0.452	32.38
8	87.65*	0.404	35.41
NPV			<u>198.33</u>

\*Rs 71.65 + Re 1 (salvage value) + Rs 15 (recovery of working capital)

**Recommendation:** Sagar Industries Ltd is advised to accept the project as it yields positive NPV of Rs 198.33 lakh.**PS 5.15**

ABC Ltd manufactures toys and other short-lived fad items. The research and development department has come up with an item that would make a good promotional gift for office equipment dealers. As a result of efforts by the sales personnel, the firm has commitments for this product.



To produce the quantity demanded, ABC Ltd will need to buy additional machinery and rent additional space. It appears that about 25,000 sq. ft. will be needed; 12,500 sq. ft. of presently unused space, but leased at the rate of Rs 3 per sq. ft. per year, is available. There is another 12,500 sq. ft. adjoining the facility available at the annual rent of Rs 4 per sq. ft.

The equipment will be purchased for Rs 9,00,000. It will require Rs 30,000 in modifications and Rs 1,50,000 for installation. The equipment will have a salvage value of about Rs 2,80,000 at the end of the third year. It is subject to 25 per cent depreciation on reducing balance basis. The firm has no other assets in this block. No additional general overhead costs are expected to be incurred.

The estimates of revenues and costs for this product for the 3 years have been developed as follows:

<i>Particulars</i>	<i>Year 1</i>	<i>Year 2</i>	<i>Year 3</i>
Sales	Rs 10,00,000	Rs 20,00,000	Rs 8,00,000
<i>Less costs:</i>			
Material, labour and overhead incurred	4,00,000	7,50,000	3,50,000
Overheads allocated	40,000	75,000	35,000
Rent	50,000	50,000	50,000
Depreciation	2,70,000	2,02,500	Nil
Total costs	7,60,000	10,77,500	4,35,000
Earnings before taxes	2,40,000	9,22,500	3,65,000
<i>Less taxes</i>	84,000	3,22,875	1,27,750
Earnings after taxes	1,56,000	5,99,625	2,37,250

If the company sets a required rate of return of 20 per cent after taxes, should this project be accepted?

### ***Solution***

#### *Cash outflows*

Cost of equipment	Rs 9,00,000
Modification cost	30,000
Installation cost	1,50,000
	10,80,000

#### *Cash inflows-operating*

<i>Particulars</i>	<i>Year 1</i>	<i>Year 2</i>	<i>Year 3</i>
Sales revenue	Rs 10,00,000	Rs 20,00,000	Rs 8,00,000
<i>Less relevant/incremental cost:</i>			
Material, labour and overhead incurred	4,00,000	7,50,000	3,50,000
Rent payable	50,000	50,000	50,000
Rent sacrificed	37,500	37,500	37,500
Depreciation	2,70,000	2,02,500	Nil
Earnings before taxes	2,42,500	9,60,000	3,62,500
<i>Less taxes</i>	84,875	3,36,000	1,26,875
Earnings after taxes	1,57,625	6,24,000	2,35,625
<i>Add depreciation</i>	2,70,000	2,02,500	Nil
CFAT	4,27,625	8,26,500	2,35,625

*Net present value*

<i>Particulars</i>	<i>Year</i>	<i>Amount</i>	<i>PV factor (at 0.20)</i>	<i>Total PV</i>
Cash outflows	<i>t</i> = 0	Rs (10,80,000)	1.000	Rs (10,80,000)
Operating CFAT	1	4,27,625	0.833	3,56,212
Operating CFAT	2	8,26,500	0.694	5,73,591
Operating CFAT	3	2,35,625	0.579	1,36,427
Salvage value	3	2,80,000	0.579	1,62,120
Tax advantage on short-term capital loss (Rs 3,27,500 × 0.35)	3	1,14,625	0.579	66,368
NPV				2,14,718

**Recommendation:** The projected should be accepted.

**PS 5.16**

New Delhi Manufacturers Ltd is producing and selling 5,000 units per year. Costs and profit data for the current capacity are as follows:

Selling price per unit			Rs 400
<i>Variable cost per unit:</i>			
Materials	Rs 150		
Labour	60		
Factory overhead	30	Rs 240	
<i>Fixed costs per unit:</i>			
Manufacturing	50		
Selling and administrative	70	120	360
Profit per unit			40

There is little competition for the product, and demand exceeds supply. A market survey at a cost of Rs 20,000 was conducted. It indicates that an additional 1,000 units could be sold each year for the next 4 years.

The machinery and equipment to produce the additional units would require an initial investment of Rs 2,00,000 and working capital of Rs 20,000. Fixed costs, excluding depreciation of new equipment, would increase as follows:

Indirect manufacturing cost—Rs 30,000 per year

Selling and administrative costs—Rs 5,000 per year

Any changes that might occur in the unit variable costs would be covered by adjustments in the selling price of the product. The tax relevant depreciation on the block of assets to which the machine belongs is 25 per cent. No scrap value is expected. The income tax and the required rate of return are 35 and 20 per cent respectively.

The directors are reluctant to authorise the increase in capacity since they doubt whether the additional profits promised over a short period justify investment in new machinery and equipment, and they have asked you to supply quantitative data to help them reach a decision.

You are required to evaluate the proposal and prepare a report for submission to the directors together with your recommendations.

***Solution***

*Cash outflow (t = 0)*

Cost of new machinery and equipment	Rs 2,00,000
Working capital	20,000
Total	2,20,000

*Determination of CFAT and NPV*

<i>Particulars</i>	<i>Year 1</i>	<i>Year 2</i>	<i>Year 3</i>	<i>Year 4</i>
Incremental sales revenue	Rs 4,00,000	Rs 4,00,000	Rs 4,00,000	Rs 4,00,000
<i>Less incremental costs:</i>				
Variable costs	2,40,000	2,40,000	2,40,000	2,40,000
Indirect manufacturing	30,000	30,000	30,000	30,000
Selling and administrative	5,000	5,000	5,000	5,000
Depreciation	50,000	37,500	28,125	21,094
Incremental EBT	75,000	87,500	96,875	1,03,906
<i>Less taxes (0.35)</i>	26,250	30,625	33,906	36,367
EAT	48,750	56,875	62,969	67,539
CFAT	98,750	94,375	91,094	88,633
Release of working capital				20,000
PV factor	0.833	0.694	0.579	0.482
PV	82,259	65,496	52,743	52,361
Total present value ( $t = 1 - 4$ )				2,52,859
Less cash outflows				2,20,000
NPV				32,859

**Note:** Cost of market survey is irrelevant.

**Recommendation:** The company is advised to expand the capacity.

**PS 5.17**

Avon Ltd is investigating the feasibility of manufacturing one of the components needed for its finished product rather than purchasing it from an outside supplier. Its present supplier has just announced that he intends to increase the price from Rs 100 to Rs 125 per unit.

The equipment needed to make this product can be purchased for Rs 10 lakh, and is expected to have salvage value of Rs 2,00,000 at the end of the fifth year. Additional fixed costs (excluding depreciation) are estimated to increase by Rs 1,00,000 per year. The variable costs of manufacturing each component will be Rs 30 per unit. The company is subject to a 35 per cent tax rate and 15 per cent is the appropriate cost of capital for this project. The company projects annual needs at 7,500 units per year for the 6-year period. The tax relevant rate of depreciation is 25 per cent and there are no other assets in the 25 per cent block.

Advise the company whether it should continue buying from outside suppliers, or start manufacturing on its own. Will your answer be different if the requirement of the company is only 6,000 units per year?

***Solution***

*Cash outflows:*

Cost of equipment

Rs 10,00,000

(i) *Cash inflows (CFAT)*

	<i>7,500 units</i>	<i>6,000 units</i>
Buy costs @ Rs 125 per unit	Rs 9,37,500	Rs 7,50,000
<i>Less manufacturing costs:</i>		
Variable cost @ Rs 30 per unit	2,25,000	1,80,000
Fixed cost	1,00,000	1,00,000
Cost saving (profit) before taxes	6,12,500	4,70,000
<i>Less taxes</i>	2,14,375	1,64,500
Cash flows after taxes	3,98,125	3,05,500
( $\times$ ) PV factor of annuity for 5 years	3.352	3.352
Total PV	13,34,515	10,24,036

(Contd.)

**Solution (Contd.)**(ii) *Present value of tax shield due to depreciation*

Year	Depreciation	Tax shield	PV factor	Total PV
1	Rs 2,50,000	Rs 87,500	0.870	Rs 76,125
2	1,87,500	65,625	0.756	49,612
3	1,40,625	49,219	0.658	32,386
4	1,05,469	36,914	0.572	21,115
5	79,101	27,685	0.497	13,752
				<u>1,92,997</u>

(iii) *Present value of salvage value* (Rs 2,00,000  $\times$  0.497) = Rs 99,400.(iv) *PV of short-term capital loss*:  $[0.35 \times (\text{Rs } 2,37,305 - \text{Rs } 2,00,000 \text{ salvage value}) \times 0.497] = \text{Rs } 6,489$ .(v) *Determination of NPV*

Particulars	7,500 units	6,000 units
PV of cash savings	Rs 13,34,515	Rs 10,24,036
PV of tax shield (depreciation)	1,92,997	1,92,997
PV of salvage value	99,400	99,400
PV of short-term capital loss	6,489	6,489
Total PV	<u>16,33,401</u>	<u>13,22,922</u>
Less cash outflows	10,00,000	10,00,000
NPV	<u>6,33,401</u>	<u>3,22,922</u>

**Recommendation:** The company is advised to start manufacturing on its own, irrespective of the fact whether the required units are 7,500 or 6,000 as the NPV is positive in both the situations.

**PS 5.18**

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*(Contd.)*

**Solution (Contd.)**(i) *Present value of cash inflows (excluding depreciation),  $t = 1 - 5$* 

Particulars	Amount
Increase in sales revenue ( $30,000 \times \text{Rs } 15$ )	Rs 4,50,000
Cost saving: reduction in disposal costs ( $30,000 \times \text{Rs } 1$ )	30,000
Less incremental costs:	4,80,000
Variable ( $30,000 \times \text{Rs } 5$ )	Rs 1,50,000
Fixed, manufacturing or processing	30,000
Advertising	20,000
Earnings before taxes	2,80,000
Less taxes	98,000
CFAT	1,82,000
$\times \text{PVIFA}$	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
5	47,461	16,611	0.497	8,256
				1,15,798

(ii) *PV of tax advantage due to short-term capital loss:  $[0.35 \times (\text{Rs } 1,42,383 - \text{Rs } 47,461) \times 0.497] = \text{Rs } 16,512$ .*(iv) *Determination of NPV*

Gross present value [(i) + (ii) + (iii)]	Rs 7,42,374
Less cost of additional investment	6,00,000
NPV	1,42,374

**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.**PS 5.19**

The project department of Bharat Petroleum Corporation Ltd (BPCL), which is engaged in the refining, storage and distribution of a wide variety of petroleum and petro-chemical products, is proposing to construct a new regional office complex to house 500 employees. The cost of the project is estimated at Rs 21 crore and is expected to be completed in 5 years.

Seven staff members of BPCL comprising one deputy manager, four engineers and two clerks are posted to supervise the construction work. Tea is required for them twice a day. It is available from a nearby restaurant at Rs 2.50 per cup. The monthly charges are reimbursed by the BPCL. The staff has to work 6 days a week. On Sundays and holidays, only two persons are on duty. On an average, there are 5 such days in a month. On an average, one person is out of office for official work or on leave and there are 10 guests per day as various agencies are working on the project including architects. Three telephone calls have to be made daily for ordering tea, each call costing Re 1.

Some members of the staff have suggested that tea should be prepared in the office instead of purchasing from the restaurant. A tea-making machine, model Mini-mate, is available at Rs 5,500 plus 10 per cent tax. It can take refill of milk powder, sugar and water requirement for 35 persons at a time after which it requires refilling. The annual maintenance including cost of spares with effect from the second year is Rs 750, while Rs 100 per year will be the cost of insurance. The other associated costs are as detailed:

- Tea bag cost, Rs 44 per 100 tea bags. Assume 2 tea bags are used in 10 per cent tea cups.
- Cost of milk powder, Rs 68 for 500 grams, 2.5 gm being used per cup. 2 per cent is wasted in handling.
- Cost of sugar, Rs 12 per kg; 10 gm used per tea cup. Assume average consumption is 10 per cent more as some staff members take more sugar and 2 per cent is wasted in storage and handling.
- Manpower costs, Rs 400 per month to a person in the office for the additional work.
- Power consumption, one unit per day at the rate of Rs 2.40 per unit.
- Telephone charges, Rs 300 per annum.
- Net working capital requirement (one month's stock of tea bags, milk powder and sugar), Rs 600.

As the finance manager of the BPCL, what position would you take, assuming 35 per cent tax, written down value method with 25 per cent rate of depreciation, cost of capital 14 per cent, useful life of machine 5 years with no salvage value and no other asset in this block?

### ***Solution***

*Financial evaluation of whether to instal tea-making machine.*

#### ***Cash outflows:***

Cost of mini-mate tea making machine	Rs 6,050
Increase in working capital	600
	6,650

#### ***Cash inflows after taxes and NPV***

<i>Particulars</i>	<i>Years</i>				
	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
Savings in tea costs	Rs 17,100	Rs 17,100	Rs 17,100	Rs 17,100	Rs 17,100
Savings in telephone costs	600	600	600	600	600
Total savings	17,700	17,700	17,700	17,700	17,700
<b><i>Less incremental costs:</i></b>					
Tea bag costs	3,311	3,311	3,311	3,311	3,311
Milk powder costs	2,372	2,372	2,372	2,372	2,372
Sugar costs	921	921	921	921	921
Manpower costs	4,800	4,800	4,800	4,800	4,800
Power costs	900	900	900	900	900
Insurance costs	100	100	100	100	100
Maintenance costs	—	750	750	750	750
Depreciation	1,512	1,134	851	638	Nil
Earnings before taxes	3,784	3,412	3,695	3,908	4,546
Less taxes	1,324	1,194	1,293	1,367	1,591
EAT	2,460	2,218	2,402	2,541	2,955
CFAT (EAT + Depreciation)	3,972	3,352	3,253	3,179	2,955
Release of working capital					600
Tax advantage on short-term capital loss (Rs 1,915 × 0.35)					670
PV factor (at 0.14)	0.877	0.769	0.675	0.592	0.519
Present value	3,483	2,577	2,195	1,882	2,193
Total PV ( $t = 1 - 5$ )					12,330
Less cash outflows					6,650
NPV					5,680

**Recommendation:** BPCL is advised to go for installing tea-making machine.

**Working notes**

(1) <i>Tea costs (when ordered outside)</i>	
For week days (6 persons $\times$ 2 cups a day $\times$ 25 days $\times$ 12 months)	Rs 3,600
For sundays and holidays (2 persons $\times$ 2 cups a day $\times$ 5 days $\times$ 12 months)	240
For guests (10 guests $\times$ 25 days $\times$ 12 months)	3,000
Total tea cups required in a year	6,840
Tea costs (6,840 $\times$ Rs 2.50)	17,100
(ii) <i>Tea bag costs:</i> (6,840 $\times$ 1.1 $\times$ Re 0.44 per tea bag)	3,311
(iii) <i>Cost of milk powder:</i>	
Milk cost used per tea cup (Rs 68/500 $\times$ 2.5 grams)	0.34
Total milk costs (Re 0.34 $\times$ 6,840 tea cups $\times$ 1.02)	Rs 2,372
(iv) <i>Sugar costs</i>	
Sugar cost per tea cup (Rs 12/1,000 $\times$ 10 grams)	0.12
Total sugar costs (6,840 cups $\times$ Re 0.12 $\times$ 1.1 $\times$ 1.02)	Rs 921

**PS 5.20**

The Delhi State Lottery Development Authority (DSLDA) has been issuing 5-digit number lotteries for which draws are held on 10th, 20th and 30th of every month. The DSLDA does not have its own printing press. It has to pay Rs 40 lakh to two private printing houses to print the lottery tickets.

It is now contemplating to also issue 2-digit and 3-digit number lotteries. The monthly estimated requirement is 18,000 booklets and 90,000 booklets of two-digit and three-digit number lotteries respectively. A booklet of lotteries cost Rs 3. It comprises 100 pages and each page consists of five coupons of lotteries with the same number.

In order to reduce the cost of printing the 2-digit and 3-digit number of lottery tickets accounting for almost 95 per cent of the printing cost of the DSLDA, the top management is planning to set up its own printing press. The projected cost data are detailed below.

(1) Cost of machinery (no salvage value and expected life 5 years):	
— Offset printing machine	Rs 40,00,000
— Cutting machine	5,00,000
	Rs 45,00,000
(2) Installation cost: Rs 5,00,000	
(3) Working capital: Rs 5,00,000	
(4) Annual employee salary: Rs 4,64,400	
(5) Yearly printing material: Rs 10,93,000	
(6) Other expenses consisting of plate, plate photo exposure and plate montage per annum: Rs 3,27,600	
(7) Bonus at the end of the year: 150 per cent of monthly salary	
(8) Assumptions:	
— Cost of capital, 15 per cent	
— Tax rate, 0.35	
— Depreciation method - written down value; the plant is subject to 25 per cent depreciation. There are no other plant and equipment in the block of 25 per cent depreciation.	

**Required:** Should the top management of the DSLDA implement the proposal to set up a printing press?

**Solution**

*Financial evaluation whether to instal a printing press or get the lottery booklets printed outside.*

(i) *Cash outflows*

Cost of printing machine	Rs 40,00,000
Cost of cutting machine	5,00,000
Installation cost	5,00,000
Working capital	5,00,000
	55,00,000

(Contd.)

**Solution (Contd.)****(ii) Determination of CFAT and NPV**

Particulars	Years				
	1	2	3	4	5
Savings in printing expenses	Rs 38,88,000	Rs 38,88,000	Rs 38,88,000	Rs 38,88,000	Rs 38,88,000
Less incremental costs:					
Labour cost	4,64,400	4,64,400	4,64,400	4,64,400	4,64,400
Bonus	58,050	58,050	58,050	58,050	58,050
Printing materials	10,93,000	10,93,000	10,93,000	10,93,000	10,93,000
Other expenses	3,27,600	3,27,600	3,27,600	3,27,600	3,27,600
Depreciation	12,50,000	9,37,500	7,03,125	5,27,344	—
Earnings before taxes	6,94,950	10,07,450	12,41,825	14,17,606	19,44,950
Less taxes	2,43,232	3,52,607	4,34,639	4,96,162	6,80,733
Earnings after taxes	4,51,718	6,54,843	8,07,186	9,21,444	12,64,217
CFAT (EAT + Depreciation)	17,01,718	15,92,343	15,10,311	14,48,788	12,64,217
Release of working capital					5,00,000
Tax benefit on short-term capital loss (Rs,15,82,031 × 0.35)					5,53,711
PV factor (at 0.15)	0.870	0.756	0.658	0.572	0.497
PV	14,80,495	12,03,811	9,93,785	8,28,707	11,52,010
Total PV ( $t = 1 - 5$ )					56,58,808
Less cash outflows					55,00,000
NPV					1,58,808

**Recommendation:** Since NPV is positive, DSLDA is advised to set up the printing press.

**Working notes****1 Depreciation schedule**

Year	Cost of printing and cutting machines	Depreciation @25 per cent (WDV method)
1	55,00,000	12,50,000
2	37,50,000	9,37,500
3	28,12,500	7,03,125
4	21,09,375	5,27,344
5	15,82,031	Nil*

\*No depreciation is to be charged as the block consists of single asset only.

2 Printing expenses for 2-digit and 3-digit number of lottery tickets:  $(18,000 + 90,000 \text{ booklets}) \times 12 \text{ months} \times \text{Rs } 3 = \text{Rs } 38,88,000$ .

**PS 5.21**

The Proagro Seed Company (PSC) Ltd is in the business of developing new variety of seeds and their processing and marketing through a large network of dealers all over India. It has recently developed a hybrid seed of rice. On the basis of marketing a small quantity of this seed, the company finds that the seed has a viable demand. Since the necessary processing facilities are yet to be developed, it got the seeds processed on a plant hired from the Value Adding Company (VAC) Ltd which charges Rs 120 per hour for 8 hours a day. The hourly charges beyond 8 hours daily are Rs 150. The processing charges of VAC Ltd are subject to an upward 'revision' of 13 per cent annually. The plant cannot be operated continuously exceeding 20 hours. The PSC Ltd estimates that it would require 1,250 hours working of the plant in 70 days so that the seed reach the market before the sowing season.



The PSC Ltd is considering setting up its own plant in order to economise the operations as well as exercise better control. The plant is expected to have a useful life of 5 years with a salvage value of Rs 50,000 at the end of the fifth year. The cost associated with its acquisition and operations are detailed below.

- Acquisition cost, Rs 4,25,000
- Installation cost, Rs 75,000
- Additional working capital, Rs 30,000
- Annual operating cost:
  - (a) Maintenance cost, Rs 25,000 per year
  - (b) Energy consumption, Rs 90,000
  - (c) Manpower (additional), Rs 80,000
  - (d) Overheads (additional), Rs 50,000

The plant can be rented out at least eight hours a day for Rs 150 per hour 200 days in a year.

Assuming 35 per cent tax, 10 per cent cost of capital, and 25 per cent depreciation per annum on written down value basis, work out the financial viability of the proposal to install the plant as an alternative to hiring. The company does not have any other plant in the block of 25 per cent depreciation.

### **Solution**

*Financial evaluation whether to instal the plant as an alternative to hiring*

(i) *Cash outflows*

Cost of plant	Rs 4,25,000
Installation cost	75,000
Additional working capital	30,000
	5,30,000

(ii) *Determination of CFAT and NPV*

Particulars	Years				
	1	2	3	4	5
Savings in hire charges	Rs 1,70,700	Rs 1,92,891	Rs 2,17,967	Rs 2,46,303	Rs 2,78,322
Income from hiring out	2,40,000	2,40,000	2,40,000	2,40,000	2,40,000
	4,10,700	4,32,891	4,57,967	4,86,303	5,18,322
<i>Less incremental costs:</i>					
Maintenance cost	25,000	25,000	25,000	25,000	25,000
Energy costs	90,000	90,000	90,000	90,000	90,000
Manpower costs	80,000	80,000	80,000	80,000	80,000
Overheads	50,000	50,000	50,000	50,000	50,000
Depreciation	1,25,000	93,750	70,312	52,734	Nil
Earnings before taxes	40,700	94,141	1,42,655	1,88,569	2,73,322
Less taxes	14,245	32,949	49,929	65,999	95,663
Earnings after taxes	26,455	61,192	92,726	1,22,570	1,77,659
CFAT (EAT + Depreciation)	1,51,455	1,54,942	1,63,038	1,75,304	1,77,659
Release of working capital					30,000
Salvage value					50,000
Tax benefit on short-term capital loss (Rs 1,08,204 × 0.35)					37,871
PV factor (at 0.10)	0.909	0.826	0.751	0.683	0.621
Present value	1,37,673	1,27,982	1,22,441	1,19,733	1,83,524
Total PV ( $t = 1 - 5$ )					6,91,353
Less cash outflows					5,30,000
NPV					1,61,353

**Recommendation:** Since NPV is positive, the company is advised to instal the plant.

**Working notes***Depreciation schedule*

<i>Year</i>	<i>Cost of plant</i>	<i>Depreciation @25 per cent (WDV)</i>
1	Rs 5,00,000	Rs 1,25,000
2	3,75,000	93,750
3	2,81,250	70,312
4	2,10,938	52,734
5	1,58,204	Nil*

\*As the block consists of single asset, no depreciation is to be charged in fifth year.

**PS 5.22**

The Prompt Photocopiers (PPL) Ltd provides photocopying service within the library premises of Delhi University. It has to pay a monthly office rental of Rs 7,500 including electricity and air-conditioning costs.

The PPL is using four photocopiers which are fully depreciated and have negligible salvage value. Each machine works 12 hours a day and requires one operator. The machines operate at full capacity during the working period in the University for nine months. During the term break period of one month, they work only 20 per cent of normal capacity. On an average, the PPL uses 400 reams of ordinary paper every month. The cost of paper is Rs 65 per ream consisting of 500 pages. There is 10 per cent waste due to faulty printing. The monthly wages of four operators based on their skills and work experiences are Rs 3,000, Rs 4,000, Rs 5,000 and Rs 5,500 respectively. Maintenance charges are Rs 5,000 per machine as per annual maintenance contract. The current photocopying service charge by the PPL is Re 0.50 per page.

However, during the last two months, the photocopiers have been operating at only 40 per cent of their capacity due to competition from two new modern photocopiers. In order to recapture the business (400 reams), the management of PPL is seriously contemplating to acquire two modern machines at a cost Rs 2,50,000 each, the salvage value being 20 per cent of initial cost at the end of 5 years. They will require standard quality of toner at a cost of Rs 800 per toner for using 20 reams of paper. The waste due to faulty printing will be 5 per cent. Moreover, there would be no maintenance cost during the 5-year guarantee period. The wages of two operators for the machines would be Rs 5,000 each. However, the monthly office rental cost would increase to Rs 10,000.

What advice would you give to the management of PPL? Assume 35 per cent tax rate, cost of capital 12 per cent, tax-relevant rate of depreciation of 25 per cent on WDV basis with several machines in the asset block of 25 per cent. Assume additional working capital required is Rs 50,000.

**Solution**

*Financial analysis whether to buy two new modern photocopiers (using NPV method)*

(i) *Cash outflows:*

Cost of 2 new machines (Rs 2,50,000 × 2)	Rs 5,00,000
Additional working capital	50,000
	<u>5,50,000</u>

(ii) *Existing CFAT*

Operating revenues (400 reams × 0.4 × 500 pages × 12 months × Re.0.50)	4,80,000
<i>Less costs:</i>	
Paper costs (160 reams × 1.1 × 12 months × Rs 65)	1,37,280
Toner costs [(160 reams × 1.1)/20] × 12 months × Rs 800)	84,480
Operators' wages (Rs 17,500 × 12 months)	2,10,000
Maintenance cost (Rs 5,000 × 4 machines)	20,000
Office rental costs including electricity and air-conditioning costs (Rs 7,500 × 12)	90,000
	<i>(Contd.)</i>

**Solution (Contd.)**

Depreciation	Nil
Operating loss	(61,760)
Tax advantage $(0.35 \times \text{Rs } 61,760)$	21,616
Cash loss	40,144

**(iii) CFAT (with new photocopiers)**

(a) Operating revenues $(400 \text{ reams} \times 500 \text{ pages} \times 12 \text{ months} \times \text{Re } 0.50)$	Rs 12,00,000
Less costs:	
Paper costs $(400 \text{ reams} \times 1.05 \times 12 \text{ months} \times \text{Rs } 65)$	3,27,600
Toner costs $[(400 \text{ reams} \times 1.05)/20] \times 12 \text{ months} \times \text{Rs } 800$	2,01,600
Operators' wages $(\text{Rs } 10,000 \times 12 \text{ months})$	1,20,000
Office rental costs $(\text{Rs } 10,000 \times 12 \text{ months})$	1,20,000
Earnings before taxes	4,30,800
Less taxes $(0.35)$	1,50,780
Cash profits after taxes	2,80,020
(b) Tax advantage on depreciation:	
Year 1 $(\text{Rs } 5,00,000 \times 0.25) =$	Rs 1,25,000 $\times 0.35$ 43,750
2 $(\text{Rs } 3,75,000 \times 0.25) =$	93,750 $\times 0.35$ 32,812
3 $(\text{Rs } 2,81,250 \times 0.25) =$	70,312 $\times 0.35$ 24,609
4 $(\text{Rs } 2,10,938 \times 0.25) =$	52,735 $\times 0.35$ 18,457
5 $(\text{Rs } 1,58,203 - \text{Rs } 1,00,000, \text{ SV}) \times 0.25 =$	14,551 $\times 0.35$ 5,093

**Incremental CFAT and NPV**

Particulars	Years				
	1	2	3	4	5
CFAT (with new machine)	Rs 2,80,020	Rs 2,80,020	Rs 2,80,020	Rs 2,80,020	Rs 2,80,020
Add tax advantage on depreciation	43,750	32,812	24,609	18,457	5,093
Add cash loss (with existing machine)	40,144	40,144	40,144	40,144	40,144
Add salvage value					1,00,000
Add recovery of working capital					50,000
Incremental CFAT	3,63,914	3,52,976	3,44,773	3,38,621	4,75,257
PV factor (0.12)	0.893	0.797	0.712	0.636	0.567
PV	3,24,975	2,81,322	2,45,478	2,15,363	2,69,471
Total PV $(t = 1 - 5)$					13,36,609
Less cash outflows					5,50,000
NPV					7,86,609

**Recommendation:** Since NPV is positive, it is advised that the PPL should buy the two new photocopiers.

**PS 5.23**

The United Lubricants (UL) Ltd is a leading manufacturer of lubricant products such as mobil oil and products used for a variety of applications in industrial as well as consumer sector. One of the leading brands of the UL is a consumer product, named  $U_4$ . Presently, it is buying the empty boxes (empties) which are used to fill in the lubricants for the product from outside supplier. The projected annual demand for  $U_4$  is 50,000 units and is likely to grow @ 5,000 units annually for the next 5 years. The UL has to pay Rs 19 per unit of empties and place order in multiples of 1,000 units.

The ordering cost including transportation, loading and unloading, telephone calls and related to other paper work is Rs 200 per order.

In order to ensure uninterrupted supply and avoid delays as well as to meet the growing demand of U<sub>4</sub>, the UL has under consideration a proposal to manufacture the product rather than buy from outside suppliers. It has entrusted the task of financial analysis to Avon Financial Consultants Ltd. They have compiled the undermentioned operating parameters associated with the proposal.

- (1) Machinery: cost—Rs 5,00,000; installation cost—Rs 25,000; useful life—5 years with Rs 50,000 salvage value; annual manufacturing capacity—75,000 units.
- (2) Working capital requirement—Rs 1,50,000.
- (3) Raw materials cost: They have to be bought in a bulk @ Rs 7,000 per bulk out of which a lot size of 1,000 empties is to be made.
- (4) Supplies; Rs 2,500 for a lot of 1,000 empties in terms of chemicals, stickers, glue and so on.
- (5) Labour: year 1–5, one technician and two helpers at a salary of Rs 6,000 and Rs 3,000 per month respectively; year 3–5, an additional helper would have to be hired.
- (6) Utility expenses in terms of cost of electricity, Rs 2,500 per 1,000 empties.
- (7) Maintenance cost—Rs 10,000 annually.
- (8) Assumptions: (i) tax rate, 0.35; (ii) required rate of return, 15 per cent; (iii) depreciation rate, 25 per cent on written down value basis; (iv) there is no other asset in the block of 25 per cent depreciation.

From the foregoing information, analyse the financial viability of the make-buy alternatives for the UL.

### ***Solution***

*Financial analysis whether to buy machinery to produce empty boxes (using NPV method)*

#### ***Total cash outflows:***

Cost of machine	Rs 5,00,000
Installation cost	25,000
Working capital required	1,50,000
	6,75,000

#### ***Determination of CFAT and NPV***

<b><i>Particulars</i></b>	<b><i>Years</i></b>				
	<b><i>1</i></b>	<b><i>2</i></b>	<b><i>3</i></b>	<b><i>4</i></b>	<b><i>5</i></b>
Annual demand (units)	50,000	55,000	60,000	65,000	70,000
Savings in buying cost @ Rs 19 per unit	Rs 9,50,000	Rs 10,45,000	Rs 11,40,000	Rs 12,35,000	Rs 13,30,000
Savings in ordering cost (Rs 200 per 1,000 units)	10,000	11,000	12,000	13,000	14,000
<b><i>Less:</i></b>					
Raw material cost (Rs 7,000 per 1,000 units)	3,50,000	3,85,000	4,20,000	4,55,000	4,90,000
Supplies and other costs (Rs 2,500 per 1,000 units)	1,25,000	1,37,500	1,50,000	1,62,500	1,75,000
Labour cost	1,44,000	1,44,000	1,80,000	1,80,000	1,80,000
Utility cost (Rs 2,500 per 1,000 units)	1,25,000	1,37,500	1,50,000	1,62,500	1,75,000
Maintenance costs	10,000	10,000	10,000	10,000	10,000
Depreciation (0.25)	1,31,250	98,438	73,828	55,371	Nil
Earnings before taxes	74,750	1,43,562	1,68,172	2,22,629	3,14,000
Less taxes	26,162	50,247	58,850	77,920	1,09,900

*(Contd.)*

(Contd.)

Earnings after taxes	48,588	93,315	1,09,312	1,44,709	2,04,100
CFAT	1,79,838	1,91,753	1,83,140	2,00,080	2,04,100
Add salvage value					50,000
Add recovery of working capital					1,50,000
Add tax advantage on short-term capital loss (Rs 1,41,113 – Rs 50,000) $\times$ 0.35					31,890
PV factor (0.15)	0.870	0.756	0.658	0.572	0.497
PV	1,56,459	1,44,965	1,20,506	1,14,446	2,16,687
Total PV ( $t = 1 - 5$ )					7,53,063
Less cash outflows					6,75,000
NPV					78,063

**Recommendation:** Since NPV is positive, the firm is advised to manufacture empties on its own.

### PS 5.24

The Micro-Tech International (MTI) Ltd is a computer and software supplier company. It also conducts training programmes particularly for school and college students.

The Innovative Academy which is a leading senior secondary school wishes to add computer activities but is faced with serious financial constraints. It has approached the MTI with a proposal to extend the computer literacy to its students (presently of three classes). The main elements of the proposal are listed below:

- Space for the computer laboratory will be provided by the Academy.
- There will be three sections in each class with an average size of 50 students.
- Every year one extra class will be added for 2 years.
- Electricity bill will be paid and computer diskette, ribbon and computer papers will be supplied by the Academy.
- Rs 200 per student per month for 5 years will be paid to MTI. At the end of the project after 5 years, all the printers and computers will be sold to the Academy at 10 per cent of their original cost.

The managing director of MTI desires the finance manager to spell out the operating parameters on the basis of which a rigorous financial analysis should be carried out before accepting the proposal. On the basis of extensive discussion, he has identified the undermentioned parameters:

- (i) Investment cost: In order to cater to the requirements of the Academy, 15 computers and two printers will have to be acquired in the first year at a cost of Rs 50,000 and Rs 25,000 per computer and per printer respectively. In addition, the cost of cables and connectors would amount to Rs 2,000 per computer; the cost of cables and installation would be borne by the Academy itself.
- (ii) Operating cost: Two instructors and one supervisor and one additional instructor would have to be hired in the first and second years respectively at a monthly salary of Rs 5,000 for each instructor and Rs 3,000 for each supervisor. In the third year, there would be an increase in the salary of 10 per cent for instructors as well as supervisor. The other associated costs would be (1) spare parts, Rs 3,000 per computer per annum, (2) transportation, Rs 25,000 yearly and (3) insurance, 1 per cent of investment cost. The cost of spare parts and transportation is anticipated to increase by 20 per cent in the third year.

From the foregoing information and assuming 35 per cent tax, WDV method of depreciation at 25 per cent and 15 per cent required rate of return, should the proposal under consideration be accepted on the basis of financial viability? The MTI has other assets in the block of 25 per cent depreciation.

### Solution

*Financial evaluation whether to engage in the contract of extending computer literacy to the students of Innovative Academy*

**Total cash outflows:**

Cost of computers (Rs 50,000 × 15)	Rs 7,50,000
Cost of two printers (Rs 25,000 × 2)	50,000
	<u>8,00,000</u>

**Determination of CFAT and NPV**

Particulars	Years				
	1	2	3	4	5
Revenue received from Academy (working note 1)	Rs 10,80,000	Rs 14,40,000	Rs 18,00,000	Rs 18,00,000	Rs 18,00,000
Less operating cost (working note 2)	2,34,000	2,94,000	3,29,600	3,29,600	3,29,600
Less depreciation (0.25)	2,00,000	1,50,000	1,12,500	84,375	63,281
Earnings before taxes	6,46,000	9,96,000	13,57,900	13,86,025	14,07,119
Less taxes (0.35)	2,26,100	3,48,600	4,75,265	4,85,109	4,92,492
EAT	4,19,900	6,47,400	8,82,635	9,00,916	9,14,627
CFAT	6,19,900	7,97,400	9,95,135	9,85,291	9,77,908
Add salvage value					80,000
PV factor (0.15)	0.870	0.756	0.658	0.572	0.497
Present value	5,39,313	6,02,834	6,54,799	5,63,586	5,25,780
Total present value ( $t = 1 - 5$ )					28,86,312
Less cash outflows					8,00,000
NPV					<u>20,86,312</u>

**Recommendation:** Since NPV is positive, Innovative Academy offer is viable and should be accepted by MTI.

**Working notes****1. Revenue receipts from Innovative Academy**

Year 1 (3 classes × 3 sections × 50 students × Rs 200 per student × 12 months) = Rs 10,80,000

Year 2 (4 classes × 3 sections × 50 students × Rs 200 per student × 12 months) = Rs 14,40,000

Year 3–5 (5 classes × 3 sections × 50 students × Rs 200 per student × 12 months) = Rs 18,00,000

**2. Operating costs**

Particulars	Years				
	1	2	3	4	5
Salary of instructor*	Rs 1,20,000	Rs 1,80,000	Rs 1,98,000	Rs 1,98,000	Rs 1,98,000
Salary of supervisor	36,000	36,000	39,600	39,600	39,600
Spare parts @ Rs 3,000 per computer for years 1 and 2 and Rs 3,600 for years 3 – 5	45,000	45,000	54,000	54,000	54,000
Transportation, Rs 25,000 for years 1 and 2 and Rs 30,000 for years 3 – 5	25,000	25,000	30,000	30,000	30,000
Insurance (0.01 × investment cost)	8,000	8,000	8,000	8,000	8,000
Total cost	<u>2,34,000</u>	<u>2,94,000</u>	<u>3,29,600</u>	<u>3,29,600</u>	<u>3,29,600</u>

\*For year 1: (2 instructors × Rs 5,000 × 12 months) = Rs 1,20,000

For year 2: (3 instructors × Rs 5,000 × 12 months) = 1,80,000

For year 3-5: (Rs 1,80,000 + 0.10 × Rs 1,80,000) = 1,98,000

**PS 5.25**

Mr A S Evergreen has just retired from service with a public sector company. He has received retirement benefit totalling Rs 7 lakh. He can invest the amount in one of the schemes of the Unit Trust of India for 5 years at 12 per cent rate of return (after taxes) compounded annually.

Mr Evergreen has come across an advertisement from IIT Delhi in the Hindustan Times for putting up three vending machines for coke and coffee, one each in the boys hostel, girls hostel and academic block. The IIT Delhi is proposing to offer the contract only for 5 years on the basis of an initial non-refundable payment of Rs 2,00,000 and recurring annual rent of Rs 15,000 for space.

The vending machines are available for Rs 1,50,000 each with additional Rs 50,000 as transportation charges. About Rs 2,500 would be required to print posters for advertisement in the IIT campus per year. The vending machines have a capacity of 500 units of coke and coffee each. They would have to be refilled every alternate day; yearly estimated cost is Rs 5,000. The annual maintenance charges and power and electricity bills are projected at Rs 5,000 and Rs 10,000 respectively.

A survey of drinking habits of the students and residents yields the undermentioned information.

Month	Daily average consumption (units)	
	Coke	Coffee
January-February	50	475
March-April	600	350
May-August	1,000	75
September-October	700	320
November-December	50	650

Against a unit cost of Rs 3 and Rs 2.50 of coke and coffee respectively, IIT Delhi would permit Evergreen to charge Rs 5. The cups are available in the market for 1 rupee each. The yearly wastage of material during refilling and maintenance are estimated to amount to Rs 5,000.

If tax rate is 35 per cent, straight line method of depreciation is used for tax purposes and there is no salvage value, which course of action should Mr Evergreen adopt? Give reasons.

**Solution**

*Financial analysis whether to opt for vending machines (to be installed at IIT Delhi) or invest in Unit Trust of India*

**Cash outflows:**

Initial payment to IIT Delhi	Rs 2,00,000
Cost of three vending machines (Rs 1,50,000 × 3)	4,50,000
Transportation charges	50,000
	7,00,000

**Cash inflows after taxes and NPV**

Revenue (working note 1)		
Coke (2,08,300 × Rs 5)	Rs 10,41,500	
Coffee (1,17,700 × Rs 5)	5,88,850	Rs 16,30,350
Less costs:		
Cost of coke (2,08,300 × Rs 3)	6,24,900	
Cost of coffee (1,17,770 × Rs 2.50)	2,94,425	
Refilling charges	5,000	
Advertisement cost	2,500	
Maintenance costs	5,000	
Power and electricity charges	10,000	
Annual rent	15,000	

(Contd.)

**Solution (Contd.)**

Cost of cups (throwaway) (3,26,070 cups × Re.1)	3,26,070	
Depreciation (Rs 4,50,000/5)	90,000	
Amortization of initial payment (Rs 2,00,000/5)	40,000	
Miscellaneous expenses	5,000	14,17,895
Earnings before taxes		2,12,455
Less taxes (0.35)		74,359
Earnings after taxes		1,38,096
Add depreciation		90,000
Add amortisation		40,000
CFAT ( $t = 1 - 5$ )		2,68,096
(×) PV factor of annuity for 5 years at 12 per cent (5, 12)		× 3.605
Total PV		9,66,485
Less initial cash outflows		7,00,000
NPV		2,66,485

**Recommendation:** Since NPV is positive, Mr Evergreen is advised to opt for putting up vending machines in IIT Delhi.

**Working notes***Determination of revenue*

Months	Days	Daily consumption		Total consumption		Revenue @ Rs 5 per coke and coffee
		Coke	Coffee	Coke	Coffee	
January-February	59	50	475	2,950	28,025	Rs 1,54,875
March-April	61	600	350	36,600	21,350	2,89,750
May-August	123	1,000	75	1,23,000	9,225	6,61,125
September-October	61	700	320	42,700	19,520	3,11,100
November-December	61	50	650	3,050	39,650	2,13,500
				2,08,300	1,17,770	16,30,350

**Assumptions:** (i) It is assumed that initial payment of Rs 2,00,000 is treated like licence fee and tax advantage is available. (ii) Opportunity cost of Mr Evergreen (working) is zero.

**PS 5.26**

The Maharaja Luxury Hotel (MLH) makes special arrangements during Diwali festivals. The perimeter of the MLH is lighted up using earthen lamps. However, they cannot be displayed or used on the upper parapets of MLH due to wind. Certain portion of the ground floor also cannot be lighted up for the same reason. The marketing department of MLH has proposed the use of string of electric bulbs for decorating the MLH. The operating parameters and the underlying assumptions with respect to the two alternatives are summarised below.

The total perimeter covered at present is 1,000 meters and 10 earthen lamps are used per meter. About 1,000 lamps are required as backup for breakage in transportation and defective pieces. Each lamps cost Rs 2 and lasts about 7 years after lighting. The variable overheads consist of (a) overtime payment to four employees @ Rs 100 per person for installation, lighting and removal of the lamps next morning, (b) transportation cost from the place of manufacture of lamps to the MLH, Rs 150, and (c) temporary storage space for lamps received before Diwali, Rs 500.

In case of the use of the electric bulbs, the electricity charges would be Rs 2.40 per unit. The decorative lightings are available in unit strings of 22 bulbs. With an approximate gap of 10 cm between two bulbs, the length of the string would be 220 cm or 2.2 m. Each bulb costs Re 0.50 while the cost of each holder and decorative cover is Re 1. After



using the string for 10 hours, 30 per cent of the bulbs become non-functional. This necessitates maintenance of spare bulbs. Each bulb consumes 8 watts of power. The installation and dismantling of lighting charges will be Rs 1,000. As a precaution against power failures, a generator is to be hired for Rs 5,000. The wires and plastic holders numbering 1,000 would cost Rs 1.50 each. They could be sold as a scrap after 7 years for Rs 1,100. The used bulbs would not have any value. The insurance premium against theft during storage would be 1 per cent of the cost of wiring and bulbs.

The assumptions are: 0.35 tax, 0.10 required rate of return and straight line method of depreciation for tax purposes. Is the proposal to use electric bulbs instead of earthen lamps financially viable?

### **Solution**

*Financial analysis whether to replace earthen lamps by electric bulbs for lighting during Diwali festival*

#### **Incremental cash outflows:**

Cost of electric bulb and holders (10,000 × Rs 1.50): (Bulbs required are: 1,000 metres/10 cm = 10,000)	Rs 15,000
Cost of wire (1,000 m × Rs 1.50)	1,500
	<u>16,500</u>

#### **Incremental cash inflows**

Savings on earthen lamps (11,000 × Rs 2)	Rs 22,000
Savings in variable overheads (Rs 400 + Rs 150 + Rs 500)	1,050
Less incremental costs:	
Cost of electricity (8 W × 10 hours × Rs 2.4 × 10,000)/1,000	1,920
Insurance (0.01 × Rs 16,500)	165
Hiring charges of generator	5,000
Labour charges for installation and dismantling of lighting	1,000
Cost of spare bulbs (0.3 × 10,000 × Re 0.50)	1,500
Depreciation/amortisation of initial costs (Rs 16,500 – Rs 1,100)/7 years	<u>2,200</u>
Earnings before taxes	11,265
Less taxes (0.35)	<u>3,943</u>
Earnings after taxes	7,322
CFAT	<u>9,522</u>

#### **Determination of NPV**

Year	CFAT	PV factor (at 0.10)	Total PV
1-6	Rs 9,522	4.355	Rs 41,468
7	10,622 *	0.513	<u>5,449</u>
Total PV of savings			46,917
Less cash outflows			<u>16,500</u>
NPV			<u>30,417</u>

\*Including salvage value, Rs 1,100.

**Recommendation:** Since the NPV of the proposal is positive, the proposal is financially viable.

### **PS 5.27**

The North South Airlines (NSA) is considering two proposals to expand its current operations in a big way. At present, it has a fleet of two Boeing 737-200 jets and four Dornier aircrafts. The B-737s were leased from Wright Airways Inc. of USA. The profits of NSA on a revenue of Rs 92 crore are Rs 21 crore.

The Director (Operations) of NSA favours the induction of two additional latest model B737-400 aircrafts. With four jets the NSA would get the airlines status while its present status is that of Air Taxi Operator (ATO). As a result of achieving the airlines status, the NSA would have to fly on unprofitable routes also. It is suggested that the existing B737-200 models would serve the unprofitable routes. Moreover, Fly-By-Wire Airways (FBWA) is ready to buy one Dornier aircraft for Rs 12 crore whose book value is Rs 10 crore with remaining useful life of 8 years.

According to an alternative proposal, NSA should acquire an one Airbus-320 (A-320) which has a capacity of 180 passengers compared to 120 of the B737. The NSA would not be required to fly on uneconomical routes with a total fleet of three aircrafts.

On a reference from the managing director of the NSA, the finance manager has worked out the financial parameters as detailed below.

<i>(Amount in Rs crore)</i>		
<i>Particulars</i>	<i>Option 1 (Buy 737-400 and sell Dornier)</i>	<i>Option 2 (Buy A-320)</i>
Cost of aircraft	150	120
Staff training	2	—
Recurring costs:		
Fuel (5 per cent annual increase)	20	12
Maintenance	10	8
Salary/wages	5	3
Insurance premium	5	6
Overheads (airport charges)	5	3
Sale of Dornier	12	—
Recurring revenues:		
Profitable routes (10 per cent annual increase)	70	55
Unprofitable routes (constant)	5	—
Salvage value (after 8 years)	30	40

The fuel costs are expected to increase 5 per cent annually, while the likely annual increase in salary, wages and overheads would be 10 per cent. The projected recurring revenues are based on the assumption of average occupancy of 70 per cent on profitable routes and 20 per cent on uneconomical routes.

Assuming 35 per cent tax rate, 10 per cent required rate of return and straight line method of depreciation for tax purposes, how do you evaluate the financial viability of the two proposals? Which one would you recommend and why? Ignore tax shield on staff training costs.

## ***Solution***

### *Financial evaluation of Options I and II*

*Option I (to sell 1 Dornier and buy B-737) (amount in crore of rupees):*

*Cash outflows:*

Cost of aircraft	150
Add cost of staff training	2
Less sale proceeds of Dornier	(12)
Add tax payment on sale of Dornier (Rs 12 crore – Rs 10 crore) × 0.35	0.7
	140.7

*Determination of CFAT and NPV (amount in crore of rupees)*

<i>Year</i>	<i>Net cash inflow*</i>	<i>Incremental depreciation**</i>	<i>EBT</i>	<i>EAT (EBT × 0.65)</i>	<i>CFAT</i>	<i>PV factor (at 0.10)</i>	<i>Total PV</i>
1	30	13.75	16.25	10.56	24.31	0.909	22.10
2	35	13.75	21.25	13.81	27.56	0.826	22.76
3	40.55	13.75	26.80	17.42	31.17	0.751	23.41

*(Contd.)*

4	46.72	13.75	32.97	21.43	35.18	0.683	24.03
5	53.54	13.75	39.79	25.86	39.61	0.621	24.60
6	61.11	13.75	47.36	30.78	44.53	0.564	25.11
7	69.49	13.75	55.74	36.23	49.98	0.513	25.64
8	78.79	13.75	65.04	42.28	56.03	0.467	26.17
8	Salvage value				30.00	0.467	14.01
	Less cash outflows						(140.7)
	NPV						67.13

**\*\*Working note 2**

1. *Determination of net cash inflows (amount in crore of rupees)*

Year	Gross revenues			Costs					Net cash inflows	
	PR	UR	Total	Fuel	Maint- enance	Salary and wages	IP	OH		Total
1	70	5	75	20	10	5	5	5	45	30
2	77	5	82	21	10	5.5	5	5.5	47	35
3	84.7	5	89.7	22.05	10	6.05	5	6.05	49.15	40.55
4	93.17	5	98.17	23.15	10	6.65	5	6.65	51.45	46.72
5	102.49	5	107.49	24.31	10	7.32	5	7.32	53.95	53.54
6	112.74	5	117.74	25.53	10	8.05	5	8.05	56.63	61.11
7	124.01	5	129.01	26.80	10	8.86	5	8.86	59.52	69.49
8	136.41	5	141.41	28.14	10	9.74	5	9.74	62.62	78.79

2. Incremental depreciation (Rs crore)

Depreciation (new base) (Rs 150 crore – Rs 30 crore)/8 years	Rs 15
Less depreciation (Dornier) Rs 10 crore/8 years	1.25
Incremental depreciation	<u>13.75</u>

*Cash outflows:*

*Determination of CFAT and NPV (amount in crore of rupees)*

[illegible]

\*Working note 3

\*\* $(Rs\ 120\ crore - Rs\ 40\ crore)/8\ years = Rs\ 10\ crore$

# $(EBT \times 0.65)$

**Recommendation:** Option I is recommended for NSA as it has higher NPV.

### Working notes

3. *Determination of net cash inflows (amount in crore of rupees)*

Year	Revenues	Costs					Total	Net cash inflows
		Fuel	Maint- enance	Salary and wages	IP	OH		
1	55	12	8	3	6	3	32	23
2	60.5	12.6	8	3.3	6	3.3	33.2	27.3
3	66.55	13.23	8	3.63	6	3.63	34.49	32.06
4	73.21	13.89	8	3.99	6	3.99	35.87	37.34
5	80.53	14.59	8	4.39	6	4.39	37.37	43.16
6	88.58	15.32	8	4.83	6	4.83	38.98	49.60
7	97.44	16.08	8	5.31	6	5.31	40.70	56.74
8	107.18	16.89	8	5.84	6	5.84	42.57	64.61

### PS 5.28

Arvind Mills Ltd is considering two mutually exclusive investment proposals for its expansion programme. Proposal A requires an initial investment of Rs 7,50,000 and yearly cash operating costs of Rs 50,000. Proposal B requires an initial investment of Rs 5,00,000 and yearly cash operating costs of Rs 1,00,000. The life of the equipment used in both the investment proposals will be 12 years, with no salvage value; depreciation is on the straight line basis for tax purposes. The anticipated increase in revenues is Rs 1,50,000 per year in both the investment proposals. The firm's tax rate is 35 per cent and its cost of capital is 15 per cent. Which investment proposal should be undertaken by the company?

### Solution

*Economics of proposal A requiring Rs 2,50,000 more than proposal B*

	Amount before tax	Amount after tax
<b>Cash inflows:</b>		
Cost savings	Rs 50,000	Rs 32,500
Differential depreciation		
Proposal A	Rs 62,500	
Proposal B	41,667	
	20,883	7,309
CFAT		39,809
PVIFA (15,12)		$\times 5.421$
Total present value		2,15,805
Less additional outlay		2,50,000
NPV		(34,195)

Since the NPV is negative, equipment under proposal B should be accepted.

**PS 5.29**

The capital budget department of the ABC Ltd has developed the following data for the purpose of determining the financial feasibility of an investment proposal:

(a) Purchase of land requires Rs 3,00,000 to be paid at the time of purchase ( $t = 0$ ), and two instalments of Rs 2,00,000 each to be made at the end of the next 2 years ( $t = 1 - 2$ ); (b) construction of the factory is to be completed in 2 years. The contractor is to be paid Rs 12,00,000 in two equal instalments at the end of year ( $t = 2 - 3$ ); (c) equipment cost to be incurred at the start of year 4 ( $t = 3$ ) is Rs 12,00,000; (d) the operations will begin at the start of year 5 ( $t = 4$ ). It is expected that there will be a need for working capital investments. The details are: Rs 3,00,000, accounts receivable; Rs 15,00,000, inventories; current liabilities will also increase by Rs 2,00,000.

The operations will begin in year 5 and will continue for 12 years, through year 16. The sales revenues and operating costs are assumed to come at the end of each year ( $t = 5 - 16$ ). The following additional assumptions are made:

- (a) The building and equipment will be depreciated over 12 years starting in year 5. The factory building after 12 years is estimated to have a salvage value of Rs 6,00,000. The plant, however, is expected to have no salvage value. The company expects to sell the land at Rs 8,00,000 when the plant is closed down. The company uses the straight line method of depreciation and the same is allowed for tax purposes.
- (b) Its cost of capital is 10 per cent.
- (c) Annual sales are Rs 28,00,000.
- (d) Annual variable operating costs are Rs 10,00,000.
- (e) Annual fixed operating costs, excluding depreciation, are Rs 2,00,000.
- (f) The normal tax rate is 35 per cent.

Should the company accept the project? Use the NPV method for the purpose of calculations.

**Solution**

*Determination of PV of cash outflows at  $t = 0$*

Year	Particulars	Cash outlays	PV factor	Total PV
	(i) Land			
0	Cash payment	Rs 3,00,000	1.000	Rs 3,00,000
1	Instalment 1	2,00,000	0.909	1,81,800
2	Instalment 2	2,00,000	0.826	1,65,200
	(ii) Factory building			
2	Instalment 1	6,00,000	0.826	4,95,600
3	Instalment 2	6,00,000	0.751	4,50,600
3	(iii) Equipment cost	12,00,000	0.751	9,01,200
4	(iv) Net working capital	16,00,000	0.683	10,92,800
Total PV				35,87,200

*Cash inflows ( $t = 5 - 16$ )*

Sales revenues		Rs 28,00,000
Less costs		
Variable operating costs	Rs 10,00,000	
Fixed operating costs	2,00,000	
Depreciation [(Rs 24,00,000 - 6,00,000) ÷ 12]	1,50,000	13,50,000
Earnings before taxes		14,50,000
Less taxes		5,07,500
EAT		9,42,500

(Contd.)

**Solution (Contd.)**

Plus depreciation		1,50,000
(a) CFAT ( $t = 5 - 15$ )		10,92,500
(b) CFAT ( $t = 16$ )	10,92,500	
Add sale of building	6,00,000	
Add sale of land	8,00,000	
Add recovery of working capital	16,00,000	40,92,500

*Determination of PV of CFAT at the start of year 5*

Year	Total time period	CFAT	PV factor	Total PV
5-15	11 years	Rs 10,92,500	6.495	Rs 70,95,787
16	12th year	40,92,500	0.319	13,05,508
Total PV				84,01,295
PV at $t = 0$ (4 years before) = (Rs 84,01,285 $\times$ 0.683)				57,38,084
Less PV of cash outflows				35,87,200
NPV				21,50,884

**Recommendation:** The company should accept the project.

**PS 5.30**

Royal Industries Ltd requires more machinery for a manufacturing process that will be carried out for the next 8 years. Two machines that meet the firm's needs are available. The relevant data regarding these two machines are as follows:

	Machine X	Machine Y
Purchase cost	Rs 43,600	Rs 72,000
Annual cash operating expenses	25,000	25,000
Salvage value at the end of the useful life	4,000	8,000
Useful life (years)	4	8

The company makes use of the straight line method of depreciation and the same is accepted for tax purposes. In determining the amount of depreciation, provision would be made for salvage value. It is estimated that the firm would need Rs 48,000 to replace machine X at the end of 4 years, if that machine is selected. The other data applicable to machine X given above apply to the replacement model as well.

Cost of capital is 15 per cent and tax rate is 35 per cent. You are required to determine the course of action that the firm should take.

**Solution***PV of total cost*

		Present value
<b>Machine Y:</b>		
Purchase cost		Rs 78,400
Annual operating cost after taxes (Rs 25,000 $\times$ 0.65)	Rs 16,250	
Less tax advantage on depreciation (Rs 8,000 $\times$ 0.35)	2,800	
Net cash outflows	13,450	
( $\times$ ) PV factor, annuity of 8 years	( $\times$ ) 4.487	60,350

(Contd.)

**Solution (Contd.)**

Less salvage value	(8,000)	
(×) PV factor, for 8th year	× 0.351	(2,808)
Total PV		1,35,942
<b>Machine X:</b>		
Purchase cost		43,600
Annual operating cost after taxes (Rs 20,000 × 0.65)	13,000	
Less tax advantage on depreciation (Rs 9,900 × 0.35)	3,465	
Net cash outflows	9,535	
(×) PV factor, annuity of 4th years, 15%	(×) 2.855	27,222
Less salvage value	(4,000)	
(×) PV factor, for 4th year	× 0.572	(2,888)
Purchase price of replacement machine	48,000	
(×) PV factor for 4th year	× 0.572	27,456
Annual operating costs after taxes	13,000	
Less tax advantage on depreciation	3,500	
Net cash outflows	9,500	
(×) PV factor, for 4 years (0.497 + 0.432 + 0.376 + 0.327)	× 1.632	15,504
Less salvage value	(4,000)	
(×) PV factor, for 8th year	× 0.327	(1,308)
Total		1,09,586

**Recommendation:** The firm should buy machine X and replace it at the end of 4 years.

**PS 5.31**

Amul Ltd is considering two mutually exclusive proposals, X and Y.

Proposal X will require the initial cost of Rs 1,40,000 with no salvage value, and will also require an increase in the level of inventories and receivables of Rs 60,000 over its life. The project will generate additional sales of Rs 1,30,000, and will require cash expenses of Rs 40,000 in each of its 5 year life. It will be depreciated on straight line method and the same is accepted for tax purposes.

Proposal Y will require an initial capital of Rs 2,00,000 with no salvage value, and will be depreciated on straight line basis. The earnings before depreciation and taxes during its 5-year life are:

Year 1	Year 2	Year 3	Year 4	Year 5
Rs 70,000	Rs 76,000	Rs 80,000	Rs 90,000	Rs 92,000

The company has to pay corporate income tax at the rate of 35 per cent, and is evaluating projects with 10 per cent as the cost of capital.

- Which project is acceptable under the NPV method?
- Will it make any difference to the above decision if profitability index is employed?

**Solution**

(i) NPV:

*Proposal X: Cash outflow at  $t = 0$*

Cost of new project	Rs 1,40,000
Working capital required for an increase in the level of inventories and receivables	60,000
Total	2,00,000

(Contd.)

**Solution (Contd.)***Cash inflows, years 1 - 4*

Sales	Rs 1,30,000
Less cash expenses	40,000
Earnings before taxes	90,000
Less depreciation (Rs 1,40,000 ÷ 5)	28,000
Taxable income	62,000
Less taxes	21,700
Earnings after taxes	40,300
Add depreciation	28,000
CFAT $t = (1 - 4)$	68,300
$t = 4$ (Rs 68,300 + Rs 60,000, working capital release)	1,28,300

*Determination of NPV*

Years	CFAT	PV factor	Total PV
1-4	Rs 68,300	3.170	Rs 2,16,511
5	1,28,300	0.621	79,674
Total PV			2,96,185
Less cash outflows			2,00,000
NPV			96,185

*Proposal Y: Determination of NPV (rupees in thousand)*

Year	Gross earnings	Depreciation (200 ÷ 5)	Taxable income (Col 3-2)	Tax	EAT (Col 4 - 5)	CFAT (Col 6 + 3)	PV factor	Total PV (Col 7 x 8)
1	2	3	4	5	6	7	8	9
1	70	40	30	10.5	19.5	59.5	0.909	54.09
2	76	40	36	12.6	23.4	63.4	0.826	52.37
3	80	40	40	14	26	66	0.751	49.56
4	90	40	50	17.5	32.5	72.5	0.683	49.52
5	92	40	52	18.2	33.8	73.8	0.621	45.83
Total PV								251.37
Less cash outflows								200.00
NPV								51.37

**Recommendation:** Proposal X is acceptable under the NPV method.(ii) *Profitability index (PI) method:*

Proposal X = Rs 2,96,185 / Rs 2,00,000 = 1.48

Proposal Y = Rs 2,52,868 / Rs 2,00,000 = 1.26

It does not make any difference to the above decision if PI is employed.

**PS 5.32**

A job which is presently done entirely by manual methods has a labour cost of Rs 46,000 a year. It is proposed to install a machine to do the job, which involves an investment of Rs 80,000 and an annual operating cost of Rs 10,000. Assume that the machine can be written off in 5 years on straight line depreciation basis for tax purposes. Salvage value at the end of its economic life is zero. The tax rate is 35 per cent. Analyse the economic implications of the proposal by the IRR method.



## Solution

### Decision analysis

Cash inflows	Amount before tax	Amount after tax
Cost savings (Lower running expenses: Rs 46,000 – Rs 10,000)	Rs 36,000	Rs 23,400
Tax advantage on depreciation (Rs 80,000 ÷ 5)	16,000	5,600
CFAT (T = 1 – 5)		29,000

Determination of IRR: PB value = Rs 80,000/Rs 29,000 = 2.758

Table A-4 indicates that the closest factor to 2.758 is 2.745 at 24 per cent rate of discount against 5 years. Thus, the IRR is 24 per cent.

The proposal should be accepted only when the firm's cost of capital is less than 24 per cent. Otherwise, the present method of doing work manually should continue.

### PS 5.33

Indian Oil Ltd proposes to install a pipeline for transport of crude oil from wells to refinery. Investments and operating costs of the pipeline vary from different diameters of pipes. The following details have been collected:

Pipeline diameter	3"	4"	5"	6"	7"
Investment required (Rs in lakh)	16	24	36	64	150
Gross annual savings in operating costs before depreciation	5	8	15	30	50

Estimated life of the installation is 10 years. Tax rate is 35 per cent. Calculate the net savings after tax, and the cash flow generation; from these recommend the largest pipeline to be installed if the company desires a 15 per cent after tax return and follows straight line method of depreciation for tax purposes.

## Solution

### Determination of CFAT (Rs in lakh)

Pipeline diameter	3"	4"	5"	6"	7"
Gross annual savings	5	8	15	30	50
Less depreciation	1.6	2.4	3.6	6.4	15
Earnings before taxes	3.4	5.6	11.4	23.6	35
Less taxes (0.35)	1.19	1.96	3.99	8.26	12.25
Earnings after taxes	2.21	3.64	7.41	15.34	22.75
CFAT (EAT + Depreciation)	3.81	6.04	11.01	21.74	37.75
(×) PV factor of annuity for 10 years (at 0.15)	5.019	5.019	5.019	5.019	5.019
PV	19.12	30.31	55.26	109.11	189.47
Less investment	16	24	36	64	150
NPV	3.12	6.31	19.26	45.11	39.47

**Recommendation:** Pipeline diameter 6" is recommended for installation as it has the highest NPV.

### PS 5.34

Hypothetical Ltd engaged in manufacturing chemical products is evaluating two new processes for producing a particular compound. Demand for the compound will be small during the next 5 years ( $t = 1 - 5$ ) and increase thereafter. Process A requires equipment which is appropriate for small output levels. It will be replaced in 5 years with process B, which will utilise equipment with an 18-year life. B is capable of meeting large output requirements. The alternative to

using process A and B is to install (time 0) process C which employs equipment with an estimated life of 20 years. The costs of A, B, and C are as follows:

	<i>Expected capital outlay for the process</i>		
	<i>A</i>	<i>B</i>	<i>C</i>
Now ( $t = 0$ )	Rs 10,00,000		Rs 20,00,000
5 years hence		Rs 35,00,000	

The future annual net cash flows from each process are:

	<i>Period of cash flow (years) Annual cash flow</i>		
1-5	Rs 3,00,000		Rs 2,50,000
6-20		Rs 5,00,000	4,50,000
21-23		5,00,000	

The cost of capital is 10 per cent.

(i) Should the firm adopt A and B, or adopt C? Justify your approach.

(ii) If the life of process C were only 15 years instead of 20 years, would your answer be different? Explain.

### **Solution**

(i) *Cash outflows: processes (A and B) and C*

<i>Year</i>	<i>Cash outflows</i>	<i>PV factor</i>	<i>Total PV</i>
0	Rs 10,00,000	1.000	Rs 10,00,000
5	35,00,000	0.621	21,73,500
Total cash outflows			31,73,500
Process C (cash outflows)			20,00,000

*NPV of cash inflows (Processes A and B)*

<i>Year</i>	<i>Cash flows</i>	<i>PV factor</i>	<i>Total PV</i>
1-5	Rs 3,00,000	3.791	Rs 11,37,300
6-23	5,00,000	8.201	41,00,500*
5	41,00,500*	0.621	25,46,410
Total PV of cash inflows			36,83,710
Less PV of cash outflows			31,73,500
NPV			5,10,210

*NPV of cash inflows (process C)*

<i>Year</i>	<i>CFAT</i>	<i>PV factor</i>	<i>Total PV</i>
1-5	Rs 2,50,000	3.791	Rs 9,47,750
6-20	4,50,000	7.606	34,22,700*
5	34,22,700*	0.621	21,25,496.70
Total PV of cash inflows			30,73,246.70
Less PV of cash outflows			20,00,000.00
NPV			10,73,246.70

The firm should adopt process C.

(ii) NPV, life of process C = 15 years

1-5	Rs 2,50,000	3.791	Rs 9,47,750
6-15	4,50,000	6.145	27,65,250.00 *
5	27,65,250 *	0.621	17,17,220.20
Total PV of cash inflows			26,64,970.20
Less PV of cash outflows			20,00,000.00
NPV			6,64,970.20

No, the answer would not be different as the NPV of process C is still higher than that of processes A and B.

### PS 5.35

Hypothetical Ltd is considering the purchase of a delivery van, and is evaluating the following two choices:

- The company can buy a used van for Rs 20,000 and after 4 years sell the same for Rs 2,500 (net of taxes), and replace it with another used van which is expected to cost Rs 30,000 and has 6 years life with no terminating value.
- The company can buy a new van for Rs 40,000. The projected life of the van is 10 years and has an expected salvage value (net of taxes) of Rs 5,000 at the end of 10 years.

The services provided by the vans under both the choices are the same. Assuming the cost of capital at 10 per cent, which choice is preferable?

### Solution

Choice 1: PV of cash outflows ( $t = 0$ )

Year	Cash outflows	PV factor	Total PV
0	Rs 20,000	1.000	Rs 20,000.00
4	27,500	0.683	18,782.50
PV of cash outlays			38,782.50

Choice 2: PV of cash outflows ( $t = 0$ )

Year	Cash outflows	PV factor	Total PV
0	Rs 40,000	1.000	Rs 40,000
10	(5,000)	0.386	(1,930)
			38,070

Choice 2 for buying a new van is preferable as it involves less cash outlay.

### PS 5.36

ABC Ltd is considering to install a machine, either X or Y which are mutually exclusive. The details of their purchase price and operating costs are:

	Year	Machine X	Machine Y
Purchase cost	0	Rs 10,000	Rs 8,000
Operating costs	1	2,000	2,500
	2	2,000	2,500
	3	2,000	2,500
	4	2,500	3,800
	5	2,500	3,800

(Contd.)

**PS 5.36 (Contd.)**

	6	2,500	3,800
	7	3,000	
	8	3,000	
	9	3,000	
	10	3,000	

Machine X will recover a salvage value of Rs 1,500 in the year 10 while machine Y will recover Rs 1,000 in the year 6. Determine which is cheaper at the 10 per cent cost of capital, assuming that both the machines operate at the same efficiency?

**Solution***Equivalent annual cost (EAC)*

Year	Machine X			Machine Y		
	Cost	PV factor	PV adjusted cost	Cost	PV factor	PV adjusted cost
Purchase cost	0	Rs 10,000	1.000	Rs 10,000	Rs 8,000	1.000
Operating cost	1	2,000	0.909	1,818	2,500	0.909
	2	2,000	0.826	1,652	2,500	0.826
	3	2,000	0.751	1,502	2,500	0.751
	4	2,500	0.683	1,707.50	3,800	0.683
	5	2,500	0.621	1,552.50	3,800	0.621
	6	2,500	0.564	1,410.00	3,800	0.564
	7	3,000	0.513	1,539.00	—	—
	8	3,000	0.467	1,401.00	—	—
	9	3,000	0.424	1,272.00	—	—
	10	3,000	0.386	1,158.00	—	—
Total cost			25,012.00			21,313.40
Less salvage value		1,500	0.386	579.00	1,000	0.564
			24,433.00			20,749.40
Divided by annuity PV factor for 10 per cent corresponding to the life of the project (capital recovery factor)			÷ 6.1446			÷ 4.3553
Equivalent annual cost			3,976.50			4,764.20

Machine X would be cheaper to buy due to lower equivalent annual cost.

**PS 5.37**

Your advice is sought for choice between two options under consideration:

- Purchase of a petrol truck.
- Purchase of a battery-powered truck.

The comparative purchase and operating cost data are given below:

	Year	Petrol truck	Battery-powered truck
Purchase cost	0	Rs 1,50,000	Rs 2,50,000
Operating cost	1	24,000	12,000
	2	34,000	12,000
	3	29,000	12,000
	4	31,000	12,000
	5	—	12,000

Assume an investment incentive of 100 per cent initial depreciation allowance, and a 35 per cent incidence of corporate tax. No depreciation is allowed in subsequent years. Taxes are promptly paid. A return of 10 per cent after tax as investment incentives is required. Would it be advisable to buy the petrol truck or the battery-powered truck?

### Solution

*Equivalent annual cost*

	Year	PV factor	Petrol truck		Battery powered truck	
			(Costs) × (1 – tax rate)	PV adjusted costs	(Costs) × (1 – tax rate)	PV adjusted costs
Purchase cost	0	1.000	Rs 97,500	Rs 97,500	Rs 1,62,500	Rs 1,62,500
Operating cost	1	0.909	15,600	14,180	7,800	7,090
	2	0.826	22,100	18,255	7,800	6,443
	3	0.751	18,850	14,156	7,800	5,858
	4	0.683	20,150	13,762	7,800	5,327
	5	0.621	—	—	7,800	4,844
Total costs				1,57,853		1,92,062
Divided by annuity PV factor at 10% corresponding to the life of the project				÷ 3.17		÷ 3.79
Equivalent annual cost				49,796		50,676

**Recommendation:** The company is advised to buy the petrol truck.

### PS 5.38

ABC Chemicals Ltd is considering two mutually exclusive proposals for its expansion programme. Annual revenues and out-of-pocket operating cost of these two proposals are as follows:

	Proposal I	Proposal II
Purchase price of equipment	Rs 8,00,000	Rs 19,40,000
Salvage value at the end of useful life	1,00,000	1,80,000
Useful life (years)	7	11
Annual incremental revenues	5,00,000	7,50,000
Annual incremental cash operating cost	2,40,000	3,60,000

The firm's tax rate is 35 per cent, and its required rate of return is 12 per cent. The equipment will be depreciated by straight line method and the same is allowed for tax purposes. Which of the two proposals should be chosen?

### Solution

*Determination of equivalent annual net value*

	Proposal I	Proposal II
(A) Equivalent annual cashflows		
Annual revenues after tax	Rs 3,25,000	Rs 4,87,500
Annual depreciation tax shield (depreciation × tax rate)	35,000	56,000
Equivalent annual terminal salvage value:		
	I	II
Salvage value	Rs 1,00,000	Rs 1,80,000
(×) PV factor at the end of economic life (0.12)	(×) 0.452	(×) 0.287

(Contd.)

**Solution (Contd.)**

Total PV	45,200	51,660		
(÷) PV factor for annuity over economic life seven years (I) and 11 years (II), 0.12, Equivalent annual terminal salvage value	÷ 4.564	÷ 5.938	9,903.60	8,699.90
Total cash inflows (equivalent)			3,69,904	5,52,200
(B) Equivalent annual outlays:				
Cash operating cost after taxes (cost – tax savings)			1,56,000	2,34,000
Equivalent annual purchase cost (purchase cost ÷ PV factor for annuity over economic life)				
Proposal I: Rs 8,00,000 ÷ 4.564			1,75,284.80	
Proposal II: Rs 19,40,000 ÷ 5.938				3,26,709.30
Total cash outlays (equivalent)			3,31,285	5,60,709
(C) Equivalent annual net value (A – B)			38,619.80	(8,509)

**Advice:** The company should accept proposal I.

**PS 5.39**

A company is considering three methods of attracting customers to expand its business: (A) advertisement campaign, (B) display of neon signs, and (c) direct delivery service. The initial outlays for each alternative are:

A	Rs 1,00,000
B	1,50,000
C	1,50,000

If A is carried out, but not B, it has an NPV of Rs 1,25,000. If B is done, not A, B has an NPV of Rs 45,000. However, if both are done, their NPVs are Rs 2,00,000. The NPV of the delivery system, C, is Rs 90,000. Its NPV is not dependent on whether A or B is adopted, and the NPV of A or B does not depend on whether C is adopted. Which of the investments should be made by the company (i) if the firm has no budget constraint, (ii) if the budgeted amount is only Rs 2,50,000.

**Solution**

Mode of attracting customers	Initial outlay	Expected NPV
Advertisement campaign (A)	Rs 1,00,000	Rs 1,25,000
Display of neon-signs (B) [(A) + (B)]	1,50,000	45,000
	2,50,000	2,00,000
Direct delivery service (C)	1,50,000	90,000

- The firm should adopt (A + B) and C modes of attracting customers.
- The firm should adopt (A) and (C) as the NPV from this combination is the maximum.

**PS 5.40**

Philips Electrical Ltd requires additional factory space and machines to increase its production. The production manager and chief executive have two proposals under consideration. The relevant data for these two proposals are as follows:

	<i>Proposal X</i>	<i>Proposal Y</i>
Investment required	Rs 5,00,000	Rs 7,00,000
Incremental fixed cash operating costs per year	40,000	50,000
Additional capacity in machine-hours per year (hours)	50,000	70,000
Useful life (years)	10	10
Salvage value at the end of life	Nil	Nil

The company produces three products, A, B and C. The following data have been furnished by the management accountant with the help of production and sales manager regarding the capacity utilisation:

	<i>A</i>	<i>B</i>	<i>C</i>
Potential increased sales (in units)	7,500	10,000	7,500
Contribution margin per unit (Rs)	5	6	10
Machine-hours required per unit	2	4	5

The corporate tax rate is 35 per cent and the cost of capital 14 per cent. The company uses the straight line method of depreciation for tax purposes.

You are required to determine which plan should be accepted and how the increased capacity should be used (how much of each product should be made).

### ***Solution***

*The first step is to determine how to use the additional capacity. The products yield marginal contribution (MC) per machine hours as follows:*

<i>Products</i>	<i>MC (per hour)</i>
A (Rs 5 ÷ 2)	Rs 2.50
B (Rs 6 ÷ 4)	1.50
C (Rs 10 ÷ 5)	2.00

Therefore, product A should be made first, until its sales potential is reached, then product C, and finally product B.

#### *Proposal X:*

Available machine-hours	50,000
Production of 7,500 units of A (2 × 7,500)	15,000
Hours remaining	35,000
Divided by 5 hours required for product C equal number of (7,000) units to be made.	
Contribution: A (7,500 × Rs 5) = Rs 37,500	
C (7,000 × Rs 10) =	70,000
	Rs 1,07,500
Less fixed costs (additional)	40,000
Less incremental depreciation	50,000
	90,000
Income before taxes	17,500
Less taxes	6,125
Net income after taxes	11,375
Plus incremental depreciation	50,000
CFAT (t = 1 – 10)	61,375
(×) PV factor, 10 years annuity	(×) 5.216
Total PV of future cash inflows	3,20,132
Less investment required	5,00,000
NPV	(1,79,868)

(Contd.)

**Solution (Contd.)****Proposal Y:**

Available machine-hours 70,000

Product A, 7,500 units (15,000 hours)

Product C, 7,500 units (37,500 hours)

Product B, 4,375 units (17,500 hours)

**Contribution:**

Product A (7,500 × Rs 5)	Rs 37,500	
Product C (7,500 × Rs 10)	75,000	
Product B (4,375 × Rs 6)	26,250	
Total incremental contribution		1,38,750
Less fixed costs (additional)	50,000	
Less incremental depreciation	70,000	
		1,20,000
Income before taxes		18,750
Less taxes		6,562
Income after taxes		12,188
Add incremental depreciation		70,000
CFAT (t = 1 – 10)		82,188
(×) PV factor 10 years annuity		(×) 5.216
Total PV of future cash inflows		4,28,692
Less investment required		7,00,000
NPV		(2,71,308)

**Recommendation:** Neither of the proposals should be accepted as both the proposals have negative NPVs.

**PS 5.41**

AT Transport Ltd is considering starting an express bus service between Mumbai and a nearby suburb (one way fare Rs 5). It has under consideration two proposals of (i) either 32, or (ii) 52 passengers bus. The relevant data is as follows:

Particulars	32 passenger bus	52 passenger bus
Number of each to be purchased	6	4
Useful life (years)	8	8
Purchase price of each deluxe bus (Rs)	8,00,000	11,00,000
Kilometer per litre of diesel	5	4
Salvage value per bus (Rs)	80,000	1,50,000
Drivers' hourly wages (both for regular and part-time) (Rs)	15	20
Price per litre of diesel (Rs)	5	5
Other annual cash expenses per bus (Rs)	30,000	40,000

During the daily rush-hour period totalling 4 hours, all buses would be in service and are expected to operate at full capacity in both directions of the route, each bus covering the route 12 times (6 round trips) during that period. The state law prohibits standees in the buses.

During the remaining 12 hours of daily service period, 500 passengers would be carried, and the company will operate four buses on the route.

A bus travelling on the route all the day would cover 480 kms and one in use only during rush hours would cover 120 kms a day during the 260 days period.

Assuming 15 per cent cost of capital, and no taxes, all annual cash flows occurring at the end of the year, advise the company whether it should introduce buses of capacity 32 or 52 passenger. Use NPV analysis for the purpose.



***Solution****Net present value*

	<i>32 passenger bus</i>	<i>52 passenger bus</i>
Estimated operating revenues	Rs 36,45,200	Rs 38,94,800
<i>Less estimated cash expenses</i>		
Drivers' wages	2,80,800	3,32,800
Diesel cost	5,61,600	6,24,000
Other annual cash expenses	1,80,000	1,60,000
Net operating income	26,22,800	27,78,000
× PV factor (at 0.15) for 8 years	× 4.487	× 4.487
PV of operating income (a)	1,17,68,504	1,24,64,886
Salvage value	4,80,000	6,00,000
PV factor (at 0.15) for 8th year	× 0.327	× 0.327
PV of salvage value (b)	1,56,960	1,96,200
Total PV (a + b)	1,19,25,464	1,26,61,086
Less PV of cost of bus	48,00,000	44,00,000
NPV	71,25,464	82,61,086

**Recommendation:** The company should introduce buses having a capacity of 52 passengers.

**Working notes***Estimated annual revenue*

	<i>32 passenger bus</i>	<i>52 passenger bus</i>
Passengers per trip	32	52
× Trips (6 × 2, both ways) by each bus during rush-hours	× 12	× 12
Total passengers carried by each bus during rush-hours	384	624
× Number of buses	× 6	× 4
Total rush-hour passengers carried each day	2,304	2,496
Total other passengers each day	500	500
Total daily passengers	2,804	2,996
× Days per year	× 260	× 260
Total annual passengers carried	7,29,040	7,78,960
× Fare per passenger per trip (Rs)	× 5	× 5
Total	Rs 36,45,200	Rs 38,94,800

*Estimated annual drivers' wages*

	<i>32 passenger bus</i>	<i>52 passenger bus</i>
Number of buses operating during rush-hours	6	4
× Rush-hours	× 4	× 4
Rush-hours time for all drivers	24	16
Number of buses operating in non-rush-hours	4	4
× Remaining hours	× 12	× 12
	48	48
Total daily all driver-hours	72	64
× Number of days per year	× 260	× 260
Total annual driver-hours	18,720	16,640
× Hourly wage rate (Rs)	× 15	× 20
Total	Rs 2,80,000	Rs 3,32,800

*Estimated annual cost of diesel*

	32 passenger bus	52 passenger bus
Buses operating during rush hours	6	4
× Rush-hour kms per bus	× 120	× 120
Total rush-hour kms	<u>720</u>	<u>480</u>
Buses operating during non-rush hours	4	4
× Kms per bus during non-rush-hours	× 360	× 360
Total non-rush-hour kms	<u>1,440</u>	<u>1,440</u>
Total daily km	2,160	1,920
× Days per year	× 260	× 260
Total annual kms	5,61,600	4,99,200
÷ Km per litre of diesel	÷ 5	÷ 4
Annual consumption of diesel (litres)	1,12,230	1,24,800
× Cost per litre of diesel (Rs)	× 5	× 5
Total	Rs 5,61,600	Rs 6,24,000

**PS 5.42**

XYZ Ltd currently manufactures all components of its final product, but ABC Ltd has offered to provide one of the main sub-assemblies needed by XYZ Ltd at what appears to be a very attractive price. However, XYZ Ltd is hesitant in buying from ABC Ltd because quite a lot of its own special purpose equipment will become redundant and have to be sold at a considerable loss. The following is the summary of the available information:

1. ABC Ltd will supply the sub-assembly in any quantity needed at Rs 90 per unit. The forecasted value of demand is 10,000 units per year for the next 6 years.
2. The current manufacturing costs of XYZ Ltd to produce 10,000 sub-assemblies per year are as follows:

Materials	Rs 2,00,000
Direct labour	4,00,000
Variable overheads	2,00,000
Fixed overheads	<u>4,50,000</u>
	12,50,000

It is expected that the material prices will rise by 25 per cent, and labour rates by 10 per cent after 3 years. Overheads rates are not expected to increase.

3. In case of purchase from outside, all variable manufacturing costs can be avoided. Of the fixed overheads, Rs 50,000 cannot be avoided as it relates to the inside—plant administrative costs (all paid in cash) that were being allocated to the sub-assemblies. Depreciation charges on the special purpose equipment used only to manufacture sub-assemblies are Rs 4,00,000. The equipment has a current book value of Rs 24,00,000, and would be depreciated on a straight line basis for tax purposes. It can currently be sold for Rs 4,00,000. The equipment would have no resale value after 6 years. The short-term capital loss on sale of equipment is allowed to be adjusted against the income of the current year for tax purposes.
4. The company is subject to 35 per cent tax. The minimum required rate of return for projects of this type is considered to be 15 per cent.

Using the NPV analysis, determine whether it would be profitable to switch over from making sub-assemblies to buying the same from outside. Assume that the firm has a substantial taxable income.

**Solution***Financial analysis of make versus buy decision*

Particulars	Years (1-3)	Years (4-6)
(i) <i>Manufacturing costs (relevant):</i>		
Material	Rs 2,00,000	Rs 2,50,000
Direct labor	4,00,000	4,40,000
Variable overheads	2,00,000	2,00,000
Depreciation	4,00,000	4,00,000
Total manufacturing cost	12,00,000	12,90,000
Less tax savings	4,20,000	4,51,500
Effective manufacturing costs	7,80,000	8,38,500
Less depreciation	4,00,000	4,00,000
Effective cash outflows/costs	3,80,000	4,38,500
Multiplied by PV factor	$\times 2.283$	$\times 1.501$
Total PV of cash costs	8,67,540	+6,58,188
	= Rs 15,25,728	
(ii) <i>Buying costs:</i>		(Years 1 - 6)
10,000 units x Rs 90		Rs 9,00,000
Less tax savings		3,15,000
Effective cash costs		5,85,000
Multiplied by PV factor for 6 years		3.784
Total present value of cash outflows		22,13,640
Less sale value of old equipment		4,00,000
Less tax advantage due to loss on sale of equipment ( $0.35 \times \text{Rs } 20,00,000$ )		7,00,000
Total PV of buy costs		11,13,640

**Recommendation:** It would be profitable for the firm to switch over from making sub-assemblies to buying from ABC Ltd.**PS 5.43**

A company has a machine in current use. It was purchased for Rs 1,60,000, and had a projected life of 8 years with Rs 10,000 salvage value. It has been depreciated @ 25 per cent on written down value basis for 3 years to date, and can be sold for Rs 30,000.

A new machine can be purchased at a cost of Rs 2,60,000. It will have a 5-year life, salvage value of Rs 10,000, and will be depreciated @ 25 per cent like other assets of the block. It is estimated that the new machine will reduce labour expenses by Rs 15,000 per year and net working capital requirement by Rs 20,000. The income tax rate of the company is 35 per cent and its required rate of return is 12 per cent on investment.

Determine whether the new machine should be purchased. The income statement for the firm using the current machine for the current year is as follows:

Sales		Rs 20,00,000
Labour	Rs 7,00,000	
Material	5,00,000	
Depreciation	2,00,000	
Total costs		14,00,000
Earnings before tax		6,00,000
Income tax		2,10,000
After tax profit		3,90,000

**Solution***Incremental cash outflows*

Cost of new machine	Rs 2,60,000
Less sale value of existing machine	30,000
Less reduction in working capital	20,000
	<u>2,10,000</u>

*Determination of CFAT and NPV*

Particulars	Years				
	1	2	3	4	5
Cost savings	Rs 15,000	Rs 15,000	Rs 15,000	Rs 15,000	Rs 15,000
Less taxes (0.35)	<u>5,250</u>	<u>5,250</u>	<u>5,250</u>	<u>5,250</u>	<u>5,250</u>
EAT/CFAT	9,750	9,750	9,750	9,750	9,750
Tax shield on incremental depreciation (Depreciation × 0.35)	<u>20,125</u>	<u>15,094</u>	<u>11,320</u>	<u>8,490</u>	<u>5,493</u>
Total CFAT	<u>29,875</u>	<u>24,844</u>	<u>21,070</u>	<u>18,240</u>	<u>15,243</u>
(×) PV factor (0.12)	× 0.893	× 0.797	× 0.712	× 0.636	× 0.567
PV	<u>26,678</u>	<u>19,801</u>	<u>15,002</u>	<u>11,601</u>	<u>8,643</u>
Add PV of salvage value (Rs 10,000 × 0.567)					5,670
Less PV of WC required again (Rs 20,000 × 0.567)					(11,340)
Total present value ( $t = 1 - 5$ )					76,055
Less incremental cash outflows					<u>2,10,000</u>
NPV					<u>(1,33,945)</u>

Since NPV is negative, the new machine should not be purchased.

**Working notes**

(a) WDV of existing machine in the beginning of year 4:

Initial cost of machine	Rs 1,60,000
Less depreciation charges (year 1 to 3):	
Year 1 (Rs 1,60,000 × 0.25)	Rs 40,000
2 (    1,20,000 × 0.25)	30,000
3 (    90,000 × 0.25)	<u>22,500</u>
	<u>92,500</u>
	67,500

(b) Depreciation base of new machine

WDV of existing machine	Rs 67,500
Add cost of new machine	2,60,000
Less sale value of existing machine	(30,000)
	<u>2,97,500</u>

(c) Base for incremental depreciation: (Rs 2,97,500 – Rs 67,500) = Rs 2,30,000.

(d) *Incremental depreciation ( $t = 1 - 5$ )*

Year	Incremental WDV base	Depreciation
1	Rs 2,30,000	Rs 57,500
2	1,72,500	43,125
3	1,29,375	32,344
4	99,031	24,258
5	72,773	15,693*

\* $0.25 \times (\text{Rs } 72,773 - \text{Rs } 10,000) = \text{Rs } 15,693$ .

### PS 5.44

A machine purchased four years ago has been depreciated to its current book value of Rs 50,000. The machine originally had a projected life of 10 years and zero salvage value.

A new machine will cost Rs 80,000. Its installation cost estimated by the technician is Rs 20,000. The technician also estimates that the installation of the new machine will result in a reduced operating cost of Rs 30,000 per year for the next 16 years. The old machine would be sold for Rs 20,000. The new machine will have a 6-year life with no salvage value. The company's income is taxed at 35. Assuming the cost of capital at 10 per cent, determine whether the existing machine should be replaced. Make your own assumption regarding depreciation of the machine.

### Solution

#### Cash outflows

Cost of the machine	Rs 80,000
Add installation cost	20,000
Less sale value of old machine	(20,000)
	<u>80,000</u>

#### Determination of CFAT and NPV

Particulars	Years					
	1	2	3	4	5	6
Cost savings	Rs 30,000	Rs 30,000	Rs 30,000	Rs 30,000	Rs 30,000	Rs 30,000
Less incremental depreciation, Rs 80,000 (Rs 1,30,000 – Rs 50,000)	20,000	15,000	11,250	8,437	6,328	Nil*
EBT	10,000	15,000	18,750	21,563	23,672	30,000
Less taxes	3,500	5,250	6,563	7,547	8,285	10,500
EAT	6,500	9,750	12,187	14,016	15,387	19,500
CFAT	26,500	24,750	23,437	22,453	21,715	+
Add tax benefit on short-term capital loss**						6,645
(x) PV factor	$\times 0.909$	$\times 0.826$	$\times 0.751$	$\times 0.683$	$\times 0.621$	$\times 0.564$
PV	24,088	20,443	17,601	15,335	13,485	14,746
Total PV ( $t = 1 - 6$ )						1,05,698
Less incremental cash outflows						80,000
NPV						<u>25,698</u>

\*No depreciation is to be charged in the terminating year as the asset block ceases to exist.

\*\* $(\text{Rs } 80,000 - \text{Rs } 61,015, \text{ accumulated depreciation}) \times 0.35$

**Recommendation:** The machine should be replaced as NPV is positive.

**Assumptions:** The tax relevant rate of depreciation is 25 per cent and this block of assets would cease to exist after 6 years.

### PS 5.45

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. The old machine is 5 years old, has a current salvage value of Rs 30,000 and a remaining depreciable life of 10 years. The machine was originally purchased for Rs 75,000 and is being depreciated at Rs 5,000 per year for tax purposes.

The new machine will cost Rs 1,50,000 and will be depreciated on a straight line basis over 10 years, with no salvage value. The management anticipates that, with the expanded operations, there will be need of an additional net working capital of Rs 30,000. The new machine will allow the firm to expand current operations, and thereby increase annual revenues of Rs 40,000, and variable operating costs from Rs 2,00,000 to Rs 2,10,000. The company's tax rate is 35 per cent and its cost of capital is 10 per cent.

Should the company replace its existing machine? Assume that the loss on sale of existing machine can be claimed as short-term capital loss in the current year itself.

### Solution

#### Net cash outflows

Cost of the new machine	Rs 1,50,000
Add net working capital required	30,000
Less sale value of the old machine	30,000
Less tax saving on the loss of the sale of old machine $[0.35 \times (\text{Rs } 50,000 - \text{Rs } 30,000)]$	7,000
	1,43,000

#### Cash inflows

Particulars	Amount before tax	Amount after tax
Increased sales revenue	Rs 40,000	
Less increased operating cost	10,000	
Increased net income	30,000	Rs 19,500
Tax savings on excess depreciation $[0.35 \times \text{Rs } 10,000$ $(\text{Rs } 15,000 - \text{Rs } 5,000)]$		3,500
(a) CFAT ( $t = 1 - 9$ )		23,000
(b) CFAT ( $t = 10$ )		
Operating:	23,000	
Add working capital	30,000	53,000

#### Determination of NPV

Year	CFAT	PV factor	Total PV
1-9	Rs 23,000	5.759	Rs 1,32,457
10	53,000	0.386	20,458
Total PV			1,52,915
Less cash outflows			1,43,000
NPV			9,915

The company should replace the existing machine.

**PS 5.46**

An existing company has a machine which has been in operation for 2 years; its remaining estimated useful life is 4 years, with no salvage value at the end. Its current market value is Rs 1,00,000.

The management is considering a proposal to purchase an improved model of similar machine, which gives increased output. The relevant particulars are as follows:

	<i>Existing machine</i>	<i>New machine</i>
Purchase price (Rs)	2,40,000	4,00,000
Estimated life (years)	6	4
Salvage value	Nil	Nil
Annual operating hours	2,000	2,000
Selling price per unit (Rs)	10	10
Output per hour (units)	15	30
Material cost per unit (Rs)	2	2
Labour cost per hour (Rs)	20	40
Consumable stores per year (Rs)	2,000	5,000
Repairs and maintenance per year (Rs)	9,000	6,000
Working capital (Rs)	25,000	40,000

The company follows the declining balance method of depreciation @ 25 per cent and is subject to 35 per cent tax. Should the existing machine be replaced? Assume that the company's required rate of return is 15 per cent and the company has several assets in the 25 per cent block.

***Solution****Cash outflows*

Purchase price of new machine	Rs 4,00,000
Add additional working capital	15,000
Less sale value of old machine	(1,00,000)
	<u>3,15,000</u>

*Incremental cash inflows before taxes*

<i>Particulars</i>	<i>Existing machine</i>	<i>New machine</i>	<i>Differential (Col 3 – Col 2)</i>
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>
1 Annual operating hours	2,000	2,000	—
2 (×) Output per hour (units)	(×) 15	(×) 30	15
3 Total output (units)	30,000	60,000	30,000
4 (×) Selling price per unit (Rs)	× 10	(×) 10	—
5 Total sales revenue	Rs 3,00,000	Rs 6,00,000	Rs 3,00,000
<i>Less expenses</i>			
Material cost	60,000	1,20,000	60,000
Labour cost	40,000	80,000	40,000
Consumable stores	2,000	5,000	3,000
Repairs and maintenance	9,000	6,000	(3,000)
6 Total expenses	<u>1,11,000</u>	<u>2,11,000</u>	<u>1,00,000</u>
7 Cashflows before taxes	<u>1,89,000</u>	<u>3,89,000</u>	<u>2,00,000</u>

(Contd.)

**Solution (Contd.)***Determination of CFAT and NPV*

Particulars	Years			
	1	2	3	4
Incremental cashflows before taxes	Rs 2,00,000	Rs 2,00,000	Rs 2,00,000	Rs 2,00,000
Less incremental depreciation	75,000	56,250	42,187	31,641
Earnings before depreciation	1,25,000	1,43,750	1,57,813	1,68,359
Less taxes	43,750	50,312	55,235	58,926
EAT	81,250	93,438	1,02,578	1,09,433
CFAT (EAT + Depreciation)	1,56,250	1,49,688	1,44,765	1,41,074
Release of working capital				15,000
× PV factor (at 0.15)	0.870	0.756	0.658	0.572
PV	1,35,937	1,13,164	95,255	89,274
Total PV ( $t = 1 - 4$ )				4,33,630
Less cash outflows				3,15,000
NPV				1,18,630

**Recommendation:** As the NPV of incremental CFAT is positive, the existing machine should be replaced. (In fact, NPV will be higher as tax advantage will accrue on the eligible depreciation of Rs 1,25,563 – Rs 31,641 = Rs 93,922 in future years.)

**Working notes**

*Depreciation base of new machine:*

WDV of existing machine (Rs 2,40,000 – Rs 60,000 – Rs 45,000)	Rs 1,35,000
Add cost of new machine	4,00,000
Less sale value of old machine	1,00,000
	4,35,000

Base for incremental depreciation: (Rs 4,35,000 – Rs 1,35,000, WDV of existing machine) = Rs 3,00,000.

**PS 5.47**

A toy manufacturing company is considering replacing an existing piece of equipment with one of the two new, more sophisticated machines. The old machine was purchased 3 years ago at a cost of Rs 70,000. The machine originally had a projected life of 7 years and was to be depreciated straight line to zero salvage value. The two new pieces of equipment being considered are machine X and machine Y.

Machine X would cost Rs 80,000 to purchase, and Rs 20,000 to install. Due to expansion in operation, the management estimates the net working capital requirement of machine X at Rs 10,000. It has a 4-year life with no salvage value. It will be depreciated straight line.

Machine Y would cost Rs 1,15,000 and Rs 25,000 to install. It also has 4-year life with no salvage value. This machine would require a net working capital of Rs 20,000.

The old machine can be sold for Rs 25,000 on 1 year credit. The firm is taxed at 35 per cent. Assuming the cost of capital to be 10 per cent, which machine, if either, should the company acquire? The projected profits before depreciation and taxes currently and with each of the new machines are as follows:

Year	With present Machine	With Machine X	With Machine Y
1	Rs 25,000	Rs 50,000	Rs 90,000
2	25,000	50,000	90,000
3	25,000	50,000	90,000
4	25,000	50,000	90,000

What would be your answer, if the company has under consideration only the proposal to purchase machine X?



**Solution***Cash outflows*

<i>Particulars</i>	<i>Machine X</i>	<i>Machine Y</i>
Cost of the machine	Rs 80,000	Rs 1,15,000
Add installation cost	20,000	25,000
Add net working capital	10,000	20,000
Less cash inflows from the sale of the present machine	27,975*	27,975*
Net cash outflows	82,025	1,32,025

**Working notes**

\*Cash inflows from the sale of the present machine:

Book value of the machine (Rs 70,000 – Rs 30,000, accumulated depreciation)	Rs 40,000
Less sale value	25,000
Short-term capital loss on the sale of the machine	15,000
Tax savings on loss (0.35)	5,250
PV of Rs 25,000 to be received at (t = 1) = (Rs 25,000 x 0.909)	22,725
	27,975

*Cash inflows (t = 1 – 4)*

<i>Particulars</i>	<i>Present machine</i>	<i>Machine X</i>	<i>Machine Y</i>
Earning before depreciation and taxes	Rs 25,000	Rs 50,000	Rs 90,000
Less depreciation	10,000	25,000	35,000
Net earnings	15,000	25,000	55,000
Less Taxes	5,250	8,750	19,250
EAT	9,750	16,250	35,750
Add depreciation	10,000	25,000	35,000
CFAT	19,750	41,250	70,750
× PV factor	3.170	3.170	3.170
Total PV of CFAT	62,607	1,30,762	2,24,277
PV of the release of WC (PV factor = 0.683)	—	6,830	13,660
Total PV	62,607	1,37,592	2,37,937
Less cash outflows	—	82,025	1,32,025
NPV	62,607	55,567	1,05,912

The company should acquire machine Y. If the company has the proposal to buy machine X only, then it should continue with the existing machine.

**PS 5.48**

The management of X Ltd is considering the replacement of a machine which has a current written down value of Rs 25,000 and a present sale value of Rs 8,000. The machine is still usable for 5 years, but will have no scrap value at the end of 5 years.

A new machine having a useful life of 5 years, and a scrap value of Rs 10,000 at the end of this, is available for Rs 1,00,000. The installation of the new machine, it is estimated, would result in a saving of Rs 20,000 per annum in operating costs at the present level of production. The capacity of the new machine is more than that of the old, and, since sales are no problem, utilisation of the additional capacity would bring in an additional contribution of Rs 25,000 per annum (after meeting incremental costs of production and sale). The machine would be depreciated @ 25 per cent

on written down value basis. The company has other assets in the block. Current income tax is 35 per cent. Considering the firm's estimated cost of capital, it will not pay to purchase the new machine unless the net savings are 20 per cent, or more, on the added investment. Should the company replace the existing machine?

### ***Solution***

#### *Cash outflows*

Cost of the new machine	Rs 1,00,000
Less sale value of the old machine	8,000
	<u>92,000</u>

#### *Incremental CFAT and NPV*

<i>Particulars</i>	<i>Years</i>				
	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
Increased contribution	Rs 25,000	Rs 25,000	Rs 25,000	Rs 25,000	Rs 25,000
Savings in operating costs	<u>20,000</u>	<u>20,000</u>	<u>20,000</u>	<u>20,000</u>	<u>20,000</u>
Gross earnings	45,000	45,000	45,000	45,000	45,000
Less incremental depreciation	<u>23,000</u>	<u>17,250</u>	<u>12,937</u>	<u>9,703</u>	<u>4,777*</u>
EBT	22,000	27,750	32,063	35,297	40,223
Less taxes	<u>7,700</u>	<u>9,712</u>	<u>11,222</u>	<u>12,354</u>	<u>14,078</u>
EAT	14,300	18,038	20,841	22,943	26,145
CFAT (EAT + Depreciation)	37,300	35,288	33,778	32,646	30,922
Salvage value of new machine					10,000
× PV factor (at 0.20)	0.833	0.694	0.579	0.482	0.402
PV	31,071	24,490	19,557	15,735	16,451
Total present value ( $t = 1 - 5$ )					1,07,304
Less cash outflows					<u>92,000</u>
NPV					<u>15,304</u>

\*  $0.25 \times (\text{Rs } 29,110 - \text{Rs } 10,000) = \text{Rs } 4,777$

**Recommendation:** Since NPV is positive, the management is advised to replace the existing machine.

#### **Working notes**

##### *Depreciation base of new machine*

WDV of existing machine	Rs 25,000
Cost of new machine	1,00,000
Less sale value of existing machine	8,000
	<u>1,17,000</u>

Base for incremental depreciation:  $(\text{Rs } 1,17,000 - \text{Rs } 25,000, \text{ WDV of existing machine}) = \text{Rs } 92,000$

### **PS 5.49**

Aditya Mills Ltd has a number of machines that were used to make a product that the firm has phased out of its operations. An existing machine was originally purchased six years ago for Rs 5,00,000 and is being depreciated by the straight line method; its remaining useful life is 4 years. No salvage value is expected at the end of the useful life. It can currently be sold for Rs 1,50,000. The machine can also be modified to produce another product at a cost of Rs 2,00,000. The modifications would not affect the useful life, or salvage value, and would be depreciated using the straight line method.

If the firm does not modify the existing machine, it will have to buy a new machine at a cost of Rs 4,40,000, (no salvage value) and the new machine would be depreciated over 4 years. The engineers estimate that the cash operating costs with the new machine would be Rs 25,000 per year less than with the existing machine. Cost of capital is 15 per cent and corporate tax rate is 35 per cent.

Advise the company whether the new machine should be bought, or the old equipment modified. Assume straight line method of depreciation for tax purposes and loss on sale of existing machine can be claimed as short-term capital loss in the current year itself.

### ***Solution***

#### *Cash outflows*

Price of new machine	Rs. 4,40,000
Less sale proceeds of existing machine	1,50,000
Less tax savings on loss of the sale of existing machine [ $0.35 \times (\text{Rs } 2,00,000, \text{ book value} - \text{Rs } 1,50,000, \text{ sale value})$ ]	17,500
Less modifications avoided if the new machine is bought	2,00,000
Net cash outflows	72,500

#### *Cash inflows (annual savings)*

	<i>Amount before tax</i>	<i>Amount after tax</i>
Cost savings	Rs 25,000	Rs 16,250
Differential depreciation	10,000	3,500
Total cash advantage per year		19,750
( $\times$ ) PV factor		( $\times$ ) 2.855
PV of future savings from buying new machine		56,386
Cash flow required		72,500
Negative PV favouring modifying machine		(16,114)

**Recommendation:** The old machine should be modified.

### **PS 5.50**

The cost break-up of a product of a company is as follows:

	<i>Unit cost</i>
Direct labour	Rs 80
Direct material	60
Other variable expenses	50
Fixed overheads	40
	230

The above product is currently being produced on a machine that has book value of Rs 1,00,000. It was purchased for Rs 1,50,000, 5 years ago. The machine originally had a projected life of 15 years, and was to be depreciated straight line for tax purposes to the zero salvage value. The machine has a capacity of producing 1,000 units. The machine at present is working at its full capacity. The units produced are sold at Rs 300 per unit.

The original manufacturer has offered to accept the old machine as a trade-in for a new version. The new machine would cost Rs 1,80,000 after allowing Rs 60,000 for the old equipment. The seller also agrees to allow one year's credit for making the payment of balance amount. The costing department of the company has furnished the following projected costs associated with the new machine.

	<u>Unit cost</u>
Direct labour	Rs 50
Direct material	60
Other variable expenses	40
Fixed overheads	48
	<u>198</u>

The fixed overhead costs are allocations from other departments plus the depreciation of the equipment. Maintenance expenses for both the machines are the same.

The old machine is in good working condition, and can be used for its remaining life of 10 years. The new machine has an expected life of 10 years with no salvage value.

The company's tax rate is 35 per cent. Its cost of capital is 10 per cent. Assume the loss on the existing machine can be claimed as short-term capital loss in the current year itself.

The management of the company seeks your advice whether the new machine should be acquired? The management expects that the future production and sales of the product will remain at 1,000 units per year.

### **Solution**

*Cash outflows at  $t = 0$*

<i>Particulars</i>	<i>Total cash outflows</i>	<i>PV of cash outflows</i>
Cost of new machine	Rs 2,40,000	
Less sale value of old machine	<u>60,000</u>	Rs 1,80,000 $\times$ 0.909
Less tax savings from the loss of the old machine [0.35 $\times$ (Rs 1,00,000 – 60,000)]		<u>14,000</u>
Net cash outflows		<u>1,49,620</u>

*Cash inflows*

<i>Particulars</i>	<i>Amount before tax</i>	<i>Amount after tax</i>
Cost savings (1,000 units $\times$ Rs 40)	Rs 40,000	Rs 26,000
Tax advantage on additional depreciation	14,000	<u>4,900</u>
		<u>30,900</u>

*Determination of NPV*

<i>Year</i>	<i>CFAT</i>	<i>PV factor</i>	<i>Total PV</i>
1-10	Rs 30,900	6.145	Rs 1,89,880
Less PV of cash outflows			<u>1,49,620</u>
NPV			<u>40,260</u>

The management should acquire the new machine.

### **PS 5.51**

XYZ Ltd is considering a proposal to replace an existing piece of equipment by a new one. The new equipment is operationally efficient and will result in savings in operating costs estimated at Rs 90,000 annually.

It will cost Rs 3,00,000 and will be purchased at the beginning of the year. The equipment dealer states that most companies use a 4-year life while depreciating equipment with no salvage value. As the equipment will be operational during the second quarter of the year, only 60 per cent of the estimated annual savings would be obtained in the first year. The company will incur a one-time expense of Rs 30,000 in transferring production activities from the old equipment to the new one.

The equipment currently being used has a book value of Rs 20,000. A review of its condition reveals that it can be used for an additional 4 years. The firm would receive Rs 5,000 net of removal costs if it is disposed off now. However, it will have no salvage value after 4 years.

The company uses the declining balance method of depreciation. The equipment is subject to 25 per cent depreciation together with other assets in the block. Assuming that the full year's depreciation is taken into account in the first year, and the corporate tax rate and required rate of return are 35 per cent and 15 per cent respectively, what action should XYZ Ltd's management take?

### ***Solution***

#### *Cash outflows*

Cost of new equipment		Rs 3,00,000
Add shifting expenses	Rs 30,000	
Less tax benefit	<u>10,500</u>	19,500
Less sale proceeds of sold equipment		<u>5,000</u>
		3,14,500

#### *Determination of CFAT and NPV*

	Year 1	Year 2	Year 3	Year 4
Cash operating savings	Rs 90,000	Rs 1,50,000	Rs 1,50,000	Rs 1,50,000
Less incremental depreciation	<u>73,750</u>	<u>55,312</u>	<u>41,484</u>	<u>31,113</u>
Taxable earnings (incremental)	16,250	94,688	1,08,516	1,18,887
Less taxes (0.35)	<u>5,687</u>	<u>33,141</u>	<u>37,981</u>	<u>41,610</u>
Earnings after taxes (EAT)	10,563	61,547	70,535	77,277
CFAT (EAT + Depreciation)	84,313	1,16,859	1,12,019	1,08,390
× PVIF (0.15)	0.870	0.756	0.658	0.572
PV	73,352	88,345	73,709	61,999
Total				2,97,405
Less cash outflows				<u>3,14,500</u>
NPV				(17,095)

**Recommendation:** The company should reject the proposal as the NPV is negative.

#### **Working notes**

##### *Depreciation base of new equipment:*

WDV of existing equipment	Rs 20,000
Add cost of new equipment	3,00,000
Less sale proceeds of existing equipment	<u>5,000</u>
	3,15,000
Less WDV of existing equipment	<u>20,000</u>
Base of incremental depreciation	<u>2,95,000</u>

### **PS 5.52**

The Hypothetical Ltd anticipates an increased in demand for one of its major product lines, and is thus interested in expanding its production capacity. It presently operates one model, M-100, and is considering two alternatives.

*Alternative I:* Acquire an additional model M-100 to operate in tandem with the existing one

*Alternative II:* Acquire the newly-introduced model, M-500 which has double the output capacity of an M-100, but keep the old M-100 for emergencies, since tests have shown that the M-500 is a very sensitive machine.

The following information has been developed for the two alternatives:

	<i>M-100</i>	<i>M-500</i>
Acquisition cost	Rs 5,00,000	Rs 8,00,000
<i>Operating costs per unit</i>		
Material	4	8
Labour	8	3
Overhead	2	1
Annual operating fixed costs per machine (excluding depreciation)	50,000	50,000
Resale value after 10 years	Nil	Nil

The existing model, M-100, was purchased 4 years ago for Rs 4,00,000. If operated, it will have to be replaced 6 years from now at an estimated cost of Rs 6,00,000. The machine which will replace the existing model, will have a market value of Rs 3,00,000 after 4 years. If the M-500 is acquired, it will cost Rs 20,000 per year to maintain the existing M-100 on standby status.

However, if M-100 is kept as a standby, it will not need to be replaced at the end of 6 years. The company believes that a 15 per cent cost of capital rate is appropriate for this decision. The company follows straight line method of depreciation and the same is accepted for tax purposes.

Forecast sales at Rs 20 per unit over the next 10 years are as follows:

<i>Years</i>	<i>Units</i>
1-2	45,000
3-6	50,000
7-10	70,000

The corporate tax rate is 35 per cent. Advise the company as regards the alternative it should opt for.

### ***Solution***

#### *Cash outflows under proposed alternatives*

	<i>M-100</i>	<i>M-500</i>
Acquisition cost ( $t = 0$ )	Rs 5,00,000	Rs 8,00,000
Additional cost in the case of M-100 purchase: Rs 6,00,000 ( $t = 6$ ); PV of M-100 ( $t = 0$ ) [Rs 6,00,000 $\times$ 0.432]	2,59,200	—
	<u>7,59,200</u>	<u>8,00,000</u>

#### *Cash inflows (operating) when M-100 is purchased*

<i>Particulars</i>	<i>Years (1-2)</i>	<i>Years (3-6)</i>	<i>Years (7-10)</i>
Sales revenue @ Rs 20 per unit	Rs 9,00,000	Rs 10,00,000	Rs 14,00,000
<i>Less costs:</i>			
Variable cost @ Rs 14 per unit	6,30,000	7,00,000	9,80,000
Fixed costs	50,000	50,000	50,000
<i>Depreciation:</i>			
Existing M-100/replaced M-100	40,000	40,000	75,000 <sup>1</sup>
New M-100	50,000	50,000	50,000
Total costs	<u>7,70,000</u>	<u>8,40,000</u>	<u>11,55,000</u>
Taxable income	1,30,000	1,60,000	2,45,000
Less taxes	45,500	56,000	85,750
EAT	<u>84,500</u>	<u>1,04,000</u>	<u>1,59,250</u>
CFAT	<u>1,74,500</u>	<u>1,94,000</u>	<u>2,84,250</u>

<sup>1</sup>(Rs 6,00,000 – Rs 3,00,000)  $\div$  4 years = Rs 75,000

(Contd.)

**Solution (Contd.)***Cash inflows when M-500 is purchased*

	Rs 9,00,000	Rs 10,00,000	Rs 14,00,000
Sales revenue			
Less costs:			
Variable cost @ Rs 12 per unit	5,40,000	6,00,000	8,40,000
Fixed costs	50,000	50,000	50,000
Depreciation:			
Existing M-100	26,000 <sup>2</sup>	26,000	26,000
New M-500	80,000	80,000	80,000
Maintenance cost (M-100)	20,000	20,000	20,000
Total costs	7,16,000	7,76,000	10,16,000
Taxable income	1,84,000	2,24,000	3,84,000
Less taxes	64,400	78,400	1,34,400
EAT	1,19,600	1,45,600	2,49,600
CFAT	2,25,600	2,51,000	3,55,600

2 M-100 is initially assumed to have an effective useful life of 10 years (the new M-100 has also the same life). In the first 4 years, accordingly, depreciation @ Rs 40,000 is likely to have been charged. Therefore, depreciable cost at the time of decision is Rs 2,60,000. Depreciation per year, therefore, is Rs 26,000.

*Net present value of proposed alternatives*

Year		CFAT		PV factor		Total PV	
		M-100	M-500			M-100	M-500
0	Rs (7,59,200)	Rs (8,00,000)		1.000		Rs (7,59,200)	Rs (8,00,000)
1	1,74,500	2,25,600		0.870	1.626		
2	1,74,500	2,25,600		0.756		2,83,737	3,66,826
3	1,94,000	2,51,600		0.658			
4	1,94,000	2,51,600		0.572			
5	1,94,000	2,51,600		0.497	2.159	4,18,846	5,43,204
6	1,94,000	2,51,600		0.432			
7	2,84,250	3,55,600		0.376			
8	2,84,250	3,55,600		0.327	1.234		
9	2,84,250	3,55,600		0.284		3,50,764	4,38,810
10	2,84,250	3,55,600		0.247			
10	3,00,000*	—		0.247		74,100	—
						3,68,247	5,48,840

\*Salvage value

**Recommendation:** The company should purchase the M-500 model.**PS 5.53**

The Jubilee Hostel of Delhi University (JHDU) has residence strength of 300 students. In addition to other basic amenities, the JHDU provides hot water during the 3 months in the winter season: November to January. It has two boilers which operate alternatively in the mornings and evenings which use kerosene oil as energy source.

The operational duration of one boiler in the mornings and evenings for the months of November and January is three and two hours respectively. Due to winter vacation in December, some students go home. The operational duration of the boilers is 1.5 hours in the morning and evening. The average quantity of fuel used per hour is 10 litres. The cost of the fuel is Rs 15/litre.

One worker operates the boiler in the mornings and evenings. The daily labour cost is Rs 100. The total maintenance costs amount to Rs 4,000.

In keeping with the trend to utilise non-conventional energy sources, the JHDU wishes to set up solar heaters to convert solar energy to heat energy. The operating and financial parameters of the proposal have been worked out as detailed under :

- Solar heaters required, 10 @ Rs 15,000 each
- Per heater installation cost, Rs 2,000
- Annual total maintenance cost, Rs 3,000
- Salvage value of existing boilers, Rs 3,000
- Useful life, 10 years with no salvage value

Is the proposal financially viable if the required rate of return is 12 per cent. You can make other assumptions, if necessary.

### ***Solution***

#### *Financial analysis related to replacement of existing boilers*

##### *Incremental cash outflows:*

Cost of solar heaters (10 × Rs 15,000)	Rs 1,50,000
Installation cost of solar heaters (Rs 2,000 × 10)	20,000
Less salvage value of existing boilers	(3,000)
	1,67,000

##### *Incremental cash inflows and NPV*

Savings in fuel cost (working note 1)	Rs 59,700
Savings in labour cost (working note 2)	9,200
Savings in maintenance cost (Rs 4,000 – Rs 3,000)	1,000
CFAT	69,900
(×) PV factor for 10 years at 0.12	× 5.650
Total PV	3,94,935
Less cash outflows	1,67,000
NPV	2,27,935

**Recommendation:** Since the NPV is positive, the proposal is financially viable.

### **Working notes**

#### *(1) Savings in fuel costs:*

— For the months of November and January:	
Use of boiler per day (morning, three hours + evening, two hours)	5
(×) Average quantity of fuel used per hour (litres)	10
(×) Number of days (30 + 31)	61
Total fuel used (litres) (5 × 10 × 61)	3,050
— For the month of December:	
Use of boiler per day (1.5 hours + 1.5 hours)	3
(×) Average quantity of fuel used per hour (litres)	10
(×) Number of days	31
Total fuel used (litres) (3 × 10 × 31)	930
— Cost of kerosene fuel used [3,980 litres (3,050 + 930) × Rs 15] = Rs 59,700	



(2) *Savings in labour cost*

November	30 days	
December	31	
January	31	
Total days	92	
Labour cost (92 × Rs 100)		Rs 9,200

(3) *Depreciation is not taken into account as there is no tax advantage as University does not pay taxes.*

**PS 5.54**

A small textile company currently expects its after tax profits (EAT) for the next years to be as follows:

Year	1	2	3	4	5
EAT	Rs 34,000	Rs 28,000	Rs 60,000	Rs 40,000	Rs 50,000

The company is considering replacing an existing machine with a new one, costing Rs 27,000. The new machine would cost Rs 3,000 to install and would be depreciated at 25 per cent on written down value basis over 5 years after which it is expected to have zero salvage value.

The existing machine was purchased for Rs 12,000 3 years ago and is being depreciated by WDV method @ 25 per cent over an 8-year period. It can be sold for Rs 5,000 currently with Rs 1,000 removal costs.

If the expected after-tax profits, after the acquisition of the new machine are as given below, at what approximate rate of cost of capital would the firm be indifferent regarding the purchase of the new machine? The firm is taxed at 35 per cent.

Year	1	2	3	4	5
EAT	Rs 40,000	Rs 28,000	Rs 65,000	Rs 50,000	Rs 55,000

Also suggest at which rate of cost of capital the firm would (i) accept or (ii) reject the proposed investment proposal? What is the economic logic for your answer? State your assumptions, if any.

***Solution****Incremental cash outflows:*

Cost of new machine	Rs 27,000
Installation cost	3,000
Less net sale proceeds	(4,000)
	<u>26,000</u>

*Determination of CFAT (incremental)*

Year	EAT			Incremental	
	Existing machine	New machine	Differential	Depreciation	CFAT
1	Rs 34,000	Rs 40,000	Rs 6,000	Rs 6,500	Rs 12,500
2	28,000	28,000	Nil	4,875	4,875
3	60,000	65,000	5,000	3,656	8,656
4	40,000	50,000	10,000	2,742	12,742
5	50,000	55,000	5,000	2,057	7,057
					<u>45,830</u>

The fake payback period (Rs 26,000/9,166) = 2.836. From Table A-4, the value closest to the fake PB period against 5 years is 2.864 at 22 per cent. Since the initial actual cashflow (for year 1) is higher than the average, let us try IRR at 23 per cent as well.

*Determination of IRR at 22 per cent and at 23 per cent*

Year	CFAT	PV factor at		Total PV at	
		0.22	0.23	0.22	0.23
1	Rs 12,500	0.820	0.813	Rs 10,250	Rs 10,162
2	4,875	0.672	0.661	3,276	3,222
3	8,656	0.551	0.537	4,769	4,649
4	12,742	0.451	0.437	5,747	5,568
5	7,057	0.370	0.355	2,611	2,505
Total present value				26,653	26,106

IRR = 23 per cent.

The firm would accept the proposal if cost of capital is less than 23 per cent based on the economic logic that the project is profitable if  $IRR > K$ .

**Working notes***(1) WDV of existing machine at the beginning of year 4*

Initial cost of the machine		Rs 12,000
Less depreciation:		
Year 1	Rs 3,000	
2	2,250	
3	1,687	
		<u>6,937</u>
		(a) <u>5,063</u>

*Depreciation base of new machine:*

WDV of existing machine	5,063
Plus cost of new machine	30,000
Less net sale proceeds	<u>(4,000)</u>
	(b) <u>31,063</u>
Base for incremental depreciation	[(b) – (a)] <u>26,000</u>

*(2) Incremental depreciation*

Year 1	Rs 6,500 (Rs 26,000 × 0.25)
2	4,875
3	3,656
4	2,742
5	<u>2,057</u>

**PS 5.55**

Batch & Company Ltd is producing product 'A' and is presently commanding a market share of 15 per cent. The cost and profit margin for one unit of product 'A' is as under:

Sale price		Rs 100
Variable costs:		
Material	Rs 40	
Labour	20	
Overhead	<u>10</u>	<u>70</u>
Contribution		<u>30</u>
Less fixed cost		<u>20</u>
Profit		<u>10</u>

The sale of the product is 15,000 units at 15 per cent market share in the current year.

It has now been estimated that the market share can be increased up to 25 per cent from next year if the following promotional expenses are incurred in the previous year:

For year 1	Rs 1,00,000
2	75,000
3	50,000

There will also be an increase in fixed cost by Rs 30,000, if production has to be increased from present level.

The company wants to achieve a 15 per cent return and would apply DCF rate.

You are required to find out the effect when

- (i) Market share is increased to 25 per cent
  - (ii) Market share is increased to 20
  - (iii) Market share is increased to 19
- and also recommend action to be taken by the company. Ignore taxes.

### Solution

*Present value of promotional expenses incurred*

Year	Promotional expenses	PV factor	Total PV
1	Rs 1,00,000	1.000	Rs 1,00,000
2	75,000	0.870	65,250
3	50,000	0.756	37,800
			<u>2,03,050</u>

*NPV of increased market share (25, 20 and 19 per cent)*

Particulars	Increased market shares (Years 1 - 3)		
	25 per cent	20 per cent	19 per cent
Incremental sales revenue	Rs 10,00,000	Rs 5,00,000	Rs 4,00,000
Less variable costs (0.70)	7,00,000	3,50,000	2,80,000
Less incremental fixed costs	30,000	30,000	30,000
Incremental profit	<u>2,70,000</u>	<u>1,20,000</u>	<u>90,000</u>
(x) PV factor annuity (0.15) for 3 years	2.283	2.283	2.283
PV of incremental profit	<u>6,16,410</u>	<u>2,73,960</u>	<u>2,05,470</u>
Less PV of cash outflows	<u>2,03,050</u>	<u>2,03,050</u>	<u>2,03,050</u>
NPV	<u>4,13,360</u>	<u>70,910</u>	<u>2,420</u>

**Recommendation:** It will be worthwhile to incur promotional expenses even if it is expected that market share will increase to 19 per cent.

### PS 5.56

Better Judgement Ltd manufacture a machine that is not fully depreciated for tax purposes. The machine has a current book value of Rs 1,50,000 and has remaining useful life of 5 years. The cash cost of the product per unit are as follows (at the level of production and sales of 20,000 units):

Variable costs	Rs 140
Fixed costs	60
	<u>200</u>

The company is thinking of replacing the existing machine. The new machine would cost Rs 10,00,000. The projected cash cost associated with new machine are:

Variable costs	Rs 110
Fixed costs	50
	<u>160</u>

The existing machine can be sold now at Rs 1,00,000 in the open market. The new machine has expected useful life of 5 years. The company follows WDV method of depreciation. Both the machines are subject to 25 per cent depreciation. There is no other asset in this block. The new machine is expected to have salvage value of Rs 1,00,000 at the end of the fifth year.

Assume the demand of the product will stay at 20,000 units in the future years, corporate tax rate of 35 per cent and cost of capital of Rs 12 per cent. Should the new equipment be purchased? State your assumptions, if any.

### ***Solution***

*Financial evaluation whether new equipment should be purchased or not*

#### ***Incremental cash outflows:***

Cost of new machine	Rs 10,00,000
Less sale of existing machine	<u>1,00,000</u>
	<u>9,00,000</u>

#### ***Determination of CFAT and NPV***

Particulars	Years				
	1	2	3	4	5
<b><i>Savings in costs:</i></b>					
Variable costs	Rs 6,00,000	Rs 6,00,000	Rs 6,00,000	Rs 6,00,000	Rs 6,00,000
Fixed costs	<u>2,00,000</u>	<u>2,00,000</u>	<u>2,00,000</u>	<u>2,00,000</u>	<u>2,00,000</u>
Total savings	8,00,000	8,00,000	8,00,000	8,00,000	8,00,000
Less incremental depreciation	<u>2,25,000</u>	<u>1,68,750</u>	<u>1,26,562</u>	<u>94,922</u>	<u>Nil</u>
EBT	5,75,000	6,31,250	6,73,438	7,05,078	8,00,000
Less taxes	<u>2,01,250</u>	<u>2,20,937</u>	<u>2,35,703</u>	<u>2,46,773</u>	<u>2,80,000</u>
EAT	3,73,750	4,10,313	4,37,735	4,58,305	5,20,000
CFAT (EAT + Depreciation)	5,98,750	5,79,063	5,64,297	5,53,227	5,20,000
Salvage value					1,00,000
Tax advantage on short-term capital loss (Rs 1,84,766 × 0.35)					64,668
× PV factor (0.12)		0.893	0.797	0.712	0.636
PV	5,34,684	4,61,513	4,01,779	3,51,852	3,88,207
Total PV ( $t = 1 - 5$ )					21,38,035
Less cash outflows					<u>9,00,000</u>
NPV					<u>12,38,035</u>

**Recommendation:** Since NPV is positive, the company is advised to replace the existing machine.

### **PS 5.57**

The Indo Metal Works (IMW) Ltd manufactures products such as cooler shelving, stocking carts and bakery racks. Most of its products are directly sold to shops, super markets and hotels.

The IMW is currently using a manual system which was purchased 2 years ago for Rs 20 crore and has a remaining useful life of 6 years and zero salvage value. In order to gain competitive advantage by adopting new technology for higher level of profitability with improved quality of products and productivity, the managing director of IMW has

under consideration the replacement of the manual system with a robotics manufacturing system. It would require an initial investment of Rs 56 crore as purchase and Rs 7 crore as installation cost. To work out the cost-benefit analysis of the proposal, he assigns the task to a committee consisting of the controller, the marketing director and the production director.

The controller supplies the given facts relating to the expected revenues and expenses (in lakh of rupees):

Year	Sales	Variable costs	Fixed costs (excluding depreciation)
1	4,000	2,280	720
2	4,500	2,360	730
3	4,750	2,445	800
4	5,150	2,705	880
5	5,550	2,810	960
6	5,800	2,864	1,000

The AIDE 900 robotic system has the capability to weld stainless steel and aluminum used by the IMW as raw materials and can be programmed to adjust the path, angle and speed of the torch. The production director is excited as the system would eliminate the need to hire welders who are so expensive and the market for welders seems perpetually tight.

Since the robotics welding is likely to provide better quality products and product scheduling and avoid late deliveries, the marketing director is convinced that the annual sales would increase by 40 per cent compared to the existing manual system of equipment. It is also anticipated that there would be reduction to the extent of 25 per cent in variables costs and 10 per cent in fixed costs (excluding depreciation).

The existing manual system can be sold for Rs 3 crore. Due to replacement, the management estimates the working capital requirement of Rs 7 crore.

Assuming 12 per cent cost of capital and 35 per cent tax, prepare a financial analysis report for the committee of directors of IMW to be submitted to the managing director. What recommendation would you make? The IMW uses written down value method of depreciation. The new system like the existing manual system will be subject to 25 per cent depreciation. It is expected to have useful economic life of six years with Rs 5 crore as salvage value. The company has several other plants in the asset block of 25 per cent depreciation.

## Solution

*Financial analysis whether to adopt AIDE 900 robotic system (Rs in lakh)*

*Cash outflows (incremental):*

Cost of AIDE 900 system	5,600
Installation costs	700
Working capital	700
Less sale value of existing manual system	300
	<u>6,700</u>

*Determination of incremental CFBT (in lakh of rupees)*

Year	Manual system				Robotic system				Differential CFBT
	Sales	– VC	– FC	= CFBT	Sales	– VC	– FC	= CFBT	
1	4,000	2,280	720	1,000	5,600	2,394 *	648	2,558	1,558
2	4,500	2,360	730	1,410	6,300	2,478	657	3,165	1,755
3	4,750	2,445	800	1,505	6,650	2,567	720	3,363	1,858
4	5,150	2,705	880	1,565	7,210	2,840	792	3,578	2,013
5	5,550	2,810	960	1,780	7,770	2,950	864	3,956	2,176
6	5,800	2,864	1,000	1,936	8,120	3,007	900	4,213	2,277

\*(Existing VC ratio  $\times$  0.75  $\times$  sales under robotic system)

*Determination of CFAT and NPV (amount in lakh of rupees)*

Particulars	Years					
	1	2	3	4	5	6
CFBT	1,558	1,755	1,858	2,013	2,176	2,277
Incremental Depreciation	1,500	1,125	844	633	475	231
Taxable income	58	630	1,014	1,380	1,701	2,046
Less taxes	20.3	220	355	483	595	716
EAT	37.7	410	659	897	1,106	1,330
CFAT	1,537.7	1,535	1,503	1,530	1,581	1,561
Add SV + Release of WC	1,200					
× PV factor (0.12)	0.893	0.797	0.712	0.636	0.567	0.507
PV	1,373	1,223	1,070	973	896	1,400
Total PV ( $t = 1 - 6$ )						6,935
Less cash outflows						6,700
NPV						235

**Recommendation:** Since the NPV is positive, IMW is advised to switch to robotic system.

#### Working notes

(i) WDV of existing machine in the beginning of year 3 (Rs in lakh):

Cost of machine			2,000
Less depreciation:	year 1	500	
	2	375	
			875
			1,125

(ii) Depreciation base of new robotic system (Rs in lakh):

WDV of existing system	1,125
Add cost of new robotic system	6,300
Less sale value of existing system	300
	7,125

(iii) Base for incremental depreciation: Rs 7,125 lakh – Rs 1,125 lakh = Rs 6,000 lakh.

Incremental depreciation ( $t = 1 - 6$ ) (Rs in lakh)

Year	Increment asset cost base	Depreciation
1	6,000	1,500
2	4,500	1,125
3	3,375	844
4	2,531	633
5	1,898	475
6	1,423	231*

\* $0.25 \times (\text{Rs } 1,423 \text{ lakh} - \text{Rs } 500 \text{ lakh, salvage value})$

#### PS 5.58

The Swadeshi Rubber Industries Ltd (SRIL) manufactures small rubber components for the local market. It is presently using 6 machines which were acquired 3 years ago at a cost of Rs 18 lakh each having a useful life of 8 years, with no salvage value. The policy of the firm is to depreciate all machines in 5 years. Their production capacity is 37 lakh units while the annual demand is 30 lakh units. The SRIL has received an order from a leading automobile manufacturer from Japan for the supply of 20 lakh rubber bushes at Rs 15 per unit. The existing machines can be sold @ Rs 12 lakh per machine. It is estimated that the removal cost of one machine would be Rs 50,000. In order to meet

the increased demand, the SRIL can acquire 2 new machines at an estimated cost of Rs 100 lakh each which will have a combined production capacity of 52 lakh units.

The operating parameters of the existing machines are summarised below:

- (i) Labour requirements (unskilled—18; skilled—18; supervisor—3; and maintenance—2), their respective salaries—are Rs 3,500, Rs 5,500, Rs 6,500 and Rs 5,000, with a 10 per cent annual increase to reflect inflation.
- (ii) Raw materials cost inclusive of wastage, 60 per cent of revenues.
- (iii) Maintenance cost, year 1 – 5, Rs 22.5 lakh; year 6-8, Rs 67.5 lakh.
- (iv) Operating expenses, Rs 52.10 lakh expected to increase annually by 5 per cent.
- (v) Insurance cost/premium: year 1, 2 per cent of the original cost of the machine; afterwards, discounted by 10 per cent.
- (vi) Sale price, Rs 15 per unit.

The projected operating parameters with the replacement by the new machines are:

- (i) Additional working capital, Rs 45 lakh.
- (ii) Savings in cost of utilities, Rs 2.5 lakh.
- (iii) Maintenance cost: year 1 - 2, Rs 7.5 lakh; year 3 - 5, Rs 37.5 lakh.
- (iv) Raw material cost, 55 per cent of sales.
- (v) Employee requirement (6 skilled at monthly salary of Rs 7,000 and, 1 maintenance at monthly salary of Rs 6,500).
- (vi) Laying-off cost of 34 workers (unskilled 18, skilled 12, supervisors, 3 and maintenance, 1), Rs 9,21,000, that is., equivalent to six months salary.
- (vii) Insurance premium, 2 per cent of purchase cost of machine in the first year and discounted by 10 per cent in subsequent years.
- (viii) Life of the machines, 5 years and salvage value, Rs 10 lakh per machine.

As the finance manager of SRIL, prepare a report for submission to the top management. What recommendation would you make? The company uses straight line method of depreciation and the same is accepted for tax purposes. Corporate tax rate is 35 per cent and cost of capital is 20 per cent.

## Solution

*Financial analysis whether to replace the existing machines (using NPV method)*

*Incremental cash outflows:*

Cost of two new machines (Rs 100 lakh × 2)	Rs 2,00,00,000
Additional working capital	45,00,000
Less sale proceeds of existing machines (Rs 12 lakh × 6)	(72,00,000)
Add: removal cost of existing machines (Rs 50,000 × 6)	3,00,000
tax on profit on sale of machines (working note 1)	9,03,000
cost of laying off 34 workers (Rs 9,21,000 – tax advantage at 0.35, i.e., to Rs 3,22,350)	5,98,650
	1,91,01,650

*Incremental CFAT and NPV (amount in lakh of rupees)*

Particulars	Years				
	1	2	3	4	5
Sales	300	300	300	300	300
Add cost savings:					
Maintenance (note 2)	15	15	30	30	30
Cost of utilities	2.5	2.5	2.5	2.5	2.5
Labour cost (note 3)	17.16	18.87	20.76	22.84	25.12

(Contd.)

**Solution (Contd.)***Less incremental costs:*

Raw material (note 4)	142.50	142.50	142.50	142.50	142.50
Depreciation (note 5)	14.40	14.40	36.00	36.00	36.00
Insurance (note 6)	2.43	2.18	1.96	1.77	1.59
Earnings before taxes	175.33	177.29	172.80	175.07	177.53
Less taxes (0.35)	61.37	62.05	60.48	61.27	62.14
Earnings after taxes	113.96	115.24	112.32	113.80	115.39
CFAT (EAT + Depreciation)	128.36	129.64	148.32	149.80	151.39
Salvage value					20
Release of working capital					45
(x) PV factor at 0.20	0.833	0.694	0.579	0.482	0.402
PV	106.92	89.97	85.88	72.20	86.99
Total present value ( $t = 1 - 5$ )					441.96
Less cash outflows					191.02
NPV					250.94

**Recommendation:** Since the NPV is positive, replacement of the existing machines is financially viable.

**Working notes***1. Tax on profit on sale of existing machines*

Sale proceeds of existing machines	Rs 72,00,000
Less book value (Rs 108,00,000 original cost — accumulated depreciation, Rs 64,80,000)	43,20,000
Profit (gross)	28,80,000
Less removal cost (Rs 50,000 x 6)	3,00,000
Profit (net)	25,80,000
(x) Tax rate	× 0.35
Taxes payable on profit	9,03,000

*2. Savings in maintenance costs (amount in lakh of rupees)*

Year	1	2	3	4	5
Old machine	22.50	22.50	67.50	67.50	67.50
New machine	7.50	7.50	37.50	37.50	37.50
Cost savings	15.00	15.00	30.00	30.00	30.00

*3. Savings in labour cost**Existing labour cost:*

Unskilled (18 × Rs 3,500 × 12 months)	Rs 7,56,000	
Skilled (18 × Rs 5,000 × 12 months)	11,88,000	
Supervisor (3 × Rs 6,500 × 12 months)	2,34,000	
Maintenance (2 × Rs 5,000 × 12 months)	1,20,000	Rs 22,98,000

*Proposed labour cost:*

Skilled (6 × Rs 7,000 × 12 months)	5,04,000	
Maintenance (1 × Rs 6,500 × 12 months)	78,000	5,82,000
Cost savings		17,16,000

Savings in subsequent years will increase by 10 per cent.



## 4. Incremental cost of raw materials (Rs in lakh)

Raw material required for old machine (30 lakh units $\times$ Rs 15 per unit $\times$ 0.6)	270
Raw material required for new machine (50 lakh units $\times$ Rs 15 per unit $\times$ 0.55)	412.5
Additional raw material cost	142.5

## 5. Incremental depreciation (Rs in lakh)

Years	1 - 2	3 - 5
Depreciation (with new machine) (Rs 200 lakh – Rs 20 lakh)/5 years	36	36
Less depreciation (with old machine) (Rs 108 lakh/5 years)	21.60	—
Incremental depreciation	14.40	36

## 6. Insurance (Rs in lakh)

Year	1	2	3	4	5
New machine	4.00	3.60	3.24	2.92	2.62
Old machine	1.57	1.42	1.28	1.15	1.03
Incremental insurance	2.43	2.18	1.96	1.77	1.59

## Assumptions:

- (1) SRIL is expected to have additional demand of 20 lakh units for the next 5 years.
- (2) Tax advantage will accrue on retrenchment costs.

**PS 5.59**

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	2,40,020	2,00,000	40,020	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
		<u>79,460</u>

(iii) *Capital budget is Rs 5,00,000*

E	3,00,000	72,900
C	2,00,000	40,020
		<u>1,12,920</u>

(iv) (a) *Capital budget is Rs 4,00,000*

Project	Investment	PI	NPV
E	Rs 3,00,000	1.243	72,900
D (0.50)	1,00,000 (0.50 × Rs 2,00,000)	1.200	<u>20,010</u>
			92,910

(b) *Capital budget is Rs 5,00,000*

E	3,00,000	1.243	72,900
C	2,00,000	1.200	40,020
			<u>1,12,920</u>

**PS 5.60**

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.

## EXERCISES

**E.5.1** A company is considering two mutually exclusive projects. Both require an initial cash outlay of Rs 10,000 (with no salvage value) and have a life of 5 years. The company's required rate of return is 10 per cent, and it pays tax at a rate of 35 per cent. The project will be depreciated on a straight line basis for tax purposes. The cash flows (before depreciation and taxation) expected to be generated by the projects are as follows:

	Year				
	1	2	3	4	5
Project A (Rs)	4,000	4,000	4,000	4,000	4,000
Project B (Rs)	6,000	3,000	2,000	5,000	5,000

Calculate the net present value and the IRR for each project, and suggest which project should be accepted and why.

**E.5.2** A company is considering which of the two mutually exclusive project 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 equal initial outlay and life. The company anticipates a cost of capital of 10 per cent and the after tax net profit flows of the projects are as follows: (amount in thousands of rupees)

Year	0	1	2	3	4	5
Project X	(200)	35	80	90	75	20
Project Y	(200)	218	10	10	4	3

You are required to:

- Calculate the NPV and IRR of each project.
- State, with reasons, which project would you recommend?
- Explain the inconsistency in the ranking of the two projects.

**E.5.3** A company is considering a Rs 30,000 outlay on an air cooling system designed to produce a more congenial work environment for those working on a fairly tedious assembly line. It is expected that such a system will increase efficiency, which means it will reduce costs. In fact, over the 10-year life of the system, cost reductions are expected to be 2 per cent of the current cost of Rs 6,00,000 per year to operate this line. The other revenues and non-depreciation expenses will remain unaffected. The air cooling system will be depreciated to zero on a straight line basis and the same is accepted for tax purposes. The company's tax rate is 35 per cent. The cost of capital is 12 per cent. Should the proposal of the air cooling system be adopted?

**E.5.4** Modern Enterprises Ltd is considering the purchase of a new computer system for its research and development division, at cost of 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 draftsmanship 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 on research and development, the proposal would attract 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.

**E.5.5** Techtronics Ltd an existing company, is considering a new project for the manufacture of pocket video games involving a capital expenditure of Rs 600 lakh, and a working capital of Rs 150 lakh. The plant has an annual production capacity of 12 lakh units, and capacity utilisation during the 6-year working life of the project is expected to be as given below:

<i>Year</i>	<i>Capacity utilisation (per cent)</i>
1	33.33
2	66.67
3	90
4-6	100

The average price per unit of the project is expected to be Rs 200, netting a contribution of 40 per cent. Annual fixed costs, excluding depreciation, are estimated to be Rs 480 lakh per annum from the third year onwards; for the first and the second years, they would be Rs 240 and Rs 360 lakh respectively. The average rate of depreciation for tax purposes is 33.33 per cent on the capital assets. No other tax reliefs are anticipated. The rate of income tax may be taken to be 35 per cent.

At the end of the third year, an additional investment of Rs 100 lakh would be required for the working capital.

The company, without taking into account the effects of financial leverage, has targeted at a rate of return of 15 per cent.

You are required to indicate whether the proposal is viable, giving your working notes and analysis.

Terminal value for the fixed assets may be taken at 10 per cent, and for the current assets at 100 per cent. The calculation may be rounded off to a lakh of rupees.

**E.5.6** Welcome Ltd is considering the manufacture of a new product. The accountant has prepared following estimate of profit in the first year of manufacture.

Sales, 9,000 units @ Rs 32		Rs 2,88,000
Cost of goods sold:		
Labour 40,000 hours @ Rs 3.50 per hour	Rs 1,40,000	
Materials and other variable costs	65,000	
Depreciation	45,000	
	2,50,000	
Less closing stock	25,000	2,25,000
Net profit		63,000

The product is expected to have a life of 4 years. Annual sales volume is expected to be constant over the period at 9,000 units. Production, which was estimated at 10,000 units in the first year, would be only 9,000 units each in year 2 and 3, and 8,000 units in year 4. Debts at the end of each year would be 20 per cent of sales during the year; credits would be 10 per cent of materials, and other variable costs. If sales differed from the forecast level, stocks would be adjusted in proportion.

Depreciation relates to machinery which would be purchased especially for the manufacture of the new product, and is calculated on the straight line basis, assuming that the machinery would last for 4 years and have no terminal scrap value. Fixed costs are included in the labour cost.

There is a high level of confidence concerning the accuracy of all the above estimates except the annual sales volume. Cost of capital is 20 per cent per annum. You may assume that debts are realised and credits are paid in the following year. No changes in the prices of inputs or outputs are expected over the next 4 years.

You are required to show whether manufacture of the new product is worthwhile. Ignore taxes.

**E.5.7** BS Electronics Ltd 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 value is Rs 6 lakh. The company has several machines in the 25 per cent block of depreciation.

The new machine costs Rs 15 lakh 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 company 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.

**E.5.8** XYZ Ltd manufactures several products. One of the firm's principal products sells Rs 20 per unit. The sales manager of XYZ Ltd has stated repeatedly that he could sell more units of this product, were they available. To substantiate his claim, the sales manager conducted a market research study last year at a cost of Rs 35,000. The study indicated that XYZ Ltd could sell 18,000 units of this product annually for the next 5 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 5 years. The salvage value of the equipment is negligible now, and will be zero in 5 years.

A maximum of 20,000 units could be produced annually if a new machinery can be purchased. The new equipment costs Rs 2,50,000 and has an estimated useful life of 5 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 of Rs 7 per unit.

The firm uses the straight-line method of depreciation on all its equipment for tax purposes. It is subject to a 35 per cent tax on its income, and its tax cost of capital is 15 per cent.

The sales manager felt so strongly about the need for additional capacity that he prepared 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.

(i) Required investment:			
Purchase of new equipment			Rs 2,50,000
Disposal of existing equipment:			
Loss on disposal	Rs 60,000		
Less tax benefit	21,000		39,000
Cost of market research study			35,000
Total investment			<u>3,24,000</u>
(ii) Annual returns:			
<i>Contribution margin from product</i>			
New equipment [18,000 × Rs 13(Rs 20 – 7)]			2,34,000
Existing equipment [11,000 × Rs 11(Rs 20 – Rs 9)]			<u>1,21,000</u>
Increase in contribution			1,13,000
Less depreciation			<u>50,000</u>
Increase in income before tax			63,000
Income tax			<u>22,050</u>
Increase in income			40,950
Less cost of capital on the additional investment required (0.15 × Rs 3,24,000)			<u>48,600</u>
Net annual return of proposed investment in new equipment			<u>(7,650)</u>

The financial controller of XYZ Ltd plans to prepare a discounted cashflow analysis for this investment proposal. He asked you to prepare the corrected calculations of (a) required investment in new equipments, and (b) recurring annual cash flows.

Give your recommendations on the basis of the above information assuming 25 per cent depreciation on the block of assets to which the machine belongs.

**E.5.9** A textile company has Rs 20 lakh available for investment. It has evaluated its options and has found that only four investments (W, X, Y and Z) have positive NPVs. All these investments are entirely independent of one another. However, they have an equal life span 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 is as follows:

<i>Investment</i>	<i>Initial outlay</i>	<i>Present value of future cash inflows from the investment</i>
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 should the firm adopt? Would your answer be different if the present value of cash flows of project W was Rs 12,50,000, instead of Rs 10,00,000?

**E.5.10** Gama Ltd wants to replace its old machine with a new automatic machine. Two models Zee and Chee are available at the same cost of Rs 5 lakh each. Salvage value of the old machine is Rs 1 lakh. The utilities of the existing machine can be used if the company purchases Zee. Additional cost of utilities to be purchased in that case would be Rs 1 lakh. If the company purchases Chee, all the existing utilities will have to be replaced with utilities costing Rs 2 lakh. The salvage value of the old utilities will be Rs 0.20 lakh. The cash inflows after taxation are expected to be:

<i>Year</i>	<i>Cash inflows after taxes</i>	
	<i>Zee</i>	<i>Chee</i>
1	Rs 1,00,000	Rs 2,00,000
2	1,50,000	2,10,000
3	1,80,000	1,80,000
4	2,00,000	1,70,000
5	1,70,000	40,000
Salvage value at the end of year 5	50,000	60,000

The target return on capital is 15 per cent. You are required to (i) compute for the two machines separately, NPV, discounted pay back period and present value index and (ii) advise which of the two machines is to be selected.

**E.5.11** The following statements give quantitative considerations relevant for the ranking of projects A and B.

<i>Criteria</i>	<i>Project A</i>	<i>Project B</i>
Investment	Rs 400	Rs 300
Internal rate of return	18	20
PV at 6% discount	542.7	421.2
NPV at 6% discount	142.7	121.2
NPV at 12% discount	60.5	60.5

Project A requires an investment of Rs 400 and is expected to have a cash inflow of Rs 110, Rs 120, Rs 130, Rs 140, and Rs 150 over its 5 years economic life. Project B involves an investment of Rs 300 and is expected to have cash inflows of Rs 100 each over its 5 economic life.

Which of the two projects will you select if cost of capital is (i) 10 per cent, (ii) 12 per cent, and (iii) 15 per cent? Give reasons in support of your decision.

## ANSWERS

**E.5.1** Project A (higher NPV as well IRR)

**E.5.2** (a) NPV, Project X (Rs 19,350), Project Y (Rs 3,210)  
IRR, Project X, 0.16, Project Y, 0.185

- 
- (b) Both
  - (c) Differences in cashflow patterns.
- E.5.3** Yes (NPV, Rs 13,132.50).
- E.5.4** No (Negative NPV = Rs 1,20,300)
- E.5.5** Yes (NPV Rs 252 lakh).
- E.5.6** Yes (NPV Rs 58,398).
- E.5.7** Yes (NPV Rs 5,32,243).
- E.5.8** (a) Rs 2,50,000,  
(b) Rs 95,325 (year 1); Rs 89,856 (year 2); Rs 85,755 (year 3); Rs 82,678 (year 4); Rs 80,371 (year 5).  
(c) NPV, Rs 44,527. Replace the asset.
- E.5.9** (i) NPV: Machine Zee, Rs 44,000; Machine Chee, Rs 20,000  
Discounted PB: Both machines, 4.6 years  
PV index: Zee, 1.088; Chee, 1.034  
(ii) Machine Zee (higher NPV as well as PV index)
- E.5.10** (i) The firm should adopt X, Y and Z investment proposals.  
(ii) No.
- E.5.11** (i) Project A should be preferred if cost of capital is 10 per cent.  
(ii) At 12 and 15 per cent cost of capital, Project B should be preferred.

# 6 **RISK ANALYSIS**

## BASIC THEORY

### INTRODUCTION

The term *risk* with reference to capital budgeting is defined as the variability in the actual returns emanating from a proposal in future, in relation to the estimated returns forecasted at the time of the initial decision. Risk can be quantified in more precise terms. The measures which express risk more precisely are (i) standard deviation (absolute measure), and (ii) coefficient of variation (relative measure).

### MEASURES OF RISK

Risk, as a measure of dispersion around a probability distribution, is defined as the variability of cash flows around the expected value. The expected value ( $\overline{CF}$ ) is

$$\overline{CF} = \sum_{i=1}^n CF_i P_i \quad (6.1)$$

where  $CF_i$  = Value of  $i$ th possible outcome  
 $P_i$  = Probability that the  $i$ th outcome will occur  
 $n$  = Number of possible outcomes

Absolute risk is measured by standard deviation:

$$\sigma = \sqrt{\sum_{i=1}^n P_i (CF_i - \overline{CF})^2} \quad (6.2)$$

Relative risk is measured by the coefficient of variation, which is:

$$V = \frac{\sigma}{\overline{CF}} \quad (6.3)$$

### TECHNIQUES OF RISK ANALYSIS

The important techniques to incorporate risk in capital budgeting exercise include:

1. Risk adjusted discount rate (RAD) approach,
2. Certainty equivalent (CE) approach,
3. Probability distribution (PD) approach, and
4. Decision tree (DT) approach.

#### Risk Adjusted Discount Rate (RAD) 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 ones for less risky projects. The NPV (net present value) under the RAD method is computed according to Equation 6.4.



$$NPV = \sum_{t=1}^n \frac{CFAT_t}{(1 + k_r)^t} - CO \quad (6.4)$$

where  $k_r$  = Risk adjusted discount rate.

### Certainty Equivalent (CE) Approach

The CE approach adjusts the risk through the cash flows associated with the projects. The CE coefficient is equal to:

$$\frac{\text{Riskless cash flows}}{\text{Risky cash flows}} \quad (6.5)$$

The NPV of the project is calculated using Equation 6.6.

$$NPV = \sum_{t=1}^n \frac{a_t CFAT_t}{(1 + i)^t} - CO \quad (6.6)$$

where  $a_t$  = CE coefficient for year  $t$ ,  
 $i$  = Riskless interest rate.

### Probability Distribution (PD) Approach

PD approach illustrates the analysis of risk in capital budgeting through the application of probability distribution, assuming independence of cash flows over time. The steps involved are:

(i) Determination of expected  $NPV$ :

$$NPV = \sum_{t=1}^n \frac{\overline{CF}_t}{(1 + i)^t} - CO \quad (6.7)$$

(a) Standard deviation of expected cash flows

$$\sigma(NPV) = \sqrt{\sum_{t=1}^n \frac{\sigma_t^2}{(1 + i)^{2t}}} \quad (6.8)$$

where  $\sigma_t$  = standard deviation of the probability distribution of expected cash for period  $t$ :

$$\sigma_t = \sqrt{\sum_{j=1}^m (CF_{jt} - \overline{CF}_t)^2 P_{jt}} \quad (6.9)$$

where  $CF_{jt}$  = Value of  $j$ th possible outcome in period  $t$   
 $P_{jt}$  = Probability that the  $j$ th outcome will occur in period  $t$ .

(ii) Calculation of probability of different values of  $NPV$ :

$$(a) Z = \frac{X_t - \bar{X}}{\sigma} \quad (6.10)$$

Where  $X_t$  = Expected outcome,  
 $\bar{X}$  = Expected NPV

(b) The probability of expected  $NPV$  is given in  $Z$  Table (Appendix A-5).

### Decision Tree (DT) Approach

The DT approach takes into account the impact of all probable estimates of potential outcomes. Every possible outcome is weighed in probabilistic terms and then evaluated, assuming dependence of cash flows.

The expected  $NPV$ , ( $\overline{NPV}$ ) of the project is given by Equation 6.11.

$$\overline{NPV} = \sum_{j=1}^m P_j NPV_j \quad (6.11)$$

where  $P_j$  = Probability of the  $j$ th path occurring, which is equal to the joint probability along the path  
 $NPV_j$  =  $NPV$  of the  $j$ th path occurring.

## SOLVED PROBLEMS

### PS 6.1

ABC Ltd is considering a proposal to buy a machine for Rs 30,000. The expected cash flows after taxes from the machine for a period of 3 consecutive years are Rs 20,000 each. After the expiry of the useful life of the machine, the seller has guaranteed its repurchase at Rs 2,000. The firm's cost of capital is 10 per cent and the risk adjusted discount rate is 18 per cent. Should the company accept the proposal of purchasing the machine?

### Solution

*NPV under risk adjusted discount rate method*

Year	CFAT	PV factor (0.18)	Total PV
1-3	Rs 20,000	2.174 (Table A-4)	Rs 43,480
3	2,000	0.751 (Table A-3)	1,502
			<u>44,982</u>
	Less cash outlays		<u>30,000</u>
	NPV		<u>14,982</u>

Yes, the company should accept the proposal.

### PS 6.2

The Hypothetical Ltd is examining two mutually exclusive proposals. The management of the company uses certainty equivalents (CE) approach to evaluate new investment proposals. From the following information pertaining to these projects, advise the company as to which project should be taken up by it.

Year	Proposal A		Proposal B	
	CFAT	CE	CFAT	CE
0	Rs (25,000)	1.0	Rs (25,000)	1.0
1	15,000	0.8	9,000	0.9
2	15,000	0.7	18,000	0.8
3	15,000	0.6	12,000	0.7
4	15,000	0.5	16,000	0.4

The firm's cost of capital is 12 per cent, and risk-free borrowing rate is 6 per cent.

**Solution**

NPV under CE method: project A

Year	Expected CFAT	Certainty equivalent (CE)	Adjusted CFAT	PV factor (0.06)	Total PV
0	Rs (25,000)	1.0	Rs (25,000)	1.000	Rs (25,000)
1	15,000	0.8	12,000	0.943	11,316
2	15,000	0.7	10,500	0.890	9,345
3	15,000	0.6	9,000	0.840	7,560
4	15,000	0.5	7,500	0.792	5,940
Total NPV <sub>A</sub>					9,161

NPV under CE method: project B

Year	Expected CFAT	(CE)	Adjusted CFAT	PV factor (0.06)	Total PV
0	Rs (25,000)	1.0	Rs (25,000)	1.000	Rs (25,000)
1	9,000	0.9	8,100	0.943	7,638
2	18,000	0.8	14,400	0.890	12,816
3	12,000	0.7	8,400	0.840	7,056
4	16,000	0.4	6,400	0.792	5,069
Total NPV <sub>B</sub>					7,579

The company should take up Project A.

**PS 6.3**

XYZ Ltd is considering the proposal of buying one of the two machines to manufacture a new product. Each of these machines requires an investment of Rs 50,000, and is expected to provide benefits over a period of 4 years. After the expiry of the useful life of the machines, the sellers of both the machines have guaranteed to buy back the machines at Rs 5,000. The management of the company uses CE approach to evaluate risky investments. The company's risk adjusted discount rate is 16 per cent and the risk-free rate is 10 per cent. The expected values of net cash flows (CFAT) with their respective CE are:

Year	Proposal A		Proposal B	
	CFAT	CE	CFAT	CE
1	Rs 30,000	0.8	Rs 18,000	0.9
2	30,000	0.7	36,000	0.8
3	30,000	0.6	24,000	0.7
4	30,000	0.5	32,000	0.4

Which machine, if either, should be purchased by the company?

**Solution**

NPV under CE approach: machine A

Year	Expected CFAT	(CE)	Adjusted CFAT	PV factor (0.10)	Total PV
0	Rs (50,000)	1.0	Rs (50,000)	1.000	Rs (50,000)
1	30,000	0.8	24,000	0.909	21,816

(Contd.)

**Soution (Contd.)**

2	30,000	0.7	21,000	0.826	17,346
3	30,000	0.6	18,000	0.751	13,518
4 (a)	30,000	0.5	15,000	0.683	10,245
4 (b)	5,000	1.0	5,000	0.683	3,415
Total NPV <sub>A</sub>					16,340

NPV under CE approach: machine B

Year	Expected CFAT	(CE)	Adjusted CFAT	PV factor (0.10)	Total PV
0	Rs (50,000)	1.0	Rs (50,000)	1.000	Rs (50,000)
1	18,000	0.9	16,200	0.909	14,726
2	36,000	0.8	28,800	0.826	23,789
3	24,000	0.7	16,800	0.751	12,617
4 (a)	32,000	0.4	12,800	0.683	8,742
4 (b)	5,000	1.0	5,000	0.683	3,415
Total NPV <sub>B</sub>					13,289

Machine A should be purchased by the company.

**PS 6.4**

The Premier Ltd is considering a proposal to buy one of the two machines to manufacture a new product. Each of these machines requires an investment of Rs 50,000, and is expected to provide benefits over a period of 12 years. The firm has made pessimistic, most likely, and optimistic estimates of the returns associated with each of these alternatives. These estimates are as follows:

	Machine A	Machine B
Cost	Rs 50,000	Rs 50,000
Cash flow estimates:		
Pessimistic	8,000	0
Most likely	12,000	10,000
Optimistic	16,000	20,000

Assuming 14 per cent cost of capital, which project do you consider more risky, and why?

**Solution**

Computation of net present value

Cash flow estimates	CFAT (t = 1 – 12)	PV factor (0.14)	Total PV	Cash outlays	NPV
<b>Machine A</b>					
Pessimistic	Rs 8,000	5.660	Rs 45,280	Rs 50,000	Rs(4,720)
Most likely	12,000	5.660	67,920	50,000	17,920
Optimistic	16,000	5.660	90,560	50,000	40,560
<b>Machine B</b>					
Pessimistic	Nil	5.660	Nil	50,000	(50,000)
Most likely	10,000	5.660	56,660	50,000	6,660
Optimistic	20,000	5.660	1,13,200	50,000	63,200

Project B is more risky because the NPV can be negative as high as Rs 50,000, while in Project A, the NPV can be negative only by Rs 4,720.

### PS 6.5

The Hypothetical Ltd is considering two mutually exclusive projects X and Y. Project X costs Rs 30,000 and project Y Rs 36,000. You have been given below the NPV probability distribution for each project:

Project X		Project Y	
NPV estimate	Probability	NPV estimate	Probability
Rs 3,000	0.1	Rs 3,000	0.2
6,000	0.4	6,000	0.3
12,000	0.4	12,000	0.3
15,000	0.1	15,000	0.2

- Compute the expected NPV of projects X and Y.
- Compute the risk attached to each project, that is, standard deviation of each probability distribution.
- Which project do you consider more risky and why?
- Compute the profitability index of each project.

### Solution

(i) Expected NPV

Project X			Project Y		
NPV	$P_i$	Expected NPV ( $NPV \times P_i$ )	NPV	$P_i$	Expected NPV ( $NPV \times P_i$ )
Rs 3,000	0.1	Rs 300	Rs 3,000	0.2	Rs 600
6,000	0.4	2,400	6,000	0.3	1,800
12,000	0.4	4,800	12,000	0.3	3,600
15,000	0.1	1,500	15,000	0.2	3,000
Expected $\overline{NPV}_x$		9,000	Expected $\overline{NPV}_y$		9,000

(ii) Standard deviation of each probability distribution

NPV	$\overline{NPV}_i$	$(\overline{NPV}_i - NPV)^2$	$P_i$	$(\overline{NPV}_i - NPV)^2 P_i$
Project X				
Rs 3,000	Rs 9,000	Rs 36,00,000	0.1	Rs 3,60,000
6,000	9,000	90,00,000	0.4	36,00,000
12,000	9,000	90,00,000	0.4	36,00,000
15,000	9,000	3,60,00,000	0.1	36,00,000
				1,44,00,000
Project Y				
3,000	9,000	3,60,00,000	0.2	72,00,000
6,000	9,000	90,00,000	0.3	27,00,000
12,000	9,000	90,00,000	0.3	27,00,000
15,000	9,000	3,60,00,000	0.2	72,00,000
				1,98,00,000

$$\sigma_x = \sqrt{1,44,00,000} = 3,795$$

$$\sigma_y = \sqrt{1,98,00,000} = 4,450$$

(iii) Risk of the project is to be determined with reference to coefficient of variation (V).

$$V = \sigma/NPV: \quad V_x = \text{Rs } 3,795/9,000 = 0.42, \quad V_y = \text{Rs } 4,450/9,000 = 0.49.$$

Project Y is more risky because of higher coefficient of variation.

$$(iv) PI_{(x)} = \text{Rs } 39,000/30,000 = 1.3, \quad PI_{(y)} = \text{Rs } 45,000/36,000 = 1.25$$

## PS 6.6

A local department store is considering the renovation of its appliances department. The renovation will cost the store Rs 10,00,000. Its incremental CFAT is very sensitive to general economic conditions as estimated below.

Event	Probability of event	Incremental CFAT
Super economic boom	0.1	Rs 8,00,000
Mild economic expansion	0.2	5,00,000
Normal economic expansion	0.4	4,00,000
Mild recession	0.2	3,00,000
Severe recession	0.1	2,00,000

The store thinks that the probability distribution of possible incremental CFAT exists for each of the 4 years, during which the appliance department will be functioning. The firm's cost of capital is 10 per cent.

- What is the expected annual incremental CFAT?
- What is the project's expected NPV?
- If the project's standard deviation is Rs 1,80,000, what is the project's risk per rupee of expected return?
- What is the probability that the project will have a negative NPV?

## Solution

(i) Expected annual incremental CFAT

Event	Incremental CFAT	Probability event (i) occurrence	Expected annual CFAT
1	2	3	4
Super economic boom	Rs 8,00,000	0.1	Rs 80,000
Mild economic expansion	5,00,000	0.2	1,00,000
Normal economic expansion	4,00,000	0.4	1,60,000
Mild recession	3,00,000	0.2	60,000
Severe recession	2,00,000	0.1	20,000
			4,20,000

(ii) Expected NPV

Year	CFAT	PV factor (0.10)	Total PV
1-4	Rs 4,20,000	3.167	Rs 13,31,400
Less PV of $C_0$			10,00,000
NPV			3,31,400

(iii) Risk per rupee of expected return is given by the coefficient of variation (V):  $(Rs\ 1,80,000/3,31,400) = 0.543$ .

(iv)  $Z = Rs\ 0. - Rs\ 3,30,140/1,80,000 = 1.83$

According to Table Z, the probability of NPV being zero is 0.4671. Therefore, the probability of NPV being negative would be  $0.5 - 0.4671 = 0.0329$ , or 3.29 per cent.

### PS 6.7

You have been asked to evaluate an investment project for the Hypothetical Ltd. The project requires an initial investment of Rs 12,00,000 with a 6-year life, with no salvage value, and to be depreciated on a straight line basis for tax purposes. Cash earnings before depreciation and taxes are projected in each of the next 6 years as:

Amount	Probability of occurrence
Rs 2,00,000	0.20
4,00,000	0.40
6,00,000	0.40

The risk-free interest rate is 8 per cent and the firm has a policy of assigning CE factors of 0.90 to the cash inflows of projects equal to risk class, such as revenue expansion projects involving existing product lines. For projects which require the firm's entry into new product areas, CE quotient of 0.8 is used to adjust cash inflows. The tax rate is 35 per cent.

- Determine the annual cash inflows prior to any risk adjustment.
- Calculate the risk-adjusted NPV for the project if it involves expansion of (a) existing product lines, (b) new product areas.
- Calculate the risk adjusted IRR, based on expansion in new product areas. Would you recommend the project?

### Solution

(i) Expected annual cash inflows

(Rs 2,00,000 × 0.2)	Rs 40,000
(4,00,000 × 0.4)	1,60,000
(6,00,000 × 0.4)	2,40,000
Expected CFBDT*	4,40,000
Less depreciation	2,00,000
Taxable income	2,40,000
Less taxes (0.35)	84,000
EAT	1,56,000
Add depreciation	2,00,000
CFAT	3,56,000

\*CFBDT × Probability of occurrence

(ii) Risk-adjusted NPV under CE method

Year	Expected CFAT	Certainty equivalent	Adjusted CFAT	PV factor (0.08)	Total PV
1	2	3	4	5	6
Existing product:					
1-6	Rs 3,56,000	0.9	Rs 3,20,400	4.623	Rs 14,81,209
Less PV of Co					12,00,000
NPV					2,81,209

(Contd.)

**Solution (Contd.)***New product:*

1-6	3,56,000	0.8	2,84,800	4.623	13,16,630
Less PV of Co					12,00,000
NPV					1,16,630

(iii) *Risk-adjusted IRR* = Rs 12,00,000/2,84,800 = 4.2135

The factors closest to 4.2135 corresponding to 6 years' life of the project are, 4.231 at 11 per cent and 4.111 at 12 per cent. IRR would be between these rates. By interpolation,

$$\text{IRR} = 0.11 + (4.231 - 4.213)/(4.231 - 4.111) = 11.15 \text{ per cent.}$$

The project should be accepted as the risk adjusted IRR is higher than the risk-free interest rate.

**PS 6.8**

A project under consideration is likely to cost Rs 50 lakh by way of fixed assets and requires another Rs 20 lakh for current assets. It is expected to have a life of 10 years, during which the returns are likely to be uniform, and at the end of which, it is likely to have scrap value of Rs 5 lakh. Various estimates of the gross income before depreciation and tax have been made. These are as follows:

<i>Annual amount (Rs in lakh)</i>	<i>Probability</i>
5	0.1
10	0.2
20	0.5
30	0.1
40	0.1

The rate of income tax is 35 per cent. The cut-off rate is 12 per cent. Assuming straight line method of depreciation is allowed for tax purposes, would you recommend acceptance of the project?

**Solution**

*Expected cash flows, years  $t = 1 - 10$  (amount in lakh of Rs)*

<i>Cash flows before axes and depreciation</i>	<i>Depreciation (Rs 45 ÷ 10 years)</i>	<i>Taxable income</i>	<i>Tax</i>	<i>EAT</i>	<i>CFAT (EAT + D)</i>	<i>Probability</i>	<i>Adjusted CFAT</i>
5	4.5	0.5	0.175	0.325	4.825	0.1	0.483
10	4.5	5.5	1.925	3.575	8.075	0.2	1.615
20	4.5	15.5	5.425	10.075	14.575	0.5	7.288
30	4.5	25.5	8.925	16.575	21.075	0.1	2.108
40	4.5	35.5	12.425	23.075	27.575	0.1	2.757
							14.251

*Determination of NPV (Rs in lakh)*

<i>Year</i>	<i>CFAT</i>	<i>PV factor (at 0.12)</i>	<i>Total PV</i>
1-10	Rs 14.251	5.650	Rs 80.52
10	25	0.322	8.05
Total			88.57
Less cash outflows (Rs 50 + Rs 20)			70
NPV			18.85

Yes, the project should be accepted.



**PS 6.9**

The probability distribution of two projects' NPVs are given below:

Project X		Project Y	
NPV	Probability	NPV	Probability
Rs 5,000	0.2	Rs 0	0.1
7,500	0.7	7,500	0.7
10,000	0.1	15,000	0.2

Calculate the expected NPV, the standard deviation, and the coefficient of variation for each project. Which of these mutually exclusive projects do you prefer, and why?

**Solution**

*Expected value*

Project X			Project Y		
NPV	$P_i$	$(NPV \times P_i)$	NPV	$P_i$	$(NPV \times P_i)$
Rs 5,000	0.2	Rs 1,000	Rs Nil	0.1	Rs Nil
7,500	0.7	5,250	7,500	0.7	5,250
10,000	0.1	1,000	15,000	0.2	3,000
Expected $\overline{NPV}_x$		7,250	Expected $\overline{NPV}_y$		8,250

*Standard deviation*

NPV	$\overline{NPV}$	$(NPV - \overline{NPV})^2$	$P_i$	$(NPV - \overline{NPV})^2_i$
<b>Project X</b>				
Rs 5,000	Rs 7,250	Rs 50,62,500	0.2	Rs 10,12,500
7,500	7,250	62,500	0.7	43,750
10,000	7,250	75,62,500	0.1	7,56,250
				18,12,500
<b>Project Y</b>				
Nil	8,250	6,80,62,500	0.1	68,06,250
7,500	8,250	5,62,500	0.7	3,93,750
15,000	8,250	4,55,62,500	0.2	91,12,500
				1,63,12,500

$$\sigma_x = \sqrt{18,12,500} = 1,346, \quad \sigma_y = \sqrt{1,63,12,500} = 4,039$$

$$\text{Coefficient of variation: } V_x = Rs\ 1,346/7,250 = 0.186, \quad V_y = Rs\ 4,039/8,250 = 0.489$$

Project X is preferable as it is less risky.

**PS 6.10**

ABC Ltd is considering a proposal to purchase a new machine. The machine has an initial cost of Rs 50,000. The capital budgeting department has developed the following discrete probability distribution for cash flows generated by the project during its useful life of 3 years.

Period 1		Period 2		Period 3	
CFAT	Probability	CFAT	Probability	CFAT	Probability
Rs 15,000	0.2	Rs 20,000	0.5	Rs 25,000	0.1
20,000	0.4	23,000	0.1	30,000	0.3
25,000	0.3	25,000	0.2	35,000	0.3
30,000	0.1	28,000	0.2	50,000	0.3

- (i) Assuming that the probability distribution of cash flows for future periods are independent, the firm's cost of capital is 10 per cent, and the firm can invest in 5 per cent treasury bills, determine the expected NPV.
- (ii) Determine the standard deviation about the expected value.
- (iii) If the total distribution is approximately normal, and assumed continuous, (a) what is the probability of the NPV being zero or less, (b) greater than zero, (c) profitability index being 1 or less, (d) at least equal to mean, (e) 10 per cent below mean, and (f) 10 per cent above mean?

### Solution

#### (i) Determination of expected NPV

Year 1			Year 2			Year 3		
CF	$P_j$	$CF \times P_j$	CF	$P_j$	$CF \times P_j$	CF	$P_j$	$CF \times P_j$
Rs 15,000	0.2	Rs 3,000	Rs 20,000	0.5	Rs 10,000	Rs 25,000	0.1	Rs 2,500
20,000	0.4	8,000	23,000	0.1	2,300	30,000	0.3	9,000
25,000	0.3	7,500	25,000	0.2	5,000	35,000	0.3	10,500
30,000	0.1	3,000	28,000	0.2	5,600	50,000	0.3	15,000
$(\overline{CF}_1) = 21,500$			$(\overline{CF}_2) = 22,900$			$(\overline{CF}_3) = 37,000$		
PV factor (0.05)		0.952			0.907			0.864
PV		20,468			20,770			31,968
Total PV								73,206
Less cash outflows								50,000
NPV (expected)								23,206

#### (ii) Period 1

$$\begin{aligned}
 \frac{(CF_{j1} - \overline{CF}_1)^2 \times P_{j1}}{Rs \ 4,22,50,000 \quad 0.2} &= \frac{(CF_{j1} - \overline{CF}_1)^2 P_{j1}}{Rs \ 84,50,000} \\
 \frac{22,50,000 \quad 0.4}{1,22,50,000 \quad 0.3} &= \frac{9,00,000}{36,75,000} \\
 \frac{7,22,50,000 \quad 0.1}{(CF_{j1} - \overline{CF}_1)^2 \quad P_{j1}} &= \frac{72,25,000}{2,02,50,000} \\
 &= \sqrt{2,02,50,000} = 4,500
 \end{aligned}$$

#### Period 2

$$\begin{aligned}
 \frac{(CF_{j2} - \overline{CF}_2)^2 \times P_{j2}}{84,10,000 \quad 0.5} &= \frac{(CF_{j2} - \overline{CF}_2)^2 P_{j2}}{42,05,000} \\
 \frac{10,000 \quad 0.1}{44,10,000 \quad 0.2} &= \frac{1,000}{8,82,000} \\
 \frac{2,60,10,000 \quad 0.2}{(CF_{j2} - \overline{CF}_2)^2 \quad P_{j2}} &= \frac{52,02,000}{1,02,90,000} \\
 &= \sqrt{1,02,90,000} = 3,208
 \end{aligned}$$

Period 3

$$\begin{aligned}
 (CF_{j3} - \overline{CF}_3)^2 \times P_{j3} &= (CF_{j3} - \overline{CF}_3)^2 P_{j3} \\
 14,40,00,000 \quad 0.1 &= 1,44,00,000 \\
 4,90,00,000 \quad 0.3 &= 1,47,00,000 \\
 40,00,000 \quad 0.3 &= 12,00,000 \\
 16,90,00,000 \quad 0.3 &= 5,07,00,000 \\
 (CF_{j3} - \overline{CF}_3)^2 \times P_{j3} &= 8,10,00,000 \\
 &= \sqrt{8,10,00,000} = 9,000
 \end{aligned}$$

Standard deviation about the expected value

$$\begin{aligned}
 &= \sqrt{\frac{(4,500)^2}{(1+0.05)^2} + \frac{(3,208)^2}{(1+0.05)^4} + \frac{(9,000)^2}{(1+0.05)^6}} \\
 &= \sqrt{\frac{2,02,50,000}{1.102} + \frac{102,91,264}{1.216} + \frac{8,10,00,000}{1.340}} \\
 &= \sqrt{1,83,75,681 + 84,63,211 + 6,04,47,761} \\
 &= \sqrt{8,72,86,653} = 9,343
 \end{aligned}$$

(iii) (a) Probability of the NPV less than zero

$$Z = \frac{0 - NPV}{r} = \frac{0 - 23,206}{9,343} = -2.484$$

According to Table Z, the probability of the NPV being zero is 0.4934. Therefore, the probability of the NPV being less than zero would be  $0.5 - 0.4934 = 0.0066$  or 0.66 per cent.

(b) Greater than zero

$$1 - 0.0066 = 0.9934 \quad \text{or} \quad 99.34 \text{ per cent.}$$

(c) Profitability index will be 1 when NPV is zero; it will be less than 1 if the NPV is negative. Therefore, the probability of the profitability index being zero or less would be the same as that of NPV being zero or less, that is, 0.66 per cent.

(d) At least equal to mean

$$Z = (Rs\ 23,206 - Rs\ 23,206)/9,343 = 0.0$$

Reading from the normal distribution Table Z, we get the probability corresponding to 0.0 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.

(e) 10 per cent below mean

$$Z = (Rs\ 20,885.40 - Rs\ 23,206)/9,343 = -0.2483$$

The area as per Table Z corresponding to 0.25 is 0.0987. In other words, there is 9.87 per cent probability of NPV being less than 10 per cent of the value of mean.

(f) 10 per cent above mean

The same as (e), that is, 9.87 per cent.

**PS 6.11**

Determine the risk-adjusted NPV of the following projects, whose relevant data are given below.

<i>Projects</i>	<i>A</i>	<i>B</i>	<i>C</i>
Net cash outlays (Rs)	1,00,000	1,20,000	2,10,000
Project life (years)	5	5	5
Annual cash inflow	30,000	42,000	70,000
Coefficient of variation	0.4	0.8	1.2

The company selects the risk-adjusted rate of discount on the basis of the coefficient of variation.

<i>Coefficient of variation</i>	<i>Risk-adjusted rate of discount</i>
0	10
0.4	12
0.8	14
1.2	16
1.6	18
2	22
More than 2	25

***Solution***

*Determination of expected NPV*

<i>Project</i>	<i>CFAT</i>	<i>Risk-adjusted rate of discount</i>	<i>PV factor</i>	<i>Total PV</i>	<i>Cash outlays</i>	<i>NPV</i>
A	Rs 30,000	12	3.605	Rs 1,08,150	Rs 1,00,000	Rs 8,150
B	42,000	14	3.433	1,44,186	1,20,000	24,186
C	70,000	16	3.274	2,29,180	2,10,000	19,180

**PS 6.12**

A company has made the following estimates of the CFAT associated with an investment proposal. The company intends to use a decision tree to get a clearer picture of the project's cash inflows. The project has an expected life of 2 years.

<i>CFAT (t = 1)</i>	<i>Probability</i>
Rs 25,000	0.4
30,000	0.6
<i>CFAT (t = 2)</i>	
If CFAT <sub>1</sub> = Rs 25,000 ... Rs 12,000	0.2
16,000	0.3
22,000	0.5
If CFAT <sub>2</sub> = Rs 30,000 ... 20,000	0.4
25,000	0.5
30,000	0.1

The equipment costs Rs 40,000 and the company uses a 10 per cent discount rate for this type of investment.

- (i) Construct a decision tree for the proposed investment project.

- (ii) What NPV will the project yield if the worst outcome is realised? What is the probability of occurrence of this NPV?
- (iii) What will be the NPV if the best outcome occurs? What is its probability?
- (iv) Will the project be accepted?

### Solution

(i) *Decision tree*

Time 0	1	2	CFAT <sub>2</sub>	NPV at 10%	Joint probability	Expected NPV
<div>Equipment cost (Rs 40,000)</div>	Rs 25,000	CFAT 0.2	Rs 12,000	(Rs 7,363)	0.08	Rs (589.04)
		0.3	16,000	(4,059)	0.12	(487.08)
		0.5	22,000	897	0.20	179.40
	0.4					
	Rs 30,000	0.4	20,000	3,790	0.24	909.60
		0.5	25,000	7,920	0.30	2,376.00
		0.1	30,000	12,050	0.06	723.00
					<u>NPV</u>	<u>3,111.88</u>

- (ii) If the worst outcome is realised, the NPV of the project would be (Rs 7,363).
- (iii) If the best outcome, the NPV of the project would be Rs 12,050. There is a 6 per cent probability of this outcome.
- (iv) Yes, the project should be accepted, because the project is expected to yield a positive NPV of Rs 3,111.88.

### PS 6.13

Toy Enterprises Ltd designs and manufactures toys. Past experience indicates that the product life of a toy is 3 years. Promotional advertising produces an increase in sales in the early years, but there is a substantial sales decline in the final year of a toy's life.

Consumer demand for new toys placed on the market tends to fall into three classes. About 30 per cent of the new toys sell well above expectations, 60 per cent sell as anticipated, and 10 per cent have poor consumer acceptance.

A new toy has been developed. The following sales projections were made by carefully evaluating the consumer demand.

Consumer demand for a new toy	Probability of occurrence	Estimated sales in year (Rs in lakh)		
		1	2	3
Above average	0.30	12	25	6
Average	0.60	7	17	4
Below average	0.10	2	9	1.5

Variable costs are estimated at 30 per cent of the selling price. Special machinery must be purchased at a cost of Rs 8,60,000 which will be installed in an unused portion of the factory. The company has been trying unsuccessfully for several years to rent out the vacant portion at Rs 50,000 per year. Fixed expenses (excluding depreciation) are estimated at Rs 50,000 per year. The new machinery will be depreciated by the written down value method @ 25 per cent with an estimated value of Rs 1,10,000 at the end of the third year. Assume this is the only asset in the block. Advertising and promotional expenses will be incurred uniformly, and will total Rs 1,00,000 in the first year, Rs 1,50,000 in the second year, and Rs 50,000 in the third year.

The company is subject to a corporate tax rate of 35 per cent. Its cost of capital is 10 per cent.

- (i) Prepare a schedule computing the probable sales of this new toy in each of the three years. Also, determine the NPV of the proposal.
- (ii) Assuming that cash flows occur uniformly throughout each year, determine the NPV of the proposal. The present value of Re 1 earned uniformly throughout the year discounted at 10 per cent is as follows:

Year	Discount factor
1	0.95
2	0.86
3	0.78

- (iii) Give your recommendations in both the situations.

### Solution

(i) Schedule showing probable sales of the new toy, years 1–3 (Rs in lakh)

Consumer demand for new toy	Probability of occurrence ( $P_j$ )	Years (estimated sales)			Probable sales per year		
		1	2	3	1	2	3
Above average	0.30	12	25	6	3.6	7.5	1.80
Average	0.60	7	17	4	4.2	10.2	2.40
Below average	0.10	2	9	1.5	0.2	0.9	0.15
					8.0	18.6	4.35

#### Determination of CFAT

Particulars	Years		
	1	2	3
Probable sales revenue	Rs 8,00,000	Rs 18,60,000	Rs 4,35,000
Less variable costs (0.30)	2,40,000	5,58,000	1,30,500
Less: depreciation	2,15,000	1,61,250	Nil*
cash fixed costs	50,000	50,000	50,000
advertising expenses	1,00,000	1,50,000	50,000
EBT	1,95,000	9,40,750	2,04,500
Less taxes (0.35)	68,250	3,29,263	71,575
EAT	1,26,750	6,11,487	1,32,925
CFAT (EAT + Depreciation)	3,41,750	7,72,737	1,32,925
Add salvage value	—	—	1,10,000
Add tax savings on short-term capital loss**	—	—	1,30,812
	3,41,750	7,72,737	3,73,737

\*No depreciation in terminal year.

\*\* (Rs 3,73,750 × 0.35)

#### Determination of NPV

Year	CFAT	PV factor (0.10)	Total PV
1	Rs 3,41,750	0.909	Rs 3,10,651
2	7,72,737	0.826	6,01,111
3	3,73,737	0.751	2,80,676
			11,92,438
Less cash outflows			8,60,000
NPV			3,32,438

(ii) *Determination of NPV assuming CFAT occurs uniformly throughout the year.*

Year	CFAT	PV factor (0.10)	Total PV
1	Rs 3,41,750	0.95	Rs 3,24,662
2	7,27,737	0.86	6,25,854
3	1,32,925	0.78	1,03,681
3	1,10,000 (salvage value)	0.751	82,610
3	1,32,812 (tax savings on short-term capital loss)	0.751	98,240
			12,35,047
	Less cash outflows		8,60,000
	NPV		3,75,047

(iii) **Recommendation:** The project should be accepted in both the situations.

### PS 6.14

A company has spent Rs 75,000 on research in developing a new product. The product will be marketed if it promises a risk-adjusted rate of return (applicable to such projects) of at least 25 per cent after taxes. For the purposes of financial analysis, the following information has been collected.

1. The estimated life of the product is 3 years
2. Projected sales are as follows:

Year	Sales revenue
1	Rs 15,00,000
2	25,00,000
3	6,00,000

3. Variable costs to manufacture and sell the product are estimated at 60 per cent of the selling price.
4. The present cash fixed costs will be increased by Rs 10,000 to cover insurance, and maintenance of new equipment.
5. Advertising of the new product will be incurred uniformly, and will total Rs 1,25,000 in the first year, and Rs 75,000 and Rs 60,000 in years 2 and 3, respectively.
6. New machinery will have to be purchased at an estimated cost of Rs 9,60,000. The machinery will be depreciated at the rate of 33.33 per cent on the basis of written down value method of depreciation. The salvage value at the expiry of 3 years is estimated at Rs 1,00,000. There are several other machines in this block of assets.
7. The new machinery will be installed in a factory area now occupied by equipment that can be no longer be used, that is, scrap equipment. The company has already arranged for removal of the old equipment at a cost of Rs 10,000.
8. The new product will be stored in a company owned warehouse in a portion that is vacant now. The company has been trying unsuccessfully to rent this space at Rs 25,000 per year. Several offers have been rejected, the highest rent offer being Rs 15,000 per year, payable uniformly over the year under a 3-year lease.
9. The firm pays 35 per cent tax on its income. It is assumed that these taxes will be paid uniformly as income is earned.
10. PV of Re 1 at a 25 per cent discount rate are as follows:

Year	Re 1 received at the end of year	Re 1 received uniformly over the year
1	0.80	0.88
2	0.64	0.69
3	0.51	0.54

Evaluate the financial implications of the proposal, assuming that the operating cash flows occur uniformly throughout the period of the project's life.

**Solution***Determination of CFAT*

Particulars	Year 1	Year 2	Year 3
Sales revenue	Rs 15,00,000	Rs 25,00,000	Rs 6,00,000
Less costs:			
Variable costs (0.60)	9,00,000	15,00,000	3,60,000
Incremental fixed costs	10,000	10,000	10,000
Advertising costs	1,25,000	75,000	60,000
Depreciation (0.333)	3,20,000	2,13,333	1,42,222
Rent (opportunity cost of the space used)	15,000	15,000	15,000
Total costs	13,70,000	18,13,333	5,87,222
EBT	1,30,000	6,86,667	12,778
Less taxes paid (0.35)	45,500	2,40,333	4,472
EAT	84,500	4,46,334	8,306
CFAT (EAT + Depreciation)	4,04,500	6,59,667	1,50,528

*Determination of NPV assuming CFAT are received uniformly throughout the year.*

Year	CFAT	PV factor (0.25)	Total PV
1	Rs 4,04,500	0.88	Rs 3,55,960
2	6,59,667	0.69	4,55,170
3	1,50,528	0.54	81,285
3	1,00,000 (salvage value)*	0.51	51,000
			9,43,415
Less cash outflows			9,60,000
NPV			(16,585)

\*At the beginning of year 4.

**Recommendation:** The proposal is not financially viable.

**PS 6.15**

A company is trying to decide whether to invest in a new project. Two mutually exclusive projects are available, each requiring an investment of Rs 3,00,000. Project A is expected to generate cash inflows of Rs 2,00,000 per year in the next 2 years. It is estimated that the cash inflows associated with project B would either be Rs 1,80,000, or Rs 2,20,000 (each with 0.5 probability of occurrence) next year. If Rs 1,80,000 is received in the first year, the cash inflow for the second year is likely to be Rs 1,50,000 (probability of 0.3), Rs 1,80,000 (probability of 0.4) and Rs 2,00,000 (probability of 0.3). In case the first year's cash inflow is Rs 2,20,000, the second year's likely cash inflow would be Rs 1,80,000 and Rs 2,70,000 (each with 0.3 probability), and Rs 2,20,000 (probability 0.4).

The firm uses a 14 per cent minimum required rate of return for deciding whether to invest in projects comparable in risk to the ones under consideration.

- Calculate the risk adjusted expected NPV for projects A and B.
- Identify the best and the worst possible outcomes for B.
- Which of the projects, if any, would you recommend? Why?



## Solution

### (i) Determination of expected NPV of project A

Year	CFAT	PV factor (0.14)	Total PV
1	Rs 2,00,000	0.877	Rs 1,75,400
2	2,00,000	0.769	1,53,800
			3,29,200
Less PV of cash outflows			3,00,000
NPV			29,200

### Determination of expected NPV of project B

Time 0	1			CFAT <sub>2</sub>	NPV at 14%	Joint probability	Expected NPV
Cost of the project (Rs 3,00,000)	0.5	CFAT Rs 1,80,000	0.3	Rs 1,50,000	(Rs 26,790)	0.15	(Rs 4,019)
			0.4	1,80,000	(3,720)	0.20	(744)
			0.3	2,00,000	11,660	0.16	1,749
	0.5	CFAT Rs 2,20,000	0.3	1,80,000	31,360	0.15	4,704
			0.4	2,20,000	62,120	0.20	12,424
			0.3	2,70,000	1,00,570	0.15	15,085

- (ii) The worst possible outcome is a CFAT of Rs 1,80,000 (year 1) and Rs 1,50,000 (year 2) with the maximum negative NPV as Rs 26,790.

The best possible outcome is when NPV is maximum, Rs 1,00,570. It results when CFAT in year 1 is Rs 2,20,000, followed by Rs 2,70,000 in year 2.

- (iii) The expected NPVs are the same for both projects. However, from the point of view of risk, project A should be chosen as there is no variability of possible events.

## EXERCISES

**E.6.1** The Hypothetical Ltd has under consideration two mutually exclusive projects for increasing its plant capacity. The management has developed pessimistic, most likely, and optimistic estimates of the annual cash flow associated with each project. The estimates are as follows:

	Project A	Project B
Net investment	Rs 30,000	Rs 30,000
CFAT estimates		
Pessimistic	1,200	3,700
Most likely	4,000	4,000
Optimistic	7,000	4,500

- (a) Determine the NPV associated with each of the estimates given for the projects. The projects have 20-year life each, and the cost of capital is 10 per cent.
- (b) Which project should be selected by the company and why?

**E.6.2** Delta Corporation Ltd 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 CE approach is employed in evaluating risky investments. The current yield on treasury bills is 5 per cent, and the company uses this as the riskless rate. Expected values of the cash flows with their respective CE are:

Year	Project A		Project B	
	Cash flow	Certainty equivalent	Cash flow	Certainty equivalent
1	Rs 90,000	0.8	Rs 90,000	0.9
2	1,00,000	0.7	90,000	0.8
3	1,10,000	0.5	1,00,000	0.6

- Which project should be acceptable to the company?
- How would you judge which project is more risky?
- If the company was to use the risk-adjusted discount rate method, which project would be analysed with higher rate?

**E.6.3** Alfa Ltd is evaluating three proposed projects. You are required to rank the projects with respect to both risk and returns. The relevant data is as follows:

A		B		C	
NPV	Probability	NPV	Probability	NPV	Probability
Rs (3,500)	0.05	Rs (2,000)	0.01	Rs (4,500)	0.03
(1,000)	0.10	0	0.04	(1,500)	0.07
0	0.15	500	0.15	0	0.10
2,000	0.20	1,500	0.20	3,000	0.50
4,000	0.25	2,000	0.30	4,000	0.25
6,000	0.15	2,500	0.20	5,000	0.05
11,000	0.08	3,000	0.06	—	—
17,500	0.02	3,750	0.04	—	—

**E.6.4** The Hypothetical Ltd is considering an investment in a project that requires an initial investment of Rs 3,000 with an expected CFAT generated over 3 years as follows:

Year 1		Year 2		Year 3	
CFAT	Probability	CFAT	Probability	CFAT	Probability
Rs 800	0.1	Rs 800	0.1	Rs 800	0.2
1,000	0.2	1,000	0.3	1,000	0.5
1,500	0.4	1,500	0.4	1,500	0.2
2,000	0.3	2,000	0.2	2,000	0.1

- What is the expected NPV of this project? (Assume that the probability distribution are independent, and the risk free rate of interest in the market is 5 per cent.)
- Calculate the standard deviation about the expected value.
- Find the probability that the NPV will be zero or less (assume that the distribution is normal and continuous).
- What is the probability that the NPV will be greater than zero?
- What is the probability that NPV will be (i) between Rs 500 and Rs 750, (ii) between Rs 400 and Rs 600, (iii) at least Rs 300, and (iv) at least Rs 1,000.

**E.6.5** ABC Ltd has an investment proposal requiring an outlay of Rs 2,00,000 at present ( $t = 0$ ). The proposal is expected to have a 2 years' economic life, with no salvage value. In year 2, there is 0.3 probability that CFAT will be Rs 80,000, 0.4 probability that CFAT will be Rs 1,10,000 and 0.3 probability that CFAT will be Rs 1,50,000. In year 2, the CFAT probabilities depend on the CFAT that occur in year 1. The estimated conditional CFAT and their associated conditional probabilities are as follows:

$CFAT_1 = \text{Rs } 80,000$		$CFAT_1 = \text{Rs } 1,10,000$		$CFAT_1 = \text{Rs } 1,50,000$	
$CFAT_2$	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

Construct a decision tree for the proposed investment proposal and answer the following:

- What NPV will the project yield if the worst outcome is realised? What is the probability of occurrence of this NPV?
- What will the NPV be if the best outcome occurs? What is its probability?
- Will the project be accepted?

## ANSWERS

**E.6.1** (a) Project A: NPV = Rs (19,783.2) (pessimistic) Rs 4,056 (most likely), Rs 29,598 (optimistic); Project B: Rs 1,501.80 (pessimistic), Rs 4,056 (most likely), Rs 8,313 (optimistic).

(b) Project A is more risky.

**E.6.2** (i) Project B

(ii) Project A (CE are lower)

(iii) Project A

<b>E.6.3</b>	Project	Return	Risk
	A	1 (NPV: Rs 3,255)	3 (CV: 1.178)
	B	3 (Rs 1,785)	1 (0.73)
	C	2 (Rs 2,510)	1 (0.818)

**E.6.4** (a) Rs 663

(b) Rs 622

(c) Rs 14.2%

(d) Rs 85.8%

(e) (i) 15.8%, (ii) 12.3%, (iii) 71.9%, (iv) 29.5%

**E.6.5** (i) NPV = Rs (5,800.8) (6%), (ii)  $\overline{\text{NPV}}$  = (Rs 20,004) (24%),

(ii) NPV = Rs 15,582.80

# 7 LEASING

## BASIC THEORY

### INTRODUCTION

Leasing is a contractual arrangement under which the owner of an asset (called the lessor) allows the use of the asset by the lessee in consideration for the lease rent. In other words, leasing arrangements provide an enterprise with the use and control of assets without having a title to them.

There is a wide variety of lease arrangements. Short-term or cancelable leases are referred to as operating leases, while long-term or non-cancelable leases are known as financial leases. A sale and lease back arrangement provides for the sale of the asset by the present owner to the lessor and at the same time retaining it for use. A leveraged or third party lease involves, besides the lessor and the lessee, a lender who ordinarily provides a major share of the asset's price. A direct lease involves the lease of the asset either directly from the manufacturer, or the lessee arranges for the desired equipment to be purchased by the leasing company.

### FINANCIAL EVALUATION

A leasing arrangement can be evaluated from the point of view of both the lessee and lessor. It can be viewed as a financing or investment decision.

#### Lessee's Perspective

There are two approaches to lease evaluation from the viewpoint of the lessee. They are summarised in Exhibits 7.1 and 7.2 respectively.

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#### **EXHIBIT 7.1** *Net Present Value of Cash Outflows Under Leasing and Buying Alternatives*

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- 1 Determine the after tax cash outflows for each year under the lease alternative. This is arrived at by multiplying the lease rental payment ( $L$ ) by  $(1 - \text{tax rate}, t)$ .
  - 2 Determine the after tax cash outflows for each year under the buying alternative based on borrowing, that is, Loan instalment (gross cash outflows, GCO) less tax ( $t$ ) advantage on interest ( $I$ ) component of loan instalment ( $I \times t$ ) Less tax shield due to depreciation allowance ( $D$ ) ( $D \times t$ ).
  - 3 Compare the present value (PV) of the cash outflows associated with leasing (step 1) and buying (step 2) alternatives by employing after tax cost of debt ( $k_d$ ) as the discount rate for the purpose.
  - 4 Select the alternative with the lower PV of cash outflows. Thus, the decision criterion is:

PV of cash outflows for leasing alternative	>	PV of cash outflows as per buying alternative	: Buy the asset
PV of cash outflows under leasing alternative.	<	PV of cash outflows as per buying alternative	: Lease the asset
-

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**EXHIBIT 7.2** *Net Advantage of Leasing (NAL)/Net Present Value of Leasing (NPV<sub>L</sub>) Approach*


---

**(A) Benefits from Leasing**

- (1) Investment cost of asset (saved)
  - (2) Plus PV of tax shield on lease payment, discounted by  $K_c$ , that is, post-tax marginal cost of capital
  - (3) Plus PV of tax shield on management fee, discounted by  $K_c$
- 

**(B) Cost of Leasing**

- (1) PV of lease rentals, discounted by  $K_d$ , that is, pre-tax cost of long-term debt
  - (2) Plus management fee
  - (3) Plus PV of depreciation shield, discounted by  $K_c$
  - (4) Plus PV of salvage value, discounted by  $K_c$
  - (5) Plus PV of interest shield, discounted by  $K_c$
- 

**(C) (A – B) NPV of Leasing [NPV(L)]/Net Advantage of Leasing (NAL)**

If NPV<sub>L</sub>/NAL is positive, leasing alternative is preferable

The break even lease rentals (BELR) from the angle of the lessee (indifference between leasing and borrowing or buying alternative) are computed as shown in Exhibit 7.3.

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**EXHIBIT 7.3** *Break Even Lease Rentals (BELR)*


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**(A) Benefits from Leasing**

- (i) Cost of the asset
  - (ii) Plus PV of the tax shield on lease rentals
- 

**(B) Cost of Leasing**

- (i) PV of lease rentals
  - (ii) Plus PV of tax shield foregone on depreciation
  - (iii) Plus PV of interest shield foregone on debt
  - (iv) Plus PV of salvage value
- 

**(C) A = B = BELR (NAL = Zero)****Lessor's Perspective**

The lessor will undertake the cost benefit analysis of leasing out the assets. He will agree to a leasing arrangement only when the asset earns a return which exceeds his weighted average cost of capital ( $K_o$ ). In other words, the after tax cash inflows accruing to him must generate a rate of return which is greater than  $K_o$ . The evaluation framework is summarised in Exhibits 7.4 to 7.6.

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**EXHIBIT 7.4** *Net Present Value of Cashflows*


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**1. Determination of Cash Outflows:**

Cost of the asset

**2. Determination of Cash Inflows (CFAT):**

Lease revenue (gross cash inflow)

Less tax on lease revenue

Add tax shield due to depreciation

**Alternatively,**

Lease revenue

Less depreciation

Earnings before taxes

---

(Contd.)

**Exhibit 7.4 (Contd.)**

Less taxes

Earnings after taxes

Add depreciation

**3. Determination of PV of CFAT:**

CFAT  $\times$  PV factor, using weighted average cost of capital ( $K_o$ )

**4. Selection:** If PV of cash inflows exceeds PV of cash outflows, the leasing of the asset is viable.**EXHIBIT 7.5** *Net Advantage of Leasing (NAL)/Net Present Value of Leasing ( $NPV_L$ )***(A) Benefits from Leasing**

- (1) PV of lease rentals, discounted by  $K_o$ , that is, the marginal weighted average cost of capital
- (2) Plus PV of tax shield on depreciation, discounted by  $K_o$
- (3) Plus PV of salvage value

**(B) Cost of Leasing**

- (1) Cost of asset/equipment including sales tax
- (2) Plus PV of tax payment on lease discounted by  $K_o$
- (3) Plus lease administration expenses, if any

**(C) (A – B) Net Advantage of Leasing (NAL)/Net Present Value of Leasing [ $NPV_L$ ]****EXHIBIT 7.6** *Break Even Lease Rentals (BELR)***(A) Cost of Leasing**

- (1) Cost of equipment inclusive of sales tax
- (2) Plus PV of tax payments on lease rentals, discounted by the marginal weighted cost of capital,  $K_o$

**(B) Benefits from Leasing**

- (1) PV of lease rentals, discounted by  $K_o$
- (2) Plus PV of tax shield on depreciation, discounted by  $K_o$
- (3) Plus PV of salvage value, discounted by  $K_o$

**(C) (A = B) = BELR (NAL = Zero)**

## SOLVED PROBLEMS

**PS 7.1**

The Hypothetical Equipments Ltd (HEL) has recently leased assets worth Rs 2,500 lakh from the Hypothetical Leasing Ltd (HLL). The following facts are available:

- (1) Lease period, 9 years, of which the first 6 years constitute the lease term;
- (2) Annual lease rates: First 6 years, Rs 360/Rs 1,000; Next 3 years, Rs 15/Rs 1,000;
- (3) Incremental borrowing rates for HEL, 22 per cent.
- (a) Assuming 14 years as the average economic life of the equipment, is the lease a finance lease or an operating lease?
- (b) Assuming further (i) physical life of 14 years, (ii) technological life of 9 years and (iii) product-market life of 11 years, how will you classify the lease?

### Solution

A lease is finance lease if one of the following two conditions is satisfied:

- (i) The lease term exceeds 75 per cent of the useful life of the equipment (the minimum of physical useful life, technological life and product market life).
  - (ii) The PV of lease payments exceeds 90 per cent of the fair market value of the equipment (cost of equipment), the discount rate being incremental borrowing rate in the case of lessee and cost of capital in the case of lessor.
- (a) (i) Term of lease is  $9/14$  years = 64 per cent.  
 (ii) *Determination of PV of lease payment (Rs in lakh)*

Year	Lease payment	Discount factor (0.22)	Total PV
1 – 6	900	3.167	Rs 2,850
7 – 9	37.5	0.62*	23
			<u>2,873</u>

\*(0.249 + 0.204 + 0.167)

The lease is finance lease as the PV of lease payment exceeds the cost of asset.

- (b) Finance lease as term of lease is  $9/9 = 100$  per cent.

### PS 7.2

In **PS 7.1**, assume the following:

- (1) Monthly lease rentals payable in advance; first 6 years: Rs 26/1,000; next 3 years, Rs 1.50/1,000;

- (2) Incremental borrowing rate of HEL, 23 per cent compounded monthly.  $\text{hint: } \frac{i(.23)}{(d)^{12}} = 1.121 \text{ (Table A-6)}$

What will be your answer to **PS 7.1** (a) and (b)?

### Solution

- (a) (i) Term of lease = 64 per cent.  
 (ii) *Determination of PV of lease payment*

– First 6 years:

$$\begin{aligned} & \text{Rs } 2,500 \text{ lakh} \times 0.026 \times 12 \times \text{PIVFA}_m(23, 6) \\ &= \text{Rs } 780 \text{ lakh} \times i/(d)^{12} \times \text{PVIFA}(i, 3) \text{ where } i = 0.23 \text{ and } d = \text{discount factor} \\ &= \text{Rs } 780 \text{ lakh} \times 1.121 \times 3.092 = \text{Rs } 2,703.6 \text{ lakh} \end{aligned}$$

– Next 3 years:

$$\begin{aligned} & \text{Rs } 2,500 \text{ lakh} \times 0.0015 \times 12 \times \text{PVIFA}_m(23, 7-9 \text{ years}) \\ &= \text{Rs } 45 \text{ lakh} \times 1.121 \times 12 \times [0.235 + 0.191 + 0.155] = \text{Rs } 351.7 \text{ lakh} \end{aligned}$$

– Total PV: Rs 2,703.6 lakh + Rs 351.7 lakh = Rs 3,055.3 lakh

The lease is a finance lease.

- (b) Finance lease.

### PS 7.3

For **PS 7.1**, assume (i) average economic life of the equipment, 10 years, (ii) salvage value, 10 per cent of the original cost, (iii) implicit rate of interest in lease, 25 per cent. Is it a finance lease?

### Solution

- (i) Term of lease is  $9/10$  years = 90 per cent.

(ii) *Determination of PV of lease payments (in lakh of Rs)*

Year	Lease payment	Discount factor (0.25)	Total PV
1 – 6	900	2.951	2,656
7 – 9	37.5	0.512*	19
10 (salvage value)	250	0.107	27
Total PV			2,702

\*(0.210 + 0.168 + 0.134)

The lease is finance lease as both the conditions of a finance lease are satisfied.

### PS 7.4

The following data are furnished by the Hypothetical Leasing Ltd (HLL):

Investment cost	Rs 500 lakh
Primary lease term	5 years
Estimated residual value after the primary period	Nil
Pre-tax required rate of return	24 per cent

The HLL seeks your help in determining the annual lease rentals under the following rental structures:

(a) Equated, (b) Stepped (an annual increase of 15 per cent), (c) Ballooned (annual rental of Rs 80 lakh for years 1–4) and (d) Deferred (2 years deferment period).

You are required to compute the relevant annual rentals.

### Solution

(a) *Equated annual lease rentals, Y:*

$$Y = \text{Investment cost} / \text{PVIFA}(24, 5 \text{ years}) = \text{Rs } 500 \text{ lakh} / 2.745 = \text{Rs } 182.15 \text{ lakh}$$

(b) *Stepped lease rental (assuming annual increase of 15 per cent annually), Y:*

$$Y \times \text{PVIF}(24, 1) + (1.15)Y \times \text{PVIF}(24, 2) + (1.15)^2 Y \times \text{PVIF}(24, 3) + (1.15)^3 Y \times \text{PVIF}(24, 4) + (1.15)^4 Y \times \text{PVIF}(24, 5) = \text{Rs } 500 \text{ lakh.}$$

$$\text{Or } 0.806Y + 0.7475Y + 0.693Y + 0.6433Y + 0.5894Y = \text{Rs } 500 \text{ lakh}$$

$$\text{Or } 3.4792Y = \text{Rs } 500 \text{ lakh or } Y = \text{Rs } 500 \text{ lakh} / 3.4792 = \text{Rs } 143.71 \text{ lakh}$$

*Lease rentals (year-wise) (in lakh of rupees):*

Year	1	2	3	4	5
Lease rent	143.71	165.26	190.05	218.56	251.34

(c) *Ballooned lease rental (Rs 80 lakh for years, 1 – 4)*

$$\text{Rs } 80 \text{ lakh} \times \text{PVIFA}(24, 4) + Y \times \text{PVIF}(24, 5) = \text{Rs } 500 \text{ lakh}$$

$$\text{Rs } 80 \text{ lakh} \times 2.404 + 0.341Y = \text{Rs } 500 \text{ lakh}$$

$$0.341Y = \text{Rs } 500 \text{ lakh} - \text{Rs } 192.32 \text{ lakh} = \text{Rs } 307.68 \text{ lakh}$$

$$\text{or } Y = \text{Rs } 307.68 / 0.341 = \text{Rs } 902.29 \text{ lakh (ballooned payment)}$$

(d) *Deferred lease rental (deferment of 2 years)*

Denoting  $Y$  as the equated annual rental to be charged between years 3–5,

$$Y \times \text{PVIF}(24, 3) + Y \times \text{PVIF}(24, 4) + Y \times \text{PVIF}(24, 5) = \text{Rs } 500 \text{ lakh}$$

$$0.524Y + 0.423Y + 0.341Y = \text{Rs } 500 \text{ lakh}$$

$$Y = \text{Rs } 500 \text{ lakh} / 1.288 = \text{Rs } 388.20 \text{ lakh.}$$

### PS 7.5

From the given facts relating to the Hypothetical Leasing Ltd, calculate the annual rentals under the following rental structure for the 6-year period;



- (a) Equated,
- (b) Stepped (annual increase of 12 per cent),
- (c) Ballooned (annual rental of Rs 15 lakh for year 1 and 2)
- (d) Deferred (deferment period of 1 year).

Investment cost	Rs 96 lakh
Primary lease term	3 years
Residual value	Nil
Pre-tax required rate of annual return	22 per cent

Assume that the lease can be renewed for an additional period of 3 years (secondary lease period). The lease rental for the secondary period will be 5 per cent of the rental charged during the primary period.

### Solution

- (a) *Equated annual lease rentals, Y*  
 $Y \times \text{PVIFA} (22, 3) + 0.05Y \times \text{PVIFA} (22, 4-6) = \text{Rs } 96 \text{ lakh}$   
 $2.042Y + 0.05625Y = \text{Rs } 96 \text{ lakh}$   
 $Y = \text{Rs } 96 \text{ lakh} / 2.09825 = \text{Rs } 45.75 \text{ lakh (primary lease period); Rs } 2.29 \text{ lakh (secondary lease period).}$
- (b) *Stepped lease rentals (annual increase of 12 per cent)*  
 $Y \times \text{PVIF} (22, 1) + 1.12Y \times \text{PVIF} (22, 2) + (1.12)^2Y \times \text{PVIF} (22, 3) + (1.12)^3Y \times \text{PVIF} (22, 4) + (1.12)^4Y \times \text{PVIF} (22, 5) + (1.12)^5Y \times \text{PVIF} (22, 6) = \text{Rs } 96 \text{ lakh}$   
 $\text{Or } 0.820Y + 0.7526Y + 0.6912Y + 0.6336Y + 0.5822Y + 0.534Y = \text{Rs } 96 \text{ lakh}$   
 $\text{Or } Y = \text{Rs } 96 \text{ lakh} / 4.0136 = \text{Rs } 23.92 \text{ lakh}$
- (c) *Ballooned lease rental (Rs 15 lakh for year 1–2)*  
 $\text{Rs } 15 \text{ lakh} \times \text{PVIFA} (22, 2) + Y \times \text{PVIF} (22, 3) + 0.5Y \times \text{PVIFA} (22, 4-6) = \text{Rs } 96 \text{ lakh}$   
 $\text{Rs } 22.38 \text{ lakh} + 0.658Y + 0.05625Y = \text{Rs } 96 \text{ lakh}$   
 $Y = \text{Rs } 96 \text{ lakh} - \text{Rs } 22.38 \text{ lakh} / 0.71425 = \text{Rs } 103.07 \text{ lakh}$
- (d) *Deferred lease rental (deferment of 1 year), Y*  
 $Y \times \text{PVIF} (22, 2) + Y \times \text{PVIF} (22, 3) + 0.5Y \times \text{PVIF} (22, 4-6) = \text{Rs } 96 \text{ lakh}$   
 $0.672Y + 0.551Y + 0.05625Y = \text{Rs } 96 \text{ lakh}$   
 $Y = \text{Rs } 96 \text{ lakh} / 1.2795 = \text{Rs } 75.04 \text{ lakh}$

### PS 7.6

XYZ Builders Ltd need to acquire the use of a crane for their construction business, and are considering buying or leasing a crane. The crane costs Rs 10,00,000, and is subject to the straight line method of depreciation to a zero salvage value at the end of 5 years. In contrast, the lease rent is Rs 2,20,000 per year to be paid in advance each year for 5 years. XYZ Builders Ltd can raise debt at 14 per cent payable in equal annual instalments, each instalment due at the beginning of the year. The company is in the 50 per cent tax bracket. Should it lease or buy the crane?

### Solution

*PV of cash outflows under leasing alternative*

Year	Lease payment	Tax shield (Lease sum $\times$ Tax rate: 0.50)	Cash outflows after taxes	PV factor at 0.07( $K_d$ )	Total PV
0	Rs 2,20,000	—	Rs 2,20,000	1.000	Rs 2,20,000
1–4	2,20,000	Rs 1,10,000	1,10,000	3.387	3,72,570
5	—	1,10,000	(1,10,000)	0.713	(78,430)
					5,14,140

(Contd.)

**Solution (Contd.)***Determination of interest and principal components of loan instalment*

Year	Loan instalment	Loan at the beginning of the year	Payment of		Principal outstanding at the end of the year (Col 3 – Col 5)
			Interest (Col 3 × 0.14)	Principal (Col 2 – Col 4)	
1	2	3	4	5	6
0	Rs 2,55,493*	Rs 10,00,000	—	Rs 2,55,493	Rs 7,44,507
1	2,55,493	7,44,507	Rs 1,04,231	1,51,262	5,93,245
2	2,55,493	5,93,245	83,054	1,72,439	4,20,806
3	2,55,493	4,20,806	58,913	1,96,580	2,24,226
4	2,55,493	2,24,226	31,267	2,24,226	—

\*Annual instalment of loan can be determined by solving the following equation:

$$\text{Rs } 10,00,000 = \sum_{t=0}^4 \frac{\text{Loan instalment}}{3.914 [2.914 + 1.0 (\text{PV factor for making payment in } t = 0)]}$$

Loan instalment = Rs 10,00,000/3.914 = Rs 2,55,493

*PV of cash outflows under buying alternative*

Year	Loan instalment	Tax advantage on		Cash outflows after taxes [Col 2 – (Col 3 + Col 4)]	PV factor at 0.07	Total PV
		Interest (I × t)	Depreciation (D × t)			
1	2	3	4	5	6	7
0	Rs 2,55,493	—	—	Rs 2,55,493	1.000	Rs 2,55,493
1	2,55,493	Rs 52,115	1,00,000	1,03,378	0.935	66,658
2	2,55,493	41,527	1,00,000	1,13,966	0.873	99,492
3	2,55,493	29,456	1,00,000	1,26,037	0.816	1,02,846
4	2,55,493	15,633	1,00,000	1,39,860	0.763	1,06,713
5	—	—	1,00,000	–1,00,000	0.713	–71,300
						5,59,902

**Recommendation:** The company is advised to opt for leasing as the total PV of cash outflows is lower (Rs 5,14,140) than that of the buying and borrowing option (Rs 5,59,902).

**PS 7.7**

An industrial unit desires to acquire a diesel generating set costing Rs 20 lakh which has an economic life of 10 years at the end of which the asset is not expected to have any residual value. The unit is considering the alternative choices of (a) taking the machinery on lease, or (b) purchasing the asset outright by raising a loan.

Lease payments are to be made in advance and the lessor requires the asset to be completely amortised over its useful period and the asset will yield him a return of 10 per cent.

The cost of debt is worked out at 16 per cent per annum. The lender requires the loan to be re-paid in 10 equal annual instalment becoming due at the beginning of the first year. Average rate of income tax is 50 per cent. It is expected that the operating costs would remain the same under either method. The firm follows straight line method of depreciation and the same is accepted for tax purposes. As a financial consultant, indicate what your advice will be.

**Solution***PV of cash outflows under leasing alternative*

Year end	Lease payment*	Tax shield	Cash outflows after taxes	PV factor [0.16 (1 - 0.5) = (0.08)]	Total present value
0	Rs 2,95,902	—	Rs 2,95,902	1.000	Rs 2,95,902
1–9	2,95,902	Rs 1,47,951	1,47,951	6.247	9,24,250
10	—	1,47,951	(1,47,951)	0.463	(68,501)
					11,51,651

\*Lease rental = Rs 20,00,000/6.759, or 5.759 + 1.0 (the PV factor for making payment in  $t = 0$ ) = Rs 2,95,902

*Schedule of debt payment*

Year-end	Loan instalment	Loan at the beginning of the year	Payments		Principal outstanding at the end of the year (Col 3 – Col 5)
			Interest on loan (Col 3 × 0.16)	Principal re-payment (Col 2 – Col 4)	
1	2	3	4	5	6
0	Rs 3,56,697*	Rs 20,00,000	—	Rs 3,56,697	Rs 16,43,303
1	3,56,697	16,43,303	Rs 2,62,928	93,769	15,49,534
2	3,56,697	15,49,534	2,47,925	1,08,772	14,40,762
3	3,56,697	14,40,762	2,30,522	1,26,175	13,14,587
4	3,56,697	13,14,587	2,10,334	1,46,363	11,68,224
5	3,56,697	11,68,224	1,86,916	1,69,781	9,98,443
6	3,56,697	9,98,443	1,59,751	1,96,946	8,01,497
7	3,56,697	8,01,497	1,28,240	2,28,457	5,73,040
8	3,56,697	5,73,040	91,686	2,65,011	3,08,029
9	3,56,697	3,08,029	48,668	3,08,029	—

\*Annual instalment of loan = Rs 20,00,000/5.607, that is, 4.607 + 1.0 (the PV factor for making payment in 0 year) = Rs 3,56,697.

*PV of cash outflows under buying alternative*

Year	Loan instalment	Tax advantage		Net cash outflows (Col 2 – Col 3 + 4)	PV factor at after tax cost of debt (0.08)	Total PV
		On interest $I(t = 0.5)$	On depreciation Rs 2,00,000 (0.08) × (0.5)			
1	2	3	4	5	6	7
0	Rs 3,56,697	—	—	Rs 3,56,697	1.000	Rs 3,56,697
1	3,56,697	Rs 1,31,464	Rs 1,00,000	1,25,233	0.926	1,15,966
2	3,56,697	1,23,962	1,00,000	1,32,735	0.857	1,13,754
3	3,56,697	1,15,261	1,00,000	1,41,436	0.794	1,12,300
4	3,56,697	1,05,167	1,00,000	1,51,530	0.735	1,11,375
5	3,56,697	93,458	1,00,000	1,63,239	0.681	1,11,166
6	3,56,697	79,875	1,00,000	1,76,822	0.630	1,11,398
7	3,56,697	64,120	1,00,000	1,92,557	0.583	1,12,272
8	3,56,697	45,843	1,00,000	2,10,854	0.540	1,13,861
9	3,56,697	24,334	1,00,000	2,32,363	0.500	1,16,181
10	—	—	1,00,000	(1,00,000)	0.463	(46,300)
						13,28,670

**Recommendation:** The company is advised to go for leasing of diesel generating set as the PV of cash outflows under leasing alternative is lower than that under buying alternative.

### PS 7.8

Alfa Ltd is thinking of installing a computer. Decide whether the computer is to be purchased outright (through 14 per cent borrowing) or to be acquired on lease rental basis. The company is in the 50 per cent tax bracket. The other data available are:

#### *Purchase of computer:*

Purchase price: Rs 20,00,000

Annual maintenance, (to be paid in advance), Rs 50,000 per year

Expected economic useful life, 6 years

Depreciation (for tax purposes), Straight line method

Salvage value: Rs 2,00,000

#### *Leasing of computer:*

Lease charges (to be paid in advance): Rs 4,50,000

Maintenance expense to be borne by lessor

*Payment of Loan:* 6 year-end equal instalments of Rs 5,14,271

### **Solution**

#### *PV of cash outflows under leasing alternative*

<i>Year-end</i>	<i>Lease payment (net)</i>	<i>Tax shield</i>	<i>Cash outflows after taxes</i>	<i>PV factor (0.07)</i>	<i>Total PV</i>
0	Rs 4,00,000*	—	Rs 4,00,000	1.000	Rs 4,00,000
1–5	4,00,000	Rs 2,00,000	2,00,000	4.100	8,20,000
6	—	2,00,000	(2,00,000)	0.666	(1,33,200)
					<u>10,86,800</u>

\*(Rs 4,50,000, lease rent – Rs 50,000 saving in maintenance expenses).

#### *Schedule of debt payment*

<i>Year end</i>	<i>Loan instalment</i>	<i>Loan at the beginning of the year</i>	<i>Payment</i>		<i>Principal outstanding at the end of the year (Col 3 – Col 5)</i>
			<i>Interest on loan (Col 3 × 0.14)</i>	<i>Principal re-payment (Col 2–Col 4)</i>	
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>
1	Rs 5,14,271	Rs 20,00,000	Rs 2,80,000	Rs 2,34,271	Rs 17,65,729
2	5,14,271	17,65,729	2,47,202	2,67,069	14,98,660
3	5,14,271	14,98,660	2,09,812	3,04,459	11,94,201
4	5,14,271	11,94,201	1,67,188	3,47,083	8,47,118
5	5,14,271	8,47,118	1,18,596	3,95,675	4,51,443
6	5,14,271	4,51,443	62,828	4,51,443	—

(Contd.)

**Solution (Contd.)***PV of after tax cash outflows under buying alternative*

Year-end	Loan instalment	Tax advantage on interest	Tax advantage on depreciation	Net cash outflows (Col 2 – Col 3 + 4)	PV factor at after tax cost of debt (0.07)	Total PV
1	2	3	4	5	6	7
1	Rs 5,14,271	Rs 1,40,000	Rs 1,50,000	Rs 2,24,271	0.935	Rs 2,09,693
2	5,14,271	1,23,601	1,50,000	2,40,670	0.873	2,10,105
3	5,14,271	1,04,906	1,50,000	2,59,365	0.816	2,11,642
4	5,14,271	83,594	1,50,000	2,80,677	0.763	2,14,157
5	5,14,271	59,298	1,50,000	3,04,973	0.713	2,17,446
6	5,14,271	31,414	1,50,000	3,32,857	0.666	2,21,683
						12,84,726
						(1,33,200)
						11,51,526

Less PV of salvage value (Rs 2,00,000 × 0.666)

Net cash outflows under buying alternative

**Recommendation:** Computer should be acquired on lease basis.**PS 7.9**

ABC Machine Tool Company Ltd is considering the acquisition of a large equipment to set up its factory in a backward region for Rs 12,00,000. The equipment is expected to have an economic useful life of 8 years. The equipment can be financed either with an 8-year term loan at 14 per cent interest, repayable in equal instalments of Rs 2,58,676 per year, or by an equivalent amount of lease rent per year. In both cases, payments are due at the end of the year. The equipment is subject to the straight line method of depreciation for tax purposes. Assuming no salvage value after the 8-year useful life and 50 per cent tax rate, which of the financing alternatives should it select?

**Solution***PV of cash inflows under leasing alternative*

Year end	Lease payment after taxes (L) (1 – 0.5)	PV factor at 0.07 ( $K_d$ )	Total PV
1–8	Rs 1,29,338	5.971	Rs 7,72,277

*Determination of interest and principal components of loan instalment*

Year end	Loan instalment	Loan at the beginning of the year	Payment of		Principal outstanding at the end of the year (Col 3 – Col 5)
			interest (Col 3 × 0.14)	principal (Col 2 – Col 4)	
1	2	3	4	5	6
1	Rs 2,58,676	Rs 12,00,000	Rs 1,68,000	Rs 90,676	Rs 11,09,324
2	2,58,676	11,09,324	1,55,305	1,03,371	10,05,953
3	2,58,676	10,05,953	1,40,833	1,17,843	8,88,110
4	2,58,676	8,88,110	1,24,335	1,34,341	7,53,769
5	2,58,676	7,53,769	1,05,528	1,53,148	6,00,621
6	2,58,676	6,00,621	84,087	1,74,589	4,26,032
7	2,58,676	4,26,032	59,644	1,99,032	2,27,000
8	2,58,676	2,27,000	31,676	2,27,000	—

*PV of cash outflows under buying alternative*

Year	Loan instalment	Tax advantage on		Cash outflows after taxes [Col 2 – (Col 3 + Col 4)]	PV factor at 0.07	Total PV
		interest ( $I \times t$ )	depreciation ( $D \times t$ )			
1	2	3	4	5	6	7
1	Rs 2,58,676	Rs 84,000	Rs 75,000	Rs 99,676	0.935	Rs 93,197
2	2,58,676	77,652	75,000	1,06,024	0.873	92,559
3	2,58,676	70,416	75,000	1,13,260	0.816	92,420
4	2,58,676	62,167	75,000	1,21,509	0.763	92,711
5	2,58,676	52,764	75,000	1,30,912	0.713	93,340
6	2,58,676	42,043	75,000	1,41,633	0.666	94,328
7	2,58,676	29,822	75,000	1,53,854	0.623	95,851
8	2,58,676	15,838	75,000	1,67,838	0.582	97,682
						7,52,088

**Recommendation:** The borrowing (buying) alternative of financing the purchase of the large equipment should be selected.

**PS 7.10**

For **PS 7.9** compute the net advantage of leasing (NAL) to the lessee assuming (i) The company follows written down value method of depreciation, the depreciation rate being 25 per cent; (ii) The corporate tax is 35 per cent; (iii) Post-tax marginal cost of capital ( $K_c$ ) is 12 per cent and (iv) The company has several assets in the asset block of 25 per cent.

**Solution***Computation of NAL to the lessee***Benefits from lease:**

Cost of the equipment (investment saved)	Rs 12,00,000
PV of tax shield on lease rentals (working note 2)	4,49,786
<b>Total</b>	<b>16,49,786</b>

**Cost of lease:**

PV of lease rental (1)	11,99,998
PV of tax shield foregone on depreciation (3)	2,72,333
PV of interest tax shield foregone on debt (4)	2,08,381
<b>Total</b>	<b>16,80,712</b>
<b>NAL</b>	<b>(30,926)</b>

The lease is not financially viable.

**Working notes**

(1) *PV of lease rentals:* Lease rentals  $\times$  PVIFA (14,8) = Rs 2,58,676  $\times$  4.639 = Rs 11,99,998.

(2) *PV of tax shield on lease rentals:* Lease rentals  $\times$  tax rate  $\times$  PVIFA (12,8) = Rs 2,58,676  $\times$  0.35  $\times$  4.968 = Rs 4,49,786

(3) *PV of tax shield foregone on depreciation*

Year	Depreciation	Tax shield	PV factor (at 0.12)	Total PV
1	Rs 3,00,000	Rs 1,05,000	0.893	Rs 93,765
2	2,25,000	78,750	0.797	62,764
3	1,68,750	59,062	0.712	42,052
4	1,26,562	44,297	0.636	28,173
5	94,922	33,223	0.567	18,837
6	71,191	24,917	0.507	12,633
7	53,393	18,688	0.452	8,447
8	40,045	14,016	0.404	5,662
				<u>2,72,333</u>

(4) *PV of interest tax shield*

Year	Interest	Tax shield	PV factor (at 0.12)	Total PV
1	Rs 1,68,000	Rs 58,800	0.893	Rs 52,508
2	1,55,305	54,357	0.797	43,322
3	1,40,833	49,292	0.712	35,096
4	1,24,335	43,517	0.636	27,677
5	1,05,528	36,935	0.567	20,942
6	84,087	29,430	0.507	14,921
7	59,644	20,875	0.452	9,436
8	31,676	11,087	0.404	4,479
				<u>2,08,381</u>

**PS 7.11**

For facts in **PS 7.10**, determine the break even lease rentals (BELR) for the lessee.

***Solution****Computation of BELR**Benefits from lease:*

Cost of the equipment	Rs 12,00,000
PV of tax shield on lease rentals (working note 2)	<u>1.62365L</u>

*Cost of lease:*

PV of lease rentals (note 1)	4.639L
PV of tax shield foregone on depreciation	2,72,333
PV of interest tax shield foregone on debt	<u>2,08,381</u>

$$BELR (L) = 4.639L + Rs\ 4,80,714 = 1.62365L + Rs\ 12,00,000$$

$$4.639L - 1.62365L = Rs\ 12,00,000 - Rs\ 4,80,714$$

$$L = Rs\ 7,19,286 / 3.01535 = Rs\ 2,38,541$$

**Working notes**

(i) *PV of lease rentals:*  $L \times PVIFA (14,8) = 4.639 \times L = 4.639L$

(ii) *PV of tax shield on lease rentals:*  $L \times PVIFA (14,8) \times \text{tax rate} = 4.639L \times 0.35 = 1.62365L$

**PS 7.12**

Mr X, the Finance Manager of ABC Ltd, had almost decided to finance the purchase of Rs 20 lakh in new computer equipment with 16 % long-term debt when he was contacted by First Leasing Company Ltd. The manager of the leasing company tried to convince Mr X that leasing the equipment would be more beneficial to ABC Ltd.

If ABC borrowed, the firm would be required to pay 16 per cent interest on the borrowed funds plus an annual sinking fund payment of Rs 2,00,000. The equipment has an expected life of 10 years, with an anticipated salvage value of Rs 4,00,000. The firm uses the straight line method of depreciation, and is in the 50 per cent tax bracket.

The leasing company is willing to lease the equipment for Rs 3,80,000 per year. Further, it was stressed that the lease payments were fully tax deductible, while debt repayment was not.

Mr X seeks your advice before committing to lease the computer equipment. What advise would you, as a financial consultant, give to the finance manager of ABC Ltd?

**Solution**

*PV of cash outflows under leasing alternative*

Year end	Lease payment after taxes (L) (1 – 0.5)	PV factor (0.08)	Total PV
1–10	Rs 1,90,000	6.710	Rs 12,74,900

*PV of cash outflows under buying alternative*

Year-end	Total payment			Tax advantage on			Cash outflows after taxes (Col 4 – Col 7)	PV factor (0.08)	Total PV
	Principal	Interest (0.16)*	Total	Interest (I × 0.50)	Depreciation (D × 0.50)*	Total			
1	2	3	4	5	6	7	8	9	10
1	Rs 2,00,000	Rs 3,20,000	Rs 5,20,000	Rs 1,60,000	Rs 80,000**	Rs 2,40,000	Rs 2,80,000	0.926	Rs 2,59,280
2	2,00,000	2,88,000	4,88,000	1,44,000	80,000	2,24,000	2,64,000	0.857	2,26,248
3	2,00,000	2,56,000	4,56,000	1,28,000	80,000	2,08,000	2,48,000	0.794	1,96,912
4	2,00,000	2,24,000	4,24,000	1,12,000	80,000	1,92,000	2,32,000	0.735	1,70,520
5	2,00,000	1,92,000	3,92,000	96,000	80,000	1,76,000	2,16,000	0.681	1,47,096
6	2,00,000	1,60,000	3,60,000	80,000	80,000	1,60,000	2,00,000	0.630	1,26,000
7	2,00,000	1,28,000	3,28,000	64,000	80,000	1,44,000	1,84,000	0.583	1,07,272
8	2,00,000	96,000	2,96,000	48,000	80,000	1,28,000	1,68,000	0.540	90,720
9	2,00,000	64,000	2,64,000	32,000	80,000	1,12,000	1,52,000	0.500	76,000
10	2,00,000	32,000	2,32,000	16,000	80,000	96,000	1,36,000	0.463	62,968
11	Salvage value	—	—	—	—	—	(4,00,000)	0.463	(1,85,200)
									12,77,816

\* Interest is charged on the principal sum outstanding at the beginning of the year.

\* Depreciation = (Rs 20 lakh – Rs 4 lakh) ÷ 10 years = Rs 1,60,000 × 0.50

**Recommendation :** Lease alternative is better.

**PS 7.13**

Hypothetical Limited is contemplating having an access to a machine for a period of 5 years. Discussions with various financial institutions have shown that the company can have the use of machine for the stipulated period through leasing arrangement, or the requisite amount can be borrowed at 14 per cent to buy the machine. The firm is in the 50 per cent tax bracket. In case of leasing, the firm would be required to pay an annual end-of-year rent of Rs 1,20,000 for 5 years. All maintenance, insurance and other costs are to be borne by the lessee.



In the case of purchase of the machine (which costs Rs 3,43,300), the firm would have a 14 %, 5-year loan, to be paid in 5 equal instalments, each instalment becoming due at the end of each year. The machine would be depreciated on a straight line basis for tax purposes, with no salvage value.

Advise the company regarding the option it should go for, assuming lease rentals are paid (a) at the end of the year (b) in advance.

### Solution

(a) *PV of cash outflows under leasing alternative (year-end payment of lease rentals)*

Year-end	Lease payment (L) after tax	PV factor at after tax cost of debt (0.07)	Total PV of lease payments Col (2) × Col (3)
1	2	3	4
1–5	Rs 60,000	4.100	Rs 2,46,000

*Determination of the interest and principal components of loan instalment*

Year-end	Loan instalment	Loan at the beginning of the year	Payment		Principal out- standing at the end of the year (Col 3 – Col 5)
			Interest on loan (Col 3 × 0.14)	Principal re-payment (Col 2–Col 4)	
1	2	3	4	5	6
1	Rs 1,00,000*	Rs 3,43,300	Rs 48,062	Rs 51,938	Rs 2,91,362
2	1,00,000	2,91,362	40,791	59,209	2,32,153
3	1,00,000	2,32,153	32,501	67,499	1,64,654
4	1,00,000	1,64,654	23,052	76,948	87,706
5	1,00,000	87,706	12,294	87,706	—

\*Determination of loan instalment: Amount of loan/ PVIFA(14,5) = Rs 3,43,300/3.433 = Rs 1,00,000

*PV of cash outflows after tax under buying (borrowing) alternative*

Year-end	Loan instalment	Tax advantage on interest payment	Tax advantage on depreciation	Net cash outflows (Col 2 – Col 3 + 4)	PV factor at after- tax cost of debt (0.07)	PV of buying alternative
1	2	3	4	5	6	7
1	Rs 1,00,000	Rs 24,031	Rs 34,330	Rs 41,639	0.935	Rs 38,932
2	1,00,000	20,395	34,330	45,275	0.873	39,525
3	1,00,000	16,250	34,330	49,420	0.816	40,327
4	1,00,000	11,526	34,330	54,144	0.763	41,312
5	1,00,000	6,147	34,330	59,523	0.713	42,440
				Total		2,02,536

**Recommendation:** Since the PV of cash outflows for buying/borrowing (Rs 2,02,536) is lower than that of leasing (Rs 2,46,000), the buying alternative is preferred.

(b) *PV of cash outflows under leasing alternative, when lease rental is paid in advance*

Year-end	Lease payment	Tax shield	Cash outflows after taxes	PV factor (0.07)	Total PV
1	2	3	4	5	6
0	Rs 1,20,000	—	Rs 1,20,000	1.000	Rs 1,20,000
1–4	1,20,000	Rs 60,000	60,000	3.387	2,03,220
5	—	60,000	(60,000)	0.713	(42,780)
					<u>2,80,440</u>

**Recommendation:** Buying alternative is better.

### PS 7.14

For the Hypothetical Ltd in **PS 7.13** assume, (i) The company follows written down value method of depreciation, the depreciation rate being 25 per cent. There is no other asset in this asset block; (ii) The corporate tax rate is 35 per cent; (iii) Post-tax marginal cost of capital is 10 per cent; (iv) Salvage value, Rs 40,000 at the end of 5th year.

Compute the NAL to the lessee if lease rentals are paid (a) at the end of the year (b) in advance.

### Solution

(a) *Computation of NAL (lease rentals are paid in arrear, that is, at the year-end)*

*Benefits from leasing:*

Cost of the machine	Rs 3,43,300
PV of tax shield on lease rentals (working note 2)	<u>1,59,222</u>

Total	<u>5,02,522</u>
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*Cost of leasing:*

PV of lease rentals (1)	4,11,960
PV of tax shield foregone on depreciation (3)	67,259
PV of interest tax shield foregone on debt (4)	43,810
PV of salvage proceeds (Rs 40,000 × 0.621)	24,840
PV of tax shield on short-term capital loss (5)	<u>24,018</u>

Total	<u>5,71,887</u>
NAL	<u>(69,365)</u>

**Recommendation:** Leasing is not financially viable.

### Working notes

(1) *PV of lease rentals:* Lease rentals × PVIFA (14,5) = Rs 1,20,000 × 3.433 = Rs 4,11,960

(2) *PV of tax shield on lease rentals:* Rs 1,20,000 × 0.35 × 3.791 = Rs 1,59,222

(3) *PV of shield foregone on depreciation*

Year	Depreciation*	Tax shield	PV factor (at 0.10)	Total PV
1	Rs 85,825	Rs 30,039	0.909	Rs 27,305
2	64,369	22,529	0.826	18,609
3	48,277	16,897	0.751	12,690
4	36,207	12,672	0.683	8,655
				<u>67,259</u>

\*No depreciation is to be charged in 5<sup>th</sup> year as the block of assets ceases to exist.

(4) *PV of interest tax shield*

Year	Interest	Tax shield	PV factor (at 0.12)	Total PV
1	Rs 48,062	Rs 16,822	0.909	Rs 15,291
2	40,791	14,277	0.826	11,793
3	32,501	11,375	0.751	8,543
4	23,052	8,068	0.683	5,511
5	12,294	4,303	0.621	2,672
				<u>43,810</u>

(5) *PV of tax shield on short-term capital loss:* (Cost of machine – Accumulated depreciation – Salvage value)  $\times t =$  (Rs 3,43,000 – Rs 2,34,678 – Rs 40,000)  $\times 0.35 =$  Rs 68,622  $\times 0.35 =$  Rs 24,018.

(b) *Computation of NAL (lease rentals are paid in advance)*

**Benefits from leasing:**

Cost of the machine	Rs 3,43,300
PV of tax shield on lease rentals	1,59,222
Total	<u>5,02,522</u>

**Cost of leasing:**

PV of lease rentals (1)	4,69,680
PV of tax shield foregone on depreciation	67,259
PV of interest tax shield foregone on debt	43,810
PV of salvage proceeds	24,840
PV of tax shield on short-term capital loss	24,018
Total	<u>6,29,607</u>
NAL	<u>(1,27,085)</u>

**Recommendation:** Leasing is not financially viable.

**Working notes**

(1) *PV of lease rentals:*

Year	Lease payment	PV factor (at 0.14)	Total PV
0	Rs 1,20,000	1.000	Rs 1,20,000
1–4	1,20,000	2.914	3,49,680
			<u>4,69,680</u>

**PS 7.15**

For the facts in **PS 7.14**, determine the break even lease rental (BELR) for the lessee in both the situations.

**Solution**

(a) *Computation of BELR (lease rents are paid at the end of the year)*

**Benefits from leasing:**

Cost of the machine	Rs 3,43,300
PV of tax shield on lease rentals (2)	<u>1.20155L</u>

**Cost of leasing:**

PV of lease rentals (1)	3.433L
PV of tax shield foregone on depreciation	Rs 67,259
PV of interest tax shield foregone on debt	43,810

(Contd.)

**Solution (Contd.)**

PV of salvage proceeds	24,840	
PV of tax shield on short-term capital loss	<u>24,018</u>	<u>1,59,927</u>
BELR (L) = Rs 3,43,300 + 1.20155L = 3.433L + Rs 1,59,927		
2.23145L = Rs 1,83,373		
L = Rs 82,177		

**Working notes**

- (1) *PV of lease rentals:*  $L \times \text{PVIFA} (14,5) = 3.433 \times L = 3.433L$   
 (2) *PV of tax shield on lease rentals:*  $3.433L \times \text{tax rate} = 3.433L \times 0.35 = 1.20155L$   
 (b) *BELR (lease rents paid in advance)*

**Benefits from leasing**

Cost of the machine	Rs 3,43,300
PV of tax shield on lease rentals (2)	<u>1.3699L</u>

**Cost of leasing**

PV of lease rentals (1)	3.914L
Other costs (already computed)	<u>1,59,927</u>

BELR(L) = Rs 3,43,300 + 1.3699L = 3.914L + Rs 1,59,927  
 2.5441L = Rs 1,83,373  
 L = Rs 1,83,373/2.5441 = Rs 72,078

**Working notes**

- (1) *PV of lease rentals* =  $3.914 \times L = 3.914L$ ,  $\text{PVIFA} = 2.914$  (years, 1–4) + 1 (year 0) = 3.914  
 (2) *PV of tax shield on lease rentals:*  $3.914L \times 0.35 = 1.3699L$

**PS 7.16**

Hypothetical Ltd is expanding its facilities. In the coming year, the company will either purchase or lease equipment which it plans to use for 4 years and then replace it with a new one. Its current tax bracket is 50 per cent. The other data are as follows:

**Purchase:** (i) The purchase price of the equipment is Rs 40,00,000, (ii) The expected salvage value after 4 years is Rs 10,00,000, (iii) The equipment is subject to the straight line method of depreciation, (iv) Funds to finance the equipment can be obtained at 16 per cent, (v) The loan is to be repaid in four equal annual instalments due at the end of each year, (vi) The equipment will increase the annual revenues by Rs 30,00,000, and increase annual cash operating costs by Rs 20,00,000.

**Leasing:** (i) The annual lease is Rs 10,00,000, (ii) The lease rent is payable at the end of each year for 4 years, (iii) The equipment will increase annual revenues by Rs 30,00,000 and increase annual non-depreciation operating costs by Rs 19,00,000, as the lessor will pay Rs 1,00,000 for the maintenance costs associated with the equipment.

Determine whether the company should purchase or lease the equipment.

**Solution*****PV of cash outflows under leasing alternative***

Year-end	Effective lease payment					PV factor (0.08)	Total PV
	Gross	Savings in main- tenance costs	Net (Col 2 – Col 3)	Tax shield (Col 4 x 0.50)	Cash outflows after taxes		
1	2	3	4	5	6	7	8
1–4	Rs 10,00,000	Rs 1,00,000	Rs 9,00,000	Rs 4,50,000	Rs 4,50,000	3.312	Rs 14,90,400

*Determination of interest and principal components of loan instalment*

Year-end	Loan instalment	Loan at the beginning	Payment of		Principal out-standing at the end of the year
			Interest (Col 3 $\times$ 0.16)	Principal (Col 2 – Col 4)	
1	2	3	4	5	6
1	Rs 14,29,593*	Rs 40,00,000	Rs 6,40,000	Rs 7,89,593	Rs 32,10,407
2	14,29,593	32,10,407	5,13,665	9,15,928	22,94,497
3	14,29,593	22,94,479	3,67,117	10,62,476	12,32,003
4	14,29,593	12,32,003	1,97,590	12,32,003	—

\*Rs 40,00,000  $\div$  2.798 that is, PV annuity factor of 4 years at 16 per cent.

*PV of cash outflows under buying alternative*

Year	Loan instalment	Interest ( $I \times t$ )	Depreciation ( $D \times t$ )	Cash outflows after taxes [Col 2 – (Col 3 + Col 4)]	PV factor (0.08)	Total PV
1	2	3	4	5	6	7
1	Rs 14,29,593	Rs 3,20,000	Rs 3,75,000	Rs 7,34,593	0.926	Rs 6,80,233
2	14,29,593	2,56,832	3,75,000	7,97,761	0.857	6,83,681
3	14,29,593	1,83,558	3,75,000	8,71,035	0.794	6,91,602
4	14,29,593	98,795	3,75,000	9,55,798	0.735	7,02,512
4	Salvage value	—	—	(10,00,000)	0.735	(7,35,000)
						20,23,028

**Recommendation:** The lease alternative is better, as it is a cheaper source of finance than debt in terms of the NPV of the cash outflows.

**PS 7.17**

HB Finance Ltd is considering entering the computer leasing business. Miniframe computers can be purchased for Rs 2,00,000 each and, in turn, be leased out at Rs 50,000 per year for 8 years with the initial payment occurring at the end of the first year. You may ignore taxes and depreciation.

- Estimate the annual before expense and tax IRR for the company.
- What should be the yearly payment charged by the company in order to earn a 20 per cent annual compound rate of return before expenses and taxes?
- Assume that the firm uses the straight line method of depreciation, there is no salvage value, the annual expenses are Rs 20,000, and the tax rate is 35 per cent. Calculate the yearly lease payment in order to enable the firm to earn 20 per cent after tax annual compound rate of return.
- Further, assume that the computer has a resale value of Rs 40,000. Determine the revised lease rent to enable the firm to earn 20 per cent.

**Solution**

- Determination of IRR*

PB period = Cash outflows (Rs 2,00,000)/Cash inflows per year (Rs 50,000) = 4.000

The PV factor closest to 4.000 corresponding to 8 years is 4.078 at 18 per cent. Accordingly, IRR = 18 per cent.

- Desired lease rent to earn 20 per cent IRR before expenses and taxes*

Cash outflows (Rs 2,00,000)/PV factor annuity (20,8) 3.837 = Rs 52,124

(iii) *Desired lease rental to earn 20 per cent IRR after expenses and taxes*

$$PVf_r[(X - E - D)(I - t) + D] = CO$$

$PVf_r$  = Relevant PV factor in terms of annuity of Re 1 for the life of the project (8 years) at the rate of discount (0.20)

$X$  = Desired lease rent

$E$  = Expenses

$D$  = Depreciation

$CO$  = Cost of the equipment

Substituting the values, we have,

$$3.837 [(X - \text{Rs } 20,000 - \text{Rs } 25,000) (1 - 0.35) + \text{Rs } 25,000] = \text{Rs } 2,00,000$$

$$3.837 [(X - \text{Rs } 45,000) \times 0.65 + \text{Rs } 25,000] = \text{Rs } 2,00,000$$

$$3.837 [0.65X - \text{Rs } 29,250 + \text{Rs } 25,000] = \text{Rs } 2,00,000$$

$$2.49405X + \text{Rs } 16,307 = \text{Rs } 2,00,000$$

$$X = \text{Rs } 2,16,307 / 2.49405 = \text{Rs } 86,729$$

*Confirmation table*

Lease rent		Rs 86,729
Less: expenses	Rs 20,000	
depreciation	<u>25,000</u>	<u>45,000</u>
EBT		41,729
Less taxes (0.35)		<u>14,605</u>
EAT (Earnings after taxes)		27,124
Add depreciation		<u>25,000</u>
CFAT ( $t = 1 - 8$ )		<u>52,124</u>
Rs 2,00,000 ÷ Rs 52,124 = 3.837, or 0.20 (20 per cent)		

(iv) *Desired lease rent to earn 20 per cent when salvage value is given*

$$PVf_r[(X - E - D)(I - t) + D] + (PVf_s \times SV) = CO$$

$PVf_s$  = PV factor of Re. 1 in the year of the sale of plant (8 years) at 20 per cent rate of discount

$SV$  = Salvage value

Substituting the values, we have

$$3.837 [(X - \text{Rs } 20,000 - \text{Rs } 20,000) \times 0.65 + \text{Rs } 20,000] + (\text{Rs } 40,000 \times 0.233) = \text{Rs } 2,00,000$$

$$3.837 [(X - \text{Rs } 40,000) \times 0.65 + \text{Rs } 20,000] + 9,320 = \text{Rs } 2,00,000$$

$$3.837 [0.65X - \text{Rs } 26,000 + \text{Rs } 20,000] + \text{Rs } 9,320 = \text{Rs } 2,00,000$$

$$2.49405X - \text{Rs } 23,022 + \text{Rs } 9,320 = \text{Rs } 2,00,000$$

$$X = \text{Rs } 2,13,702 / 2.49405 = \text{Rs } 85,685$$

*Confirmation table*

Lease rent		Rs 85,685
Less: expenses	Rs 20,000	
depreciation	<u>20,000</u>	<u>40,000</u>
EBT		45,685
Less taxes		<u>15,990</u>
EAT		29,695
Add depreciation		<u>20,000</u>
CFAT		<u>49,695</u>
CO - PV of salvage value/CFAT = Rs 2,00,000 - Rs 9,320/Rs 49,695 = 3.837 or 20 per cent.		

**PS 7.18**

The Hypothetical Manufacturers Ltd (HML) has under consideration investment in a project. The cost of the equipment estimated to be Rs 900 lakh plus 4 per cent central sales tax (CST). The useful life of the equipment is 5 years, with a salvage value of 40 per cent of the book value after 5 years. The depreciation relevant for tax purposes is 25 per cent. The HML has other assets in this block of 25 per cent. The investment is likely to generate an incremental earnings before depreciation, interest and tax of Rs 720 lakh per annum for the first 3 years and Rs 480 lakh per annum for the last 2 years.

The HML has two alternatives to choose from to finance the equipment:

Alternative I: Leasing of the equipment from the Hypothetical Leasing Ltd (HLL). The lease rental for a 5-year non-cancellable lease is Rs 27 pmpt (per month per thousand) payable in arrears (at the end of the year). The purchase of the equipment by the HLL is subject to a CST of 10 per cent.

Alternative II: Borrow and buy the equipment at 20 per cent per annum. The debt is repayable in 5 equated annual instalment payable at the end of the year. The target debt-equity ratio of the HML is 2:1. Its cost of debt may be assumed to be 20 per cent while the cost of equity is 22 per cent. The marginal tax rate of HML is 35 per cent.

You are required to compute the BELR for the lessee (HML). Should it buy or lease the equipment?

**Solution**

*Computation of BELR (L) for the lessee (Rs lakh)*

**Benefits of leasing:**

Investment cost (saved)	936
PV of tax shield on lease rentals (working note 2)	13.75L

**Cost of leasing:**

PV of lease rentals (note 1)	39.66L
PV of tax shield foregone on depreciation (3)	177.18
PV of the interest tax shield foregone on debt	6.58L
PV of salvage value (5)	178.21

Rs 936 lakh + 13.75L = 39.66L + 6.58L + Rs 177.18 lakh + 178.12 lakh

Or 32.49L = Rs 580.61 lakh or  $L = \text{Rs } 580.61/32.49 = \text{Rs } 17.87 \text{ lakh per month}$

**Working notes**

(1)  $PV \text{ of lease rentals} = 12L \times i/d^{(12)} \times PVIFA(20,5) = 12L \times 1.015 \times 2.991 = 39.66L$

(2)  $PV \text{ of tax shield on lease rentals} = 12L \times PVIFA(16^*,5) \times 0.35 = 13.75L$

\*0.16 = (cost of debt,  $0.13 \times 2/3$ ) + (cost of equity,  $0.22 \times 1/3$ )

(3)  $PV \text{ of tax shield foregone on depreciation (Rs lakh)}$

Depreciation	(Tax shield $\times$ PVf)	PV of tax shield
234	(81.90 $\times$ 0.862)	70.6
175	(61.25 $\times$ 0.743)	45.51
132	(46.20 $\times$ 0.641)	29.61
99	(34.65 $\times$ 0.552)	19.13
74	(25.90 $\times$ 0.476)	12.33
		177.18

(4)  $PV \text{ of interest on tax shield}$ :

(a) Equated annual instalment = Amount borrowed/PVIFA(20,5) =  $39.66L/2.991 = \text{Rs } 13.26L$

## (b) Debt repayment schedule (Rs lakh)

Year	Amount outstanding at the beginning	Interest content (at 0.20)	Capital content	Instalment
1	39.66L	7.93L	5.33L	13.26L
2	34.33L	6.87L	6.39L	13.26L
3	27.94L	5.59L	7.67L	13.26L
4	20.27L	4.05L	9.21L	13.26L
5	11.06L	2.20L	11.06L	13.26L

(c) PV of interest tax shield:  $[(7.93L \times 0.862) + (6.87L \times 0.743) + (5.59L \times 0.641) + (4.05L \times 0.552) + (2.20L \times 0.476)] \times 0.35 = (6.84L + 5.10L + 3.58L + 2.24L + 1.05L) \times 0.35 = 6.58L$

(5) PV of salvage value: Rs 936 lakh  $\times 0.4 \times 0.476 =$  Rs 178.21 lakh

**PS 7.19**

For the Hypothetical Manufacturers Ltd (HIM) of **PS 7.18** compute the NAL to the lessee. Is the lease economically viable?

**Solution**

Computation of NAL to the lessee (in lakh of rupees)

**Benefits from leasing:**

Investment cost (saved)	936
PV of tax shield on lease rentals (2)	367.57
Total	1,303.57

**Cost of leasing:**

PV of lease rentals (working note 1)	1,064.93
PV of tax shield foregone on depreciation	177.18
PV of the interest tax shield foregone on debt (3)	176.73
PV of salvage value	178.21
Total	1,597.05

NAL (Rs 1,303.57 – Rs 1,597.05) (293.48)

Since NAL is negative, the lease is economically not viable.

**Working notes**

(1) PV of lease rentals:  $(Rs\ 990\ \text{lakh} \times 0.027 \times 12\ \text{months}) \times i/d^{12} \times PVIFA(20,5) = Rs\ 320.76\ \text{lakh} \times 1.11 \times 2.991 = Rs\ 1,064.93\ \text{lakh}$

(2) PV of tax shield on lease rentals:  $(Rs\ 320.76\ \text{lakh} \times 0.35) \times PVIFA(16,5) = Rs\ 112.27\ \text{lakh} \times 3.274 = Rs\ 367.57\ \text{lakh}$

(3)(a) Debt repayment schedule

Year	Amount outstanding at the beginning	Interest content (at 0.20)	Capital content	Instalment*
1	1,064.93	212.99	143.05	356.04
2	921.88	184.38	171.66	356.04
3	750.22	150.04	206.00	356.04
4	544.22	108.84	247.20	356.04
5	297.02	59.02	297.02	356.04

\*Rs 1,064.93/2.991 = Rs 356.04



(3) (b) *PV of interest tax shield (in lakh of Rs)*

$$[(Rs\ 212.99 \times 0.862) + (Rs\ 184.38 \times 0.743) + (Rs\ 150.04 \times 0.641) + (Rs\ 108.84 \times 0.552) + (Rs\ 59.02 \times 0.476)] \times 0.35 \\ = (Rs\ 183.60 + Rs\ 137 + Rs\ 96.18 + Rs\ 60.08 + Rs\ 28.09) \times 0.35 = Rs\ 176.73 \text{ lakh.}$$

### PS 7.20

For the facts in **PS 7.18** assume the lease rental is payable annually in arrear. What is the break even lease rental (BELR) from the point of view of the lessor? Which alternative would you suggest and why? Assume the marginal cost of funds to the HLL is 15 per cent.

### Solution

*Computation of BELR (L) for the lessor (Rs in lakh)*

*Benefits from leasing:*

PV of lease rentals (working note 1)	3.352L
PV of tax shield on depreciation (3)	190.56
PV of salvage proceeds (Rs 990 lakh $\times$ 0.4 $\times$ 0.476)	188.50

*Cost of leasing:*

Cost of equipment (Rs 900 lakh + 10%)	990
PV of tax payment on lease rentals (2)	1.173L

$$3.352L + 190.56 \text{ lakh} + Rs\ 188.50 \text{ lakh} - Rs\ 990 \text{ lakh} - 1.173L = 0$$

$$3.352L - 1.173L = Rs\ 990 \text{ lakh} - Rs\ 190.56 - Rs\ 188.50$$

$$2.179L = Rs\ 610.94 \text{ lakh or } L = Rs\ 610.94/2.179 = Rs\ 280.38 \text{ lakh}$$

### Working notes

(1) *PV of lease rentals:  $L \times [PVIFA(15,5)] = 3.352L$*

(2) *PV of tax payment on lease:  $0.35 \times 3.352L = 1.173L$*

(3) *PV of tax shield on depreciation (Amount in lakh of rupees)*

<i>Depreciation</i>	<i>Tax shield <math>\times</math> PVf</i>	<i>PV of tax shield</i>
247	Rs 86.45 $\times$ 0.870	Rs 75.21
185	64.75 $\times$ 0.756	48.95
139	48.65 $\times$ 0.658	32.01
104	36.40 $\times$ 0.572	20.82
78	27.30 $\times$ 0.497	13.57
		190.56

### PS 7.21

The Hypothetical Manufacturers Ltd (HML) has taken a plant on lease, valued at Rs 20 crore. The lease arrangement is in the form of a leveraged lease. The HLL is the equity participant and the Hypothetical Bank Ltd (HBL) is the loan participant. They fund the investment in the ratio of 2 : 8. The loan from HBL carries a fixed rate of interest of 19 per cent, payable in 6 equated annual instalments. The lease term is 6 years, with lease rental payable annually in arrear.

(a) Compute the equated annual instalment from the point of view of HBL.

(b) If the lease rate is unknown, and HBL's per-tax yield is 25 per cent, what is the minimum lease rate that must be quoted?

### Solution

(a) *Equated annual instalment to HBL:* Loan amount, or Rs 20 crore  $\times$  8/10 = Rs 16 crore/PVIFA(19, 6), or 3.410 = Rs 4.792 crore

- (b) *Annual lease rental (Y)*: Annual cash flow to HLL =  $(Y - \text{Rs } 4.692 \text{ crore})$ . Given the required rate of return to HLL of 25 per cent,  $Y$  would be,  $(Y - \text{Rs } 4.692 \text{ crore}) \times \text{PVIFA } (25,6) = \text{Rs } 4 \text{ crore equity or } 2.951$   
 $(Y - \text{Rs } 4.692 \text{ crore}) = \text{Rs } 4 \text{ crore}$ ,  $Y = 17.846 \text{ crore}/2.951 = \text{Rs } 6.05 \text{ crore}$ .

### PS 7.22

The controller of General Electronics Corporation of India Ltd has been analysing the firm's policy regarding computers, which are now being leased on a yearly basis on rental amounting to Rs 1,00,000 per year. The computers can be bought for Rs 5,00,000. The purchase would be financed by 16 per cent loan repayable in 4 equal annual instalments.

On account of rapid technological progress in the computer industry, it is suggested that a 4-year economic life should be used, instead of the 10-year physical life. It is estimated that the computers would be sold for Rs 2,00,000 at the end of 4 years.

The company uses the straight line method of depreciation. Corporate tax rate is 50 per cent.

- Comment on whether the equipment should be bought or leased?
- Analyse the financial viability from the point of view of the lessor, assuming 14 per cent cost of capital.
- Determine the minimum lease rent at which the lessor would break even.
- Determine the lease rent which will yield an IRR of 16 per cent to the lessor.

### Solution

(a) *PV of cash outflows under leasing alternative*

Year	Lease rent after taxes	PV factor (0.08)	Total PV
1–4	Rs 50,000	3.312	Rs 1,65,600

*Cash outflows under buying alternative*

Year-end	Loan at the beginning of the year	Loan instalment	Interest on loan (0.16)	Principal repayment	Principal outstanding at the end of year
1	Rs 5,00,000	Rs 1,78,699*	Rs 80,000	Rs 98,699	Rs 4,01,301
2	4,01,301	1,78,699	64,208	1,14,491	2,86,810
3	2,86,810	1,78,699	45,890	1,32,809	1,54,001
4	1,54,001	1,78,699	24,698	1,54,001	—

\*[Rs 5,00,000 ÷ 2.798 (PV factor of annuity of Re 1 at 16 per cent for 4 years)]

*PV of cash outflows under buying alternatives*

Year	Loan instalment	Payment of		Net cash outflows	PV factor (0.08)	Total PV
		Interest	Depreciation			
1	Rs 1,78,699	Rs 40,000	Rs 37,500	Rs 1,01,199	0.926	Rs 93,710
2	1,78,699	32,104	37,500	1,09,095	0.857	93,494
3	1,78,699	22,945	37,500	1,18,254	0.794	93,894
4	1,78,699	12,349	37,500	1,28,850	0.735	94,705
4	Salvage value			(2,00,000)	0.735	(1,47,000)
						2,28,803

**Recommendation:** The leasing option is financially superior.

(b) *Viability from the lessor's point of view*(i) *Determination of CFAT*

Lease rent received	Rs 1,00,000
Less depreciation	75,000
EBT	25,000
Less taxes (0.50)	12,500
EAT	12,500
Add depreciation	75,000
CFAT	87,500

(ii) *Determination of NPV*

Year	CFAT	PV factor (at 0.14)	Total PV
1-4	Rs 87,500	2.914	Rs 2,54,975
4	2,00,000	0.592	1,18,400
			3,73,375
Less cost of computer			5,00,000
NPV			(1,26,625)

The proposal is not financially viable to the lessor.

(c) *Lease rent, at which lessor would break-even*

Cost of computers	Rs 5,00,000
Less PV of salvage price of computers	1,18,400
Net cost to be recovered	3,81,600
Divide by PV annuity factor (14,4)	÷ 2.914
CFAT (desired)	1,30,954
Less depreciation	75,000
EAT	55,954
Add taxes	55,954
EBT	1,11,908
Add depreciation	75,000
Lease rental (desired)	1,86,908

(d) *Lease rent to yield 16 per cent IRR*

CFAT (desired)	Rs 1,39,242
Less depreciation	75,000
EAT	64,242
Add tax (0.50)	64,242
EBT	1,28,484
Add depreciation	75,000
Lease rental (desired)	2,03,484

**Working notes**

Desired CFAT:  $\text{Rs } 5,00,000 = \sum_{t=1}^4 \frac{X}{(1+0.16)^t} + \frac{\text{Rs } 2,00,000}{(1+0.16)^4}$ , where  $X = \text{CFAT}$

$$\text{Rs } 5,00,000 - \frac{\text{Rs } 2,00,000}{(1.16)^4} = \sum_{t=1}^4 \frac{x}{(1.16)^t}$$

Substituting (i) PV factor of annuity (16, 4) 2.798 and (ii) PV factor (16, 4), 0.552, Rs 5,00,000 – (Rs 2,00,000 × 0.552) = X/2.798

3,89,600/2.798 = X, or X = Rs 1,39,242.

### PS 7.23

NBT Ltd is thinking of installing a computer. It is to decide whether the computer should be acquired on lease, or be purchased through borrowings at a 12 per cent rate of interest payable at the end of the each year. Principal is due for repayment after 10 years. The following data has been collected for the purpose:

#### *Purchase of computer:*

Purchase price, Rs 40,00,000

Annual maintenance, Rs 50,000 (to be paid in advance every year)

Life of the computer, 10 years

Depreciation, 15 per cent per annum on written down value basis

Salvage value, Rs 4,00,000

#### *Leasing of computer:*

Initial lease payment, Rs 4,00,000

Lease rent, Rs 7,00,000 (payable in advance every year for 10 years)

Maintenance expenses, to be borne by the lessor.

You are required to advise NBT Ltd as to whether it should purchase the computer or acquire its services on lease basis, assuming it does not pay tax.

### ***Solution***

#### *PV of cash outflows under leasing alternative*

Year	Payment under lease contract	PV factor (at 0.12)	Total PV
0	Rs 4,00,000	1.000	Rs 4,00,000
1–10	7,00,000	6.328*	44,29,600
			48,29,600

\*6.328, that is, 5.328 (PV factor for 9 years) + 1.000 (PV factor for payment at the beginning of year 1).

#### *PV of cash outflows under buying alternative*

Particulars	Year	Amount	PV factor (0.12)	Total PV
Annual maintenance (advance)	1–10	Rs 50,000	6.328	Rs 3,16,400
Interest (end of the year)	1–10	4,80,000	5.650	27,12,000
Principal repayment	10	40,00,000	0.322	12,88,000
Salvage value	10	(4,00,000)	0.322	(1,28,800)
Total				41,87,600

**Note:** Depreciation is ignored as no tax advantage is accruing to the firm.

**Recommendation:** NBT Ltd is advised to buy the computer under consideration, as it is economical compared to the leasing alternative.

### PS 7.24

HCL Ltd is considering acquiring an additional computer to supplement its time-share computer services to its clients. It has two options:

- To purchase the computer for Rs 22,00,000.

- (ii) To lease the computer for 3 years from a leasing company for Rs 5,00,000 annual lease rent plus 10 per cent of gross time-share service revenue. The agreement also requires an additional payment of Rs 6,00,000 at the end of the third year. Lease rent are payable at the year end, and the computer reverts to the lessor after the contract period.

The company estimates that the computer under review now will be worth Rs 10 lakh at the end of the third year.

Forecast revenues are:

Year 1	Rs 22,50,000
2	25,00,000
3	27,50,000

Annual operating costs (excluding depreciation and lease rent of computer) are estimated at Rs 9,00,000, with an additional Rs 1,00,000 for start-up and training costs at the beginning of the first year.

HCL Ltd will borrow at 16 per cent interest to finance the acquisition of the computer; repayments are to be made according to the following schedule.

Year-end	Principal	Interest	Total
1	Rs 5,00,000	Rs 3,52,000	Rs 8,52,000
2	8,50,000	2,72,000	11,22,000
3	8,50,000	1,36,000	9,86,000

The company uses the straight line method to depreciate its assets and pays 50 per cent tax on its income.

The management of HCL Ltd approaches you for advice. Which alternative would you recommend? Why?

## Solution

*PV of cash outflows under leasing alternative*

Year	Payment under lease contract			Tax shield @ 50% on lease payments	Net cash outflows	PV factor (0.08)	Total PV
	Lease rent	10% of gross revenue	Lumpsum payment				
1	Rs 5,00,000	Rs 2,25,000	—	Rs 3,62,500	Rs 3,62,500	0.926	Rs 3,35,675
2	5,00,000	2,50,000	—	3,75,000	3,75,000	0.857	3,21,375
3	5,00,000	2,75,000	Rs 6,00,000	6,87,500	6,87,500	0.794	5,45,875
							12,02,925

*PV of cash outflows under borrowing alternative*

Year	Loan instalment	Tax advantage on		Net cash outflows	PV factor (0.08)	Total PV
		$(I \times 0.50)$	$(D \times 0.50)$			
1	Rs 8,52,000	Rs 1,76,000	Rs 2,00,000	Rs 4,76,000	0.926	Rs 4,40,776
2	11,22,000	1,36,000	2,00,000	7,86,000	0.857	6,73,602
3	9,86,000	68,000	2,00,000	7,18,000	0.794	5,70,092
	Salvage value			(10,00,000)	0.794	(7,94,000)
						8,90,470

**Assumption:** The start-up and training costs are to be borne by the lessee even if the computer is acquired on lease basis.

**Recommendation:** The management is advised to buy the computer.

**PS 7.25**

A departmental store owns a large building and the land on which it is situated. Their respective book values are Rs 20 crore and Rs 8 crore. The building is being depreciated @ Rs 1 crore per year over 20 years.

Canhome Finance Ltd has offered to buy the land and building at book value and to lease it back to the firm for 20 years at annual rental of Rs 3 crore, payable at the end of each year. At the end of the 20th year, it is estimated that, after paying the costs of demolishing the building, the land could net Rs 9 crore.

If the sale and lease back proposals were accepted, the departmental store would still be responsible for maintenance, insurance and so on, but would have no residual claims on the property at the end of the 20th year. The finance manager of the departmental store estimates the firm's after tax cost of capital is 12 per cent. The firm can borrow at 14 per cent. The corporate tax rate on ordinary income is likely to remain unchanged at the present level of 35 per cent and on capital gains at 20 per cent.

Advise the company on the relative suitability of the options.

**Solution**

*PV of cash outflows under leasing alternative*

Year	Lease payment after taxes	PV factor (0.12)	Total PV
1	Rs 1,95,00,000	10.594	Rs 20,65,83,000

*PV of cash outflows under retaining the asset alternative*

PV of land and building	Rs 28,00,00,000
Less PV of tax shield on depreciation foregone [Rs 1,00,00,000 × 0.35 (t)] × 7.469 (PV factor of annuity for 20 years at 12%)	2,61,41,500
Less effective salvage value foregone [Rs 9 crore – Rs 0.20 crore (capital gain tax on Rs 1,00,00,000 × PV factor at 12% in 20th year, ie, 0.104)]	91,52,000
	<u>24,47,06,500</u>

**Advice:** It will be advantageous for the firm to sell, and then acquire the asset on lease basis.

**PS 7.26**

A company has to acquire a new deluxe Maruti car for the use of its chief executive officer. It can be done in either of the two ways.

It can be purchased outright for Rs 3,00,000 with a bank loan with 16 per cent interest payable annually, and the principal repayable in full at the end of 5 years. The car will have a resale value of Rs 1,00,000. Alternatively, the car could be leased for 5 years, the annual rentals being Rs 90,000 payable at the beginning of each year.

The company pays 50 per cent tax on its income and uses the straight line depreciation method.

- Using the NPV method, evaluate the alternative proposals.
- Evaluate the above proposals from the point of view of the lessor, assuming (i) required rate of return of 12 per cent, (ii) straight line method of depreciation, and (iii) salvage value of Rs 1 lakh after 5 years.

**Solution**(a) *PV of cash outflows under leasing alternative (lessee's point of view)*

Year	Lease payment	Tax shield	Cash outflows after taxes	PV factor (0.08) (after tax)	Total PV
1	2	3	4	5	6
0	Rs 90,000	—	Rs 90,000	1.000	Rs 90,000
1–4	90,000	Rs 45,000	45,000	3.312	1,49,040
5	—	45,000	(45,000)	0.681	(30,645)
					<u>2,08,395</u>

*PV of cash outflows under buying alternative*

Year	Payment under loan contract	Tax advantage at 50% on		Net cash outflows	PV factor (0.08)	Total PV
		Depreciation	Interest			
1–4	Rs 48,000	Rs 20,000	Rs 24,000	Rs 4,000	3.312	Rs 13,248
5	3,48,000	20,000	24,000	3,04,000	0.681	2,07,024
5	1,00,000 salvage value			(1,00,000)	0.681	(68,100)
						<u>1,52,172</u>

**Recommendation:** The buying option is a financially superior alternative.(b) *Financial analysis from the point of view of the lessor**Determination of CFAT:*

Lease rent	Rs 90,000
Less depreciation	40,000
EBT	<u>50,000</u>
Less taxes (0.50)	<u>25,000</u>
EAT	<u>25,000</u>
Add depreciation	<u>40,000</u>
	<u>65,000</u>

*Determination of NPV*

Year(s)	CFAT	PV factor (0.12)	Total PV
0	Rs 90,000	1.000	Rs 90,000
1–4	65,000	3.037	1,97,405
5	(25,000)*	0.567	(14,175)
5	1,00,000	0.567	<u>56,700</u>
			<u>3,29,930</u>
Less cost of car			<u>3,00,000</u>
NPV			<u>29,930</u>

\*Taxes payable on income received in advance in year 4.

**Recommendation:** It is profitable for the lessor to lease out the car.**PS 7.27**

Computeronics Ltd sells computer services to its clients. The company has recently completed a feasibility study and decided to acquire an additional computer the details of which are as follows:

1. The purchase price of the computer is Rs 2,30,000; maintenance, property taxes and insurance will be Rs 20,000 per year. The additional annual expenses to operate the computer are estimated at Rs 80,000. If the computer is rented, the annual rent will be Rs 85,000, plus 5 per cent of annual billings. The rent is due on the last day of each year.

- Due to competitive conditions, the company feels it will be necessary to replace the computer after the expiry of 3 years with a more advanced model. The resale value is estimated at Rs 1,10,000.
- The appropriate income tax rate is 35 per cent. The relevant block-wise depreciation on the written down value basis is 25 per cent. There are no other assets in this block.
- The estimated annual billing for the services of the new computer will be Rs 2,20,000 during the first year, and Rs 2,60,000 during the subsequent 2 years.
- If the computer is purchased, the company will borrow to finance the purchase from a bank with interest at 20 per cent. The interest will be paid regularly, and the principal will be returned in one lumpsum at the end of year 3.

Should the company purchase the computer or lease it?

Assuming (i) cost of capital at 12 per cent, (ii) straight-line method of depreciation, (iii) Salvage Value of Rs 1,10,000, and (iv) corporate tax rate of 35 per cent, you are also required to analyse the financial viability of the proposal from the view point of the leasing company.

### Solution

#### PV of cash outflows under leasing alternative

Year	Payments under lease		Tax advantage on lease payment (0.35)	Net cash outflows	PV factor (0.13)	Total PV
	Lease rent	5% of annual billing				
1	2	3	4	5	6	7
1	Rs 85,000	Rs 11,000	Rs 33,600	Rs 62,400	0.885	Rs 55,224
2	85,000	13,000	34,300	63,700	0.783	49,877
3	85,000	13,000	34,300	63,700	0.693	44,144
						1,49,245

#### PV of cash outflows under buying alternative

Year	Obligations under buying			Tax advantage @ 0.35			Net cash outflows	PV factor	Total PV
	Loan payment	Maintenance, taxes	Interest	Depreciation	Maintenance				
1	2	3	4	5	6	7	8	9	
1	Rs 46,000	Rs 20,000	Rs 16,100	Rs 20,125	Rs 7,000	Rs 22,775	0.885	Rs 20,156	
2	46,000	20,000	16,100	15,094	7,000	27,806	0.783	21,772	
3	2,76,000	20,000	16,100	11,320	7,000	2,41,580	0.693	1,67,415	
3	Salvage value (beginning of year 4)					(1,10,000)	0.693	(76,230)	
3	Tax on short-term capital gain*					4,539	0.693	3,146	
									1,36,259

\*(Rs 2,30,000 – Rs 1,32,969 – Rs 1,10,000) = Rs 72,969 × 0.35 = Rs 4,539.

**Recommendation:** Computeronics Ltd should buy the computer.

*Viability from the view point of the lessor*

	Year 1	Year 2	Year 3
(a) Revenue:			
Lease rent	Rs 85,000	Rs 85,000	Rs 85,000
Add 5% of annual billing	11,000	13,000	13,000
Total	96,000	98,000	98,000

(Contd.)



**Solution (Contd.)****(b) Costs:**

Maintenance	Rs 20,000	Rs 20,000	Rs 20,000
Depreciation	40,000	40,000	40,000
Total	60,000	60,000	60,000
EBT (a – b)	36,000	38,000	38,000
Less taxes	18,000	19,000	19,000
EAT	18,000	19,000	19,000
Add depreciation	40,000	40,000	40,000
CFAT (operating)	58,000	59,000	59,000
Add salvage value	–	–	1,10,000
CFAT (total)	58,000	59,000	1,69,000

**Determination of NPV**

Year	CFAT	PV factor (at 0.12)	Total PV
1	Rs 58,000	0.893	Rs 51,794
2	59,000	0.797	47,023
3	1,69,000	0.712	1,20,328
			2,19,145
Less cost of computer			2,30,000
NPV			(10,855)

From the point of view the lessor, the proposal is financially unsound.

**PS 7.28**

Assume for the firm in **PS 7.27** the following: (a) the leasing company follows written down value method of depreciation, the depreciation rate being 30 per cent; there is no other asset in this block, (b) the expected salvage value after the expiry of 3 years of the computer is Rs 1,00,000. (c) the corporate tax rate is 35 per cent.

Determine (a) NAL and (b) BELR for the lessor.

**Solution****(a) Determination of NAL for the lessor****Benefits from leasing:**

PV of lease rentals (working note 1)	Rs 2,32,186
PV of tax shield on depreciation (2)	43,464
PV of salvage proceeds	1,00,000
Total	3,75,650

**Cost of leasing:**

Cost of computer	2,30,000
PV of tax payment on lease rentals (3)	81,550
PV of tax payment on short-term capital gain (4)	5,261
Total	3,16,811
NAL	58,839

**Working notes***(1) PV of lease rentals*

Year	Lease rent	PV factor (at 0.12)	Total PV
1	Rs 96,000	0.893	Rs 85,728
2	98,000	0.797	78,106
3	98,000	0.712	68,352
			<u>2,32,186</u>

*(2) PV of tax shield on depreciation*

Year	Depreciation	Tax shield	PV factor (at 0.12)	Total PV
1	Rs 69,000	Rs 24,150	0.893	Rs 21,566
2	48,300	16,905	0.797	13,473
3	33,810	11,833	0.712	8,425
	<u>1,51,110</u>			<u>43,464</u>

*(3) PV of tax payment on lease*

Year	Lease rent	Tax shield	PV factor (at 0.12)	Total PV
1	Rs 96,000	Rs 33,600	0.893	Rs 30,005
2	98,000	34,300	0.797	27,337
3	98,000	34,300	0.712	24,208
				<u>81,550</u>

*(4) PV of tax payment on short-term capital gain (at the beginning of the fourth year)*

Salvage value	Rs 1,00,000
Less book value of computer	
Cost	Rs 2,30,000
Less accumulated depreciation	<u>(1,51,110)</u>
Short-term capital gain	78,890
PV of tax payment (Rs 21,110 × 0.35 × 0.712)	<u>21,110</u>
	5,261

*(b) Determination of BELR (L) for the lessor**Benefits from leasing:*

PV of lease rentals (PVIFA, 12,3) × L	2.402L
Other benefits (already computed)	Rs 1,43,464

*Cost of leasing:*

PV of tax payment on lease rentals (2.402L × 0.35)	0.8407L
Other costs (already computed)	<u>2,35,261</u>

BELR = 2.402L + Rs 1,43,464 = 0.8407 + Rs 2,35,261

1.5614L = Rs 91,797 or L = Rs 91,797/1.5613 = Rs 58,795

## EXERCISES

**E.7.1** Beta Ltd is considering the acquisition of a personal computer costing Rs 50,000. The effective life of the computer is to be 5 years. The company plans to acquire the same either by borrowing Rs 50,000 from its banker at 15 per cent interest per annum or on lease from Udar Leasing Ltd (ULL). The company wishes to know the lease rentals to be paid annually which will match the loan option. The following further information is provided to you:

- The principal amount of the loan will be repaid in 5 annual equal instalments.
- Interest, lease rentals, principal repayments are to be paid on the last day of each year.

- (c) The full cost of the computer will be written off over its effective life on a straight line basis and the same will be allowed for tax purposes.
- (d) The company's effective tax rate is 40 per cent and the after tax cost of capital is 9 per cent.
- (e) The computer will be sold for Rs 1,700 at the end of the 5th year. The commission on such sales is 9 per cent on the sale value and the same will be paid.

You are required to compute the annual lease rentals payable by Beta Ltd, which will result in indifference to the loan option.

**E.7.2** Elite Builders Ltd (EBL), a leading construction company, has been approached by a foreign embassy to build for it a block of six flats to be used as guest houses. As per the terms of the contract, the foreign embassy would provide EBL the plans and the land costing Rs 25 lakh. EBL would build the flats at their own cost and lease them out to the foreign embassy for 15 years at the end of which the flats will be transferred to the foreign embassy for a nominal value of Rs 8 lakh. EBL estimates the cost of construction as follows:

Area per flat: 1,000 sq. ft.

Construction cost: Rs 400 per sq. ft.

Registration and other costs: 2.5 per cent of the cost of production.

EBL will also incur Rs 4 lakh each in year 14–15 towards repairs. They propose to charge the lease rentals as follows:

<i>Years</i>	<i>Rentals</i>
1 – 5	Normal
6 – 10	120 per cent of normal
11 – 15	150 per cent of normal

The present tax rate of EBL averages at 35 per cent and is likely to remain the same in future. The full cost of construction and registration will be written off over 15 years at a uniform rate and will be allowed for tax purposes.

You are required to calculate the normal lease rental per annum per flat. For your exercise you may assume (a) minimum desired return of 10 per cent, (b) rentals and repairs will arise on the last day of the year and (c) construction, registration and other costs will be incurred at  $t = 0$ .

**E.7.3** C-DOT's management is contemplating acquiring the equipment that manufactures printed circuit boards (PCBs) for Rs 24,00,000 whose economic life is expected to be 8 years. C-DOT Board is in a fix as to whether to get it financed with an 8-year term loan at the rate of 14 per cent, repayable in equal instalments of Rs 5,17,352 per year or by an equivalent amount of lease rent per year. The finance department of C-DOT has been called upon to give its judgement as to which alternative is better. Assume (a) there is no salvage value (b) straight line method of depreciation is used and allowed for tax purposes, and (c) corporate tax rate is 35 per cent.

Which course of action should be preferred?

**E.7.4** Computer Peripherals Ltd is in the business of manufacturing computer ribbons. With the recent merger with Computer Graphics Ltd and change of its CEO, it plans to diversify and add new product lines. A board meeting of the company has been convened to decide whether to buy a new machine or to acquire it on lease.

The following data is made available: (i) value of machine: Rs 20,00,000; (ii) useful life: 8 years; (iii) no salvage value; (iv) corporate tax rate: 35 per cent; (v) rate of interest: 15 per cent; and (vi) lease rent: Rs 4,00,000 (payable at the end of the year).

What advice would you, as a financial consultant, give and why?

**E.7.5** VSNL Ltd is contemplating to buy an ASIC design simulator. The finance department of VSNL Ltd has suggested leasing at a rent of Rs 1,20,000 annually for a period of 5 years.

The outright purchase of the simulator would cost Rs 3,35,200 at an interest rate of 15 per cent from the State Bank of India. Depreciation would be charged at the rate of 25 per cent on written down value basis. The anticipated salvage value of the simulator is Rs 50,000.

An additional Rs 20,000 would have to be spent as operating expenses, in either case and borne by the lessee.

Assuming corporate tax of 35 per cent, comment on the suggestion of the finance department to acquire the simulator on lease.

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**ANSWERS**

**E.7.1** Annual lease rental: Rs 14,495.

**E.7.2** Normal lease rental: Rs 59,097 per flat.

**E.7.3** Buying option is preferred.

**E.7.4** Buying option is better.

**E.7.5** Buying option is better.

# 8

## BASIC THEORY

### INTRODUCTION

The term merger refers to the process of combining two or more firms. The analysis of financial aspects of merger covers three aspects, namely, (i) determining the firm's value, (ii) financing techniques for merger, and (iii) merger as a capital budgeting decision.

### DETERMINING VALUE

Determining the worth of a firm is the first step in a merger. It is a difficult task as, in estimating the value of a firm, several factors are considered in conjunction with one another. The book value, although not an effective measure by itself, is useful in specific situations. The appraisal value may or may not be a good indicator to be paid for a company. Its merit depends upon the approach adopted, and the nature of the business. The market value is the key element in evaluating a firm's worth, particularly in case of large listed corporate firms. The earnings per share (EPS) is another important criterion for merger decisions. However, a firm's worth should not be determined on the basis of a single approach and a single figure, but within a range, after considering all alternative approaches.

The EPS basis of determining the value of the firm is based on the effect of merger on the future EPS, that is, the EPS of the merged firm ( $EPS_m$ ). The procedure to measure the impact is summarised in Exhibit 8.1.

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#### **EXHIBIT 8.1** *Effect of Merger on Earnings Per Share (EPS)*

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##### **(i) Determination of Combined $EPS_m$**

$$EPS_m = \frac{EAT_A + EAT_T}{N_A + N_T} \quad (8.1)$$

where  $EAT_A$  = Earnings after taxes of the acquiring firm

$EAT_T$  = Earnings after taxes of the target firm

$N_A$  = Number of outstanding equity shares of the acquiring firm

$N_T$  = Number of equity shares issued to the shareholders of the target firm

##### **(ii) Determination of Market Value of Merged Firm**

$$V_m = EPS_m \times P/E_A \quad (8.2)$$

where  $V_m$  = Market Value of merged firm

$P/E_A$  = Price/earning ratio of acquiring firm

##### **(iii) Total Gain from Merger**

$$V_m - (V_A + V_T) \quad (8.3)$$

where  $V_A = EPS_A \times P/E_A$

$$(8.4)$$

$V_T = EPS_T \times P/E_T$

$$(8.5)$$

---

(Contd.)

**Exhibit 8.1 (Contd.)****(iv) Gain for Acquiring Firm ( $G_A$ ) and Target Firm ( $G_T$ )**

$$G_A = [\text{Post-merger value of firm } A - \text{Pre-merger value of firm } A] \quad (8.6)$$

$$G_T = [\text{Post-merger value of firm } T - \text{Pre-merger value of firm } T] \quad (8.7)$$

**FINANCING TECHNIQUES FOR MERGER**

The second aspect of merger is the mode of financing. In the case of a firm having a high P/E ratio, issue of equity shares is advantageous, both to the acquiring and the acquired firms. To meet the investment needs of different types of investors, convertible securities can also be issued. Yet another form of financing merger is the deferred payment plan.

Tender offer is another alternative to acquiring a firm. The purchasing firm directly approaches the shareholders of the target firm. This approach may be cheaper, provided the management of the target firm does not attempt to block it.

**MERGER AS A CAPITAL BUDGETING DECISION**

The capital budgeting framework for the merger decision requires comparison between the expected benefits [measured in terms of the present value of expected benefits or cash inflows (CFAT) from the merger] with the cost of acquiring the target firm. The acquisition costs include the payment made to the target firm's shareholders, payment to discharge the external liabilities of the acquired firm, less cash proceeds expected to be realised by the acquiring firm from the sale of certain asset(s) of the target firm. The decision criterion is "to go for the merger" if the NPV is positive; the decision would be 'against the merger' if the NPV is negative.

**SOLVED PROBLEMS****PS 8.1**

You have been provided the following financial data of two companies:

	<i>T Ltd</i>	<i>A Ltd</i>
Earnings after taxes (EAT) (Rs)	7,00,000	10,00,000
Equity shares outstanding	2,00,000	4,00,000
Earnings per share (EPS) (Rs)	3.50	2.50
Price-earnings (P/E) ratio (times)	10	14
Market price per share (Rs)	35	35

A Ltd is the acquiring company; exchanging its shares on a 1 : 1 basis for T Ltd's shares. The exchange ratio is based on the market prices of the shares of the two companies.

- What will be the EPS subsequent to merger?
- What is the change in EPS for the shareholders of A Ltd and T Ltd?
- Determine the market value of the post-merger firm.
- Ascertain the profits accruing to shareholders of both the firms.

**Solution**

- $EPS \text{ of } A \text{ Ltd after merger} = (\text{Rs } 10,00,000 + \text{Rs } 7,00,000) / (4,00,000 + 2,00,000) = \text{Rs } 2.833$

(ii) *Change in EPS for the shareholders of A Ltd and T Ltd*

	<i>A Ltd</i>	<i>T Ltd</i>
Pre-merger EPS	Rs 2.500	Rs 3.500
Post-merger EPS	2.833	2.833
Change in EPS: increase (decrease)	0.333	(0.667)

(iii) *Market value of the post-merger firm (assuming the P/E ratio of A Ltd remains unchanged)*

EPS of the post-merger firm	Rs 2.833
Multiplied by P/E ratio	14
Market price per share	39.662
Multiplied by shares outstanding	6,00,000
Total market value	2,37,97,200

(iv) *Gain from the merger*

Post-merger market value of the firm	Rs 2,37,97,200
Less pre-merger market value	
T Ltd (2,00,000 × Rs 35)	Rs 70,00,000
A Ltd (4,00,000 × Rs 35)	1,40,00,000
Gain from merger	2,10,00,000
	27,97,200

*Apportionment of gains*

	<i>A Ltd</i>	<i>T Ltd</i>
Post-merger value	Rs 1,58,64,800*	Rs 79,32,400**
Less pre-merger value	1,40,00,000	70,00,000
Total gain	18,64,800	9,32,400
Alternatively,		
Increase in shares price	4.662	4.662
Multiplied by number of shares	4,00,000	2,00,000
Total gain	18,64,800	9,32,400

\*(4,00,000 × Rs 39.662)

\*\*(2,00,000 × Rs 39.662)

**PS 8.2**

AB Ltd wishes to acquire CD Ltd on the basis of an exchange ratio of 0.8. Other relevant financial data is as follows:

	<i>AB Ltd</i>	<i>CD Ltd</i>
Earnings after taxes (EAT)	Rs 1,00,000	Rs 20,000
Equity shares outstanding	50,000	20,000
Earnings per share (EPS)	2	1
Market price per share	20	8

- Determine the number of shares required to be issued by AB Ltd for acquisition of CD Ltd
- What would be the exchange ratio if it is based on the market prices of shares of AB Ltd and CD Ltd?
- What is the current price-earnings ratio of the two companies?
- Assuming the earnings of each firm remains the same, what is the EPS after the acquisition?
- What is the equivalent EPS per share of CD Ltd?
- Ascertain the gain to shareholders of both the companies (a) at 0.8 exchange ratio, and (b) an exchange ratio based on market price.

**Solution**

(i) *Shares required to be issued by AB Ltd:* Shares of CD Ltd ( $\times$ ) Exchange ratio =  $20,000 \times 0.8 = 16,000$ .

(ii) *Exchange ratio based on market prices:* Market price per share of CD Ltd/Market price per share of AB Ltd = Rs 8/Rs 20 = 0.4.

For every 10 shares of CD Ltd, 4 shares of AB Ltd would be issued.

(iii) *P/E ratio of the companies (before merger)*

	AB Ltd	CD Ltd
Market price per share	Rs 20	Rs 8
EPS	2	1
P/E ratio	10	8

(iv) *EPS after acquisition*

(a) Exchange ratio 0.8 =  $(\text{Rs } 1,00,000 + \text{Rs } 20,000) / (50,000 + 16,000) = \text{Rs } 1.82$

(b) Exchange ratio 0.4 =  $(\text{Rs } 1,00,000 + \text{Rs } 20,000) / (50,000 + 8,000) = \text{Rs } 2.069$

(v) Equivalent EPS per share of CD Ltd =  $(\text{EPS after the acquisition} \times \text{exchange ratio}) = \text{Rs } 1.82 \times 0.8 = \text{Rs } 1.45$ .

(vi) *Gain from the merger*

Post-merger market value of the firm (Post-merger earnings $\times$ P/E ratio of AB Ltd)	Rs 12,00,000
Less pre-merger market values	
AB Ltd ( $50,000 \times \text{Rs } 20 = \text{Rs } 10,00,000$ )	
CD Ltd ( $20,000 \times \text{Rs } 8 = 1,60,000$ )	
	11,60,000
	40,000

*Apportionment of gains between shareholders of the two companies*

Particulars	Exchange ratio 0.8		Exchange ratio 0.4	
	AB Ltd	CD Ltd	AB Ltd	CD Ltd
Post-merger value	Rs 9,09,091 <sup>1</sup>	Rs 2,90,909 <sup>2</sup>	Rs 10,34,483 <sup>3</sup>	Rs 1,65,517 <sup>4</sup>
Less pre-merger value	10,00,000	1,60,000	10,00,000	1,60,000
Gain (Loss)	(90,909)	1,30,909	34,483	5,517

<sup>1</sup>12,00,000  $\times$  50/66; <sup>2</sup>12,00,000  $\times$  16/66; <sup>3</sup>12,00,000  $\times$  50/58; <sup>4</sup>12,00,000  $\times$  8/58

**PS 8.3**

Hypothetical Ltd (HL) wishes to acquire Target Ltd (TL), a small company with good growth prospects. The relevant information for both companies is as follows:

Company	Equity shares outstanding	Share price	Earnings after taxes (EAT)	Earnings per share (EPS)
Hypothetical Ltd	Rs 10,00,000	Rs 25	Rs 20,00,000	Rs 2
Target Ltd	1,00,000	10	2,00,000	2

Hypothetical Ltd is considering three different acquisition plans:

(i) Pay Rs 12.5 per share for each share of TL.

(ii) Exchange Rs 25 cash and one share of HL for every four shares of TL.

(iii) Exchange one share for every two shares of TL.

What will HL's EPS be under each of the three plans? What will the share prices of HL be under each of the three plans, if its current P/E ratio remains unchanged?



**Solution**

*Determination of EPS and market price per share under different acquisitions plans*

	Acquisition plans		
	Plan 1	Plan 2	Plan 3
Post-merger earnings	Rs 22,00,000	Rs 22,00,000	Rs 22,00,000
Divide by the number of shares	10,00,000	10,25,000	10,50,000
EPS	2.2	2.146	2.095
Multiply by P/E ratio (Rs 25 ÷ 2)	12.5	12.5	12.5
Market price per share	27.5	26.82	26.19

**PS 8.4**

XYZ Ltd is considering merging with ABC Ltd. XYZ's shares are currently traded at Rs 25, it has 2,00,000 shares outstanding and its earnings after taxes (EAT) amount to Rs 4,00,000. ABC has 1,00,000 shares outstanding; its current market price is Rs 12.5, and its EAT are Rs 1,00,000. The merger will be effected by means of a stock swap (exchange). ABC has agreed to a plan under which XYZ will offer the current market value of ABC Ltd's shares.

- What is the pre-merger earnings per share (EPS) and P/E ratios of both the companies?
- If ABC's P/E ratio is 8, what is its current market price? What is the exchange ratio? What will XYZ's post-merger EPS be?
- What must the exchange ratio be for XYZ's pre- and post-merger EPS to be the same?

**Solution**

(i) *Pre-merger EPS and P/E ratios of XYZ Ltd and ABC Ltd*

	XYZ	ABC
Earnings after taxes	Rs 4,00,000	Rs 1,00,000
Divide by the number of shares outstanding	2,00,000	1,00,000
EPS	2	1
Market price per share	25	12.5
P/E ratio (times)	12.5	12.5

- Current market price of ABC Ltd, if P/E ratio is 8 =  $Rs\ 1 \times 8 = Rs\ 8$
  - Exchange ratio =  $Rs\ 25/8 = 3.125$
  - Post-merger EPS of XYZ Ltd =  $(Rs\ 4,00,000 + Rs\ 1,00,000)/(2,00,000 + 32,000) = Rs\ 2.16$
- Desired exchange ratio*
  - Total number of shares in post-merged company = Post merger earnings/Pre-merger EPS of XYZ Ltd =  $Rs\ 5,00,000/2 = 2,50,000$ .
  - Number of shares required to be issued =  $2,50,000 - 2,00,000 = 50,000$
  - Therefore, the exchange ratio is =  $50,000/1,00,000 = 0.5$

**PS 8.5**

A Ltd has acquired T Ltd in the current year. T Ltd has its base year earnings of Rs 15 lakh. At the time of merger, its equity shareholders received initial payment of 1 lakh shares of A Ltd. The market value of A Ltd's share is Rs 100 per share and the P/E ratio is 10. As a part of the agreement, it has been also decided to pay to the shareholders of T Ltd on deferred payment basis for next 3 years; the payment is contingent to the realisation of the potential projected earnings after merger.

The projected post-merger earnings of T Ltd for next 3 years are Rs 18 lakh, Rs 20 lakh and Rs 25 lakh respectively. Assuming no change in the P/E ratio and share prices of T Ltd, determine the number of shares required to be issued to the shareholders of T Ltd during these years.

### ***Solution***

The number of required shares = (Excess post-merger earnings  $\times$  P/E ratio)/Share price of acquiring firm

$$\text{Year 1 : (Rs 3 lakh} \times 10)/100 = 30,000$$

$$2 : (\text{Rs 5 lakh} \times 10)/100 = 50,000$$

$$3 : (\text{Rs 10 lakh} \times 10)/100 = 1,00,000$$

### **PS 8.6**

The Sick Company Ltd (SCL) has total accumulated losses of Rs 25 lakh caused by operating losses of past several years. The Strong Ltd has acquired the SCL to use these losses and to diversify its operations. The Strong Ltd's expected earnings before taxes are Rs 20 lakh per year for the next 3 years.

Assuming these earnings are realised and setting off the losses is allowed under tax laws, determine the likely benefit to Strong Ltd, given corporate tax rate of 35 per cent and its cost of capital as 15 per cent.

### ***Solution***

*PV of tax savings (benefit) to Strong Ltd. (Rs lakh)*

Year	Tax savings	PV factor at 0.15	Total PV
1	$20 \times 0.35 = 7$	0.870	6.1
2	$5 \times 0.35 = 1.75$	0.756	1.3
			<u>7.4</u>

### **PS 8.7**

Royal Industries Ltd (RIL) is considering a takeover of Supreme Industries Ltd (SIL). The earnings, number of outstanding equity shares and P/E ratios of the two companies are as follows:

	Royal Industries Ltd	Supreme Industries Ltd
Earnings after taxes (EAT)	Rs 20,00,000	Rs 10,00,000
Equity shares outstanding	10,00,000	10,00,000
Earnings per share (EPS)	2	1
P/E ratio (times)	10	5

- What is the market value of each company before merger?
- Assume that the management of RIL estimates that the shareholders of SIL will accept an offer of one share of RIL for four shares of SIL. If there are no synergic effects, what is the market value of the post-merger RIL? What is the new price per share? Are the shareholders of RIL better or worse-off than they were before the merger?
- Assume because of synergic effects, the management of RIL estimates that the earnings will increase by 10 per cent, what is the new post-merger EPS and price per share? Are the shareholders better or worse off than before the merger?

***Solution****(i) Market value of companies before merger*

	<i>RIL</i>	<i>SIL</i>
EPS	Rs 2	Re 1
Multiplied by P/E ratio	10	5
Market price per share	20	5
Multiplied by equity shares outstanding	10,00,000	10,00,000
Total market value	2,00,00,000	50,00,000

*(ii) Post-merger effects on RIL*

Post-merger earnings		Rs 30,00,000
Divide by the number of equity shares outstanding (exchange ratio of 1:4)		12,50,000
EPS		2.4
Multiply by P/E ratio		10
Market price per share		24
Market value		3,00,00,000
<i>Gain from the merger</i>		
Post-merger market value of the firm		3,00,00,000
Less pre-merger market value		
RIL	Rs 2,00,00,000	
SIL	50,00,000	2,50,00,000
Total gain from merger		50,00,000

*Apportionment of gains between the shareholders*

	<i>RIL</i>	<i>SIL</i>
Post-merger market value	Rs 2,40,00,000*	Rs 60,00,000**
Less pre-merger market value	2,00,00,000	50,00,000
Gain	40,00,000	10,00,000

\*10,00,000 × 24

\*\*Rs 2,50,00 × 24

The shareholders of both the companies are better off.

(iii) Post-merger earnings	Rs 33,00,000
Divide by the number of equity shares outstanding	12,50,000
EPS	2.64
Multiplied by P/E ratio	10
Market price per share	26.40

The shareholders will be better-off than before the merger.

**PS 8.8**

A Ltd is contemplating to acquire T Ltd. The following data has been assembled in this connection:

	<i>A Ltd</i>	<i>T Ltd</i>
Earnings per share (EPS)	Rs 2	Rs 1
Expected growth in EPS	0.05	0.10
Number of equity shares outstanding (lakh)	10	3
Price per share	20	15

- (i) If A Ltd acquires T Ltd on the basis of exchange of shares in proportion to their market values, what will the new EPS be?

- (ii) Assuming no synergic gains, construct a schedule of EPS for the next 10 years with and without the acquisition. How long would it take to eliminate the dilution in EPS? Do you think the acquisition offer is attractive?

### Solution

- (i) Exchange ratio = Market price of shares of *T Ltd* / Market price of shares of *A Ltd* = Rs 15/20 = 0.75.

Number of shares to be issued in *A Ltd* =  $3,00,000 \times 0.75 = 2,25,000$ .

EPS (new) =  $(Rs\ 2 \times 10,00,000) + (Rs\ 1 \times 3,00,000) / (10,00,000 + 2,25,000) = Rs\ 1.88$

- (ii) Schedule of EPS with and without merger of *A Ltd*

Year	<i>A Ltd</i>		<i>T Ltd</i>		<i>AT Ltd (combined firm)</i>	
	Total EAT	EPS <sup>a</sup>	Total EAT	EPS <sup>b</sup>	EATC	EPS <sup>c</sup>
0	Rs 20,00,000	Rs 2.00	Rs 3,00,000	Rs 1.00	Rs 23,00,000	Rs 1.88
1	21,00,000	2.10	3,30,000	1.10	24,30,000	1.98
2	22,05,000	2.20	3,63,000	1.21	25,68,000	2.10
3	23,15,250	2.32	3,99,300	1.33	27,14,550	2.22
4	24,31,012	2.43	4,39,230	1.46	29,14,165	2.38
5	25,52,563	2.55	4,83,153	1.61	30,35,716	2.48
6	26,80,191	2.68	5,31,468	1.77	32,11,359	2.62
7	28,14,201	2.81	5,84,615	1.95	32,64,806	2.67
8	29,54,911	2.96	6,43,077	2.14	35,97,988	2.94
9	31,02,656	3.10	7,07,384	2.36	38,10,040	3.11
10	32,57,789	3.26	7,78,123	2.59	40,35,912	3.30

<sup>a</sup> EAT ÷ 10,00,000

<sup>b</sup> EAT ÷ 30,00,000

<sup>c</sup> EATC ÷ 12,25,000

The dilution in EPS will be eliminated after 8 years. The acquisition does not seem to be an attractive proposition for *A Ltd*.

### PS 8.9

*A Ltd* is acquiring all the outstanding equity shares of *T Ltd* by exchanging one share of its own equity shares for each share of *T Ltd*. *A Ltd* has a policy of keeping 50 per cent of its capital structure in debt. The capital structure of both these firms before the merger is as follows (in Rs lakh):

	<i>A Ltd</i>	<i>T Ltd</i>
Equity capital (of Rs 100 each)	20	5
Retained earnings	25	25
14% Preference shares	5	—
13% Debt	50	—

- What will the capital structure of the merged firm be? Determine the percentage share of debt in the merged firm.
- Has the merged firm's financial risk declined?
- How much additional debt can the combined firm borrow to retain a capital structure, 50 per cent of which is debt?

**Solution**(i) (a) *Capital structure of merged firm*

	<i>Amount</i>
Equity capital	Rs 25,00,000
Retained earnings	50,00,000
14% Preference shares	5,00,000
13% Debt	50,00,000
	<u>1,30,00,000</u>

(b) *Debt/Total capital* = Rs 50,00,000/1,30,00,000 = 38.5 per cent.

(ii) Yes, the financial risk has declined due to lower debt ratio of the merged firm.

(iii)  $0.50 = (\text{Rs } 50,00,000 + X) / 1,30,00,000 + X$  where  $X$  represents additional debt.

$$0.5 (\text{Rs } 1,30,00,000 + X) = \text{Rs } 50,00,000 + X$$

$$\text{Rs } 65,00,000 + 0.5 X = \text{Rs } 50,00,000 + X$$

$$\text{Rs } 30,00,000 = X$$

**PS 8.10**

From the following data, calculate the true cost of acquiring firm A Ltd

	<i>A Ltd</i>	<i>T Ltd</i>
Market price per share	Rs 80	Rs 20
Number of shares	5,00,000	4,00,000
Market value (MV)	4,00,00,000	80,00,000

A Ltd intends to pay Rs 50 lakh in cash and its 60,000 shares in exchange for 4 lakh shares of T Ltd.

**Solution**

True cost of acquisition = Cash + MV of shares of A Ltd – Rs 80 lakh = Rs 50 lakh + (60,000 shares × Rs 80) —  
Rs 80 lakh = Rs 18 lakh

**PS 8.11**

Consider the following financial data of A Ltd and T Ltd just before the merger announcement of the latter by the former:

	<i>A Ltd</i>	<i>T Ltd</i>
Market price per share	Rs 150	Rs 30
Number of shares (in lakh)	10	6
Market value (MV) of the firm (in Rs lakh)	1,500	180

Determine the cost of merger:

(i) if A Ltd intends to pay Rs 240 lakh in cash to T Ltd;

(ii) if A Ltd intends to offer its 1,60,000 shares in exchange of shares of T Ltd. Assume further, the merger is expected to generate cost savings with present value of Rs 94.80 lakh. It is expected that these cost savings would push up the market price.

(Note: consider each case independently)

**Solution**

(i) True cost of merger = Rs 240 lakh – Rs 180 lakh = Rs 60 lakh

(ii) New share price = (Rs 1,500 lakh + Rs 180 lakh + Rs 94.80 lakh)/11,60,000 shares = Rs 153.

True cost of merger = (1,60,000 shares × Rs 153) – Rs 180 lakh = Rs 64.80 lakh.

**PS 8.12**

A Ltd is planning to acquire T Ltd. The relevant financial details of the two firms prior to merger announcement are as follows:

	<i>A Ltd</i>	<i>T Ltd</i>
Market price per share	Rs 150	Rs 60
Number of shares	1 lakh	50,000

The merger is expected to yield gains with present value of Rs 20 lakh. A Ltd offers 25,000 shares in exchange of 50,000 shares of T Ltd.

You are required to determine:

- Total value of combined firm (AT Ltd) after merger;
- Gains to the shareholders of A Ltd and T Ltd ;
- True cost of acquiring T Ltd; and
- NPV of the merger for shareholders of T Ltd.

**Solution**

(i)  $PV_{AT} = PV_A + PV_B + \text{PV of gain from merger} = \text{Rs } 150 \text{ lakh} + \text{Rs } 30 \text{ lakh} + \text{Rs } 20 \text{ lakh} = \text{Rs } 200 \text{ lakh}$ .

(ii) (a) Number of shares after the merger = 1 lakh + 25,000 = 1,25,000

(b) Rs 200 lakh will be apportioned in proportion of 4 : 1 that is, Rs 160 lakh and Rs 40 lakh for shareholders of A Ltd and T Ltd respectively.

(c) *Gain from merger:*

	<i>A Ltd</i>	<i>T Ltd</i>
Value after merger (in lakh)	Rs 160	Rs 40
Less value before merger	150	30
Gain	10	10

(iii) True cost of acquiring T Ltd = Gain to the shareholders of T Ltd = Rs 10 lakh.

(iv) NPV of merger for shareholders of T Ltd = Rs 10 lakh.

**PS 8.13**

A Ltd is considering the purchase of T Ltd. The cash inflows after taxes for T Ltd are estimated to be Rs 15 lakh per year in the future. This forecast by A Ltd includes expected merger synergic gains. T Ltd currently has total assets of Rs 50 lakh with 20 per cent being financed with debt funds. A Ltd's pre-merger weighted average cost of capital is 15 per cent.

- Based on A Ltd's pre-merger cost of capital, what is the maximum purchase price that A Ltd would be willing to pay to acquire T Ltd?
- Assume that by acquiring T Ltd, A Ltd will move towards an optimal capital structure such that its weighted average cost of capital will be 12 per cent after the acquisition. Under these conditions, what would be the maximum price A Ltd should be willing to pay?
- Assume that cash flows for T Ltd estimated at Rs 15 lakh for the coming year, will grow at a rate of 20 per cent per year for the following 2 years, and will be on level thereafter. Each rupee increase in cash flows will require Re 0.7 incremental investment in assets. Estimate the maximum purchase price of T Ltd based on a 12 per cent cost of capital.

**Solution**(i) *Maximum purchase price of T Ltd*

(a) Increase in CFAT, that is, Rs 15,00,000/Overall capitalisation rate (0.15)	Rs 1,00,00,000
(b) Less debt (0.20 × Rs 50,00,000)	10,00,000
	<u>90,00,000</u>

(ii) *Maximum purchase price*

Increase in CFAT (Rs 15,00,000/0.12)	1,25,00,000
Less debt	10,00,000
	<u>1,15,00,000</u>

(iii) *Maximum purchase price*

Year	CFAT	Increase in net investment	Net CFAT [1-2]	PV factor (0.12)	Total PV
	(1)	(2)	(3)	(4)	(5)
1	Rs 15,00,000	—	Rs 15,00,000	0.893	Rs 13,39,500
2	18,00,000	Rs 2,10,000*	15,90,000	0.797	12,67,230
3	21,60,000	2,52,000**	19,08,000	0.712	13,58,496
Perpetuity	21,60,000	—	21,60,000	—	1,28,16,000***
Total value of the firm					<u>1,67,81,226</u>
Less debt					10,00,000
Maximum purchase price					<u>1,57,81,226</u>

\* Rs 3,00,000 × 0.70 = Rs 2,10,000

\*\* Rs 3,60,000 × 0.70 = Rs 2,52,000

\*\*\*[Rs 21,60,000 ÷ 0.12 = Rs 1,80,00,000] × 0.712 = Rs 1,28,16,000

**PS 8.14**

Following are the financial statements for A Ltd and T Ltd for the current financial year. Both firms operate in the same industry.

*Balance sheets*

	A Ltd	T Ltd
Total current assets	Rs 14,00,000	Rs 10,00,000
Total fixed assets (net)	10,00,000	5,00,000
Total assets	<u>24,00,000</u>	<u>15,00,000</u>
Equity capital (of Rs 10 each)	10,00,000	8,00,000
Retained earnings	2,00,000	—
14% Long-term debt	5,00,000	3,00,000
Total current liabilities	7,00,000	4,00,000
	<u>24,00,000</u>	<u>15,00,000</u>

*Income statements*

Net sales	Rs 34,50,000	Rs 17,00,000
Cost of goods sold	<u>27,60,000</u>	<u>13,60,000</u>
Gross profit	6,90,000	3,40,000
Operating expenses	2,96,923	1,45,692

(Contd.)

**PS 8.14 (Contd.)**

Interest	70,000	42,000
Earnings before taxes (EBT)	3,23,077	1,52,308
Taxes (0.35)	1,13,077	53,308
Earnings after taxes (EAT)	2,10,000	99,000

*Additional information:*

Number of equity shares	1,00,000	80,000
Dividend payment (D/P) ratio	0.40	0.60
Market price per share (MPS)	Rs 40	Rs 15

Assume that the two firms are in the process of negotiating a merger through an exchange of equity shares. You have been asked to assist in establishing equitable exchange terms, and are required to:

- Decompose the share prices of both the companies into EPS and P/E components, and also segregate their EPS figures into return on equity (ROE) and book value or intrinsic value per share (BVPS) components.
- Estimate future EPS growth rates for each firm.
- Based on expected operating synergies, A Ltd estimates that the intrinsic value of T's equity share would be Rs 20 per share on its acquisition. You are required to develop a range of justifiable equity share exchange ratios that can be offered by A Ltd to T Ltd's shareholders. Based on your analysis in parts (i) and (ii), would you expect the negotiated terms to be closer to the upper, or the lower exchange ratio limits? Why?
- Calculate the post-merger EPS based on an exchange ratio of 0.4 : 1 being offered by A Ltd. Indicate the immediate EPS accretion or dilution, if any, that will occur for each group of shareholders.
- Based on a 0.4:1 exchange ratio, and assuming that A's pre-merger P/E ratio will continue after the merger, estimate the post-merger market price. Show the resulting accretion or dilution in pre-merger market prices.

***Solution***

(i) *Determination of EPS, P/E ratio, ROE and BVPS of A Ltd and T Ltd.*

	<i>A Ltd</i>	<i>T Ltd</i>
EAT (Rs)	2,10,000	99,000
N	1,00,000	80,000
EPS (EAT ÷ N) (Rs)	2.10	1.24
Market price per share (MPS) (Rs)	40	15
P/E ratio (MPS/EPS)	19.05	12.12
Equity funds (EF) (Rs)	12,00,000	8,00,000
BVPS (EF ÷ N) (Rs)	12	10
ROE (EAT ÷ EF)	0.175	0.1237

(ii) *Growth rates in EPS*

Retention ratio (1 – D/P ratio)	0.6	0.4
Growth rate (ROE × Retention ratio)	0.105	0.0495

(iii) *Justifiable equity share exchange ratio*

- Market price based =  $\text{MPS}_T / \text{MPS}_A = \text{Rs } 15 / \text{Rs } 40 = 0.375 : 1$  (lower limit)
- Intrinsic value based =  $\text{Rs } 20 / 40 = 0.5 : 1$  (upper limit)

Since A Ltd has a higher EPS, ROE, P/E ratio, and higher EPS growth expectations, the negotiated terms would be expected to be closer to the lower limit, based on the existing share prices.



(iv) *Post-merger EPS and other effects*

	<i>A Ltd</i>	<i>T Ltd</i>	<i>Combined</i>
EAT (Rs)	2,10,000	99,000	3,09,000
Shares outstanding	1,00,000	80,000	1,32,000*
EPS (Rs )	2.10	1.24	2.34
EPS accretion or (dilution) (Rs )	0.24	(0.30**)	—

(v) *Post-merger market price and other effects*

	<i>A Ltd</i>	<i>T Ltd</i>	<i>Combined</i>
EPS	Rs 2.10	Rs 1.24	Rs 2.34
P/E ratio	(×) 19.05	(×) 12.12	(×) 19.05
	40	15	44.60
MPS accretion	4.60	2.84***	

\* 1,00,000 shares + (0.40 × 80,000) = 1,32,000 shares

\*\* EPS claim per old share = Rs 2.34 × 0.4 = Re 0.936

EPS dilution (Rs 1.24 – Re.0.936) = Re 0.301

\*\*\*MPS claim per old share = Rs 44.60 × 0.4 = Rs 17.84

Less MPS per old share

15.00
<u>2.84</u>

**PS 8.15**

The balance sheet of XYZ Ltd as on March 31 (current year) is as follows:

<i>Liabilities</i>	<i>Amount</i>	<i>Assets</i>	<i>Amount</i>
Equity share capital (10,000 shares @ Rs 20 each)	Rs 2,00,000	Plant and machinery	Rs 2,50,000
13% Debentures	1,00,000	Furniture and fittings	5,000
Retained earnings	50,000	Inventories	90,000
Creditors	30,000	Debtors	25,000
	<u>3,80,000</u>	Bank balance	10,000
			<u>3,80,000</u>

The company is to be absorbed by ABC Ltd at the above date. The consideration for absorption is the discharge of debentures at a premium of 10 per cent, taking over the liability in respect of sundry creditors and a payment of Rs 14 in cash and one share of Rs 10 in ABC Ltd at the market value of Rs 16 per share in exchange for one share in XYZ Ltd. The cost of dissolution of Rs 10,000 is to be met by the purchasing company. Inventories are expected to realise Rs 1,00,000, and expected collection from debtors are Rs 20,000.

Expected yearly benefits (CFAT) from the business of XYZ Ltd are Rs 1,50,000 for 5 years. Assuming zero salvage value of its fixed assets, and cost of capital at 14 per cent, comment on the financial soundness of the ABC's decision regarding the merger.

**Solution***Financial analysis of merger decision*(i) *Cost of acquisition*

Redemption of 13% Debentures	Rs 1,10,000
Payment of creditors	30,000
Issue of shares (10,000 × Rs 16)	1,60,000
Payment in cash (10,000 × Rs 14)	1,40,000

(Contd.)

**Solution (Contd.)**

Cost of dissolution	10,000
Less cash realised from acquired assets (Rs 1,00,000 + Rs 20,000)	(1,20,000)
Less cash balance of XYZ Ltd	(10,000)
	<u>3,20,000</u>

**(ii) Determination of NPV of expected CFAT**

Year	CFAT	PV factor (0.14)	Total PV
1-5	Rs 1,50,000	3.433	Rs 5,14,950
Less PV of cash outflows			<u>3,20,000</u>
NPV			1,94,950

**Decision:** The merger decision is financially sound as it promises a positive NPV.

**PS 8.16**

A Ltd decided to take over the business of T Ltd on March 31 (current year); the summarised balance sheet of T Ltd as on that date was as follows:

Liabilities	Amount	Assets	Amount
Equity share capital (50,000 shares)	Rs 5,00,000	<b>Fixed assets:</b>	
General reserves	2,50,000	Land and buildings	Rs 3,00,000
P & L A/c	1,20,000	Plant and machinery	5,80,000
13% Debentures	1,00,000	<b>Current assets:</b>	
Current liabilities	30,000	Inventories	70,000
		Debtors	35,000
		Bank	15,000
	<u>10,00,000</u>		<u>10,00,000</u>

**Additional information:**

- A Ltd has agreed to take over all the current assets at their book values but the fixed assets were to be revalued as under for the purpose: land and buildings Rs 5,00,000; plant and machinery; Rs 5,00,000. In addition, A Ltd is required to pay Rs 50,000 for goodwill and is also to bear dissolution expenses of Rs 10,000 (to be paid directly by A Ltd).
- The expected realisation from current assets (other than bank balance) is Rs 90,000.
- Purchase consideration was paid as Rs 1,30,000 in cash to pay 13 %. Debentures and other liabilities and the balance is to be paid in equity shares of A Ltd.
- Expected benefits (CFAT) accruing to A Ltd are as follows:

Year	1	2	3	4	5
CFAT	Rs 2,00,000	Rs 3,00,000	Rs 2,60,000	Rs 2,00,000	Rs 1,00,000

Further, it is estimated that the market value of T's fixed assets would be Rs 6,00,000 (land and buildings) and Rs 40,000 (plant and machinery) at the end of fifth year.

- Cost of capital of T Ltd is 15 per cent.

Do you think A Ltd is likely to benefit taking over T Ltd?

***Solution****Financial analysis of merger decision**(i) Cost of acquisition*

<i>Fixed assets:</i>			
Land and building	Rs 5,00,000		
Plant and Machinery	5,00,000		
Goodwill	50,000	Rs 10,50,000	
<i>Current assets:</i>			
Inventories	70,000		
Debtors	35,000		
Bank	15,000	1,20,000	
Dissolution expenses (T Ltd )		10,000	
<i>Less realisation from current assets:</i>			
Inventories + Debtors	90,000		
Bank	15,000	(1,05,000)	
		10,75,000	

*(ii) Determination of NPV of expected CFAT*

Year	CFAT	PF factor at 0.15	Total PV
1	Rs 2,00,000	0.870	Rs 1,74,000
2	3,00,000	0.756	2,26,800
3	2,60,000	0.658	1,71,080
4	2,00,000	0.572	1,14,400
5	1,00,000	0.497	49,700
5	6,40,000*	0.497	3,18,080
Total			10,54,060
Less cost of acquisition			10,75,000
NPV			(20,940)

\*(Rs 6,00,000 + Rs 40,000, sale value of fixed assets)

**Recommendation:** The merger decision is not financially sound as the expected NPV is negative.

**EXERCISES**

**E.8.1** XYZ Ltd wants to acquire ABC Ltd by exchanging its 1.6 shares for every share of ABC Ltd. XYZ anticipates to maintain the existing P/E ratio subsequent to the merger also. The relevant financial data are furnished below:

	XYZ Ltd	ABC Ltd
Earnings after taxes (EAT)	Rs 15,00,000	Rs 4,50,000
Number of equity shares	3,00,000	75,000
Market price per share (MPS)	35	40

- What is the exchange ratio based on market prices?
- What is the pre-merger EPS and P/E ratio for each company?
- What was the P/E ratio used in acquiring ABC Ltd?
- What is the EPS of XYZ Ltd after the acquisition?
- What is expected MPS of the merged company?

**E.8.2** A Ltd wants to acquire T Ltd by exchanging 0.5 of its shares for each share of T Ltd. The relevant financial data is as follows:

	<i>A Ltd</i>	<i>B Ltd</i>
Earnings after taxes	Rs 18,00,000	Rs 3,60,000
Equity shares outstanding	6,00,000	1,80,000
Earnings per share	3	2
P/E ratio	10	7
Market price per share	30	14

- What is the number of equity shares required to be issued by A Ltd for acquisition of T Ltd?
- What is the EPS of A Ltd after the acquisition?
- Determine the equivalent earnings per share of T Ltd.
- What is the expected MPS of A Ltd after the acquisition, assuming its P/E multiple remains unchanged?
- Determine the market value of the merged firm.

**E.8.3** The following data relate to companies A and B:

	<i>A Ltd</i>	<i>B Ltd</i>
Earnings after taxes	Rs 1,40,000	Rs 37,500
Equity shares outstanding	20,000	7,500
Earnings per share	7	5
P/E ratio	10	8
Market price per share	70	40

A Ltd is the acquiring company, exchanging its one share for every 1.5 shares of T Ltd. Assuming that A Ltd expects to have the same earnings and P/E ratios after the merger as before, show the extent of gain accruing to the shareholders of the two companies as a result of the merger. Are they better or worse-off than they were before the merger?

**E.8.4** From the following data, calculate the true cost of merger.

	<i>A Ltd</i>	<i>T Ltd</i>
Market price per share	Rs 60	Rs 15
Number of shares	1,00,000	50,000
Market value of the firm	6,00,000	7,50,000

A Ltd intends to pay Rs 9,50,000 cash for acquisition. It is also expected to incur other costs amounting to Rs 50,000.

**E.8.5** A Ltd is planning to acquire T Ltd. The relevant financial details of the two firms prior to merger announcement are as follows:

	<i>A Ltd</i>	<i>T Ltd</i>
Market price per share	Rs 75	Rs 30
Number of shares	10,00,000	5,00,000
Market value of the firm (Rs lakh)	750	150

The merger is expected to bring gains which have present value of Rs 150 lakh. A Ltd offers 2,50,000 shares in exchange for 5 lakh shares to the shareholders of T Ltd.

You are required to determine:

- total value of the combined firm AT Ltd (PVAT) after merger;
- gains to the shareholders of A; and
- true cost of acquiring T Ltd.

**E.8.6** The summarised balance sheet of Target Ltd as on March 31 (current year) is given below.

<i>Liabilities</i>	<i>Amount</i>	<i>Assets</i>	<i>Amount</i>
Equity share capital (2,00,000 shares)	Rs 20,00,000	Fixed assets	Rs 19,00,000
13% Preference share capital	1,00,000	Investments	1,00,000
Retained earnings	4,00,000	<i>Current assets</i>	
12% Debentures	3,00,000	Inventories	5,00,000
Current liabilities	2,00,000	Debtors	4,00,000
	<u>30,00,000</u>	Bank	1,00,000
			<u>30,00,000</u>

Negotiations for takeover of T Ltd result in its acquisition by A Ltd. The purchase consideration consists of (i) Rs 3,30,000, 13% Debentures of A Ltd for redeeming the 12% Debentures of T Ltd, (ii) Rs 1,00,000, 12% Convertible Preference Shares in A Ltd for the repayment of the preference share capital of T Ltd, (iii) 1,50,000 equity shares in T Ltd, to be issued at its current market price (Rs 15), (iv) A Ltd would meet the dissolution expenses, estimated to cost Rs 30,000.

The break-up of eventual disposition by T Ltd of its unrequired assets and liabilities are: investments (Rs 1,25,000), debtors (Rs 3,50,000), inventories (Rs 4,25,000), and payment of current liabilities (Rs 1,90,000).

The project is expected to generate yearly operating CFAT of Rs 7,00,000 for 6 years. It is estimated that fixed assets of T Ltd would fetch Rs 3,00,000 at the end of the 6th year. The cost of capital is 15 per cent. As a financial consultant, comment on the financial prudence of the merger decisions of A Ltd.

## ANSWERS

- E.8.1** (i) 1.4,  
(ii) EPS Rs 5 (XYZ), Rs 6 (ABC Ltd), P/E ratio 7 (XYZ) 6.67 (ABC Ltd),  
(iii) 9.33,  
(iv) Rs 4.64,  
(v) Rs 32.48.

- E.8.2** (i) 90,000 shares,  
(ii) Rs 3.13,  
(iii) Rs 1.56,  
(iv) Rs 31.3,  
(v) Rs 2,15,97,000.

**E.8.3** Gain from merger Rs 75,000; Rs 20,000 gain to firm A, Rs 55,000 gain to firm B; better off.

**E.8.4** Rs 2,50,000

- E.8.5** (i) Rs 10.5 crore  
(ii) Gain to A Ltd, Rs 0.09 crore  
(iii) Rs 0.6 crore

**E.8.6** Merger is financially viable; NPV: Rs 8,78,400.

# 9

## BASIC THEORY

### INTRODUCTION

Leverage provides the framework for financing decisions of a firm. It may be defined as the employment of an asset or source of funds for which the firm has to pay a fixed cost, or fixed return.

### TYPES OF LEVERAGE

Leverage may be (i) operating, (ii) financial, and (iii) combined.

#### Operating Leverage

Leverage associated with asset acquisition or investment activities is referred to as the operating leverage. It may be defined as the ability to use fixed operating costs to magnify the effect of changes in sales on its operating profits (EBIT). Thus, operating leverage is determined by the relationship between sales revenue and EBIT. When proportionate change in EBIT, as a result of change in sales, is more than the proportionate change in sales, operating leverage occurs. Operating leverage is summarised in Exhibit 9.1.

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#### EXHIBIT 9.1 *Operating Leverage*

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Degree of operating leverage (DOL) = Percentage change in EBIT/Percentage change in sales	(9.1)	
or	DOL = (Sales – Variable costs)/EBIT	(9.2)

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#### Financial Leverage

Financial leverage is related to the financing activities of a firm. It results from the presence of fixed financial charges. Such expenses do not vary with the operating profits (EBIT). They have to be paid regardless of the amount of EBIT available to pay them. After paying them, the EBIT belongs to the shareholders. Financial leverage is concerned with the effect of changes in the EBIT on earnings available to equity shareholders (EPS). It may be defined as the ability of a firm to use fixed financial charges to magnify the effect of changes in EBIT on EPS. Financial leverage is depicted in Exhibit 9.2.

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#### EXHIBIT 9.2 *Financial Leverage*

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Degree of financial leverage (DFL) = Percentage change in EPS/Percentage change in EBIT	(9.3)	
or	DFL = EBIT/EBIT – $I$ (when preference capital is not used)	(9.4)
or	DFL = EBIT/[EBIT – $I$ – ( $D_p$ (1 – $t$ ))] (when preference capital is used)	(9.5)
where	$D_p$ = Preference dividend	
	$t$ = tax rate	

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(Contd.)

**Exhibit 9.2 (Contd.)**

$$\text{or DFL} = \frac{\text{EBIT}}{\text{EBT} - I - \frac{D_p + Wt}{1-t}} \quad (9.6)$$

where  $Wt$  = Withholding tax on dividend payment

**Combined Leverage**

Combined leverage is the product of operating and financial leverage. It indicates the effect that sales changes will have on EPS. Combined leverage is summarised in Exhibit 9.3.

**EXHIBIT 9.3 Combined Leverage**

Degree of combined leverage (DCL) = DOL × DFL = (Percentage change in EBIT/Percentage change in sales) × (Percentage change in EPS/Percentage change in EBIT) (9.7)

or = Percentage change in EPS/Percentage change in sales (9.8)

Alternatively,

$$= (\text{Sales} - \text{Variable costs})/\text{EBIT} \times (\text{EBIT}/\text{EBT} - I)$$

$$= (\text{Sales} - \text{Variable costs})/(\text{EBT} - I) \quad (9.9)$$

**SOLVED PROBLEMS****PS 9.1**

From the following selected operating data, determine the degree of operating leverage. Which company has the greater amount of business risk? Why?

	<i>A Ltd</i>	<i>B Ltd</i>
Sales	Rs 25,00,000	Rs 30,00,000
Fixed costs	7,50,000	15,00,000

Variable expenses as a percentage of sales are 50 per cent for firm A and 25 per cent for firm B.

**Solution**

*Determination of operating leverage (DOL)*

<i>Particulars</i>	<i>A Ltd</i>	<i>B Ltd</i>
Sales revenue	Rs 25,00,000	Rs 30,00,000
Less: variable costs	12,50,000	7,50,000
fixed costs	7,50,000	15,00,000
EBIT (operating profit)	5,00,000	7,50,000
DOL = (Sales – VC)/EBIT	2.5	3

B Ltd has greater business risk as its DOL is higher.

**PS 9.2**

(i) Find out operating leverage from the following data:

Sales:	Rs 50,000
Variable costs:	60 per cent
Fixed costs:	Rs 12,000.

(ii) Compute the financial leverage from the following data:

Net worth	= Rs 25,00,000
Debt/equity	= 3:1
Interest rate	= 12 per cent
Operating profit	= Rs 20,00,000

**Solution**

(i) *Determination of operating leverage*

Sales	Rs 50,000
Less variable costs (0.60)	30,000
Contribution	20,000
Less fixed costs	12,000
EBIT	8,000
DOL (Rs 20,000/8,000)	2.5

(ii)  $DFL = Rs\ 20,00,000 / (Rs\ 20,00,000 - Rs\ 9,00,000)^* = 1.82$

\*Interest on debt (Rs 25,00,000, networth  $\times$  three times, D/E ratio = Rs 75,00,000)  $\times$  0.12 = Rs 9,00,000.

**PS 9.3**

Royal Industries Ltd, a well-established firm in plastics, is considering the purchase of one of the two manufacturing companies. The financial manager of the company has developed the following information about the two companies. Both companies have total assets of Rs 15,00,000.

*Operating statement*

	<i>X Ltd</i>	<i>Y Ltd</i>
Sales revenue	Rs 30,00,000	Rs 30,00,000
Less: cost of goods sold	22,50,000	22,50,000
selling expenses	2,40,000	2,40,000
administrative expenses	90,000	1,50,000
depreciation	1,20,000	90,000
EBIT	3,00,000	2,70,000
Cost break-ups		
Variable costs:		
Cost of goods sold	9,00,000	18,00,000
Selling expenses	1,50,000	1,50,000
Total	10,50,000	19,50,000

- Prepare operating statements for both the companies, assuming that sales increase by 20 per cent. The total fixed costs are likely to remain unchanged and the variable costs are a linear function of sales.
- Calculate the degree of operating leverage.
- If Royal Industries Ltd wishes to buy a company which has a lower degree of business risk, which company would be purchased by it?



### Solution

(i) Operating statement of X Ltd. and Y Ltd.

Particulars	X Ltd	Y Ltd
Sales revenue	Rs 36,00,000	Rs 36,00,000
Less: cost of goods sold	24,30,000	26,10,000
selling expenses	2,70,000	2,70,000
administrative expenses	90,000	1,50,000
depreciation	1,20,000	90,000
EBIT	6,90,000	4,80,000
Cost of goods sold break-up		
Variable costs	10,80,000 <sup>1</sup>	21,60,000 <sup>2</sup>
Fixed costs	13,50,000	4,50,000
	24,30,000	26,10,000

<sup>1</sup>30 per cent of sales

<sup>2</sup>60 per cent of sales

(ii)  $DOL(X) = (\Delta EBIT \div EBIT) / (\Delta Sales \div Sales) = (Rs\ 3,90,000 \div Rs\ 3,00,000) / (Rs\ 6,00,000 \div Rs\ 30,00,000) = 6.5$ .

$DOL(Y) = (Rs\ 2,10,000 \div Rs\ 2,70,000) / (Rs\ 6,00,000 \div Rs\ 30,00,000) = 3.88$ .

Alternatively,

$DOL(X) = (Sales - VC) / (Current EBIT) = (Rs\ 30,00,000 - Rs\ 10,50,000) / 3,00,000 = 6.5$ .

$DOL(Y) = Rs\ 30,00,000 - Rs\ 19,50,000 / 2,70,000 = 3.88$ .

(iii) Royal Industries Ltd should purchase Y Ltd.

### PS 9.4

XYZ Ltd has an average selling price of Rs 10 per unit. Its variable unit costs are Rs 7, and fixed costs amount to Rs 1,70,000. It finances all its assets by equity funds. It pays 35 per cent tax on its income.

ABC Ltd is identical to XYZ Ltd, except in the pattern of financing. The latter finances its assets 50 per cent by equity and 50 per cent by debt, the interest on which amounts to Rs 20,000.

Determine the degree of operating, financial and combined leverage at Rs 7,00,000 sales for both the firms, and interpret the results.

### Solution

Determination of various types of leverage

Particulars	XYZ Ltd	ABC Ltd
Sales revenue	Rs 7,00,000	Rs 7,00,000
Less: variable cost (0.70)	4,90,000	4,90,000
fixed costs	1,70,000	1,70,000
EBIT (operating profit)	40,000	40,000
Less interest	Nil	20,000
EBT	40,000	20,000
Less taxes (0.35)	14,000	7,000
EAT	26,000	13,000
$DOL = (Sales - VC) / EBIT$	5.25	5.25
$DFL = EBIT / (EBIT - I)$	1	2
$DCL = (Sales - VC) / (EBIT - I)$ (or $DOL \times DFL$ )	5.25	10.5

The DCL of the ABC Ltd is higher due to higher financial leverage. Its total risk is, therefore, higher although its DOL (operating risk) is equal to that of the XYZ Ltd.

**PS 9.5**

The operating income of Hypothetical Ltd amounts to Rs 1,86,000. It pays 35 per cent tax on its income. Its capital structure consists of the following:

14% Debentures	Rs 5,00,000
15% Preference shares	1,00,000
Equity shares (Rs 100 each)	4,00,000

- (i) Determine the firm's EPS.
- (ii) Determine the percentage change in EPS associated with 30 per cent change (both increase and decrease) in EBIT.
- (iii) Determine the degree of financial leverage at the current level of EBIT.
- (iv) What additional data do you need to compute operating as well as combined leverage?

**Solution**

(i) *Determination of EPS*

Particulars	Amount
EBIT	Rs 1,86,000
Less interest (0.14 × Rs 5,00,000)	70,000
EBT	1,16,000
Less taxes (0.35)	40,600
EAT	75,400
Less dividend on preference shares	15,000
Earnings available for equity holders	60,400
EPS (Rs 60,400 ÷ 4,000)	15.1

(ii) *Change in EPS*

Particulars	Change in EBIT	
	(+30%)	(-30%)
EBIT	Rs 2,41,800	Rs 1,30,200
Less interest	70,000	70,000
EBT	1,71,800	60,200
Less taxes (0.35)	60,130	21,070
EAT	1,11,670	39,130
Less dividends payable on preference shares	15,000	15,000
Earnings available for equity holders	96,670	24,130
EPS	24.17	6.03
Change in EPS ( $\Delta \text{EPS} \div \text{EPS}$ )	(+60.05%)	(-60.05%)

(iii)  $\text{DFL} = \text{EBIT} / \text{EBIT} - I - [D_p / (1 - t)] = \text{Rs } 1,86,000 / (\text{Rs } 1,86,000 - \text{Rs } 70,000 - [\text{Rs } 15,000 \div (0.65)]) = 2$  (times).

(iv) The additional data required to compute the operating and combined leverage relate to sales and variable cost.

**PS 9.6**

The operating and cost data of ABC Ltd are:

Sales	Rs 20,00,000
Variable costs	14,00,000
Fixed costs	4,00,000 (including 15 per cent interest on Rs 10,00,000)

Calculate its operating, financial and combined leverage.

***Solution****(i) Income statement*

Sales revenue (SR)	Rs 20,00,000
Less: variable cost (VC)	14,00,000
operating fixed costs (Rs 4,00,000 – 1,50,000)	2,50,000
EBIT	3,50,000
Less interest	1,50,000
Net earnings before taxes	2,00,000
DOL = (SR – VC)/EBIT	1.71
DFL = EBIT/(EBIT – I)	1.75
DCL = (DOL × DFL)	2.99

**PS 9.7**

The Hypothetical Ltd's current EBIT is Rs 25 lakh. Its present borrowings are:

14% Term loans	Rs 40 lakh
Working capital borrowings from banks at (0.16)	33
15% Public deposits	15

The sales of the company are growing, and to support them the company proposes to obtain an additional bank loan of Rs 25 lakh. The increase in EBIT is expected to be 20 per cent. Calculate the change in interest coverage ratio after the additional borrowing and comment.

***Solution****Interest on present borrowings*

<i>Particulars</i>	<i>Amount</i>	<i>Rate</i>	<i>Total interest</i>
Term loan	Rs 40,00,000	0.14	Rs 5,60,000
Bank loan	33,00,000	0.16	5,28,000
Public deposit	15,00,000	0.15	2,25,000
			13,13,000

Interest coverage ratio = EBIT/Interest = Rs 25,00,000/ Rs 13,13,000 = 1.90.

Revised EBIT = Rs 25,00,000 + 0.20 × (Rs 25,00,000) = Rs 30,00,000.

Revised interest = Rs 13,13,000 + 0.16 × (Rs 25,00,000) = Rs 17,13,000.

Interest coverage ratio (revised) = Rs 30,00,000/ Rs 17,13,000 = 1.75.

As a result of additional borrowing, the interest coverage ratio would decrease marginally from 1.90 to 1.75. Nevertheless, the expected profit would be adequate to meet the interest liability.

**PS 9.8**

The operating profit (EBIT) of ABC Ltd is Rs 1,60,000. Its capital structure consists of the following:

10% Debentures	Rs 5,00,000
12% Preference shares	1,00,000
Equity shares of Rs 100 each	4,00,000

The company is in the 35 per cent tax bracket. The withholding tax on preference dividend is 10 per cent.

- (i) Determine the firm's EPS.
- (ii) Determine the percentage change in EPS associated with 30 per cent increase in EBIT.
- (iii) Determine the degree of financial leverage.
- (iv) Assuming DOL, 2, determine the DCL.

### ***Solution***

#### *(i) Determination of EPS*

EBIT	Rs 1,60,000
Less interest ( $0.10 \times \text{Rs } 5,00,000$ )	50,000
EBT	1,10,000
Less taxes ( $0.35 \times \text{Rs } 1,10,000$ )	38,500
EAT	71,500
Less dividends on preference shares (Rs 12,000 + Rs 1,200, 10% withholding tax)	13,200
Earnings for equity holders	58,300
EPS ( $\text{Rs } 58,300 \div 4,000$ )	14.58

#### *(ii) Change in EPS (30 per cent increase in EBIT)*

EBIT	Rs 2,08,000
Less interest	50,000
EBT	1,58,500
Less taxes	55,475
EAT	1,03,025
Less dividends on preference shares including withholding tax	13,200
Earnings for equity holders	89,825
EPS	22.46
Percentage change in EPS ( $\Delta \text{EPS} \div \text{EPS}$ )	+ 54.1

(iii)  $\text{DFL} = \text{EBIT} / \text{EBIT} - I - [D_p + Wt/(1 - t)] = \text{Rs } 1,60,000 / \text{Rs } 1,60,000 - \text{Rs } 50,000 - \text{Rs } 20,308 = 1.78$ .

(iv)  $\text{DCL} = 1.78 \times 2 = 3.56$ .

### **PS 9.9**

From the following financial data of companies, X Ltd and Y Ltd, prepare their income statements.

	<i>X Ltd</i>	<i>Y Ltd</i>
Variable cost as percentage of sales	50	60
Interest expense	Rs 20,000	6,000
DOL	3-1	5-1
DFL	2-1	3-1
Income tax rate	0.35	0.35

### ***Solution***

Income statement of companies, X Ltd and Y Ltd

<i>Particulars</i>	<i>X Ltd</i>	<i>Y Ltd</i>
Sales revenue	Rs 2,40,000	Rs 1,12,500
Less: variable cost	1,20,000	67,500

*(Contd.)*

**Solution (Contd.)**

fixed costs (sales – VC – EBIT)	80,000	36,000
EBIT	40,000	9,000
Less interest	20,000	6,000
EBT	20,000	3,000
Less taxes	7,000	1,050
EAT	13,000	1,950

**Working notes**

<i>X Ltd</i>	<i>Y Ltd</i>
EBIT/(EBIT – Rs 20,000) = 2	EBIT/(EBIT – Rs 6,000) = 6
EBIT = 2(EBIT – Rs 20,000)	EBIT = 3(EBIT – Rs 6,000)
= Rs 40,000	= Rs 9,000
3 = (Sales – 0.5 sales)/Rs 40,000	5 = (Sales – 0.6 sales)/Rs 9,000
Rs 1,20,000 = 0.5 sales	Rs 45,000 = 0.4 sales
Sales = Rs 2,40,000	Sales = Rs 1,12,500
VC (0.5 sales) = Rs 1,20,000	VC (0.6 sales) = Rs 67,500

**PS 9.10**

From the following, prepare income statement of A Ltd, B Ltd and C Ltd. Briefly comment on each company's performance:

<i>Company</i>	<i>A</i>	<i>B</i>	<i>C</i>
Financial leverage	3:1	4:1	2:1
Interest (Rs )	200	300	1,000
Operating leverage	4:1	5:1	3:1
Variable cost as a percentage of sales	66.33	75	50
Tax rate	35	35	35

**Solution**

*Income statements of companies A Ltd, B Ltd and C Ltd*

<i>Particulars</i>	<i>A</i>	<i>B</i>	<i>C</i>
Sales revenue	Rs 3,600	Rs 8,000	Rs 12,000
Less variables costs	2,400	6,000	6,000
Less fixed costs (balancing figure)	900	1,600	4,000
EBIT	300	400	2,000
Less interest	200	300	1,000
EBT	100	100	1,000
Less taxes	35	35	350
EAT	65	65	650

**Working notes**

*A Ltd:*

EBIT/(EBIT – Rs 200) = 3 or EBIT = 3 EBIT – Rs 600 or EBIT = Rs 300  
 (Sales – 2/3 sales)/Rs 300 = 4 or 1/3 sales = Rs 1,200 or sales = Rs 3,600  
 Variable costs = Rs 3,600 × 2/3 = Rs 2,400.

*B Ltd:*

EBIT/(EBIT – Rs 300) = 4 or EBIT = 4 EBIT – Rs 1,200 or EBIT = Rs 400  
 (Sales – 0.75 sales)/Rs 400 = 5 or 0.25 sales = Rs 2,000 or sales = Rs 8,000  
 Variable costs = Rs 8,000 × 0.75 = Rs 6,000.

C Ltd:

$$\text{EBIT}/(\text{EBIT} - \text{Rs } 1,000) = 2 \text{ or } \text{EBIT} = 2 \text{ EBIT} - \text{Rs } 2,000 \text{ or } \text{EBIT} = \text{Rs } 2,000$$

$$(\text{Sales} - 0.5 \text{ sales})/2,000 = 3 \text{ or } 0.5 \text{ sales} = \text{Rs } 6,000 \text{ or sales} = \text{Rs } 12,000.$$

**Comment:** The performance of C Ltd is the best. It has the lowest business risk, financial risk and total risk as reflected in the lowest degree of operating, financial and combined leverages. In addition, its interest coverage ratio is the maximum (2) as compared to 1.5 of A Ltd and 1.33 of B Ltd.

### PS 9.11

Calculate operating, financial and combined leverages under situations when fixed costs are (a) Rs 5,000 (b) Rs 10,000 and financial plans 1 and 2, respectively, from the following information pertaining to the operation and capital structure of XYZ Ltd.

Total assets	Rs 30,000	
Total assets turnover based on sales	2	
Variable costs as percentage of sales	60	
Capital structure:	<i>Financial plans</i>	
	1	2
Equity	Rs 30,000	Rs 10,000
10% Debentures	10,000	30,000

### Solution

*Determination of operating leverage*

<i>Particulars</i>	<i>Situations</i>	
	(a)	(b)
Sales revenue	Rs 60,000	Rs 60,000
Less: variable costs	36,000	36,000
fixed costs	5,000	10,000
EBIT	19,000	14,000
DOL	1.26	1.71

#### Working notes

$$\text{Sales} = \text{Rs } 60,000 (\text{Rs } 30,000 \times 2)$$

$$\text{VC} = 0.60 \times \text{Rs } 60,000 = \text{Rs } 36,000$$

$$\text{DOL(a)} = (\text{Rs } 60,000 - \text{Rs } 36,000)/19,000 = 1.26$$

$$\text{DOL(b)} = (\text{Rs } 60,000 - \text{Rs } 36,000)/14,000 = 1.71$$

*Determination of financial and combined leverages*

<i>Particulars</i>	<i>Plan 1</i>		<i>Plan 2</i>	
	(a)	(b)	(a)	(b)
EBIT	Rs 19,000	Rs 14,000	Rs 19,000	Rs 14,000
Less interest	1,000	1,000	3,000	3,000
EBT	18,000	13,000	16,000	11,000
DFL	1.06	1.08	1.19	1.27
DOL	1.26	1.71	1.26	1.71
DCL (DOL × DFL)	1.34	1.84	1.50	2.18

**PS 9.12**

The following figures relate to two companies: (Rupees in lakh)

	<i>P Ltd</i>	<i>Q Ltd</i>
Sales	500	1,000
Variable cost	200	300
Contribution	300	700
Fixed cost	150	400
EBIT	150	300
Interest	50	100
Profit before tax	100	200

You are required to: (i) calculate the operating, financial and combined leverages for the two companies; and (ii) comment on their relative risk positions.

***Solution***

(a) *Determination of operating, financial and combined leverage (Rupees in lakh)*

	<i>P Ltd</i>	<i>Q Ltd</i>
Sales	500	1,000
Less variable cost	200	300
Contribution	300	700
Fixed cost	150	400
EBIT	150	300
Less interest	50	100
EBT	100	200
DOL (contribution/EBIT)	2	2.33
DFL (EBIT/EBIT – I)	1.5:1	1.5
DCL (DOL × DFL)	3	3.5

*Q Ltd* has higher operating as well as total risk.

**PS 9.13**

A firm has sales of Rs 20,00,000, variable costs of Rs 14,00,000, fixed costs of Rs 4,00,000, and a debt of Rs 10,00,000 at 10 per cent.

Calculate its operating, financial and combined leverages.

***Solution***

$$\text{DOL} = (\text{Sales} - \text{VC})/\text{EBIT} = (\text{Rs } 20,00,000 - \text{Rs } 14,00,000)/3,00,000 = 2$$

$$\text{DFL} = \text{EBIT}/(\text{EBIT} - \text{I}) = \text{Rs } 3,00,000/2,00,000 = 1.5$$

$$\begin{aligned} \text{EBIT} &= \text{Sales} - \text{VC} - \text{Fixed costs (other than interest of Rs } 1,00,000) = \text{Rs } 20,00,000 - \text{Rs } 14,00,000 - \text{Rs } 3,00,000 \\ &= \text{Rs } 3,00,000. \end{aligned}$$

$$\text{DCL} = \text{DOL} \times \text{DFL} = 2 \times 1.5 = 3$$

**PS 9.14**

The Hypothetical Ltd is currently earning EBIT of Rs 12 lakh. Its present borrowings are:

11% Term loans (Rs lakh)	Rs 40
Working capital — borrowing from bank at 16%	33
12% Public deposit	15

The sales of the company are growing, and to support this the company proposes to obtain an additional bank borrowing of Rs 25 lakh. The increase in EBIT is expected to be 20 per cent. Calculate the change in interest coverage ratio after the additional borrowing and comment.

**Solution**

*Interest on present borrowings*

	Amount	Rate	Total interest
Term loan	Rs 40,00,000	0.11	Rs 4,40,000
Bank loan	33,00,000	0.16	5,28,000
Public deposit	15,00,000	0.12	1,80,000
			<u>11,48,000</u>

Interest coverage ratio = EBIT/Interest = Rs 12,00,000/ Rs 11,48,000 = 1.05

Revised EBIT = Rs 12,00,000 + [0.20 × (Rs 12,00,000)] = Rs 14,40,000

Revised interest = Rs 11,48,000 + (0.16 × Rs 25,00,000) = Rs 15,48,000

Interest coverage ratio (revised) = Rs 14,40,000/ Rs 15,48,000 = 0.93

The interest coverage ratio is alarmingly low (0.93). This signifies that the firm's expected profit would not be adequate to meet the interest liability. Clearly, the proposal of additional borrowings to support growing sales is not a sound plan.

**PS 9.15**

Calculate the DOL, DFL and DCL for the following firms and interpret the results, given the following data.

	P Ltd	Q Ltd	R Ltd
Output (units)	3,00,000	75,000	5,00,000
Fixed operating costs	Rs 3,50,000	Rs 7,00,000	Rs 75,000
Unit variable costs	1	7.50	0.10
Interest expenses	25,000	40,000	Nil
Unit selling price	3	25	0.50

**Solution**

*Determination of EBIT*

	P Ltd	Q Ltd	R Ltd
Sales revenue	Rs 9,00,000	Rs 18,75,000	Rs 2,50,000
Less: fixed operating costs	3,50,000	7,00,000	75,000
variable costs	3,00,000	5,62,500	50,000
	<u>2,50,000</u>	<u>6,12,500</u>	<u>1,25,000</u>



*Computation of operating, financial and combined leverages*

DOL(P) = Rs 6,00,000/Rs 2,50,000	2.40
DOL(Q) = Rs 13,12,500/Rs 6,12,500	2.14
DOL(R) = Rs 2,00,000/Rs 1,25,000	1.60
DFL(P) = Rs 2,50,000/Rs (2,50,000 – Rs 25,000)	1.11
DFL(Q) = Rs 6,12,500/Rs (6,12,500 – Rs 40,000)	1.07
DFL(R) = Rs 1,25,000/Rs (1,25,000 – 0)	1
DCL(P) = 2.40 × 1.11	2.66
DCL(Q) = 2.14 × 1.07	2.29
DCL(R) = 1.60 × 1.00	1.60

**Interpretation of results:** The DOL and DFL measures business risk and financial risk, respectively. The product of the two leverages is a measure of the total risk complexion of a firm. On this basis, out of the three, P Ltd appears to be the most risky as its individual as well as combined leverage are the highest and R Ltd is the least risky as its operating, financial, and combined leverages are the lowest. However, P Ltd and Q Ltd may not be risky at all for two reasons: (a) the values of operating, financial and combined leverages are low, and (b) the firms have adequate interest coverage (EBIT/interest) ratio; it is 10 times in the case of P Ltd, and more than 15 times in the case of firm Q Ltd.

**PS 9.16**

Calculate operating leverage and financial leverage under situations A, B and C and financial plans I, II and III respectively from the following information relating to the operations and capital structure of XYZ Ltd for producing additional 800 units.

Also, find out the combination of operating and financial leverages which gives the highest value and the least value. How are these calculations useful to the finance manager of the company?

Selling price per unit: Rs 30

Variable cost per unit: Rs 20

*Fixed operating costs:*

Situation A	Rs 2,000
B	4,000
C	6,000

*Capital structure:*

	<i>Financial plan</i>		
	<i>I</i>	<i>II</i>	<i>III</i>
Equity	Rs 10,000	Rs 15,000	Rs 5,000
Debt (0.12)	10,000	5,000	15,000

**Solution**

*Determination of DOL in situations A, B and C.*

<i>Particulars</i>	<i>Situations</i>		
	<i>A</i>	<i>B</i>	<i>C</i>
Sales revenue (800 × Rs 30)	Rs 24,000	Rs 24,000	Rs 24,000
Less variable costs (800 × Rs 20)	16,000	16,000	16,000
Contribution	8,000	8,000	8,000
Less fixed costs	2,000	4,000	6,000
EBIT	6,000	4,000	2,000
DOL (contribution/EBIT)	1.33	2	4

(Contd.)

**Solution (Contd.)***Determination of DFL in various situations and under alternative financial plans*

Particulars	Alternative financial plans		
	I	II	III
<b>Situation A:</b>			
EBIT	Rs 6,000	Rs 6,000	Rs 6,000
Less interest	1,200	600	1,800
EBT	4,800	5,400	4,200
DFL (EBIT/(EBIT – I))	1.25	1.11	1.43
<b>Situation B:</b>			
EBIT	4,000	4,000	4,000
Less interest	1,200	600	1,800
EBT	2,800	3,400	2,200
DFL	1.43	1.18	1.82
<b>Situation C:</b>			
EBIT	2,000	2,000	2,000
Less interest	1,200	600	1,800
EBT	800	1,400	200
DFL	2.5	1.43	10

*Determination of combined leverage in situations A, B and C and under financial plans, I, II and III.*

Particulars	Situation A			Situation B			Situation C		
	I	II	III	I	II	III	I	II	III
DOL	1.33	1.33	1.33	2	2	2	4	4	4
DFL	1.25	1.11	1.43	1.43	1.18	1.82	2.5	1.43	10
DCL	1.66	1.48	1.90	2.86	2.36	3.64	10	5.72	40

(i) Situation A (with fixed costs = Rs 2,000) under financial plan II (equity = Rs 15,000) gives the lowest DCL (1.48).

(ii) Situation C (with fixed costs = Rs 6,000) under financial plan III (debt = Rs 15,000) gives the highest DCL (40).

**EXERCISES**

**E.9.1** Calculate the DOL for each of the four firms A, B, C and D from the following price and cost data. For the purpose of your calculations, use a base level of sales of 5,000 units in each case. What conclusions with respect to levels of fixed cost and the DOL result? Explain.

	Firms			
	A Ltd	B Ltd	C Ltd	D Ltd
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

**E.9.2** The selected financial data for A Ltd, B Ltd and C Ltd for the current year ended March 31 are as follows:

Particulars	A Ltd	B Ltd	C Ltd
Variable expenses as a per cent of sales	66.67	75	50
Interest expenses (Rs)	200	300	1,000
DOL	5	6	2
DFL	3	4	2
Income tax rate	0.35	0.35	0.35

- (a) Prepare income statements for A Ltd, B Ltd and C Ltd.  
 (b) Comment on the financial position and structure of these companies.

**E.9.3** Calculate the DOL, and the DFL under situations A, B and C, and financial plans 1, 2 and 3, respectively, from the following information relating to the operation and capital structure of XYZ Ltd. Also, find out the combinations of operating and financial leverages which give the highest and the least values. How are these calculations useful to the financial manager of a company?

Installed capacity (units)	1,200
Actual production and sales (units)	800
Selling price per unit (Rs )	15
Variable cost per unit	10
Fixed operating cost: Situation A	1,000
B	2,000
C	3,000

*Capital structure*

	<i>Financial Plan</i>		
	1	2	3
Equity	Rs 5,000	Rs 7,500	Rs 2,500
Debt	5,000	2,500	7,500
Cost of debt		0.12	

**E.9.4** The capital structure of 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 selling price is Rs 10 per unit, variable costs Rs 6 per unit, and fixed expenses amount to Rs 2,00,000. The income tax rate is assumed to be 35 per cent. If sales increase by 20 per cent from 1,00,000 to 1,20,000 units,

- (a) Calculate (i) Percentage increase in EPS, (ii) DFL at 1,00,000 units and 1,20,000 units, (iii) DOL at 1,00,000 units, and 1,20,000 units.  
 (b) Comment on the behaviour of operating and financial leverages in relation to an increase in production from 1,00,000 units to 1,20,000 units.

**E.9.5** A firm's sales, variable cost and fixed costs amount to Rs 75 lakh, Rs 42 lakh and Rs 6 lakh respectively. It has borrowed Rs 45 lakh at nine per cent and its equity capital totals Rs 55 lakh.

- (i) What is the firm's ROI?  
 (ii) Does it have favourable financial leverage?  
 (iii) If the asset turnover for the industry is three, does it have higher or lower asset turnover?  
 (iv) Determine the DOL, DFL and DCL of the firm.

## ANSWERS

**E.9.1** DOL: 7(A), 2(B), 3(C) and 1(D); the operating leverage exists only when there are fixed costs. The higher the amount of operating fixed costs, the higher is the DOL.

**E.9.2** (a) EAT: Rs 65 (A and B), Rs 650 (C); Fixed costs, Rs 1,200 (A), Rs 2,000 (B), Rs 10,000 (C).

(b) C has the least total risk. DCL: A(15), B(24), C(4).

**E.9.3** DOL: 133 (A), 2.00 (B), 4.00 (C)

DFL: 1.43 (A), 1.18 (B), 1.82 (C)

*Degree of combined leverage*

<i>Situations</i>	<i>Financial plans</i>		
	<i>1</i>	<i>2</i>	<i>3</i>
A	1.66	1.48	1.90
B	2.86	2.36	3.64
C	10	5.72	40

- E.9.4** (a) (i) 80%, (ii) 2.0 (1,00,000 units),  
(ii) 1.56 (1,20,000 units),  
(iii) 2 (1,00,000 units),  
(iv) 1.71 (1,20,000 units).  
(b) Salutory effect on EPS (Hint: No increase in fixed costs due to increase in production).
- E.9.5** (i) 27%  
(ii) Yes, favourable financial leverage.  
(iii) 0.75, below the industry average  
(iv) DOL, 1.22; DFL, 1.18; DCL, 1.44.

# 10

## BASIC THEORY

### INTRODUCTION

Capital structure refers to the mix or proportion of different sources of financing (debt and equity) to the total capitalisation. Capital structure theories explain the theoretical relationship between cost of capital and the value of a firm. The important theories are:

- Net income (NI) approach
- Net operating income (NOI) approach
- Modigliani and Miller (MM) approach and
- Traditional approach.

### NET INCOME (NI) APPROACH

According to the NI approach, capital structure is relevant, as a change in it will lead to a corresponding change in the cost of capital and the total value of the firm. The core of this approach is that, as the degree of leverage increases, the ratio of less expensive source of funds (debt) in the capital structure increases while that of equity (involving higher cost) decreases. In fact, a change in leverage amounts to substitution of a less costly source in place of a more costly source. With a judicious mixture of debt and equity, a firm can, according to the NI approach, evolve an optimum capital structure at which the cost of capital would be the lowest, and the value of the firm would be the highest.

The approach is illustrated in Exhibit 10.1.

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#### **EXHIBIT 10.1** *Total Value of the Firm (Net Income Approach)*

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Net operating income (EBIT)

Less interest ( $I$ ),  $B \times k_i$

Earnings available to equityholders (NI)

Equity capitalisation rate ( $k_e$ )

Market value of equity ( $S$ ) =  $NI/k_e$

Market value of debt ( $B$ ) =  $I/k_i$

Total value of the firm ( $S + B$ ) =  $V$

Overall cost of capital,  $k_o$  =  $EBIT/V$

Alternatively,

$k_o = k_i(B/V) + k_e(S/V)$

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### NET OPERATING INCOME (NOI) APPROACH

The NOI approach is diametrically opposite to the NI approach. The essence of this approach is that capital structure is totally irrelevant. A change in leverage will not cause any change in the cost of capital and value of the firm. The main thrust of the 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 shareholders. To compensate for the increased risk, the shareholders would require a higher rate of return on their investment. The increase in the cost of equity would match the savings in the lower cost of debt. Therefore, the cost of debt, according to NOI, has two elements: (i) explicit, represented by the rate of interest, and (ii) implicit, the increase in the cost of equity capital caused by an increase in the degree of leverage. As a result, the advantage associated with the use of the relatively less expensive debt in terms of the explicit cost would exactly be neutralised by the implicit cost represented by the increase in the cost of equity capital. Therefore, the real cost of debt and equity are to be the same. There is nothing like an optimum capital structure. All capital structures are optimum.

The computation of the cost of capital and value of the firm according to this theory is shown in Exhibit 10.2.

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#### **EXHIBIT 10.2** *Total Value of the Firm (Net Operating Income Approach)*

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Net operating income (EBIT)

Overall capitalisation rate,  $k_o$

Total market value of the firm ( $V$ ) =  $EBIT/k_o$

Total value of debt ( $B$ )

Total value of equity ( $S$ ) =  $(V - B)$

Equity capitalisation rate,  $k_e = (EBIT - I)/(V - B)$

Alternatively,

$k_e = k_o + (k_o - k_f)B/S$

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#### **MODIGLIANI AND MILLER (MM) APPROACH**

This approach is akin to the NOI. The significance of MM hypothesis is that it provides a behavioural justification for constant cost of capital and value of the firm. In other words, the MM approach, like the NOI approach, maintains that the cost of capital and value of the firm do not change with a change in leverage. The operational justification for this is the arbitrage process. It is essentially a balancing operation. It implies that a security cannot sell at different prices. The total value of homogeneous firms that differ only in respect of leverage cannot be different because of the operations of arbitrage. The essence of arbitrage is that the investors (arbitrators) are able to substitute personal or home-made leverage for corporate leverage. The switching operation drives the total value of the two homogeneous firms together.

#### **Arbitrage Process**

The arbitrage process is illustrated in Exhibit 10.3.

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#### **EXHIBIT 10.3** *MM Approach: Arbitrage Process*

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##### **(a) When the Value of the Levered Firm is Higher:**

- (i) An investor will sell his investment in the levered firm.
- (ii) He will borrow proportionate to his share of debt of the levered firm.
- (iii) He will purchase securities of the unlevered firm equal to his percentage equity holdings in the levered firm.
- (iv) In the switching over process, he will earn from the unlevered firm the same or higher income as from the levered firm with reduced or full investment outlay.

##### **(b) When the Value of the Unlevered Firm is Higher:**

- (i) He will sell his investment in the unlevered firm.
  - (ii) He will buy securities of the levered firm equal to his percentage holdings in the unlevered firm.
  - (iii) In the process, he will earn the same income from the levered firm with a reduced investment outlay or higher income with his total investment.
-

The behaviour of the investors will have the effect of (i) lowering the price of shares of the firm whose shares are being sold, and (ii) increasing the share price of the firm whose shares are being purchased. This process will continue till the market prices of the two firms become identical.

### Value of Levered Firms with Taxes

According to MM, the value of the levered firm ( $V_l$ ) would exceed that of the unlevered firm by an amount equal to the levered firm's debt multiplied by the tax rate. Symbolically

$$V_l = V_u + Bt \quad (10.1)$$

Where  $V_u$  = Value of the unlevered firm  
 $Bt$  = Value of debt  $\times$  (Tax rate)

### TRADITIONAL APPROACH

The traditional approach is mid-way between 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 and reduce the cost of capital. However, beyond a certain point, the risk to the investors, as well as to the creditors, would increase, as also the financial risk. The increased financial risk will cause an increase in cost and decline in value. At that point, the capital structure is optimum.

The total value of the firm according to the traditional approach is computed as shown in Exhibit 10.1.

## SOLVED PROBLEMS

### PS 10.1

Alfa Ltd 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 ( $K_d$ ) (per cent)	Cost of equity ( $K_e$ ) (per cent)
1	Rs 3,00,000	10	12
2	4,00,000	10	12.5
3	5,00,000	11	13.5
4	6,00,000	12	15
5	7,00,000	14	18

### Solution

#### Determination of capital structure

Particulars	Capital structure plans having debts of various amounts				
	1	2	3	4	5
EBIT	Rs 3,00,000	Rs 3,00,000	Rs 3,00,000	Rs 3,00,000	Rs 3,00,000
Less interest ( $K_d \times B$ )	30,000	40,000	55,000	72,000	98,000
Net Income (NI) for equityholders	2,70,000	2,60,000	2,45,000	2,28,000	2,02,000
$K_e$ (equity capitalisation rate)	0.12	0.125	0.135	0.150	0.180
$S$ (market value of equity)	22,50,000	20,80,000	18,14,815	15,20,000	11,22,222
$B$ (market value of debt)	3,00,000	4,00,000	5,00,000	6,00,000	7,00,000
Total market value ( $S + B$ ) = $V$	25,50,000	24,80,000	23,14,815	21,20,000	18,22,222
Overall cost of capital ( $K_o$ ) = $EBIT/V$ (per cent)	11.76	12.10	12.96	14.15	16.47

Capital structure having debts of Rs 3,00,000 is recommended as the overall cost of capital at this level is the lowest.

**PS 10.2**

The Hypothetical Ltd's current earnings before interest and taxes are Rs 4,00,000. It currently has outstanding debts of Rs 15 lakh at an average cost ( $K_d$ ) of 10 per cent. Its cost of equity capital is estimated to be 16 per cent.

- Determine the current value of the firm, using the traditional approach.
- Determine the firm's overall capitalisation rate and both types of leverage ratios: (a) B/S and (b) B/V.
- The firm is considering reducing its leverage by selling Rs 5 lakh of equity shares in order to redeem Rs 5 lakh debt. The cost of debt is expected to be unaffected. However, the cost of equity capital is to be reduced to 14 per cent. Would you recommend the proposed action?

**Solution**

(i) *Value of the firm (traditional approach)*

EBIT	Rs 4,00,000
Less interest	1,50,000
NI for equityholders	2,50,000
$K_e$ (equity capitalization rate)	0.16
$S$ (market value of shares)	15,62,500
$B$ (market value of debt)	15,00,000
Total market value ( $S + B$ )	30,62,500

(ii)  $K_o = \text{Rs } 4,00,000 / 30,62,500 = 0.131$

Leverage ratios: (a)  $B/S = \text{Rs } 15,00,000 / 15,62,500 = 0.96$

(b)  $B/V = \text{Rs } 15,00,000 / 30,62,500 = 0.49$

(iii) *Value of the firm*

EBIT	Rs 4,00,000
Less interest	1,00,000
NI for equityholders	3,00,000
$K_e$ (equity capitalisation rate)	0.14
Market value of shares ( $S$ )	21,42,857
Market value of debt ( $B$ )	10,00,000
Total value ( $S + B$ ) = $V$	31,42,857
$K_o = EBIT/V$	0.1273

The proposal should be accepted as it would increase the value of the firm and reduce the overall cost of capital.

**PS 10.3**

XYZ Ltd, a company wholly financed through equity, has a current market value of Rs 16 lakh; the equity capitalisation rate is 0.125. An expansion programme is planned involving Rs 5 lakh in capital expenditure in the current year. The finance manager suggests that debt should be used to finance at least a part of it. Assuming a tax rate of 35 per cent, determine the weighted average cost of capital and value of the company for each of the following alternatives developed by the finance manager.

Debt (in lakh of Rs)	Equity (in lakh of Rs)	Cost of debt ( $K_d$ ) (per cent)	Cost of equity ( $K_e$ ) (per cent)	Overall cost of capital ( $K_o$ ) (per cent)
—	16	—	12.5	12.5
1		10	12.6	
2		10.4	13	

(Contd.)



**PS 10.3 (Contd.)**

3	11	14
4	12	15
5	13	17

Which financing plan would you recommend and why?

**Solution**

*Value of firm and cost of capital*

EBIT	Interest	EBT	Taxes	EAT	$K_d$ (%)	$K_e$ (%)	B	S	B + S = V	$K_o$ (%)
Rs 3,07,692	Rs 10,000	Rs 2,97,692	Rs 1,04,192	Rs 1,93,000	6.5	12.6	Rs 1,00,000	Rs 15,35,714	Rs 16,35,714	12.4
3,07,692	20,800	2,86,892	1,00,412	1,86,480	6.8	13.0	2,00,000	14,34,462	16,34,462	12.7
3,07,692	33,000	2,74,692	96,142	1,78,550	7.2	14.0	3,00,000	12,75,357	15,75,357	13.4
3,07,692	48,000	2,59,692	90,892	1,68,800	7.8	15.0	4,00,000	11,25,333	15,25,333	14.2
3,07,692	65,000	2,42,692	84,942	1,57,750	8.5	17.0	5,00,000	9,27,941	14,27,941	15.6

The financing plan, having a debt of Rs 1,00,000 is recommended, as at this level the value of  $K_o$  is minimum and that of V is maximum.

**Working notes**

Net income (NI) available to equityholders =  $0.125 \times \text{Rs } 16,00,000 = \text{Rs } 2,00,000$

EBIT =  $\text{Rs } 2,00,000 / (0.65) = \text{Rs } 3,07,692$

**PS 10.4**

Determine the optimal capital structure of a company from the following information supplied to you, assuming 35 per cent tax rate:

Cost of debt, $K_d$ (per cent)	Cost of equity, $K_e$ (per cent)	Debt/(Equity + Debt) (B/V)
11	13	0
11	13	0.1
11.6	14	0.2
12	15	0.3
13	16	0.4
15	18	0.5
18	20	0.6

**Solution**

*Determination of optimum capital structure*

$K_d$	B/V	$K_e$	S/V	$K_o = [(K_d(B/V) + (K_e(S/V))]$
7.15	0	13	1	13
7.15	0.1	13	0.9	12.4
7.54	0.2	14	0.8	12.7
7.8	0.3	15	0.7	12.8
8.45	0.4	16	0.6	13
9.75	0.5	18	0.5	13.9
11.7	0.6	20	0.4	15

Capital structure, having a debt level of 10 per cent, is optimal.

**PS 10.5**

Companies U and L are identical in every respect except that the former does not use debt in its capital structure, while the latter employs Rs 6 lakh of 15 per cent debt. Assuming that, (a) all the MM assumptions are met, (b) the corporate tax rate is 35 per cent, (c) the EBIT is Rs 2,00,000, and (d) the equity capitalisation of the unlevered company is 20 per cent, what will be the value of the firms, U and L? Also, determine the weighted average cost of capital for both the firms.

**Solution**

Value of unlevered firm,  $V_u = \text{EBIT} (1 - t)/K_e = \text{Rs } 2,00,000 (1 - 0.35)/0.20 = \text{Rs } 6,50,000$

Value of levered firm,  $V_l = V_u + B_t = \text{Rs } 6,50,000 + [\text{Rs } 6,00,000 (0.35)] = \text{Rs } 8,60,000$

$K_o$  of levered firm = 0.20 ( $K_e = K_o$ )

$K_o$  of levered firm

EBIT	Rs 2,00,000
Less interest	90,000
Net income after interest	1,10,000
Less taxes	38,500
NI for equityholders	71,500
Total market value (V)	8,60,000
Market value of debt (B)	6,00,000
Market value of equity (V - B)	2,60,000
$K_e = (\text{NI} \div S) = \text{Rs } 71,500/\text{Rs } 2,60,000$	0.275
$K_o = K_f(B/V) + K_e(B/V) = 0.0975 (\text{Rs } 6,00,000/\text{Rs } 8,60,000) + 0.275 (\text{Rs } 2,60,000/\text{Rs } 8,60,000)$	0.1511

**PS 10.6**

(a) The earnings before interest and taxes are Rs 20 lakh for companies L and U. They are alike in all respects except that firm L uses 15 per cent debt aggregating Rs 40 lakh. Given a tax rate of 35 per cent, determine the income to be received by the stakeholders of the two firms. What is the implication of such an outcome on the valuation of the firm, based on MM assumptions?

(b) Determine the values of both the firms, assuming 13 per cent equity capitalisation rate for firm U.

**Solution**

(a) Income to be received by stakeholders of firms L and U

	Company L	Company U
EBIT	Rs 20,00,000	Rs 20,00,000
Less interest	6,00,000	—
Earnings before taxes	14,00,000	20,00,000
Less taxes (0.35)	4,90,000	7,00,000
Income available to equityholders	9,10,000	13,00,000
Income available to debt-holders	6,00,000	—
Income available to stakeholders	15,10,000	13,00,000

Thus, excess income available to L is Rs 2,10,000 which is equivalent to the tax shield on interest (Rs 6 lakhs  $\times$  0.35).

PV of tax shield is  $\text{Rs } 2,10,000/0.15 = \text{Rs } 14$  lakh.

Alternatively, it is equal to  $Bt/r = Bt = \text{Rs } 40$  lakh  $\times$  0.35. Valuation of L will be higher by Rs 14 lakh.

(b)  $V_u = \text{Rs } 13,00,000/0.13 = \text{Rs } 100$  lakh

$V_l = V_u + Bt = \text{Rs } 100$  lakh  $+ (\text{Rs } 40$  lakh  $\times$  0.35) = Rs 114 lakh.

**PS 10.7**

From the following selected data, determine the value of the firms, P and Q belonging to the homogeneous risk class under (a) NI approach, and (b) the NOI approach.

	<i>Firm P</i>	<i>Firm Q</i>
EBIT	Rs 2,25,000	Rs 2,25,000
Interest (0.15)	75,000	
Equity capitalisation rate ( $K_e$ )		0.20
Tax rate		0.35

Which of the two firms has an optimal capital structure?

**Solution**

(a) *Valuation of the firms (NI approach)*

Particulars	<i>Firm P</i>	<i>Firm Q</i>
EBIT	Rs 2,25,000	Rs 2,25,000
Less interest	75,000	—
Net income	1,50,000	2,25,000
Less taxes	52,500	78,750
NI for equityholders	97,500	1,46,250
$K_e$	0.20	0.20
$S$	4,87,500	7,31,250
$B$	5,00,000	—
$(B + S)$	9,87,500	7,31,250
$K_o$	0.1481*	0.20**

\*0.0975 [(Rs 5,00,000)/9,87,500] + 0.20[(Rs 4,87,500)/9,87,500] = 0.1481

\*\* 0.20 =  $K_e$

(b) *Valuation of the firms (NOI approach)*

$$\begin{aligned}
 V_Q &= \text{EBIT}(1 - t)/K_e = [\text{Rs } 2,25,000 \times (0.65)]/0.20 = \text{Rs } 7,31,250 \\
 V_P &= V_Q + B_i = \text{Rs } 7,31,250 + [\text{Rs } 5,00,000 \times 0.35] = \text{Rs } 9,06,250 \\
 S_P &= (V_P - B_P) = \text{Rs } 9,06,250 - \text{Rs } 5,00,000 = \text{Rs } 4,06,250 \\
 K_e &= \text{Rs } 97,500/4,06,250 = 0.24 \\
 K_o(P) &= K_d(B/V) + K_e(S/V) = [0.0975 \times (\text{Rs } 5,00,000/\text{Rs } 9,06,250)] + [0.24 \times (\text{Rs } 4,06,250/\text{Rs } 9,06,250)] = 0.1614 \\
 K_o(Q) &= 0.20
 \end{aligned}$$

**Conclusion:** Firm P has optimal capital structure, under both the NI and NOI approaches.

**PS 10.8**

Compute the equilibrium values (V) and equity capitalisation rate of the two companies, X and Y on the basis of the data given below. Assume that (i) there is no income tax, and (ii) the overall rate of capitalisation for such companies in the market is 12.5 per cent.

	<i>X</i>	<i>Y</i>
Expected net operating income (NOI)	Rs 1,50,000	Rs 1,50,000
Interest ( $K_i \times B$ )	20,000	—
NI for equityholders	1,30,000	1,50,000
Equity capitalisation rate	0.13	0.12

(Contd.)

**PS 10.8 (Contd.)**

Market value of equity	10,00,000	12,50,000
Market value of debt	4,00,000	—
Total value of firm	14,00,000	12,50,000
Weighted average cost of capital, $K_o$	0.1071	0.12

**Solution**

Equilibrium value,  $V = \text{EBIT}/K_o = \text{Rs } 1,50,000/0.125 = \text{Rs } 12,00,000$  (both for X and Y)

Determination of  $K_e$

	X	Y
EBIT	Rs 1,50,000	Rs 1,50,000
Less interest	20,000	—
Earnings for equityholders	1,30,000	1,50,000
Overall capitalisation rate	0.125	0.125
Total value of firm	12,00,000	12,00,000
Less market value of debt	4,00,000	—
Market value of equity	8,00,000	12,00,000
$K_e$	0.1625	0.125

**PS 10.9**

The following are the equilibrium values of two firms belonging to the homogeneous risk class according to the NOI approach.

	X	Y
Expected NOI (net operating income)	Rs 25,000	Rs 25,000
Less cost of debt ( $I = (K_i \times B)$ )	5,000	—
Net income for equityholders (EBIT – $I$ )	20,000	25,000
Equilibrium cost of capital ( $K_o$ )	0.125	0.125
Total value ( $V$ ), $\text{EBIT}/K_o$	2,00,000	2,00,000
Market value of debt ( $B$ )	1,00,000	—
Market value of equity ( $V - B$ )	1,00,000	2,00,000
Cost of equity ( $K_e$ )	0.20	0.125

Determine the values of the firms, X and Y under the traditional approach, assuming the  $K_e$  for company Y as 11 per cent and for X as 14 per cent.

**Solution**

Valuation of the firms (traditional approach)

	X	Y
Expected NOI	Rs 25,000	Rs 25,000
Less cost of debt	5,000	—
NI	20,000	25,000
$K_e$	0.14	0.11
Market value of equity	1,42,857	2,27,273
Market value of debt	1,00,000	—
Total value	2,42,857	2,27,273

**PS 10.10**

Two companies, X and Y belong to equivalent risk group. The two companies are identical in every respect except that company Y is levered, while X is unlevered. The outstanding amount of debt of the levered company is Rs 6,00,000 in 10 per cent debentures. The other information for the two companies is as follows:

	X	Y
NOI (net operating income)	Rs 1,50,000	Rs 1,50,000
Interest on debt	—	— 60,000
Earnings to equityholders	1,50,000	90,000
Equity capitalisation rate	0.15	0.20
Market value of equity	10,00,000	4,50,000
Market value of debt	—	6,00,000
Total value of firm	10,00,000	10,50,000
Overall capitalisation rate	0.15	0.143
Debt/equity ratio	0	1.33

An investor owns 5 per cent equity shares of company Y. Show the process and the amount by which he could reduce his outlay through use of the arbitrage process. Are there any limits to the 'process'?

**Solution***Arbitrage process*

(a) Investor's current position (in firm Y)	
Dividend income ( $0.05 \times \text{Rs } 90,000$ )	Rs 4,500
Investment cost ( $0.05 \times \text{Rs } 4,50,000$ )	22,500
(b) He sells his holdings in firm Y for Rs 22,500 and creates a personal leverage by borrowing Rs 30,000 ( $0.05 \times \text{Rs } 6,00,000$ ). The total amount with him is Rs 52,500.	
Income required for break even is:	
Dividend income (Y firm)	4,500
Add interest on personal borrowings ( $0.10 \times \text{Rs } 30,000$ )	3,000
	7,500
(c) He purchases five per cent equity shares of the firm X for Rs 50,000 as the total value of the firm is Rs 10,00,000.	
Dividend of the firm X ( $0.15 \times \text{Rs } 50,000$ )	7,500
Amount of investment	50,000

The investor, thus, can reduce his outlay by Rs 2,500 through the use of leverage.

Yes, there are limits to the arbitrage process; this process will come to an end when the values of both firm become identical.

**PS 10.11**

The following particulars are available for two companies (U and L) operating identical business:

	U	L
EBIT	Rs 2,50,000	Rs 2,50,000
Less interest on 12% Debentures	—	36,000
Earnings available to equity holders	2,50,000	2,14,000
Value of firm:		
Value of equity	10,00,000	6,00,000
Value of debt	—	3,00,000
Total value	10,00,000	9,00,000

Why would this, to a proponent of the MM theory, be seen as a position of disequilibrium? How would equilibrium be reached? Use imaginary figures for any information not supplied.

### Solution

It is a position of disequilibrium as companies U and L in spite of identical EBIT of Rs 2.5 lakh and operating business have different values. As per the MM theory, two firms having identical earnings (belonging to a homogeneous risk class or group) cannot have different values. Arbitrage process will set in and will continue and restore equilibrium in their values.

Assuming that investor X holds 10 per cent of the equity shares of the overvalued firm, U, the equilibrium process would be as follows:

#### (A) Investor's position in over-valued firm, U

Investment cost ( $0.10 \times \text{Rs } 10,00,000$ )	Rs 1,00,000
Dividend income ( $0.10 \times \text{Rs } 2,50,000$ )	<u>25,000</u>

(B) He sells his holdings in Firm U for Rs 1,00,000 and purchases 10 per cent equity shares and 10 per cent of debentures of under-valued firm L to earn Rs 25,000:

	<i>Investment</i>	<i>Income</i>
Shares	Rs 60,000	21,400
Debentures	<u>30,000</u>	<u>3,600</u>
	90,000	25,000

The investment of Rs 90,000 earns the same income as he was earning on an investment of Rs 1,00,000 in firm U. He will clearly gain by switching over to the undervalued firm, L. This process will continue till their values become identical.

### PS 10.12

Two companies, A and B, belong to the same risk class. The two firms are identical in every respect except that firm A has 10 per cent debentures. The valuation of the two firms as per the traditional theory is as follows:

	A	B
NOI (net operating income)	Rs 22,50,000	Rs 22,50,000
Interest on debt	<u>1,50,000</u>	<u>—</u>
Earnings to equityholders	21,00,000	<u>22,50,000</u>
Equity capitalisation rate	0.14	0.125
Market value of equity	<u>1,50,00,000</u>	<u>1,80,00,000</u>
Market value of debt	<u>15,00,000</u>	<u>—</u>
Total market value of firm	1,65,00,000	1,80,00,000
Implied overall capitalisation rate	0.1364	0.125
Debt/equity ratio	0.1	0

Show the arbitrage process by which an investor who holds shares worth Rs 22,500 in company B will be benefited by investing in company A.

### Solution

#### Arbitrage process

##### (i) Investor's current position (in firm B)

Dividend income ( $\text{Rs } 22,50,000 \times 0.125$ )	Rs 2,812.50
Investment cost	<u>22,500</u>

(Contd.)

**Solution (Contd.)**

- (ii) He sells his current holdings in firm *B* for Rs 22,500 and acquires 12.5 per cent of equity and debt of company *A*. As a result of this investment, his income and investment outlay would be as follows:

	<i>Investment outlay</i>	<i>Income</i>
Equity	Rs 18,750	Rs 2,625
Debt	1,875	187.50
	<u>20,625</u>	<u>2,812.50</u>

- (iii) Thus, the investor can reduce his outlay by Rs 1,875 through the arbitrage process.

**PS 10.13**

“The value of a firm is independent of the proportion of debt to total capitalisation. The arbitrage process will establish a market equilibrium in which the total value of the firm will depend only on investor’s estimate of the firm’s business risk, and its expected future income.” Explain the above mentioned statement with the help of the following data regarding two companies, A and B with the same expected annual income and same risk class.

<i>Variables</i>	<i>Company A</i>	<i>Company B</i>
Expected annual income ( <i>Y</i> )	Rs 30,000	Rs 30,000
Market value of debt ( <i>L</i> )	—	1,20,000
Rate of interest on debt ( <i>i</i> )	—	0.125
Required rate of return on equity ( <i>K</i> )	0.15	0.16
Market value of equity ( <i>E</i> )	2,00,000	93,750
Market value of company ( <i>V</i> ), where $V = L + E$	2,00,000	2,13,750

**Solution**

The arbitrage process involves the following steps.

Suppose an investor, Mr *X*, holds 10 per cent of the outstanding shares of the levered firm (*B*). His holdings and dividend income would be as follows:

- (i) Investment outlay ( $0.10 \times \text{Rs } 93,750$ ) Rs 9,375  
(ii) Dividend income ( $0.16 \times 9,375$ ) 1,500

He sells his holdings in firm *B* and invests in the unlevered firm, *A*. Since firm *A* has no debt, the financial risk of Mr.*X* would be less. To reach the level of financial risk of firm *B*, he borrows additional funds equal to his proportionate share in the levered firm’s debt on his personal account (Rs 2,000 at 12.5 per cent rate of interest). He buys 10 per cent of the outstanding shares of the unlevered firm *A* at Rs 20,000 ( $0.10 \times \text{Rs } 2,00,000$ ). Mr *X*’s position in firm *A* is summarised below.

- (i) Total funds available
- |                |               |        |
|----------------|---------------|--------|
| Own funds      | Rs 9,375      |        |
| Borrowed funds | <u>12,000</u> | 21,375 |
- (ii) Investment outlay 20,000
- (iii) Dividend income
- |   |              |       |
|---|--------------|-------|
| Gross ( $0.10 \times \text{Rs } 30,000$ ) | 3,000        |       |
| Less interest payable on borrowed funds   | <u>1,500</u> | 1,500 |

Mr *X* is earning the same amount of dividend as in company *B*. But his investment outlay in company *A* is less by Rs 1,375. Thus, the investor is better off by selling his securities in the levered firm *B*, and buying the shares of the unlevered firm, *A*. Other investors will also enter into the arbitrage process. As a result, the price of the shares of the levered firm will decline, and that of unlevered firm will increase. This will continue till it is possible to reduce investment outlays and get the same return. Beyond this point, arbitrage will not be beneficial. This is the point of equilibrium. At this point, the total value of two firms as well as cost of capital would be identical. Thus, the value of the firm is independent of the proportion of debt to total capitalisation. But in actual practice, cost of capital is affected by leverage.

## EXERCISES

**E.10.1** Company X and Company Y are in the same risk class, and are identical in every fashion except that X uses debt while 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 before interest and taxes on their total assets of Rs 15 lakh. Assume perfect capital markets, rational investors; a tax rate of 35 per cent and capitalisation rate of 15 per cent for an all-equity company.

- (i) Compute the value of firms X and Y, using the NI approach.
- (ii) Compute the value of each firm using the NOI approach.
- (iii) Using the NOI approach, calculate the overall cost of capital ( $K_o$ ) for firms X and Y.
- (iv) Which of these two firms has an optimal capital structure according to the NOI approach? Why?

**E.10.2** 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 that (1) that all the MM assumptions are met, (2) the tax rate is 35 per cent, (3) EBIT is Rs 6 lakh, and (4) that equity capitalisation rate for company U is 10 per cent.

What would be the value for each firm according to the MM approach?

**E.10.3** The values for two firms X and Y in accordance with the traditional theory are given below:

	X	Y
Expected operating income ( $X$ )	Rs 50,000	Rs 50,000
Total cost of debt ( $K_d D = R$ )	0	10,000
NI ( $X - R$ )	50,000	40,000
Cost of equity ( $K_e$ )	0.10	0.1111
Market value of shares ( $S$ )	5,00,000	3,63,636
Market value of debt ( $D$ )	0	2,00,000
Total value of firm ( $V = S + D$ )	5,00,000	5,63,636
Average cost of capital ( $K_o$ )	0.10	0.09
Debt equity ratio	0	0.56

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 value of  $K_o$  is 12.5 per cent.

**E.10.4** Given (i) the EBIT of Rs 2,00,000, (ii) a corporate tax 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 (per cent)	$K_e$ (per cent)
Rs Nil	Nil	12
1,00,000	10	12
2,00,000	10.5	12.6
3,00,000	11	13
4,00,000	12	13.6
5,00,000	14	15.6
6,00,000	17	20

**E.10.5** ABC Ltd'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.

- (i) Determine the current value of the firm, using the traditional valuation approach.
- (ii) Calculate the firm's overall capitalisation rate as well as both types of leverage ratios (a) B/S, and (b) B/V.
- (iii) 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 0.12, and  $K_e$  to 0.18. Would you recommend the plan?



**E.10.6** Two companies, U and L, belong to the same risk class. They have everything in common except that firm L has 10 % Debentures of Rs 5 lakh. The valuation of the two firms is assumed to be as follows:

	<i>U</i>	<i>L</i>
NOI (net operating income)	Rs 7,50,000	Rs 7,50,000
Interest on debt	Nil	50,000
Earnings to equityholders	7,50,000	7,00,000
Equity capitalisation rate	0.125	0.14
Market value of equity	60,00,000	50,00,000
Market value of debt	—	5,00,000
Total market value of the firm	60,00,000	55,00,000
Implied overall capitalisation rate	0.125	0.1363
Debt equity ratio	0	0.1

An investor owns 10 per cent equity shares of the overvalued firm. Determine his investment cost of earning the same income so that he is at a break even point? Will he gain by investing in the undervalued firm?

## ANSWERS

**E.10.1** (i) Rs 18,10,000 (Firm X), Rs 13,00,000 (Firm Y)

(ii) Rs 13,00,000 (Firm X), Rs 16,15,000 (Firm Y)

(iii) 12.1% (Firm X), 15%

(iv) (Firm Y).

**E.10.2** Rs 39 lakh (Firm U), Rs 46 lakh (Firm L).

**E.10.3** Rs 4,00,000.

**E.10.4** Rs 3,00,000; at this level of debt the value of the firm is maximum (Rs 10,83,333).

**E.10.5** (i) Rs 30,00,000

(ii) 13.33%, B/S 0.5, B/V 0.33

(iii) No, it would lower the value of the firm (Rs 27,22,222).

**E.10.6** Rs 5,50,000. He will gain by investing in the undervalued firm.

# 11

## BASIC THEORY

### INTRODUCTION

Capital structure planning refers to the designing of an appropriate capital structure in the context of the facts and circumstances of each firm.

### TECHNIQUES

A widely-used financial technique to design an appropriate capital structure is EBIT-EPS analysis. As a method of capital structure planning, it essentially involves the comparison of alternative methods of financing under various assumptions of EBIT. The choice of combination of sources with the capital structure would be one which, for a given level of EBIT, would ensure the largest EPS. Alternatively, the choice of combination should ensure the maximum market price per share (MPS) =  $\text{EPS} \times \text{P/E ratio}$ .

### Indifference Level/Point

The EBIT level at which the EPS/MPS is the same for the alternative financing plan is referred to as indifference point. The indifference point may be defined as a level of EBIT beyond which the benefits of leverage begin to operate with respect to EPS/MPS.

In operational terms, if the expected level of EBIT exceeds the indifference level, the use of debt would be advantageous from the viewpoint of EPS/MPS. However, if the expected EBIT is less than the indifference level, the advantage will be available from the use of equity capital. The indifference point between different methods of financing can be obtained mathematically as well as graphically.

Mathematically, the indifference point can be obtained by using the symbols summarised in Exhibit 11.1.

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#### EXHIBIT 11.1 *Symbols*

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$X$  = Earning 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

$I$  = Amount of interest on debentures

$D_p$  = Amount of dividend on preference shares

$t$  = Tax rate

---

**For a New Company** The indifference point can be determined by using the equations summarised in Exhibit 11.2.

**EXHIBIT 11.2** *Indifference Point for New Company***(i) Equity Shares versus Debentures:**

$$X(1-t)/N_1 = [(X-I)(1-t)]/N_2 \quad (11.1)$$

**(ii) Equity Shares versus Preference Shares (assuming no dividend payment tax,  $W_t$ ):**

$$X(1-t)/N_1 = [X(1-t) - D_p]/N_3 \quad (11.2)$$

**(iii) Equity Shares versus Preference Shares subject to payment of dividend tax ( $W_t$ ):**

$$X(1-t)/N_1 = [X(1-t) - (D_p + W_t)]/N_3 \quad (11.3)$$

**(iv) Equity Shares versus Preference Shares and Debentures:**

$$X(1-t)/N_1 = [(X-I)(1-t) - D_p^*]/N_4 \quad (11.4)$$

\*including dividend payment tax, if any.

**For an Existing Company** If the debentures are already outstanding, assuming  $I_1$  = interest paid on existing debentures, and  $I_2$  = interest payable on additional debentures, the indifference point would be determined by Equation 11.5.

$$[(X - I_1)(1-t)]/N_1 = [(X - I_1 - I_2)(1-t)]/N_2 \quad (11.5)$$

**From the Point of View of MPS** The indifference level in terms of MPS is illustrated in Exhibit 11.3.

**EXHIBIT 11.3** *MPS-based Indifference Level*

$$P/E_1 \times [X(1-t)]/N_1 = P/E_2 \times [(X-I)(1-t) - D_p^*]/N_2 \quad (11.6)$$

where  $P/E_1$  = Price-earnings ratio when equity shares are issued

$P/E_2$  = Price-earnings ratio under debt and preference share plan

\*inclusive of dividend payment tax,  $W_t$ , if any.

**Market Price Per Share**

In addition to indifference level analysis, capital structure planning includes the computation of MPS. Consistent with the objective of value maximisation, the alternative financing plan with the maximum MPS is preferable. The computation of MPS is summarised in Exhibit 11.4.

**EXHIBIT 11.4** *Market Price Per Share*

	Proposed financial plans			
	Equity	Equity + Debt	Equity + Debt + Preference	Any other
	(1)	(2)	(3)	(4)
Sales revenue				
Less operating costs:				
Fixed				
Variable				
EBIT				
Less interest				
EBT				

(Contd.)

**Exhibit 11.4 (Contd.)**

Less taxes

EAT

Less dividend to preference shareholders

(inclusive of withholding tax)

Net Income (NI) for equityholders

EPS (NI/Number of shares)  $\times$  P/E ratio

MPS

**SOLVED PROBLEMS****PS 11.1**

X Ltd is considering three different plans to finance its total project cost of Rs 100 lakh: A, B and C.

	Plan A	Plan B	Plan C
Equity capital (Rs 100 per share)	50	34	25
10% Debentures	50	66	75
	100	100	100

Sales for the first 3 years of operations are estimated at Rs 100 lakh, Rs 125 lakh and Rs 150 lakh respectively and a 10 per cent profit before interest and taxes is forecast. The tax is to be taken at 35 per cent.

Compute EPS in each of the 3 alternative financing plans.

**Solution**

*Determination of EPS for years 1–3 under alternative financing plans (amount in lakh of rupees)*

Particulars	Year 1			Year 2			Year 3		
	A	B	C	A	B	C	A	B	C
Sales	100	100	100	125	125	125	150	150	150
EBIT (0.10 $\times$ sales)	10	10	10	12.5	12.5	12.5	15	15	15
Less interest	5.0	6.6	7.5	5.0	6.6	7.5	5.0	6.6	7.5
EBT	5	3.4	2.5	7.5	5.9	5.0	10.0	8.4	7.5
Less taxes (0.35)	1.75	1.19	0.875	2.625	2.065	1.75	3.5	2.94	2.625
EAT	3.25	2.21	1.625	4.875	3.835	3.25	6.5	5.46	4.875
Number of shares	50,000	34,000	25,000	50,000	34,000	25,000	50,000	34,000	25,000
EPS (Rs)	6.5	6.5	6.5	9.75	11.28	13	13	16.06	19.5

**PS 11.2**

A promoter is considering methods to finance establishment of a company. Initially, Rs 2,00,000 will be needed. The promoter is considering two proposals for the purpose: (a) issue of 15% Debentures of Rs 1,00,000, and issue of 1,000 equity shares of Rs 100 each; and (b) issue of 2,000 equity shares of Rs 100 each. The tax rate is 35 per cent.

- Compute the indifference point of the above proposed financial plans.
  - Show that the indifference point computed in (a) above is correct.
  - Compute EPS under the two proposed financial plans if EBIT is Rs 40,000. How do you explain the difference in your results?
- Assume that levered financial plan is used. Initially, the company is expected to operate at a level of 1,00,000 units (selling price is Rs 2 per unit; variable cost, Re 1 per unit, and fixed operating costs, Rs 50,000). Your calculations will show increase in EBIT, compared to assumed level of EBIT in (i) (c) of Rs 40,000. What

is the percentage increase in EPS due to increase in EBIT? Use these figures to compute the degree of financial leverage.

- (iii) Assuming everything to be the same as given in situation (ii), except that sales rises by 20 per cent from 1,00,000 units to 1,20,000 units, compute; (a) The percentage increase in EPS; (b) The degree of operating leverage (take 1,00,000 units as the base level); and (c) The combined leverage.

### Solution

(i) (a)  $[(X - I)(1 - t)]/N_1 = X(1 - t)/N_2 = [(X - \text{Rs } 15,000) 0.65] / 1,000 = (X - 0.65X) / 2,000 = (0.65X - \text{Rs } 9,750) / 1,000 = 0.65X / 2,000 = 2(0.65X - \text{Rs } 9,750) = 0.65X$ .

$1.3X - \text{Rs } 19,500 = 0.65X$  or  $0.65X = \text{Rs } 19,500$  or  $X = \text{Rs } 30,000$ . Indifference point would be at the level of Rs 30,000 EBIT (X).

(b) *Verification table*

Particulars	Plan 1 (Equity + Debt)	Plan 2 (Equity)
EBIT	Rs 30,000	Rs 30,000
Less interest	15,000	—
EBT	15,000	30,000
Less taxes	5,250	10,500
EAT	9,750	19,500
EPS (EAT ÷ N)	9.75	9.75

(c) *EPS: When EBIT is Rs 40,000*

Particulars	Plan 1	Plan 2
EBIT	Rs 40,000	Rs 40,000
Less interest	15,000	—
EBT	25,000	40,000
Less taxes	8,750	14,000
EAT	16,250	26,000
EPS	16.25	13

Leverage starts becoming favourable after the EBIT of Rs 30,000. Therefore, the financial plan, having debt-equity mix, yields higher EPS compared to pure equity plan.

(ii) *Determination of EPS*

Sales revenue	Rs 2,00,000
Less variable costs	1,00,000
Less fixed costs	50,000
EBIT	50,000
Less interest	15,000
EBT	35,000
Less taxes	12,250
EAT	22,750
EPS	22.75

$DFL = \% \text{ Change in EPS} / \% \text{ Change in EBIT} = 0.4 / 0.25 = 1.6$

(iii) *Determination of EPS*

Sales revenue	Rs 2,40,000
Less variable costs	1,20,000
Less fixed costs	50,000
EBIT	70,000

(Contd.)

**Solution (Contd.)**

Less interest	15,000
EBT	55,000
Less taxes	19,250
EAT	35,750
EPS	35.75

(a) Percentage increase in EPS is 57.14 per cent (Rs 13.75/Rs 22.75).

(b)  $DOL = [EBIT \div EBIT] / [Sales \div Sales] = [Rs\ 20,000 \div Rs\ 50,000] / [Rs\ 40,000 \div Rs\ 2,00,000] = 0.4/0.2 = 2$ .

(c)  $DFL = \% \text{ Change in EPS} / \% \text{ Change in EBIT} = 0.5714/0.40 = 1.43$

(d)  $DCL = DOL \times DFL = 2 \times 1.43 = 2.86$ .

**PS 11.3**

Hindustan Kite Company Ltd started business 5 years ago manufacturing kites of unusual designs. The company has grown rapidly. Its capital now consists of 8,000 shares of Rs 40 each, all subscribed by management and their relatives.

The chief designer of the company has developed a new magnesium kite which he claims will fly in winds of 5–80 km/h, and will be practically indestructible. In order to manufacture this kite, new facilities will be required, involving an investment of Rs 2 lakh.

Two financing alternatives are being considered: issuing 4,000 shares at Rs 50 each, or borrowing Rs 2 lakh, at 12 per cent per annum.

Management has considered two possible future sales projections: a pessimistic projection of Rs 7 lakh, and an optimistic projection of Rs 12 lakh.

The current years' actual and the next year's projected P & L A/c are summarised below:

<i>Current year's actual</i>		<i>Next year's projections</i>			
		<i>Debt</i>		<i>Share issue</i>	
Sales	Rs 5,00,000	Rs 7,00,000	Rs 12,00,000	Rs 7,00,000	Rs 12,00,000
Expenses	3,40,000	4,80,000	8,60,000	4,80,000	8,60,000
EBIT	1,60,000				
Interest	0				
Taxable income	1,60,000				
Taxes (0.35)	56,000				
Income after taxes	1,04,000				
EPS	13				

Calculate the values needed for the analysis in the above table.

**Solution**

(i) *Market value of shares under different financing alternatives*

<i>Current year's actual</i>		<i>Next year's projections</i>			
		<i>Debt</i>		<i>Share issue</i>	
Sales	Rs 5,00,000	Rs 7,00,000	Rs 12,00,000	Rs 7,00,000	Rs 12,00,000
Expenses	3,40,000	4,80,000	8,60,000	4,80,000	8,60,000
EBIT	1,60,000	2,20,000	3,40,000	2,20,000	3,40,000
Interest	0	24,000	24,000	—	—
Taxable income	1,60,000	1,96,000	3,16,000	2,20,000	3,40,000
Taxes (0.35)	56,000	68,600	1,10,600	77,000	1,19,000
Income after taxes	1,04,000	1,27,400	2,05,400	1,43,000	2,21,000
EPS	13	15.92	25.68	11.92	18.42

**PS 11.4**

Key information pertaining to the proposed new financing plans of Hypothetical Ltd is given below:

Sources of funds	Financing plans	
	1	2
Equity	15,000 shares of Rs 100 each	30,000 shares of Rs 100 each
Preference shares	12%, 25,000 shares of Rs 100 each	—
Debentures	Rs 5,00,000 at a coupon rate of 0.10	15,00,000, coupon rate of 0.11

Assuming 35 per cent tax rate,

- Determine the two EBIT - EPS coordinates for each financial plan.
- Determine the (a) indifference point, and (b) financial break-even point for each financing plan.
- Which plan has more financial risk and why?
- Indicate over what EBIT range, if any, one plan is better than the other.
- If the firm is fairly certain that its EBIT will be Rs 12,50,000, which plan would you recommend, and why?

**Solution**

(i) Two EBIT-EPS coordinates for each financial plan

	Financing plans	
	1	2
Interest on debentures	Rs 50,000	Rs 1,65,000
Dividend on preference shares before taxes (Rs 3,00,000/(1– 0.35))	4,61,538	—
(a)	5,11,538	1,65,000
Expected EBIT	12,50,000	12,50,000
Less interest on debentures	50,000	1,65,000
EBT	12,00,000	10,85,000
Less taxes	4,20,000	3,79,750
EAT	7,80,000	7,05,250
Less preference shares dividend	3,00,000	—
Earnings for equity holders	4,80,000	7,05,250
Number of shares	15,000	30,000
EPS	(b) 32	23.51

Coordinate	EBIT Financial plan		EPS Financial plan	
	1	2	1	2
Lower (one)	Rs 5,11,538	Rs 1,65,000	Zero	Zero
Higher (two)	12,50,000	12,50,000	Rs 32	Rs 23.51

- (ii) (a) *Indifference point*:  $[(X - I)(1 - t) - D_p]/N_1 = [(X - I)(1 - t)]/N_2 = [(X - \text{Rs } 50,000) \times 0.65 - \text{Rs } 3,00,000]/15,000 = [(X - \text{Rs } 1,65,000) \times 0.65]/30,000$  or  $[0.65X - \text{Rs } 32,500 - \text{Rs } 3,00,000]/15,000 = [0.65X - \text{Rs } 1,07,250]/30,000$ .

Multiplying both sides of the equation by 30,000, we have,

$$2(0.65X - \text{Rs } 3,32,500) = 0.65X - \text{Rs } 1,07,250$$

$$X - \text{Rs } 6,65,000 = 0.65X - \text{Rs } 1,07,250$$

$$0.65X = \text{Rs } 5,57,750, \text{ or } X = \text{Rs } 8,58,077.$$

- (b) *Financial break even points*:  $I + D_p/(1 - t)$ , Plan 1 = Rs 50,000 + (Rs 3,00,000)/0.65 = Rs 5,11,538, Plan 2 = Rs 1,65,000.

- (iii) Financial risk is measured by the DFL. Plan 1 has more financial risk as its DFL is likely to be higher.  
 (iv) Plan 2 is better for EBIT level of less than Rs 8,58,077; Plan 1 is better for EBIT ranges beyond that level.  
 (v) Plan 1, as EPS will be higher [(determined in (i) above)].

### PS 11.5

Determine the indifference point and financial break even point for each financing plan for the facts in **PS 11.4**, assuming the firm is required to pay 10 per cent tax on payment of preference dividend. Also, prepare verification table pertaining to indifference point.

### Solution

(a) Indifference point:

$$\begin{aligned} [(X - I)(1 - t) - (D_p + W_p)]/N_1 &= [(X - I)(1 - t)]/N_2 \\ [(X - \text{Rs } 50,000) \times 0.65 - \text{Rs } 3,30,000]/15,000 &= [(X - \text{Rs } 1,65,000) \times 0.65]/30,000 \\ \text{or } (0.65X - \text{Rs } 32,500 - \text{Rs } 3,30,000)/15,000 &= (0.65X - \text{Rs } 1,07,250)/30,000 \\ \text{or } 2(0.65X - \text{Rs } 3,62,000) &= 0.65X = \text{Rs } 1,07,250 \\ \text{or } 1.3X - \text{Rs } 7,25,000 &= 0.65X - \text{Rs } 1,07,250 \\ \text{or } 0.65X &= \text{Rs } 6,17,750 \quad \text{or } X = \text{Rs } 6,17,750/0.65 = \text{Rs } 9,50,385 \end{aligned}$$

(b) Financial break even points:

$$\text{Plan 1} = I + (D_p + W_p)/(1 - t) = \text{Rs } 50,000 + (\text{Rs } 3,30,000/0.65) = \text{Rs } 5,57,692$$

$$\text{Plan 2} = \text{Rs } 1,65,000.$$

(c) Verification table

	Plan 1	Plan 2
EBIT	Rs 9,50,385	Rs 9,50,385
Less interest	50,000	1,65,000
EBT	9,00,385	7,85,385
Less taxes (0.35)	3,15,135	2,74,885
EAT	5,85,250	5,10,500
Less preference dividend including withholding tax	3,30,000	—
Earnings available for equityholders	2,55,250	5,10,500
EPS	17	17

### PS 11.6

Hypothetical Ltd is in need of Rs 1,00,000 to finance its increased net working capital requirements. The finance manager of the company believes that its various financial costs and share price will be unaffected by the selection of a particular plan, since a small sum is involved. Debentures will cost 10 per cent, preference shares 11 per cent, and equity shares can be sold for Rs 25 per share. The tax rate is 35 per cent.

Sources of funds	Financial plans (per cent)		
	1	2	3
Equity shares	100	30	50
Preference shares	0	10	20
Debentures	0	60	30



- (i) Determine the financial break even point.  
 (ii) Which plan has grater risk? Assume EBIT level of Rs 50,000.

### Solution

(i)  $\text{Financial break-even point} = I + D_p / (1 - t)$

Financial plan 1 = zero

$$2 = \text{Rs } 6,000 + (\text{Rs } 1,100/0.65) = \text{Rs } 7,692$$

$$3 = \text{Rs } 3,000 + (\text{Rs } 2,200/0.65) = 6,385$$

(ii)  $\text{DFL} = \text{EBIT} / [\text{EBIT} - I - D_p / (1 - t)]$

Financial plan 1 =  $\text{Rs } 50,000 / \text{Rs } 50,000 = 1$

$$2 = \text{Rs } 50,000 / (\text{Rs } 50,000 - \text{Rs } 7,692) = 1.18$$

$$3 = \text{Rs } 50,000 / (\text{Rs } 50,000 - \text{Rs } 6,385) = 1.15$$

Financial plan 2 has higher financial risk.

### PS 11.7

Aditya Mills Ltd has submitted to you the following four ways of financing its expansion programme. The tax rate is 35 per cent. Key information relating to the four plans is as follows:

Sources of funds	Financial plans			
	1	2	3	4
Equity shares	Rs 58,500	Rs 37,500	Rs 83,500	Rs 25,000
Preference shares of Rs 100 each	Nil	11,250 @ 10%	7,500 at 9%	Nil
Debentures	15,00,000 @ 10%	10,00,000 @ 11%	Nil	25,00,000 @ 12%

- (i) Determine the financial break-even point for each plan.  
 (ii) Determine the degree of financial leverage associated with each plan. (Assume EBIT of Rs 10 lakh).  
 (iii) Which plan is the least risky?

### Solution

(i)  $\text{Financial break even point} = I + D_p / (1 - t)$

Plan 1 =  $\text{Rs } 1,50,000$

$$2 = \text{Rs } 1,10,000 + (\text{Rs } 1,12,500/0.65) = \text{Rs } 2,83,077$$

$$3 = \text{Rs } 67,500/0.65 = \text{Rs } 1,03,846$$

$$4 = \text{Rs } 3,00,000$$

(ii)  $\text{Degree of financial leverage} = \text{EBIT} / [\text{EBIT} - I - (D_p / (1 - t))]$

Plan 1 :  $\text{Rs } 10,00,000 / (\text{Rs } 10,00,000 - \text{Rs } 1,50,000) = 1.18$

$$2 : \text{Rs } 10,00,000 / (\text{Rs } 10,00,000 - \text{Rs } 1,10,000 - (\text{Rs } 1,12,500/0.65)) = 1.39$$

$$3 : \text{Rs } 10,00,000 / [\text{Rs } 10,00,000 - (\text{Rs } 67,000/0.65)] = 1.12$$

$$4 : \text{Rs } 10,00,000 / (\text{Rs } 10,00,000 - \text{Rs } 3,00,000) = 1.43$$

- (iii) Plan 3 is the least risky, as it has the lowest levels of financial break even point and financial leverage.

**PS 11.8**

The Adarsh Ltd is considering methods to finance its investment proposal. It is estimated that initially Rs 4,00,000 will be needed. Two alternative methods of raising funds are available to the firm: (a) Issue of 15 % Loan amounting to Rs 2,00,000 and issue of 2,000 equity shares of Rs 100 each; and (b) Issue of 4,000 equity shares of Rs 100 each. The appropriate tax rate is 35 per cent.

- (i) Assuming operating profits (EBIT) of : (a) Rs 70,000, and (b) Rs 80,000, which financing proposal would you recommend, and why?
- (ii) Compute the indifference point of the two financial plans.

**Solution**

(i) *Determination of EPS at various levels of EBIT under alternative financial plans*

	<i>Financial plans</i>			
	<i>Loan and equity plan</i>	<i>Equity plan</i>	<i>Loan and equity plan</i>	<i>Equity plan</i>
EBIT	Rs 70,000	Rs 70,000	Rs 80,000	Rs 80,000
Less interest (0.15)	30,000	—	30,000	—
EBT	40,000	70,000	50,000	80,000
Less taxes (0.35)	14,000	24,500	17,500	28,000
EAT	26,000	45,500	32,500	52,000
Number of shares	2,000	4,000	2,000	4,000
EPS	13	11.38	16.25	13

Levered financing plan, having loan and equity capital, is recommended in both the situations.

(ii) *Indifference point:*  $[(X - I)(1 - t)]/N_1 = [X(1 - t)]/N_2 = [(X - \text{Rs } 30,000)0.65]/2,000 = X(0.65)/4,000 = 2(0.65X \text{ Rs } 19,500) = 0.65X = \text{Rs } 39,000, X = \text{Rs } 60,000.$

**PS 11.9**

ABC Corporation Ltd plans to expand assets by 50 per cent; to finance the expansion, it is choosing between a straight 12 per cent debt issue and ordinary shares. Its balance sheet and P & L A/c are shown below:

*Balance sheet as on March 31 of ABC Corporation Ltd*

<i>Liabilities</i>		<i>Assets</i>	
11% Debentures	Rs 40,00,000	Total assets	Rs 2,00,00,000
Ordinary share capital (of Rs 10 each)	1,00,00,000		
Retained earnings	60,00,000		
	2,00,00,000		2,00,00,000

*P & L A/c for the year ended March 31*

Sales	Rs 6,00,00,000
Total costs (excluding interest)	5,40,00,000
Net income before tax (EBIT)	60,00,000
Interest on debentures (0.11)	4,40,000
Income before taxes	55,60,000
Taxes (0.35)	19,46,000
Profit after taxes	36,14,000
EPS (Rs 36,14,000 ÷ 10,00,000)	3.61
P/E ratio (times)	7.5
MPS (7.5 × Rs 3.61)	27.1

If the company finances Rs 1 crore expansion with debt, the rate of interest on the incremental debt will be 12 per cent and the price/earnings ratio of the ordinary shares will be 5 times. If the expansion is financed by equity, the new shares can be sold at Rs 12 per share, and the price/earnings ratio will remain at 7.5 times.

(i) Assuming that net income before interest and taxes (EBIT) is 10 per cent of sales, calculate EPS at sales levels of Rs 4 crore, Rs 8 crore and Rs 10 crore when financing is with (a) ordinary shares, and (b) debt.

(ii) At what level of EBIT, after the new capital is acquired, would the EPS be the same, whether new funds are raised by issuing ordinary shares or raising debt?

(iii) Determine the level of EBIT at which uncommitted EPS would be the same, if sinking fund obligations amount to Rs 5 lakh per year.

(iv) Using the P/E ratio, calculate the MPS for each sales level for both the debt and the equity financing.

### Solution

(i) and (iv) *Determination of EPS at various levels of sales under alternative forms of financing expansion programmes*

	Sales level					
	Rs 4 crore		Rs 8 crore		Rs 10 crore	
	Equity	Debt	Equity	Debt	Equity	Debt
EBIT (in Rs lakh) $[0.10 \times \text{sales}]$	40	40	80	80	100	100
Less interest	4.4	16.4	4.4	16.4	4.4	16.4
EBT	35.6	23.6	75.6	63.6	95.6	83.6
Less taxes	12.5	8.3	26.5	22.3	33.5	29.3
EAT	23.1	15.3	49.1	41.3	62.1	54.3
Number of equity shares (in lakh)	18.33	10.0	18.33	10.0	18.33	10.0
EPS (EAT $\div$ Number of equity shares)	1.26	1.53	2.68	4.13	3.39	5.43
P/E ratio (number of times)	7.5	5.0	7.5	5.0	7.5	5.0
MPS (EPS $\times$ P/E ratio)	9.45	7.67	20.1	20.67	25.42	27.15

(ii)  $[(X - I_1)(1 - t)]/N_1 = [(X - I_1 - I_2)(1 - t)]/N_2$ , where  $X = \text{EBIT}$

$$[(X - \text{Rs } 4.4)(0.65)]/18.33 = [(X - \text{Rs } 4.4 - \text{Rs } 12)(0.65)]/10$$

or  $(0.65X - \text{Rs } 2.86)/18.33 = [0.65X - \text{Rs } 10.66]/10$

Multiplying both sides of equation by 18,330

$$1,000 (0.65X - \text{Rs } 2.86) = 1,833 (0.65X - \text{Rs } 10.66)$$

$$650X - \text{Rs } 2,860 = 1,191.45X - \text{Rs } 19,539.78$$

$$1,191.45X - 650X = \text{Rs } 19,539.78 - \text{Rs } 2,860$$

$$541.45X = \text{Rs } 16,679.78$$

$$X = \text{Rs } 30,80,576$$

(iii) The adjustment will be required in the right hand side of the above equation. In the numerator, Rs 5 lakh [the amount of sinking fund (S) obligation] will be deducted. Accordingly, the modified equation will be:

$$[(X - I_1)(1 - t)]/N_1 = [(X - I_1 - I_2)(1 - t) - S]/N_2$$

$$= [(X - \text{Rs } 4.4)(0.65)]/18.33 = [(X - 16.4)(0.65) - \text{Rs } 5]/10 \text{ or } [0.65X - \text{Rs } 2.86]/18.33$$

$$= [0.65X - \text{Rs } 10.66 - \text{Rs } 5]/10$$

Multiply both sides of equation by 18,330,

or  $1,000 (0.65X - \text{Rs } 2.86) = 1,833 (0.65X - \text{Rs } 15.66)$

$$650X - \text{Rs } 2,860 = 1,191.45X - \text{Rs } 28,704.78$$

$$541.45X = \text{Rs } 25,844.78$$

$$X = \text{Rs } 47,73,253.$$

**PS 11.10**

A new project under consideration by your company requires a capital investment of Rs 150 lakh. The required funds can be raised either through the sale of equity shares or borrowed from a financial institution. Interest on term loan is 15 per cent and tax rate is 35 per cent. If the debt-equity ratio insisted by the financing agencies is 2 : 1, calculate the indifference point for the project. Explain its meaning. Also, prepare a verification table.

**Solution**

- (i) Capital investment of Rs 150 lakh will consist of Rs 100 lakh debt (2/3 of Rs 150 lakh) and Rs 50 lakh equity.  
(ii) Interest = Rs 15 lakh (Rs 100 lakh  $\times$  0.15)  
(iii) Indifference point =  $X(1 - t)/N_1 = [(X - I)(1 - t)]/N_2$   
or  $X(1 - 0.35)/\text{Rs } 1,50,00,000 = [(X - \text{Rs } 15,00,000)(1 - 0.35)]/\text{Rs } 50,00,000$   
or  $0.65X/1,50,00,000 = (0.65X - \text{Rs } 9,75,000)/\text{Rs } 50,00,000$   
Multiplying the equations by 1,50,00,000,  
 $0.65X = 3(0.65X - 9,75,000)$  or  $0.65X = 1.95X - 29,25,000$   
 $1.3X = \text{Rs } 29,25,000$  or  $X = \text{Rs } 22,50,000$

*Verification table*

Particulars	Equity plan	Equity + Debt plan
EBIT	Rs 22,50,000	Rs 22,50,000
Less interest	Nil	15,00,000
EBT	22,50,000	7,50,000
Less taxes	7,87,500	2,62,500
EAT	14,62,500	4,87,500
Number of shares (value assumed as Rs 100)	15,00,000	5,00,000
EPS (EAT $\div$ N)	0.975	0.975

**PS 11.11**

Goodshape Company Ltd has currently an ordinary share capital of Rs 25 lakh, consisting of 25,000 shares of Rs 100 each. The management is planning to raise another Rs 20 lakh to finance a major programme of expansion through one of four possible financing plans. The options are as under:

- (A) Entirely through ordinary shares.  
(B) Rs 10 lakh through ordinary shares, and Rs 10 lakh through long-term borrowings at 15 per cent interest per annum.  
(C) Rs 5 lakh through ordinary shares, and Rs 15 lakh through long-term borrowings at 16 per cent interest per annum.  
(D) Rs 10 lakh through ordinary shares, and Rs 10 lakh through preference shares with 14 per cent dividend.

The company's expected EBIT is Rs 8 lakh. Assuming a tax rate of 35 per cent, determine the EPS in each alternative, and comment on the implications of financial leverage.

**Solution***Determination of EPS under various financing alternatives*

	Financing plans			
	A	B	C	D
EBIT	Rs 8,00,000	Rs 8,00,000	Rs 8,00,000	Rs 8,00,000
Less interest	—	1,50,000	2,40,000	—
EBT	8,00,000	6,50,000	5,60,000	8,00,000
Less taxes (0.35)	2,80,000	2,27,500	1,96,000	2,80,000
EAT	5,20,000	4,22,500	3,64,000	5,20,000
Less dividends on preference shares	—	—	—	1,40,000
Earnings available to equity shareholders (E)	5,20,000	4,22,500	3,64,000	3,80,000
Number of equity shares (N)	45,000	35,000	30,000	35,000
EPS (E ÷ N)	11.56	12.07	12.13	10.86

The EPS is maximum in financing plan C, having maximum amount of debt (Rs 15 lakh out of total required amount of Rs 20 lakh).

The use of debt will have a favourable impact on the EPS, which in turn will enhance the market value of its shares. The existing policy of not making use of debt is not financially prudent, as debt is the cheapest source of raising funds since interest is deductible item of expense in arriving at taxable income. The use of debt of Rs 15 lakh will raise the debt-equity ratio to 1:2, which is very satisfactory. Interest coverage is also very high. Moreover, there is no dilution of control with the use of debt. Thus, from all points of view, the implications of financial leverage appear to be favourable.

**PS 11.12**

Sales and earnings before taxes for the ABC Ltd during current year were Rs 17,50,000 and Rs 4,50,000 respectively. During the year interest expense was Rs 4,000, and preferred dividends were Rs 10,000. These fixed charges are expected to continue for the next year.

An expansion is planned, which will require Rs 1,75,000 and is expected to increase EBIT by Rs 1,00,000 to Rs 5,50,000.

The firm is considering the following financing alternatives:

- Issue 5,000 shares of equity capital to net the firm Rs 35 per share. The firm currently has 40,000 shares of equity capital outstanding.
- Issue Rs 1,75,000 of 15-year, 15% Bonds. Sinking fund payments on these bonds will commence after 15 years.
- Issue Rs 1,75,000 of 14% Preference shares.

Assuming 35 per cent income tax,

- Calculate the EPS at the expected EBIT level of Rs 5,50,000 for each financing alternative.
- Calculate the equivalency level of EBIT between the debt and equity share alternatives.
- Calculate the equivalency level of EBIT between the preference share and equity share alternatives.

**Solution***(i) Determination of EPS at EBIT level of Rs 5,50,000*

	(a) Equity shares	(b) 15% Bonds	(c) Preference shares
EBIT	Rs 5,50,000	Rs 5,50,000	Rs 5,50,000
Less interest	4,000	30,250	4,000

(Contd.)

**Solution (Contd.)**

Taxable income	5,46,000	5,19,750	5,46,000
Less taxes	1,91,100	1,81,913	1,91,100
Income after taxes	3,54,900	3,37,837	3,54,900
Less dividend on preference shares	10,000	10,000	34,500
Earnings available for equityholders	3,44,900	3,27,837	3,20,400
Number of equity shares	45,000	40,000	40,000
EPS	7.66	8.20	8.01

(ii) *Equivalency level of earnings between equity and debt plan:*  $[(X - I_1)(1 - t) - D_p]/N_1 = [(X - I_1 - I_2)(1 - t) - D_p]/N_2$

or  $[(X - \text{Rs } 4,000) \times 0.65 - \text{Rs } 10,000]/45,000 = [(X - \text{Rs } 4,000 - \text{Rs } 26,250) \times 0.65 - \text{Rs } 10,000]/40,000$

or  $[0.65X - \text{Rs } 2,600 - \text{Rs } 10,000]/45,000 = [0.65X - \text{Rs } 19,662.5 - \text{Rs } 10,000]/40,000$

or  $[0.65X - \text{Rs } 12,600]/45,000 = [0.65X - \text{Rs } 29,662.5]/40,000$

Multiplying each side of the equation by 3,60,000, we get

$$8(0.65X - \text{Rs } 12,600) = 9(0.65X - \text{Rs } 29,662.5)$$

$$5.2X - \text{Rs } 1,00,800 = 5.85X - \text{Rs } 2,66,962.5$$

$$\text{Rs } 2,55,635 = X \text{ (EBIT)}$$

**PS 11.13**

Determine the indifference points by formulae and graphs of the financial plans (1) A and B (2) A and C formulated by the finance department of XYZ Ltd to finance its capital budget, assuming 50 per cent tax.

(A) Issue 1,00,000 equity shares of Rs 20 per share.

(B) Issue 50,000 equity shares of Rs 20 per share and 10 % Debentures of Rs 10,00,000.

(C) Issue 50,000 equity shares of Rs 20 per share and 12 % Preference shares of Rs 10,00,000.

Do you subscribe to the view that at indifference level of EBIT, since the EPS is same for all types of plans, the MPS would also be the same?

**Solution**

(1) *Indifference points between financing plans (A) and (B):*  $X(1 - t)/N_1 = [(X - I)(1 - t)]/N_2$

$$\text{or } 0.5X/1,00,000 = [(X - \text{Rs } 1,00,000)0.5]/50,000$$

$$\text{or } 0.5X/1,00,000 = (0.5X - \text{Rs } 50,000)/50,000$$

Multiplying the equations by 1,00,000

$$0.5X = X - \text{Rs } 1,00,000 \text{ or } X = 2,00,000$$

(2) *Indifference points between financing plans (A) and (C):*

$$X(1 - t)/N_1 = [X(1 - t) - D_p]/N_2$$

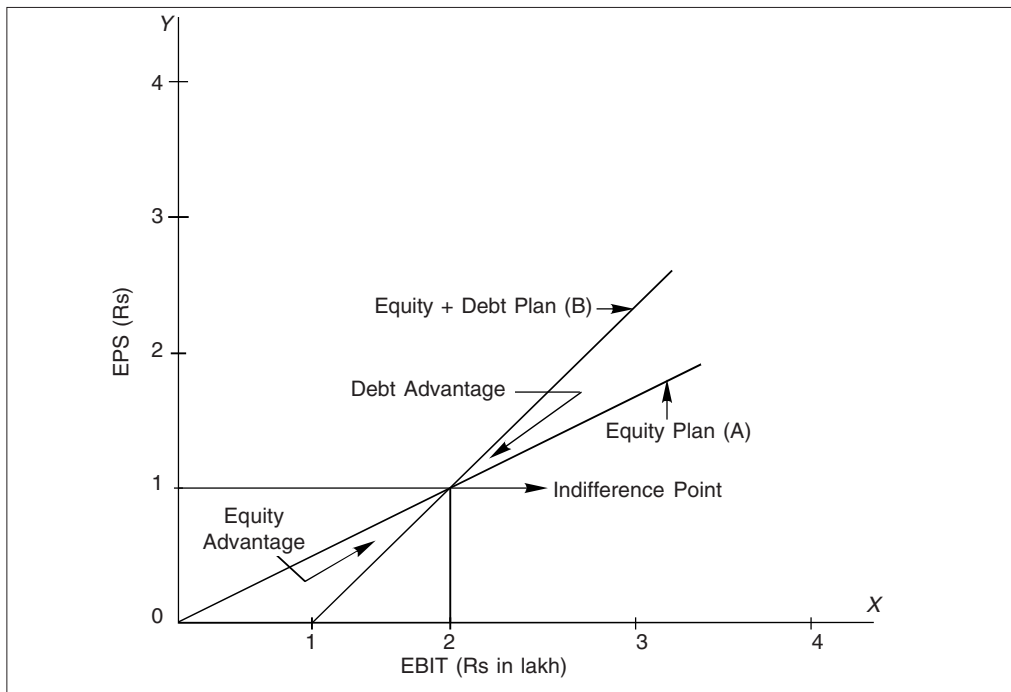
$$0.5X/1,00,000 = (0.5X - \text{Rs } 1,20,000)/50,000$$

Multiplying both sides of the equation by 1,00,000,

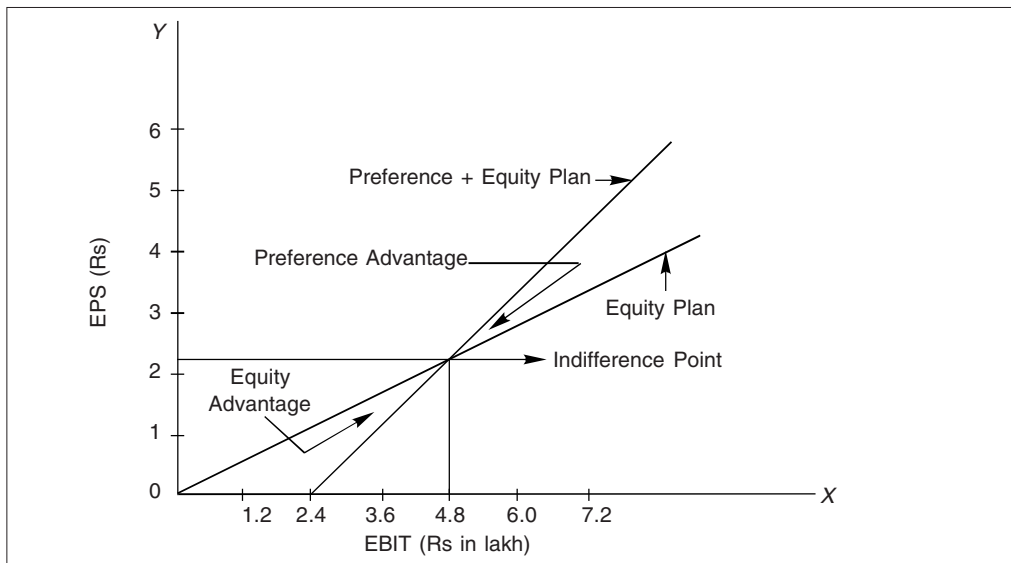
$$0.5X = X - \text{Rs } 2,40,000 \text{ or } X = \text{Rs } 4,80,000.$$

MPS would not be the same. It would be more for a plan which has higher proportion of equity in its capital structure.

The graphic presentation of indifference point is depicted in Figs. 11.1 and 11.2.



**Fig. 11.1** EBIT-EPS Chart



**Fig. 11.2** EBIT-EPS Chart

### PS 11.14

Alfa Ltd has the choice of issuing 10% Debentures or Rs 100 equity shares to raise Rs 20 lakh to meet its long-term investment requirements. Its current capital structure consists of 20,000 ordinary shares of Rs 100 each, 8%

Debentures of Rs 10,00,000 and 12% Preference shares of Rs 10,00,000. Determine the level of EBIT at which EPS would be the same, whether the new funds are acquired by issuing ordinary shares, or by issuing 10% Debentures. Tax rate is 50 per cent. Also, construct an EBIT-EPS chart assuming various levels of EBIT.

### Solution

Indifference level of EBIT:  $[(X - I_1)(1 - t) - D_p]/N_1 = [(X - I_1 - I_2)(1 - t) - D_p]/N_2$

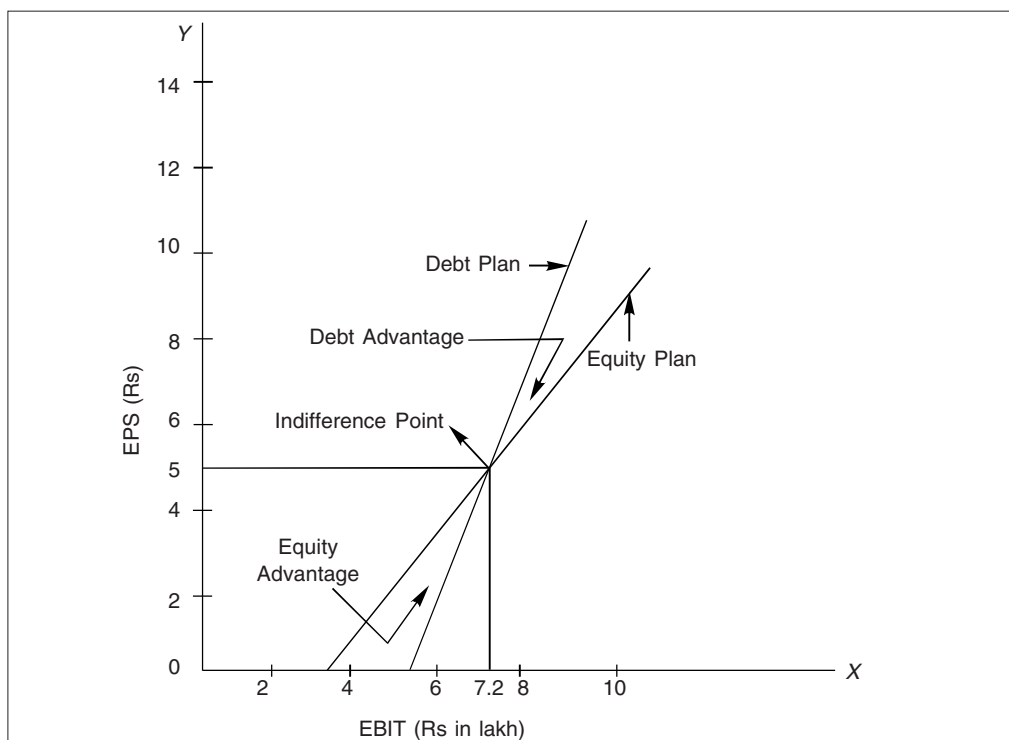
or  $[(X - \text{Rs } 80,000)0.5 - \text{Rs } 1,20,000]/40,000 = [(X - \text{Rs } 2,80,000)0.5 - \text{Rs } 1,20,000]/20,000$

or,  $(0.5X - \text{Rs } 1,60,000)/40,000 = (0.5X - \text{Rs } 2,60,000)/20,000$

Multiplying both sides by Rs 40,000,

$0.5X - \text{Rs } 1,60,000 = X - \text{Rs } 5,20,000, X = \text{Rs } 7,20,000.$

The EBIT- EPS chart is depicted in Fig. 11.3



**Fig. 11.3** EBIT-EPS Chart

### PS 11.15

Evergreen Company Ltd has been promoted by three promoters. They are trying to decide how the company should be financed. There are three choices:

- Issue Rs 5,00,000 in equity shares;
- Issue Rs 3,00,000 in equity shares, and Rs 2,00,000 in 12% Debentures;
- Issue Rs 3,00,000 in equity shares, and Rs 2,00,000 in 10% Preference shares.

Income before interest and taxes is expected to be Rs 1,00,000 per year. The tax is 50 per cent.

- You are required to compute the income available for equity shares, return on equity and EPS (assume equity shares are of Rs 100) for each financing choice.



- (ii) Suppose the tax is 35 per cent. On the basis of your calculations, can you draw any conclusions about the effects of tax rates on the relative desirability of the three choices?

### Solution

(i) *EPS under various financing alternatives (50 per cent tax)*

	Financing alternatives		
	Equity shares	12% Debt and equity shares	10% Preference and equity shares
EBIT	Rs 1,00,000	Rs 1,00,000	Rs 1,00,000
Less interest expenses	—	24,000	—
EBT	1,00,000	76,000	1,00,000
Less taxes	50,000	38,000	50,000
Net income	50,000	38,000	50,000
Less dividends to preference shareholders	Nil	Nil	20,000
Earnings available for equityholders	50,000	38,000	30,000
Equity capital	5,00,000	3,00,000	3,00,000
Return on equity (ROE)	0.10	0.1267	0.10
Number of equity shares	5,000	3,000	3,000
EPS	10	12.67	10

(ii) *EPS under different financing plans (35 per cent tax)*

EBIT	Rs 1,00,000	Rs 1,00,000	Rs 1,00,000
Less interest	Nil	24,000	Nil
EBT	1,00,000	76,000	1,00,000
Less taxes	35,000	26,600	35,000
Net income	65,000	49,400	65,000
Less dividends to preference shareholders	Nil	Nil	20,000
Earnings available for equityholders	65,000	49,400	45,000
Equity capital	5,00,000	3,00,000	3,00,000
Return on equity	0.13	0.165	0.15
Number of equity shares	5,000	3,000	3,000
EPS	13	16.5	15

One point that is fairly obvious from the comparison of ROE under the two tax rates is that the higher is the rate, the lower is the ROE as well as EPS under any financing choice. Another notable point is that the relative benefit of debt over preference shares decreases when the tax rate declines in view of lower tax shield on interest on debt.

### PS 11.16

The ZBB Ltd needs Rs 5,00,000 for construction of a new plant. The following three financial plans are feasible:

- The company may issue 50,000 equity shares of Rs 10 per share.
- The company may issue 25,000 equity shares of Rs 10 per share and 8 % debentures of Rs 100 each.
- The company may issue 25,000 equity shares of Rs 10 per share and 10 % preference shares of Rs 100 per share.

If the company's EBIT are Rs 40,000, Rs 80,000 and Rs 1,20,000, what are the EPS under each of the three financing plans? Which alternative would you recommend and why? Assume tax of 35 per cent and P/E ratio of 10 in equity plan, 9 in equity + preference plan and 8 in equity + debt plan.

**Solution***Determination of EPS at various levels of EBIT under alternative financing plans*

Particulars	EBIT								
	Rs 40,000			Rs 80,000			Rs 1,20,000		
	Equity	Equity + debt	Equity + preference	Equity	Equity + debt	Equity + preference	Equity	Equity + debt	Equity + preference
EBIT	40,000	40,000	40,000	80,000	80,000	80,000	1,20,000	1,20,000	1,20,000
Less interest	—	0,000	—	—	20,000	—	—	20,000	—
EBT	40,000	20,000	40,000	80,000	60,000	80,000	1,20,000	1,00,000	1,20,000
Less taxes (0.35)	14,000	7,000	14,000	28,000	21,000	28,000	42,000	35,000	42,000
EAT	26,000	13,000	26,000	52,000	39,000	52,000	78,000	65,000	78,000
Less dividends (preference)	—	—	5,000	—	—	25,000	—	—	25,000
Earnings available for equityholders	26,000	13,000	1,000	52,000	39,000	27,000	78,000	65,000	53,000
Number of equity shares	50,000	25,000	25,000	50,000	25,000	25,000	50,000	25,000	25,000
EPS	0.52	0.52	0.04	1.04	1.56	1.08	1.56	2.6	2.12
P/E ratio (number of times)	10	8	9	10	8	9	10	8	9
MPS	5.2	4.16	0.36	10.40	12.48	9.72	15.60	20.8	19.08

**Recommendation:** (i) Equity plan is preferred when EBIT is Rs 40,000 (ii) In cases of EBIT levels of Rs 80,000 and Rs 1,20,000, equity + debt plan is recommended.

**PS 11.17**

A growing company is confronted with a choice between 15% Debt issue and equity issue to finance its new investments. Its pre-expansion income statement is as follows:

Sale (production capacity of Rs 60,00,000 at current sales price)	Rs 45,00,000
Fixed cost	5,00,000
Variable cost (2/3 of sales)	30,00,000
EBIT	10,00,000
Interest at (0.125)	1,00,000
EBT	9,00,000
Income tax (0.35)	3,15,000
Net income	5,85,000
EPS	11.7

The expansion programme is estimated to cost Rs 5,00,000. If this is financed through debt, the rate of interest will be 15 per cent and the P/E ratio will be 10. If expansion programme is financed through equity, new shares can be sold at Rs 100 per share, and the P/E ratio will be 12. Expansion will generate additional sales of Rs 12,75,000. No additional fixed costs would be needed to meet the expansion operation. If the company is to follow a policy of maximising the market value (MV) of its shares, which form of financing should be employed by the company?

**Solution***Market value of shares under different financing alternatives*

Particulars	15% Debt	Equity shares
Sales revenue	Rs 57,75,000	Rs 57,75,000
Less fixed costs	5,00,000	5,00,000

*(Contd.)*

**Solution (Contd.)**

Less Variable costs (2/3 of sales)	38,50,000	38,50,000
EBIT	14,25,000	14,25,000
Less interest	1,75,000	1,00,000
EBT	12,50,000	13,25,000
Less taxes	4,37,500	4,63,750
EAT	8,12,500	8,61,250
Number of equity shares (N)	50,000	55,000
EPS (EAT ÷ N)	16.25	15.66
P/E ratio (times)	10	12
Market price (EPS × P/E ratio)	162.50	187.92

**Recommendation:** Equity financing should be adopted by the company, as it maximises the MPS.

**PS 11.18**

Sagar Industries Ltd anticipates a 15 per cent increase in sales over the present level of Rs 7.5 crore. As it is currently operating at fully capacity, the firm is contemplating to increase its capacity by increasing its investment in assets. Its latest balance sheet as on March 31 is summarised below:

Liabilities	Amount (Rs in lakh)	Assets	Amount (Rs in lakh)
Equity capital	218.35	Fixed assets (net)	240.00
Retained earnings	90.50	Cash and marketable securities	20.00
Long-term debt	22.50	Debtors	112.50
Sundry creditors	82.50	Inventory	127.50
Bank loan	26.15		
Other current liabilities	60.00		
	500.00		500.00

- If Sagar Industries expects to maintain its previous year's total assets turnover (based on sales) ratio, determine the expected level of total assets, and the extent of additional funds required to finance the incremental assets.
- Express past year's balance sheet as a percentage of sales. Indicate which items on the balance sheet are likely to move with sales. Also, state the amount to be met by the spontaneous increase in liabilities.
- If the firm maintains the current level of net profit margin on sales at 6 per cent, as also the current D/P ratio of 40 per cent, indicate the additional external financing required by the firm.
- Prepare a proforma balance sheet assuming that additional financing needs, if any, can be met with an increase in bank loans.
- If Sagar Industries had excess production capacity and did not anticipate increasing its fixed assets, what would be the requirement of additional external funds?

**Solution**

- (i)  $\text{Total assets turnover} = \text{Total sales} / \text{Total assets} = \text{Rs } 7.5 \text{ crore} / \text{Rs } 5 \text{ crore} = 1.5$

Total expected assets =  $8.625 \text{ crore} / 1.5 = \text{Rs } 5.75 \text{ crore}$

Additional financing requirement =  $\text{Rs } 5.75 \text{ crore} - \text{Rs } 5 \text{ crore} = \text{Rs } 0.75 \text{ crore}$ .

- (ii) *Balance sheet*

Liabilities	(Per cent of sales)	Assets	(Per cent of sales)
Equity capital	29.11	Fixed assets (net)	32
Retained earnings	12.07	Cash and marketable securities	2.67
Long-term debt	3	Debtors	15

(Contd.)

**Solution (Contd.)**

Sundry creditors	11.00	Inventory	17
Bank loan	3.49		
Other current liabilities	8		
	<u>66.67</u>		<u>66.67</u>

Since the total asset turnover ratio is the same, all assets items would be expected to change with sales. Sundry creditors and other current liabilities are also likely to move with sales.

	<i>Previous year (Rs in lakh)</i>	<i>Current year (Rs in lakh)</i>
Sundry creditors	82.50	94.875
Other current liabilities	60	69
	<u>142.50</u>	<u>163.875</u>

(iii) *Expected net profit after taxes* = Rs 862.50 lakh  $\times$  0.06 = Rs 51.75 lakh

Dividend payments = Rs 20.7 lakh (0.40)

Retained earnings = Rs 31.05 lakh (0.60)

External fund needed:  $A/NS(\Delta NS) = CL/NS(\Delta NS) - EATM(RR)(FNS)$

Where  $A/NS$  = Assets that are expected to increase directly with sales expressed as a per cent of net sales

$\Delta NS$  = Change in sales

$CL/NS$  = Current liabilities that are expected to increase directly with sales, expressed as a per cent of net sales

EATM = Earnings after tax margin

RR = Retention ratio

FNS = Forecast sales

= (Rs 500 lakh/750)  $\times$  Rs 112.5 lakh – (Rs 142.5 lakh/750)  $\times$  (112.5 lakh) – [0.06 (0.6)  $\times$

Rs 862.50 lakh] = Rs 75 lakh – Rs 21.375 lakh – Rs 31.05 lakh = Rs 22.57 lakh.

*Alternatively, external funds required*

Additional financing requirement (in lakh)	Rs 75
Less: increase in current liabilities	21.38
increase in retained earnings (internally generated funds)	31.05
	<u>22.57</u>

(iv)

*Proforma balance sheet*

<i>Liabilities</i>	<i>Amount (Rs in lakh)</i>	<i>Assets</i>	<i>Amount (Rs in lakh)</i>
Equity capital	218.35	Fixed assets (net)	276
Retained earnings (90.5 + 31.05)	121.55	Cash and marketable securities	23
Long-term debt	22.50	Debtors	129.375
Sundry creditors	94.87	Inventory	146.625
Bank loan (26.15 + 22.58)	48.73		
Other current liabilities	69		
	<u>575</u>		<u>575</u>

(v)  $A/NS (NS) - CL/NS(NS) - EATM(RR)(FNS) = (Rs\ 260\ \text{lakh}/750) \times (Rs\ 112.50) - Rs\ 21.375\ \text{lakh} - Rs\ 31.05\ \text{lakh} = (Rs\ 13.425\ \text{lakh})$ .

The firm would not need any additional funds. In fact, it has excess funds.

**PS 11.19**

Premier Ltd's capital structure consists of the following:

	<i>Amount (in Rs lakh)</i>
Equity shares of Rs 100 each	20
Retained earnings	10
9% Preference shares	12
7% Debentures	8
	<u>50</u>

The company's EBIT is at the rate of 12 per cent on its capital employed which is likely to remain unchanged after expansion. The expansion involves additional finances aggregating Rs 25 lakh for which the following alternatives are available to it:

- (i) Issue of 20,000 equity shares at a premium of Rs 25 per share.
- (ii) Issue of 10% Preference shares.
- (iii) Issue of 8% Debentures.

It is estimated that the P/E ratio in case of equity shares, preference shares and debentures financing would be 15, 12, and 10 respectively.

Which of the financing alternatives would you recommend and why? The corporate tax rate is 35 per cent.

**Solution**

*Market price per share (MPS) under proposed financial plans*

	<i>Equity shares</i>	<i>Preference shares</i>	<i>Debentures</i>
EBIT (Rs 75 lakh $\times$ 0.12)	Rs 9,00,000	Rs 9,00,000	Rs 9,00,000
Less interest	56,000	56,000	2,56,000
EBT	8,44,000	8,44,000	6,44,000
Less taxes (0.35)	2,95,400	2,95,400	2,25,400
EAT	5,48,600	5,48,600	4,18,600
Less preference dividend	1,08,000	3,58,000	1,08,000
Earnings available for equityholders	4,40,600	1,90,600	3,10,600
Number of equity shares	40,000	20,000	20,000
EPS	11.02	9.53	15.53
P/E ratio	15	12	10
MPS	165.3	114.4	155.3

**Recommendation:** Issuing equity shares is the best alternative as it maximises the MPS.

**PS 11.20**

ABC Ltd gives you the following information:

Profit (before interest and tax)		Rs 24,00,000
Less interest on debentures (0.125)	Rs 2,00,000	
Less interest on long-term loans (0.16)	<u>2,00,000</u>	4,00,000
EBT		20,00,000
Less income tax (0.35)		7,00,000
Profit after tax		13,00,000
Number of equity shares (of Rs 10 each)		4,00,000
EPS		3.25
Ruling market price		20
P/E ratio		6.15

The company has undistributed reserves and profits of Rs 81,50,000. The company needs to raise Rs 36,00,000 for repayment of debentures and modernisation of its plants.

It seeks your opinion on the advisability of taking recourse to one of the following modes of raising the required funds, on the consideration of the probable price of the share to rule on implementation.

(a) Raising the entire amount by term loans from bank: Interest @ 16 per cent.

(b) Raising partly by issue of 1,00,000 equity shares: Estimated price Rs 18 per share, and the rest by term loan from bank @ 16 per cent.

The company expects that the before tax rate of return, and interest on funds employed will improve by 4 per cent because of modernisation and that, if the debt equity ratio (debt/debt plus shareholders' fund) exceeds 25 per cent, the P/E ratio will go down to 6.

## Solution

### Determination of expected market price (MPS)

	16% Loan	Equity issue + 16% Loan
EBIT [ $0.20 \times$ capital employed of Rs 1,70,00,000 (Rs 1,50,00,000) – Rs 16,00,000 debentures paid + Rs 36,00,000 new issues)]	Rs 34,00,000	Rs 34,00,000
Less interest	7,76,000	4,88,000
EBT	26,24,000	29,12,000
Less taxes (0.35)	9,18,400	10,19,200
Profit after taxes	17,05,600	18,92,800
Number of equity shares	4,00,000	5,00,000
EPS	4.26	3.79
P/E ratio	6	6.15
MPS	25.56	23.31

Plan A (16% Loan) is better as the MPS is higher under this plan.

### Working notes

#### 1. Total capital employed

Equity capital	Rs 40,00,000 ( $4,00,000 \times$ Rs 10)
Reserves and surplus	81,50,000
12.5 per cent Debentures	16,00,000 (Rs 2,00,000 $\div$ 0.125)
16 per cent Long-term loan	12,50,000 (Rs 2,00,000 $\div$ 0.16)
	<u>1,50,00,000</u>

Profit before interest and tax = Rs 24,00,000

EBIT = Rs 24,00,000  $\div$  Rs 1,50,00,000 = 0.16 or 16 per cent.

2. Debt amount of Rs 48,50,000 in the total capital employed Rs 1,70,00,000, yields a debt-equity ratio of 28.53 per cent. Accordingly, the relevant P/E ratio in the case of the debt plan will be 6 times.

## PS 11.21

The finance manager of Bombay Textiles Ltd has been trying to develop a financial plan for the firm. He has, in co-ordination with other managers, developed the following estimates (in lakh of rupees).

	Year			
	1	2	3	4
Sales	300	360	450	630
Fixed assets (net)	240	285	330	375

In addition, for planning purposes, he has made the following estimates and assumptions about other results.

Cost of goods sold as per cent of sales	70
Return on sales (after taxes)	10
Dividend payout ratio	50

*Turnovers (times) based on year-end values:*

Cash and debtors	4
Inventory	3
Required current ratio	2 : 1
Required ratio of long-term debt to equityholders' equity	0.50

At the beginning of year 1, the treasurer expects the firm to have equity capital of Rs 180 lakh and long-term debt of Rs 90 lakh.

Determine how much additional equity capital, if any, the firm will have to issue each year if the finance manager's estimates and assumptions are correct.

### ***Solution***

*Equity capital required to be issued (amount in lakh of rupees)*

<i>Particulars</i>	<i>Year</i>			
	1	2	3	4
Sales	300	360	450	630
Cost of goods sold ( $0.70 \times \text{sales}$ )	210	252	315	441
Net income ( $0.10 \times \text{sales}$ )	30	36	45	63
Dividends paid ( $0.50 \times \text{net income}$ )	15	18	22.5	31.5
Retained earnings ( $0.50 \times \text{net income}$ )	15	18	22.5	31.5
<i>Investment in current assets (CA)</i>				
Cash and debtors ( $\text{sales} \div 4$ )	75	90	112.5	157.5
Inventory ( $\text{cost of sales} \div 3$ )	70	84	105	147
Total current assets (CA)	145	174	217.5	304.5
Fixed assets	240	285	330	375
Total assets (TA)	385	459	547.5	679.5
Current liabilities (CL) ( $\text{CA} \div 2$ )	72.50	87	108.75	152.25
Long-term debt ( $1/3$ of total long-term financing, $\text{TA} - \text{CL}$ )	104.16	124	146.25	175.75
Equity capital ( $2/3$ of total $\text{TA} - \text{CL}$ )	208.34	248	292.50	351.50
Total liabilities	385.00	459	547.50	679.50

*Schedule showing the additional equity financing required*

<i>Particulars</i>	<i>Year</i>			
	1	2	3	4
Equity capital (beginning)	180	208.34	248.00	292.50
Add retained earnings	15	18.00	22.50	31.50
Equity capital (at the end)	195	226.34	270.50	324.00
Required balance	208.34	248.00	292.50	351.50
Equity capital (to be issued)	13.34	21.66	22.00	27.50

### **PS 11.22**

The finance advisor of Aggarwal Industries Ltd is confronted with two alternative financing plans for raising Rs 10

lakh that is needed for plant expansion and modernisation. One choice is 12% Debt issue. The other is to issue 8,000 equity shares at the current market price per of Rs 125.

The modernisation and expansion programme is expected to increase the firm's operating profits (EBIT) by Rs 2,00,000 annually. The firm's condensed financial statements for current year are given below:

*Balance sheet as on March 31 current year*

<i>Liabilities</i>	<i>Amount</i>	<i>Assets</i>	<i>Amount</i>
Current liabilities	Rs 5,00,000	Current assets	Rs 16,00,000
10% Long-term loan	15,00,000	Plant and equipment (net)	34,00,000
Reserves and surpluses	10,00,000		
Equity capital (shares of Rs 100 each)	20,00,000		
	50,00,000		50,00,000

*Income statement for the current year*

Operating profits	Rs 8,00,000
Less interest expenses (0.10 × Rs 15,00,000)	1,50,000
Income before taxes	6,50,000
Less taxes (0.35)	2,27,500
Net income	4,22,500
Earnings per share	21.12
Dividends per share	10.56

However, the finance advisor is concerned about the effect that issuing debt might have on the firm. The average debt ratio for firms in industry is 45 per cent. He believes that if this ratio is exceeded, the P/E ratio will fall to 7 because of the potentially greater risk. If the firm increases its equity capital, he expects the P/E ratio to increase to 8.5. He also wonders as to what will happen to the dividend yield under each plan. The firm follows the practice of paying dividends equal to 50 per cent of net income.

- Determine the debt ratio, under each financing plan, after the securities are issued.
- Determine the expected net income in the next year, expected EPS and the expected market price of the equity shares.
- Determine the dividend yield.
- Which form of financing should be employed by the company, if the company is to follow a policy of maximising market value of its shares?

## ***Solution***

*(i) Debt to assets ratio*

	<i>12% Debt</i>	<i>Equity issue</i>
Total debt*	Rs 30,00,000	Rs 20,00,000
Total assets (Rs 50 lakh + Rs 10 lakh)	60,00,000	60,00,000
Debt ratio (Debt ÷ assets)	0.50	0.333

\*Existing, Rs 20 lakh + additional, Rs 10 lakh

*(ii) Expected net income*

Current operating profits	Rs 8,00,000	Rs 8,00,000
Additional profits	2,00,000	2,00,000
Total operating profits	10,00,000	10,00,000
Less interest	2,70,000*	1,50,000
Profit before taxes	7,30,000	8,50,000

*(Contd.)*



**Solution (Contd.)**

Less taxes	2,55,500	2,97,500
Profit after taxes (NI)	4,74,500	5,52,500
Outstanding shares (N)	20,000	28,000
EPS (NI ÷ N)	23.72	19.73
Expected P/E ratio	7	8.5
Expected MPS (EPS × P/E ratio)	166.1	167.72

@Rs 1,50,000 + Rs 1,20,000 = Rs 2,70,000

**(iii) Dividend yield**

Dividend per share	11.86	9.87
Dividend yield (dividend ÷ MPS)	0.714	0.0588

The company should use the equity financing plan to maximise market value of its shares.

## EXERCISES

**E.11.1** AT Ltd 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.

**Income and proforma statement**

	<i>Actual</i> (previous year)	<i>Sell 10,000 equity shares</i>		<i>Sell 10% debentures</i>	
		<i>optimistic</i> (Rs 12,00,000)	<i>pessimistic</i> (Rs 9,00,000)	<i>optimistic</i> (Rs 12,00,000)	<i>pessimistic</i> (Rs 9,00,000)
Sales	Rs 8,00,000				
Less: variable expenses	2,40,000				
fixed costs	3,00,000				
EBIT	2,60,000				
Less interest	—				
Earnings after interest	2,60,000				
Less taxes (0.35)	91,000				
EAT	1,69,000				
EPS	8.45				

Assuming that the variable costs, as a percentage of sales, remains constant, and fixed cost with the new project is likely to increase by Rs 1,00,000 over the previous year's level, complete the tabulation. Which plan would you recommend to finance the new project?

**E.11.2** Evergreen Company Ltd has the choice of raising the additional sum of Rs 50 lakh either by the sale of 10% 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 and no debt. At the level of EBIT after the new capital is acquired would the EPS be the same, whether new funds are raised by issuing ordinary shares or by issuing debentures? Assume a 35 per cent tax.

**E.11.3** The finance manager of Hypothetical Ltd has formulated various financial plans to finance Rs 30,00,000 required to implement various capital budgeting projects. You are required to determine the indifference point for each financial plan, assuming 35 per cent tax, and the face value of equity shares as Rs 100. The options are: (i) equity capital of Rs 30,00,000, or Rs 15,00,000, 10% Debentures and Rs 15,00,000 equity; (ii) equity capital of Rs 30,00,000, or 12% Preference shares of Rs 10,00,000 and Rs 20,00,000 equity, (iii) equity capital of Rs 30,00,000, or 12% Preference capital of Rs 10,00,000, Rs 10,00,000, 10% Debentures and Rs 10,00,000 equity; and (iv) equity share capital of Rs 20,00,000 and 10% Debentures of Rs 10,00,000, or 12% Preference capital of Rs 10,00,000, 10% Debentures of Rs 8,00,000 and Rs 12,00,000 equity.

**E.11.4** PCB Corporation Ltd has plans for expansion which call for a 50 per cent increase in assets. The alternatives before the company are issue of equity shares, or debt at 14 per cent. Its balance sheet and P & L A/c are given below.

*Balance sheet as on March 31*

<i>Liabilities</i>	<i>Amount (Rs in lakh)</i>	<i>Assets</i>	<i>Amount (Rs in lakh)</i>
12% Debentures	25	Total assets	200
Ordinary shares – shares of Rs 10 each	100		
General reserves	75		
	<u>200</u>		<u>200</u>

*P & L A/c for the year ending March 31*

	<i>Amount (Rs in lakh)</i>
Sales	750
Total costs excluding interest	<u>675</u>
EBIT	75
Interest on debentures	<u>3</u>
EBT	72
Taxes (0.35)	<u>25.2</u>
EAT	<u>46.8</u>
EPS	4.68
P/E ratio	5 times
Market price	23.4

If the company finances the expansion with debt, the incremental financing charges will be at 14 per cent, and the P/E ratio is expected to be at 4 times. If the expansion is through equity, the P/E ratio will remain at 5 times. The company expects that its new issues will be subscribed to at a premium of 25 per cent.

From the above information, determine the following:

- If the EBIT is 10 per cent of sales, calculate the EPS at sales levels of Rs 4 crore, Rs 8 crore and Rs 10 crore respectively.
- After expansion, determine at what level of EBIT, EPS would remain the same, whether new funds are raised by equity or debt.
- Using P/E ratios, calculate the MPS at each sales level for both debt and equity financing.

**E.11.5** ABC Corporation Ltd has a capital structure of 40 per cent debt and 60 per cent equity. The company is presently considering several alternative investment proposals costing less than Rs 20 lakh. It always raises the required funds without disturbing its present debt-equity ratio. The cost of raising the debt and equity are as under.

<i>Project cost</i>	<i>Cost of debt (per cent)</i>	<i>Cost of equity (per cent)</i>
Up to Rs 2 lakh	10	12
Above 2 and up to Rs 5 lakh	11	13
Above 5                      10	12	14
Above 10                     20	13	14.5

Assuming the tax at 35 per cent, calculate,

- Cost of capital of two projects, X and Y, whose fund requirements are Rs 6.5 lakh and Rs 14 lakh respectively.
- If a project is expected to give an after tax return of 10 per cent, determine under what conditions would it be acceptable?

**E.11.6** The following figures of Krish Ltd are presented to you:

EBIT		Rs 23,00,000
Less: debentures interest (0.08)	Rs 80,000	
long-term loan interest (0.11)	<u>2,20,000</u>	<u>3,00,000</u>
		20,00,000
Less tax (0.35)		<u>7,00,000</u>
EAT		<u>13,00,000</u>
Number of equity shares of Rs 10 each		5,00,000
EPS		2.6
MPS		26
P/E ratio		10

The company has undistributed reserves and surplus of Rs 20 lakh. It is in need of Rs 30 lakh to pay off debentures and modernise its plants. It seeks your advice on the following alternative modes of raising finance:

*Alternative 1:* Raising the entire amount of term loan from banks @ 12 per cent.

2: Raising part of the funds by issue of 1,00,000 shares of Rs 20 each, and the rest by term loan at 12 per cent.

The company expects to improve its rate of return by 2 per cent as a result of modernisation, but P/E ratio is likely to go down to 8 if the entire amount is raised as term loan.

- Advise the company on the financing plan to be selected.
- If it is assumed that there will be no change in the P/E ratio if either of the two alternatives are adopted, would you advice still hold good?

## ANSWERS

**E.11.1** The debt form of financing is recommended, EPS; Rs 12.67 (optimistic), Rs 5.85 (pessimistic); EPS under equity plan is Rs 9.53 (optimistic), Rs 4.98 (pessimistic).

**E.11.2** Indifference point, Rs 55 lakh

- E.11.3**
- Rs 3,00,000,
  - Rs 8,00,000,
  - Rs 5,50,000,
  - Rs 7,16,667

- E.11.4**
- EPS: Rs 1.03, Rs 2.14 and Rs 2.16 under equity alternatives and Rs 1.15, Rs 3.15 and Rs 4.15 under debt alternative,
  - Rs 34.5 lakh,
  - MPS Rs 5.15, Rs 10.70, Rs 13.45 under equity alternative and Rs 4.6, Rs 12.60 and Rs 16.60 under debt alternative.

- E.11.5**
- $K_0 = 10.8\%$  (Cost of project, Rs 6.5 lakh)  
 $K_0 = 11.3\%$  (Cost of project, Rs 14 lakh)
  - Project cost should be less than Rs 5 lakh.

# 12 *DIVIDEND POLICY*

## BASIC THEORY

### INTRODUCTION

Dividend policy refers to the choice of a firm to distribute its net earnings to shareholders, or retain them in the business. The choice would obviously depend on the effect of the decision on the value of the firm. In other words, the relationship between the dividends and the value should be the decision criterion.

### DIVIDEND THEORIES

#### Modigliani and Miller (MM) Theory

According to the MM approach, the dividend policy of a firm has no effect on the value of the firm. Modigliani and Miller's proof in support of their argument is summarised in Exhibit 12.1.

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#### EXHIBIT 12.1 *Modigliani and Miller (MM) Theory*

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**Step 1** The market price of a share at the beginning of the period is equal to the present value (PV) of dividends paid at the end of the period, plus the market price of the share at the end of the period. Symbolically

$$P_0 = \frac{1}{(1 + K_e)} (D_1 + P_1) \quad (12.1)$$

where  $P_0$  = Prevailing market price of a share (MPS)  
 $K_e$  = Cost of equity capital  
 $D_1$  = Dividend to be received at the end of period, 1  
 $P_1$  = MPS at the end of period, 1

**Step 2** Assuming no external financing, total capitalised value of the firm would simply be the number of shares ( $n$ ) times the price of each share ( $P_0$ ). Thus,

$$nP_0 = \frac{1}{(1 + K_e)} (nD_1 + nP_1) \quad (12.2)$$

**Step 3** If the firm's sources of financing its investment opportunities fall short of the funds required, and  $n$  is the number of new shares issued at the end of year 1 at  $P_1$ , Eq 12.2 can be written as

$$nP_0 = \frac{1}{(1 + K_e)} [nD_1 + (n + \Delta n)P_1 - \Delta nP_1] \quad (12.3)$$

where  $n$  = Number of shares outstanding at the beginning of the period  
 $\Delta n$  = Change in number of shares outstanding during the period

Equation 12.3 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, including new shares issued less the value of the new shares issued. Thus, in effect, Eq. 12.3 is equivalent to Eq. 12.2.

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(Contd.)

**Exhibit 12.1 (Contd.)**

**Step 4** If the firm were to finance all investment proposals, the total amount of new shares issued would be given by Eq. 12.4 as under:

$$\Delta nP_1 = I - (E - nD_1)$$

$$\text{or} \quad \Delta nP_1 = I - E + nD_1 \quad (12.4)$$

where  $\Delta nP_1$  = Amount obtained from the sale of new shares to finance capital budget

$I$  = Total funds requirement of capital budget

$E$  = Earnings of the firm during the period

$nD_1$  = Total dividends paid

$E - nD_1$  = Retained earnings

Equation 12.4 simply states that whatever investment needs ( $I$ ) are not financed by retained earnings, must be financed through the sale of additional equity shares.

**Step5** If we substitute Eq. 12.4 in Eq. 12.3, we derive Eq. 12.5 as under:

$$nP_0 = \frac{1}{(1 + K_e)} [nD_1 + (n + \Delta n)P_1 - (I - E + nD_1)] \quad (12.5)$$

Solving Eq. 12.5, we have

$$nP_0 = \frac{nD_1 + (n + \Delta n)P_1 - I + E - nD_1}{(1 + K_e)}$$

Thus,

$$nP_0 = \frac{(n + \Delta n)P_1 - I + E}{(1 + K_e)} \quad (12.6)$$

**Step 6 Conclusion:** Since dividends ( $D$ ) are not found in Eq. 12.6, MM conclude that dividends do not count, and the dividends policy has no effect on the share price.

**Walter's Model**

According to Walter, the dividend policy of a firm is relevant to its value. The value of the firm, as measured by the market price per share (MPS), is given by Eq. 12.7.

$$P = \frac{D + \frac{I}{K_e} (E - D)}{K_e} \quad (12.7)$$

where  $P$  = Prevailing MPS

$D$  = Dividend per share

$E$  = Earnings per share

$K_e$  = Equity capitalisation rate

$r$  = Rate of return on the firm's investment.

**Gordon's Model**

According to Gordon's Model, the value of the share is given by Eq 12.8.

$$P = \frac{E(1 - b)}{K_e - br} \quad (12.8)$$

where  $b$  = Retention ratio

$(1 - b)$  = Dividend pay-out ratio

$br = g$  = Growth rate in  $r$ , or rate of return on investment of an all-equity firm

This approach also supports the view that the dividend policy of a firm is relevant to its valuation.

## SOLVED PROBLEMS

### PS 12.1

The shareholders' funds of XYZ Ltd for the year ending March 31 are as follows:

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

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.

- (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.

### PS 12.2

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

(Contd.)

**Solution (Contd.)**

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.

**PS 12.3**

Royal Industries Ltd 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 lakh 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 4,00,000 equity shares (Rs 10 each) outstanding. 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 10,00,000. 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	0.15
New equity shares sold at Rs 15 to yield	Rs 14
Required rate of return on equity	0.18

- (i) What would be an appropriate dividend policy for Royal Industries Ltd?
- (ii) What assumptions, if any, do you make in your answer about investors' preference for dividends versus capital gains?

### ***Solution***

(i) The company's management should recognise that it will be consistently in 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 over a period of time, by maintaining the current dividends, as earnings rise. To the extent the shareholders have strong expectations about maintenance of the current dividend, the policy (of maintaining current dividend at Rs 1.50 per share) might be appropriate.

The company, through advertisements, should make the investors aware of the firm's new growth prospects and the greater investment opportunities ahead. Such an announcement will help to prevent the share prices from falling on reduction of dividend amount 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 increase it until earnings are so much higher that Rs 1.50 represents a low percentage of earnings and higher dividend may be feasible in coming years.

(ii) As discussed in part (i), it might perhaps be appropriate to reduce the dividend pay-out ratio as the management moves into new growth fields. This will tend to decrease the dividend yield ( $D_1/P_0$ ) component of investors' required rate of return in relation to the growth component. This assumes that the firm's shareholders are basically indifferent about the returns earned by them, either in the form of dividend income or capital gains. If the investors are not indifferent about payment of dividends or retentions owing to tax exemptions on dividends, they have preference for current dividends; equity capitalisation rate will go up if current dividends are reduced.

### **PS 12.4**

X Cement Ltd requires you 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 few 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. 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. Shares of the company are widely distributed, and there is a large majority of holdings in the hands of class investors, whose average holdings do not exceed 500 shares. The following data is also made available to you:

Particulars	Last 5 years					Current year
	1	2	3	4	5	
Earnings per share (Rs)	6	5	4.5	4.5	4	17.5
Available cash per share (Rs)	7.5	6	5	4	4	20.5
Dividend/share (Rs)	3	3	3	2	Nil	?
Payout ratio (%)	50	60	67	44	—	?
Average market price (face value, 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 answer.

### ***Solution***

The company should, and appears to be, following a stable dividend policy, that is, a policy of maintaining a stable rupee dividend. The dividend is reduced only when it appears that earnings have reached a new permanently lower level. Although the EPS declined from Rs 6 in year 1 to Rs 4.5 in year 3, no corresponding decrease occurred in the



DPS. However, when the declining trend of earnings continued in the subsequent years, the dividends were 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 decrease in market prices is less pronounced, in context of such distressing profitability and the dividend record of the company in later years. The rate of return of 6 per cent on equity capital in year 1 was the maximum. Even this modest amount consistently declined to as low as 4 per cent by the 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 years to come, coupled with favourable liquidity, a rise in dividend is commended.

The reasons for the company to pay higher dividends are as follows:

- (i) Investors would receive a dividend income free of tax.
- (ii) The investors must be expecting a substantial rise in the dividend; the current market price of Rs 140, *vis-a-vis* Rs 60 last year, is a pointer towards this fact. Failure to pay the dividend amount commensurate with the shareholders' expectations will lead to a decline in share prices. This would be inconsistent with the goal to maximise the wealth of the shareholders and, in turn, maximise the price of the share.
- (iii) In view of the growth prospects, the firm can afford high leverage ratios. The fact that the company is to put up an additional plant and would, therefore, require more funds should not prevent it from paying high dividends, as it is not likely to encounter any major difficulty in raising funds due to its bright prospects.
- (iv) The payment of dividend would resolve uncertainty. Investors, in general, are risk averters; they prefer current dividends to larger (deferred) dividends. Consequently, they are prepared to pay a higher price for such shares.

Given the well-established practice of most firms having a regular dividend policy which is built around a target dividend-payment ratio, the firm attempts to pay out a certain percentage of earnings; rather than let the dividends fluctuate, it pays a stated rupee of dividend, and adjusts it towards the target payment as proven increases in earnings occur. The payment was Rs 3 per share in year 1 when EPS was Rs 6; the payment of Rs 10 is recommended this year. Moreover, the company, through advertisements, should make the investors aware of the firm's new growth prospects and the greater investment opportunities ahead. Such an announcement will help in increasing its share prices further.

### PS 12.5

X Ltd and Y Ltd are two fast growing companies in the engineering industry. They are close competitors, and their asset composition, capital structure, and profitability records have been very similar for several years. The primary difference between the companies, from a financial management perspective, is their dividend policy. The X Ltd tries to maintain a non-decreasing dividend per share, while Y Ltd maintains a constant dividend pay-out ratio. Their recent EPS, DPS, and share price (P) history are as follows:

Year	X Ltd			Y Ltd		
	EPS	DPS	P (range)	EPS	DPS	P (range)
1	Rs 9.3	Rs 2	Rs 75–90	Rs 9.5	Rs 1.9	Rs 60–80
2	7.4	2	55–80	7	1.4	25–65
3	10.5	2	70–110	10.5	2.1	35–80
4	12.75	2.25	85–135	12.25	2.45	80–120
5	20	2.5	135–200	20.25	4.05	110–225
6	16	2.5	150–190	17	3.4	140–180
7	19	2.5	155–210	20	4	130–190

In all calculations below that require a share price, use the average of the two prices given in the share price range.

- (i) Determine the dividend pay-out (D/P), and P/E ratios for both companies for all the years.
- (ii) Determine the average D/P and P/E for both the companies over the period 1 through 7.
- (iii) The management of Y Ltd is puzzled as to why their share prices are lower than those of X Ltd, in spite of the fact that its profitability record is slightly better (particularly of past 3 years). As a financial consultant, how would you explain the situation?

**Solution**

(i) and (ii) Determination of D/P ratio and P/E ratio of X Ltd and Y Ltd

Year	X Ltd					Y Ltd				
	EPS	DPS	D/P ratio (DPS ÷ EPS) (per cent)	P	P/E ratio (P ÷ EPS) (Number of times)	EPS	DPS	D/P ratio (per cent)	P	P/E ratio (Number of times)
1	Rs 9.3	Rs 2	21.5	Rs 82.5	8.87	Rs 9.5	Rs1.9	20	Rs 70	7.37
2	7.4	2	27	67.5	9.12	7	1.4	20	45	6.43
3	10.5	2	19	90	8.57	10.5	2.1	20	57.5	5.48
4	12.75	2.25	17.6	110	8.63	12.25	2.45	20	100	8.16
5	20	2.5	12.5	167.5	8.37	20.25	4.05	20	167.5	8.27
6	16	2.5	15.6	170	10.62	17	3.4	20	160	9.41
7	19	2.5	13.2	182.5	9.6	20	4	20	160	8.00
	94.95	15.75	16.6	870	9.16	96.5	19.30	20	760	7.88

(iii) X Ltd is following a stable dividend policy, whereas Y Ltd is following constant D/P ratio policy. In the latter 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 X Ltd's average price per share exhibited a stable increasing behaviour vis-a-vis that of Y Ltd, volatile pattern of earnings of both companies (during the last three years), notwithstanding. Company Y is advised to follow a stable dividend policy.

**PS 12.6**

The following information is available in respect of the rate of return on investment ( $r$ ), the equity capitalisation rate ( $K_e$ ) and earnings per share ( $E$ ) of manufacturing company:

$r =$  (i) 0.12 (ii) 0.11 (iii) 0.10

$K_e = 0.11$

$E = \text{Rs } 20$

Determine the value of its shares as per Gordon's model (under conditions of certainty) in each alternative, assuming the following:

	D/P ratio ( $1 - b$ )	Retention ratio ( $b$ )
(a)	10 per cent	90 per cent
(b)	20	80
(c)	50	50

**Solution**

Value of shares, alternative (i) when  $r = 12$  per cent,  $> K_e$

(a) D/P ratio 0.10, retention ratio 0.90	
$br(g) = 0.9 \times 0.12 = 0.108$	
$P = \text{Rs } 20(1 - 0.9)/(0.11 - 0.108) = \text{Rs } 2/0.002$	Rs 1,000
(b) D/P ratio 0.20, retention ratio 0.80	
$br = 0.8 \times 0.12 = 0.096$	
$P = \text{Rs } 20(1 - 0.8)/(0.11 - 0.096) = \text{Rs } 4/0.014$	285.71
(c) D/P ratio 0.50, retention ratio 0.50	
$br = 0.5 \times 0.12 = 0.060$	
$P = \text{Rs } 20(1 - 0.5)/(0.11 - 0.060) = \text{Rs } 10/0.05$	200

Value of shares, alternative (ii), when  $k = r = 11$  per cent,  $= K_e$

(a) D/P ratio 0.10, retention ratio 0.90	
$br = 0.9 \times 0.11 = 0.099$	
$P = \text{Rs } 20(1 - 0.9)/(0.11 - 0.099) = \text{Rs } 2/0.011$	Rs 181.82
(b) D/P ratio 0.20, retention ratio 0.80	
$br = 0.8 \times 0.11 = 0.088$	
$P = \text{Rs } 20(1 - 0.8)/(0.11 - 0.088) = \text{Rs } 4/0.022$	181.82
(c) D/P ratio 0.50, retention ratio 0.50	
$br = 0.5 \times 0.11 = 0.055$	
$P = \text{Rs } 20(1 - 0.5)/(0.11 - 0.055) = \text{Rs } 10/0.055$	181.82

Value of shares, alternative (iii), when  $r = 10$  per cent,  $< K_e$

(a) D/P ratio 0.10, retention ratio 0.90	
$br = 0.9 \times 0.10 = 0.090$	
$P = \text{Rs } 20(1 - 0.9)/(0.11 - 0.090) = \text{Rs } 2/0.02$	Rs 100
(b) D/P ratio 0.20, retention ratio 0.80	
$br = 0.8 \times 0.10 = 0.08$	
$P = \text{Rs } 20(1 - 0.8)/(0.11 - 0.080) = \text{Rs } 4/0.03$	133.33
(c) D/P ratio 0.50, retention ratio 0.50	
$br = 0.5 \times 0.10 = 0.050$	
$P = \text{Rs } 20(1 - 0.5)/(0.11 - 0.050) = \text{Rs } 10/0.06$	166.67

### PS 12.7

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:

$$P = \frac{D}{r} + \frac{E - D}{K_e - r} = [0 + 0.20/0.10 (\text{Rs } 10 - 0)]/0.10$$

$$= \text{Rs } 20/0.10 = \text{Rs } 200$$

### Working notes

$$r = (\text{Rs } 1,00,000/\text{Rs } 5,00,000) \times 100 = 20 \text{ per cent}$$

$$E = \text{Rs } 5,00,000/50,000 = \text{Rs } 10$$

### PS 12.8

The cost of capital and the rate of return on investments of WM Ltd is 10 per cent and 15 per cent respectively. The company has 10 lakh equity shares of Rs 10 each outstanding and its earnings per share is Rs 5.

Calculate the value of the firm in the following situations using Walter's model: (i) 100 per cent retention; (ii) 50 per cent retention; and (iii) no retention. Comment on your result.

**Solution***Value of the firm (V) at varying retention ratios*

(a) 100%	(b) 10%	(c) No retention
$p = \frac{0 + \frac{0.15}{0.10} (\text{Rs } 5 - 0)}{0.10};$ $= \text{Rs } 7.5/0.10 = \text{Rs } 75$ $V = \text{Rs } 75 \times 10,00,000 \text{ shares}$ $= \text{Rs } 750 \text{ lakh}$	$p = \frac{\text{Rs } 2.5 + \frac{0.15}{0.10} (\text{Rs } 5 - \text{Rs } 2.5)}{0.10};$ $= \text{Rs } 6.25/0.10 = \text{Rs } 62.50$ $V = \text{Rs } 62.50 \times 10,00,000 \text{ shares}$ $= \text{Rs } 625 \text{ lakh}$	$p = \frac{\text{Rs } 5 + \frac{0.15}{0.10} (\text{Rs } 5 - \text{Rs } 5)}{0.10}$ $= \text{Rs } 5/0.10 = \text{Rs } 50$ $V = \text{Rs } 50 \times 10,00,000 \text{ shares}$ $= \text{Rs } 500 \text{ lakh}$

The value of the firm is maximum when retention ratio is 100 per cent; it is consistent with Walter's model. Its fundamental premise is that who can earn more. If the firm earns a return higher than the shareholders earn, 100 per cent retention is suggested and vice versa.

**PS 12.9**

(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)  $P = [\text{Rs } 7.5 \times (0.10/0.08) \times (\text{Rs } 10 - \text{Rs } 7.5)]/0.08 = \text{Rs } 10.625/0.08 = \text{Rs } 132.81$ .

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:

$$P = [0 + (0.10/0.08) \times (\text{Rs } 10 - 0)]/0.08 = \text{Rs } 12.50/0.08 = \text{Rs } 156.25.$$

**Working notes**

- (a)  $K_e$  is the reciprocal of P/E ratio =  $1/0.125 = 8$  per cent  
 (b)  $\text{EPS} = \text{Rs } 2,00,000 \div 20,000 = \text{Rs } 10$   
 (c)  $\text{ROI}(r) = (\text{Rs } 2,00,000 \div \text{Rs } 20,00,000) \times 100 = 10$  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:  $P = [10 + (0.10/0.125) \times (\text{Rs } 10 - \text{Rs } 10)]/0.125 = \text{Rs } 80$ . At all other D/P ratios, the value would be lower.

**PS 12.10**

The EPS of a company is Rs 16. The market capitalisation rate applicable to the company is 12.5 per cent. Retained earnings can be employed to yield a return of 10 per cent. The company is considering a pay-out of 25 per cent, 50 per cent and 75 per cent. Which of these would maximise the wealth of shareholders as per Walter's model.

**Solution**

Value of the share ( $P$ ) at different pay-out ratios

(a) 25%	(b) 50%	(c) 75%
$p = \frac{\text{Rs } 4 + \frac{0.10}{0.125} (\text{Rs } 16 - \text{Rs } 4)}{0.125};$ $= \frac{\text{Rs } 4 + 0.8 (\text{Rs } 12)}{0.125} = \text{Rs } 108.8;$	$p = \frac{\text{Rs } 8 + \frac{0.10}{0.125} (\text{Rs } 16 - \text{Rs } 8)}{0.125};$ $= \frac{\text{Rs } 8 + 0.8 (\text{Rs } 8)}{0.125} = \text{Rs } 115.2;$	$p = \frac{\text{Rs } 12 + \frac{0.10}{0.125} (\text{Rs } 16 - \text{Rs } 12)}{0.125};$ $= \frac{\text{Rs } 12 + 0.8 (\text{Rs } 8)}{0.125} = \text{Rs } 121.6;$

None of the above D/P ratios would maximise the wealth of shareholders. The wealth of shareholders will be maximum (Rs 128) at D/P ratio of 100 per cent as shown below:

$$\frac{\text{Rs } 16 + \frac{0.10}{0.125} (\text{Rs } 16 - \text{Rs } 16)}{0.125} = \text{Rs } 128$$

**PS 12.11**

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.

- 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?
- 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?
- What will the value of the firm be: (a) if dividend is declared, and (b) if dividend is not declared?

**Solution**

- Price,  $P_1$ , when dividend is not declared  
 $P_0 = (D_1 + P_1)/(1 + K_e)$  or  $\text{Rs } 100 = 0 + P_1/(1 + 0.10) = \text{Rs } 110 = P_1$
  - When dividend is declared  
 $\text{Price, } P_0 = (D_1 + P_1)/(1 + K_e) = \text{Rs } 100 = (\text{Rs } 8 + P_1)/0.10 = \text{Rs } 102$
- Amount required for new financing  
 $= I - (Y - nD_1) = \text{Rs } 10,00,000 - (\text{Rs } 5,00,000 - \text{Rs } 4,00,000) = \text{Rs } 9,00,000$
  - New shares to be issued  
 $\Delta n = \text{Rs } 9,00,000/102$
- Value of the firm ( $V$ ) when dividend is declared  
 $V = [nD_1 + (n + \Delta n)P_1 - I + Y - nD_1]/(1 + K_e)$   
 $= [(\text{Rs } 4,00,000 + 102 \times (50,000 + (\text{Rs } 9,00,000/102)) - 10,00,000 + 5,00,000 - 4,00,000]/1.10$   
 $= \text{Rs } 55,00,000/1.10 = \text{Rs } 50,00,000.$
  - Value, when dividend is not declared  
 $V = [(n + \Delta n)P_1 - I + Y]/(1 + K_e)$   
 $= [50,000 + (5,00,000/110 \times \text{Rs } 110)/(1 + K_e) - \text{Rs } 10,00,000 + \text{Rs } 5,00,000]/1.10$   
 $= [\text{Rs } 60,00,000 - \text{Rs } 10,00,000 + \text{Rs } 5,00,000]/1.10 = \text{Rs } 50,00,000.$

**PS 12.12**

An engineering company has a cost of equity capital of 15 per cent. The current market value of the firm is

Rs 30,00,000 @ Rs 30 per share. Assuming values for I (new investment), Rs 9,00,000, E (earnings), Rs 5,00,000, and D (total dividends), Rs 3,00,000, show that under the MM assumptions, the payment of dividend does not affect the value of the firm.

### Solution

(a) Price of the share,  $P_1$  when dividend is declared:

$$P_0 = D_1 + P_1/(1 + K_e), \text{ Rs } 30 = (\text{Rs } 3 + P_1)/1.15 \text{ or } \text{Rs } 34.50 = \text{Rs } 3 + P_1 \text{ or } \text{Rs } 31.50 = P_1$$

$P_1$  when dividend is not declared:

$$\text{Rs } 30 = P_1/1.15, \text{ Rs } 34.50 = P_1$$

(b) Amount of new financing

(i) When dividend is declared	(ii) When dividend is not declared
$I - (E - nD_1)$	$I - E$
= Rs 9,00,000 – Rs 2,00,000 = Rs 7,00,000	= Rs 9,00,000 – 5,00,000 = Rs 4,00,000
$\Delta n = \text{Rs } 7,00,000/\text{Rs } 31.50$	$\Delta n = \text{Rs } 4,00,000/\text{Rs } 34.50$

$V$ , when dividend is declared

$$\begin{aligned} &= [\text{Rs } 3,00,000 + 31.50 \times (1,00,000 + 7,00,000/31.5) - 9,00,000 + 5,00,000 - 3,00,000]/1.15 \\ &= [\text{Rs } 3,00,000 + \text{Rs } 38,50,000 - \text{Rs } 9,00,000 + \text{Rs } 5,00,000 - \text{Rs } 3,00,000]/1.15 \\ &= \text{Rs } 34,50,000/1.15 = \text{Rs } 30,00,000. \end{aligned}$$

$V$ , when dividend is not declared

$$\begin{aligned} V &= [1,00,000 + (4,00,000/34.5) \times \text{Rs } 34.50 - \text{Rs } 9,00,000 + \text{Rs } 5,00,000]/1.15. \\ &= [\text{Rs } 38,50,000 - \text{Rs } 9,00,000 + \text{Rs } 5,00,000]/1.15 = \text{Rs } 34,50,000/1.15 = \text{Rs } 30,00,000. \end{aligned}$$

Thus under MM assumptions, dividend does not affect the value of the firm.

### PS 12.13

Arvind Ltd belongs to a risk-class for which the appropriate 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 dividend of Rs 5 per share at the end of the current financial year. The company expects to have a net income of Rs 2.5 lakh and has a proposal for making new investments of Rs 5 lakh.

Show that under the MM assumption, the payment of dividend does not affect the value of the firm. Is the MM model realistic with respect to valuation? What factors might mar its validity?

### Solution

Dividends are paid	Dividends are not paid
(a) Price of the share at the end of the year ( $P_1$ ):	
$P_0 = (P_1 + D_1)/(1 + K_e)$	$P_0 = (P_1 + D_1)/(1 + K_e)$
$\text{Rs } 100 = (P_1 + \text{Rs } 5)/(1 + 0.1)$	$\text{Rs } 100 = (P_1 + 0)/(1 + 0.1)$
$P_1 = \text{Rs } 105$	$P_1 = \text{Rs } 110$
(b) Amount required for financing:	
$\text{Rs } 5 \text{ lakh} - (\text{Rs } 2.5 \text{ lakh} - \text{Rs } 1.25)$	$\text{Rs } 5 \text{ lakh} - \text{Rs } 2.5 \text{ lakh}$
= Rs 3.75 lakh	= Rs 2.5 lakh
(c) Number of shares to be issued:	
$\Delta n = \text{Rs } 3,75,000/105$	$\Delta n = \text{Rs } 2.5 \text{ lakh}/110$

(Contd.)

**Solution (Contd.)**(d) *Valuation of the firm (V):*

$$\begin{aligned} & \text{Rs } 1,25,000 + \cancel{25,000} + \frac{\text{Rs } 3,75,000}{\text{Rs } 105} \text{ Rs } 105 \\ & - [\text{Rs } 5 \text{ lakh} + \text{Rs } 2.5 \text{ lakh} - \text{Rs } 1.25 \text{ lakh}] / 1.1 \\ & = \text{Rs } 25 \text{ lakh} \end{aligned}$$

$$\begin{aligned} & \cancel{25,000} + \frac{\text{Rs } 2,50,000}{\text{Rs } 105} \text{ Rs } 110 \\ & - [\text{Rs } 5 \text{ lakh} + \text{Rs } 2.5 \text{ lakh}] / 1.1 \\ & = \text{Rs } 25 \text{ lakh} \end{aligned}$$

Since the value of the firm is Rs 25 lakh, in both the situations when dividends are paid and when dividends are not paid, it can be concluded that the payment of dividend does not affect the value of the firm.

The major factors affecting the validity of MM's model are: (i) Tax effect, (ii) Flotation cost, (iii) Transaction and inconvenience costs, (iv) Preference for current dividend by investors and resolution of uncertainty.

**EXERCISES**

**E.12.1** (a) X Ltd earns Rs 5 per share, is capitalised at a rate of 10 per cent, and has an 18 per cent rate of return on investment.

According to Walter's formulae, what should the price per share at 25 per cent dividend pay-out ratio be? 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 the values for I (new investment), Y (earnings) and D (dividends) at the end of years as I = Rs 6,80,000, Y = Rs 1,50,000, and D = Rs 1 per share. Show that under the MM assumptions, the payment of dividend does not affect the value of the firm.

**E.12.2** (a) Apex Company Ltd 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 model, determine (i) the optimum payout, (ii) the price of share at this pay-out.

(b) Agro-chemicals Ltd belongs to a 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 declaration of Rs 5 as dividend at the end of the current financial year, which has just begun. What will the price of the share at the end of the year be, if a dividend is not declared? What will it be if a dividend is declared? Answer these on the basis of MM model assuming no taxes.

**E.12.3** The following data relate to Basu Ltd and Saha Ltd, which belong to the same industry and sell the same product.

*Basu Ltd*

Year	EPS	DPS	Market price	
			High	Low
1	Rs 3.2	Rs 1.7	Rs 50	Rs 30
2	3.3	1.7	55	31
3	3.5	1.7	60	28
4	3.4	1.7	62	28
5	3.6	1.7	62	33

*Saha Ltd*

Year	EPS	DPS	Market price	
			High	Low
1	Rs 1	Rs 0.5	Rs 42	Rs 28
2	4	2	44	30
3	2.5	1.25	40	26
4	5.5	2.75	48	30
5	4	2	46	30

Comment on the differences in the dividend policies followed by the two firms, and suggest which is a better policy and why?

**E.12.4** Two companies, X Ltd and Y Ltd, are in the same industry with identical EPS for the last 5 years. X Ltd has a policy of paying 40 per cent of earnings as dividend, while Y Ltd pays a constant amount of dividend per share. There is disparity between the MPS of the two companies. The price of X's share is generally lower than that of Y, even though in some years, X pays higher dividends *vis-a-vis* Y. The data on EPS, DPS and market price for the two companies is as follows:

Year	EPS		DPS		Market price	
	X Ltd	Y Ltd	X Ltd	Y Ltd	X Ltd	Y Ltd
1	2	3	4	5	6	7
1	Rs 4	Rs 4	Rs 1.6	Rs 1.8	Rs 12	Rs 13.5
2	1.5	1.5	0.6	1.8	8.5	12.5
3	5	5	2	1.8	13.5	12.5
4	4	4	1.6	1.8	11.5	12.5
5	8	8	3.2	1.8	14.5	15.0

(a) What are the reasons for the difference in the market prices of the two companies' shares?

(b) What can X Ltd do to increase the market price of its shares?

**E.12.5** Following are the details regarding three companies A Ltd, B Ltd and C Ltd.

	A Ltd	B Ltd	C Ltd
Internal rate of return (per cent)	15	5	10
Cost of equity capital (per cent)	10	10	10
EPS (Rs)	8	8	8

Calculate the value of an equity share of each of these companies using Walter's model when D/P ratio is (i) 50 per cent, (ii) 75 per cent and (iii) 25 per cent. What conclusions do you draw?

## ANSWERS

**E.12.1** (a) Rs 80; No, optimum D/P ratio is zero per cent.

(b) Value of X Ltd remains unchanged at Rs 20 lakh. (hint:  $P_1$  is Rs 21 when dividend is declared and is Rs 22 when dividend is not declared)

**E.12.2** (a) Optimum D/P ratio is zero per cent; Rs 60.

(b) Rs 105 (when dividends are declared), Rs 110 (when dividends are not declared).

**E.12.3** Basu Ltd is following a better dividend policy.

**E.12.4** (a) The companies are following different types of dividend policies. Y Ltd is following a stable dividend policy, whereas X Ltd is following a constant D/P ratio.

(b) X Ltd should adopt a stable dividend policy.

**E.12.5** (a) Value of shares: A Ltd, Rs 110 (25% D/P ratio), Rs 100 (50% D/P ratio), Rs 90 (75% D/P ratio);  
B Ltd, Rs 50 (25% D/P ratio), Rs 60 (50% D/P ratio), Rs 70 (75% D/P ratio);  
C Ltd, Rs 80 (in all situations).

(b) Optimum; dividend payout ratio for A Ltd is zero per cent; for B Ltd it is 100%; for C Ltd, there is no optimal dividend payout ratio.



# **13** ***WORKING CAPITAL PLANNING***

## **BASIC THEORY**

### **INTRODUCTION**

Working capital (WC) planning covers the theory of WC management in terms of (i) profitability risk trade-off, (ii) financing mix, and (iii) determination of the level of WC.

### **PROFITABILITY RISK TRADE-OFF**

Working Capital management is concerned with the problems that arise in attempting to manage the current assets (CA), current liabilities (CL) and the interrelationships between them. Its operational goal is to manage the CA and CL in such a way that a satisfactory level of net working capital (NWC) ( $CA - CL$ ) is maintained. The level of NWC has a bearing on the profitability as well as the risk, in the sense that it affects the ability or otherwise, of the firm to meet its obligations as and when they become due. Therefore, the trade-off between profitability and risk is an important element in the evaluation of the level of NWC of a firm. In general, the higher the NWC, the lower is the risk and the profitability, and vice versa. Thus, the NWC measures the degree of risk in the management of WC.

### **FINANCING MIX**

The financing mix refers to the proportion of CA to be financed by CL and long-term sources. One approach to determining the financing mix is the hedging approach. According to it, long-term funds should be used to finance the fixed or core portion of the CA, and the purely temporary and seasonal requirements should be met out of short-term funds. This approach is a high-profit, high-risk financing mix. According to the second approach, namely, the conservative approach, the estimated total requirement of the CA should be financed from long-term sources, and the short-term funds should be used only in emergency situations. In effect, the conservative approach is a low-profit, low-risk combination. Neither of these two approaches is suitable for an efficient WC management. A trade-off between these two extremes provides a financing plan between these two approaches, and therefore, an acceptable financing strategy from the viewpoint of the management of WC.

### **DETERMINATION OF WORKING CAPITAL**

The need for WC (gross), or CA arises from the operating or cash cycle of the firm. The operating cycle refers to the length of time required to convert the non-cash CA into cash. In other words, cash cycle refers to the time involved in completing the following sequence of events: conversion of cash into inventory, inventory into receivables and receivables into cash. If it were possible to complete these sequences instantaneously, there would be no need for CA. But since the nature of these activities is such that a perfect synchronization is not possible, a certain minimum level of CA is necessary.

The two components of WC are CA and CL. The computation of CA and CL are summarised in Exhibits 13.1 and 13.2.

**EXHIBIT 13.1** *Computation of Different Items of Current Assets*


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Raw Materials Inventory	= [Budgeted production (units) × Cost of raw material(s) per unit × Average inventory holding period (month or days)]/12 months (365 days)	(13.1)
Work-in-process Inventory	= [Budgeted production (units) × Estimated work-in-process cost (excluding depreciation) per unit × Average time span of working process inventory (months or days)]/12 months (365 days)	(13.2)
Finished Goods Inventory	= [Budgeted production (units) × Manufacturing cost (excluding depreciation) per unit × Finished goods holding period (months or days)]/12 months (365 days)	(13.3)
Debtors	= [Budgeted credit sales (units) × Cost of sales (excluding depreciation) per unit × Average debt collection period (months or days)]/12 months (365 days )	(13.4)
<i>Cash and Bank Balances</i> = Cash requirements are to be determined on some reasonable basis.		

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**EXHIBIT 13.2** *Computation of Different Items of Current Liabilities*


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Trade Creditors	= [Budgeted yearly production (units) × Raw materials requirement per unit × Credit period allowed by creditors (months or days)]/ 12 months (365 days)	(13.5)
	Note: Proportional adjustment should be made for the cash purchases of raw materials.	
Direct Wages	= [Budgeted yearly production (units) × Direct labour cost per unit × Average time-lag in payment of wages (months or days)]/ 12 months (365 days)	(13.6)
	Note: The average credit period for the payment of wages is approximately half-a-month in the case of monthly wage payment.	
Overheads (Other Than Depreciation and Amortisation)	= [Budgeted yearly production (units) × Overhead cost per unit × Average time lag in payment of overheads (months or days)]/ 12 months (365 days)	(13.7)
Note: The amount of overheads may be calculated separately for different types of overheads. In the case of selling overheads, the relevant item would be sales volume instead of production volume.		

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The computation of WC is summarised in Exhibit 13.3.

**EXHIBIT 13.3** *Determination of Working Capital (WC)***(A) Estimation of Current Assets (CA):**

Minimum desired cash and bank balances

Add: Inventories

- Raw material
- Work-in-process
- Finished goods

Debtors\*

Expenses paid in advance

Total

**(B) Estimation of Current Liabilities(CL):**

Creditors for materials\*\*

(Contd.)

**Exhibit 13.3 (Contd.)**

Add: Creditors for expenses

- Wages
- Manufacturing overheads
- Selling overheads

Total

**(C) Net Working Capital (NWC) (A – B)**

Add margin for contingency

**NWC Required**

\*If payment is received in advance, the item would be listed under 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.

## SOLVED PROBLEMS

### PS 13.1

Form the following projections of XYZ Ltd for the next year, you are required to work out the working capital (WC) required by the company.

Annual sales	Rs 14,40,000
Cost of production including depreciation, Rs 1,20,000	12,00,000
Raw material purchases	7,05,000
Monthly expenses	30,000
Anticipated opening stock of raw materials	1,40,000
Anticipated closing stock of raw materials	1,25,000
<i>Inventory norms:</i>	
Raw material (month)	2
Work-in-progress (days)	15
Finished goods (month)	1

The firm enjoys a credit of 15 days on its purchases, and allows 1 month's credit on its supplies. The company has received an advance of Rs 15,000 on sales orders.

You may assume that production is carried on evenly throughout the year, and the minimum cash balance desired to be maintained is Rs 10,000.

### ***Solution***

*Statement showing determination of net working capital (NWC)*

<b>(A) Current assets:</b>		
Cash balance		Rs 10,000
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 requirements = (Rs 7,20,000 × 2 / 12)		1,20,000
Work-in-process (yearly cost of production excluding depreciation):		

*(Contd.)*

**Solution (Contd.)**

(Rs12,00,000 – Rs 1,20,000) [Rs10,08,000* × 1]/(2 × 12)]	45,000
Finished goods (Rs 10,80,000)/12	90,000
Debtors (Rs 10,80,000)/12	90,000**
<b>Total</b>	<b>3,55,000</b>
<b>(B) Current liabilities:</b>	
Trade creditors (Rs 7,05,000 × 1/2 × 1/12)	29,375
Advances received from debtors	15,000
<b>Total</b>	<b>44,375</b>
<b>(C) NWC (A – B)</b>	<b>3,10,625</b>

\*[Rs 7,20,000 + Rs 3,60,000 (monthly expenditure, Rs 30,000 × 12)]

\*\*It is assumed that there is neither a opening nor closing stock of finished goods and, therefore, cost of sales is Rs 10,80,000, excluding depreciation.

**PS 13.2**

XYZ Ltd sells its products on a gross profit of 20 per cent on sales. The following information is extracted from its annual accounts for the current year ended March 31.

Sales at 3 months' credit	Rs 40,00,000
Raw material	12,00,000
Wages paid—average time lag 15 days	9,60,000
Manufacturing expenses paid—one month in arrears	12,00,000
Administrative expenses paid—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 the suppliers of raw materials and maintains 2-month's stock of raw materials and  $1\frac{1}{2}$  months' stock of finished goods. The cash balance is maintained at Rs 1,00,000 as a precautionary measure. Assuming a 10 per cent margin, find out the working capital requirements of XYZ Ltd.

**Solution**

*Statement showing the determination of working capital*

<b>(A) Current assets:</b>			
Cash balance			Rs 1,00,000
<b>Inventories:</b>			
Raw materials (Rs 12,00,00 × 2/12)	Rs 2,00,000		
Finished goods (Rs 32,00,000 × 1.5/12)	4,00,000		6,00,000
Debtors (Rs 32,00,000 × 3/12)			8,00,000
Prepaid sales expenses (Rs 2,00,000 × 6/12)			1,00,000
<b>Total</b>			<b>16,00,000</b>
<b>(B) Current liabilities</b>			
Creditors for goods (Rs 12,00,000 × 1/12)			1,00,000
Wages (Rs 9,60,000 × 0.5/12)			40,000
Manufacturing expenses (Rs 12,00,000 × 1/12)			1,00,000
Administrative expenses (Rs 4,80,000 × 1/12)			40,000
<b>Total</b>			<b>2,80,000</b>
<b>(C) Net working capital (A – B)</b>			<b>13,20,000</b>
Add margin (0.10)			1,32,000
			<b>14,52,000</b>

**Working notes**

1. Sales	Rs 40,00,000
Less gross profit (0.20)	8,00,000
Cost of production	<u>32,00,000</u>

**PS 13.3**

A newly formed company, *N Ltd.*, has applied for a short-term loan to a commercial bank for financing its working capital (WC) requirements. You are requested by the bank to prepare an estimate of the requirements of the WC for that company. Add 10 per cent to your estimated figure to cover unforeseen contingencies. The information about the projected P & L A/c of the company is as under:

Sales		Rs 21,00,000
Less cost of goods sold*		<u>15,30,000</u>
Gross profit		5,70,000
Less: administrative expenses	Rs 1,40,000	
selling expenses	<u>1,30,000</u>	<u>2,70,000</u>
Profit before tax		3,00,000
Provision of tax		<u>1,00,000</u>

\*Cost of goods sold has been derived as follows:

Material used		Rs 8,40,000
Plus: wages and manufacturing expenses	Rs 6,25,000	
depreciation	<u>2,35,000</u>	<u>8,60,000</u>
		17,00,000
Less stock of finished goods produced not yet sold (0.10)		<u>1,70,000</u>
		<u>15,30,000</u>

The figures given above relate only to the goods that have been finished and not to those in process; goods equal to 15 per cent of the year's production (in terms of physical units) are in process, requiring on an average, full materials but only 40 per cent of the other expenses. The company believes in keeping 2 months' consumption of material in stock. Minimum desired cash balance is Rs 40,000.

All expenses are paid 1 month in arrears; suppliers of material extend  $1\frac{1}{2}$  month's credit; sales are at 20 per cent cash and the rest at 2 month's credit; 70 per cent of the income tax has to be paid in advance in quarterly instalments. You can make other such assumptions as you deem necessary for estimating WC requirements.

**Solution**

*Net working capital (NWC) estimate of N Ltd*

(A) Current assets		
(i) Raw materials in stock, $(Rs\ 8,40,000 \times 2) \div 12$		Rs 1,40,000
(ii) Work-in-progress		
(a) Raw material $(Rs\ 8,40,000 \times 15)/100$	Rs 1,26,000	
(b) Wages and manufacturing expenses $(Rs\ 6,25,000 \times 40/100 \times 15/100)$	<u>37,500</u>	1,63,500
(iii) Stock of finished goods $[Rs\ 1,70,000 - Rs\ 23,500$ $(0.10 \times Rs\ 2,35,000, \text{ depreciation})]$		1,46,500
(iv) Debtors $(Rs\ 1,270,800 \times 2)/12$ (note 4)		<u>2,11,800</u>
		(Contd.)

**Solution (Contd.)**

(v) Cash required (assumed)		40,000
		<u>7,01,800</u>
(B) Current liabilities		
(i) Lag in payment of expenses:		
(a) Wages and manufacturing expenses	Rs 6,25,000	
(b) Administrative expenses	1,40,000	
(c) Selling expenses	1,30,000	
	<u>8,95,000/12</u>	74,583
(ii) Creditors (Rs 8,40,000 × 3)/24		<u>1,05,000</u>
Total		<u>1,79,583</u>
(C) NWC (A – B)		<u>5,22,217</u>
Add contingencies (0.10)		<u>52,222</u>
		<u>5,74,439</u>

**Assumptions and working notes**

- (i) Depreciation is not a cash expense and, therefore, excluded from the cost of goods sold, for the purpose of determining work-in-process, finished goods and investment in debtors.
- (ii) Administrative and selling expenses are excluded from the computation of work-in-process.
- (iii) Since profit is not taken, in our calculation, as a source of WC, the income tax has been excluded as it is to be paid out of the profits.

(iv) Cost of goods sold	Rs 15,30,000
Less depreciation	<u>2,11,500</u>
	13,18,500
Add: administrative expenses	1,40,000
Selling expenses	<u>1,30,000</u>
	<u>15,88,500</u>

Cost of credit sales:  $4/5 \times \text{Rs } 15,88,500 = \text{Rs } 12,70,800$

**PS 13.4**

While preparing a project report on behalf of a client, you have collected the following facts. Estimate the net working capital (NWC) required for the project. Add 10 per cent to your computed figure to allow for contingencies.

**Estimated cost per unit of production**

Raw material	Rs 80
Direct labour	30
Overheads (including depreciation, Rs 5)	<u>65</u>
Total	<u>175</u>

**Additional information**

- Selling price, Rs 200 per unit
- Level of activity, 1,04,000 units of production per annum
- Raw material in stock, average 4 weeks
- Work-in-progress (assume full unit of raw material required in the beginning of manufacturing; other conversion costs are 50 per cent), 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 in bank (desired to be maintained), Rs 25,000

You may assume that the production is carried on evenly throughout the year (52 weeks) and wages or overheads accrue similarly. All sales are on credit basis only.

### ***Solution***

*Net working capital estimate of the project*

<b>(A) Current assets</b>		
(i) Raw material in stock, $(1,04,000 \times \text{Rs } 80 \times 4)/52$		Rs 6,40,000
(ii) Work-in-process		
(a) Raw material $(1,04,000 \times 80 \times 2)/52$	Rs 3,20,000	
(b) Direct labour $(1,04,000 \times 15 \times 2)/52$	60,000	
(c) Overheads $(1,04,000 \times 30 \times 2)/52$	<u>1,20,000</u>	5,00,000
(iii) Finished goods stock $(1,04,000 \times 170 \times 4)/52$		13,60,000
(iv) Debtors $(1,04,000 \times 170 \times 8)/52$		27,20,000
(v) Cash in bank		<u>25,000</u>
		<b>52,45,000</b>
<b>(B) Current liabilities</b>		
(i) Creditors, $(1,04,000 \times 80 \times 4)/52$		6,40,000
(ii) Lag in payment of wages, $(1,04,000 \times 30 \times 1.5)/52$		<u>90,000</u>
		<b>7,30,000</b>
<b>(C) NWC (A – B)</b>		
		<b>45,15,000</b>
Add contingencies (0.10)		<u>4,51,500</u>
		<b>49,66,500</b>

### **PS 13.5**

The management of Gemini 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 for the company's product, for the above mentioned activity level, is detailed below:

	<i>Cost per unit</i>
Raw materials	Rs 20
Direct labour	5
Overheads	<u>15</u>
Total cost	40
Profit	<u>10</u>
Selling price	50

Past trends indicate that the raw materials are held in stock, on an average, for two months. Work-in-process (50 per cent complete) will approximate to  $\frac{1}{2}$  month's production. Finished goods remain in warehouse, on an average, for 1 month. Suppliers of materials extend 1 month's credit. Two month's credit is normally allowed to debtors. A minimum cash balance of Rs 25,000 is expected to be maintained. The production pattern is assumed to be even during the year.

Prepare a statement of working capital determination.

**Solution**

*Statement to determine net working capital of Gemini Ltd*

(A) Current assets		
(i) Raw materials (25,000 units × 2 × Rs 20)		Rs 10,00,000
(ii) Work-in-process		
Raw materials (12,500 units × Rs 10)	Rs 1,25,000	
Direct labour (12,500 units × Rs 2.5)	31,250	
Overhead (12,500 units × Rs 7.5)	93,750	2,50,000
(iii) Finished goods (25,000 units × Rs 40)		10,00,000
(iv) Debtors (3,00,000 × Rs 40 × 2)/12		20,00,000
(v) Minimum cash balance		25,000
Total		42,75,000
(B) Current liabilities		
(i) Creditors for 1 month (3,00,000 × Rs 20 × 1)/12		5,00,000
(C) NWC (A – B)		37,75,000

**PS 13.6**

A client of yours, Care Ltd, is about to commence a new business, and finance has been provided in respect of fixed assets. They have, however, asked you to advise on the additional amount which they should make available for the working capital.

They provide you with the following estimates for their first year, and inform you that they have arranged an overdraft limit with their banker of Rs 1,50,000.

<i>Particulars</i>	<i>Average period of credit</i>	<i>Estimate for the first year</i>
Purchase of materials	6 weeks	Rs 26,00,000
Wages	1.5 weeks	19,50,000
<b>Overheads</b>		
Rent, etc.	6 months	1,00,000
Directors and managers salaries	1 month	3,60,000
Travellers' and office salaries	2 weeks	4,55,000
Travellers commission	3 months	2,00,000
Other overheads	2 months	6,00,000
Sales – cash		1,40,000
– credit	7 weeks	65,00,000
Average amount of stocks and work-in-process	—	3,00,000
Average amount of undrawn profits		3,10,000

Sales were made at an even rate for the year. You are required to prepare, from the above figures and information, a table for submission to your clients, giving an estimate of the average amount of working capital which they should provide.

**Solution**

*Statement showing working capital determination of Care Ltd*

(A) Current assets	
(i) Average amount of stocks and work-in-process	Rs 3,00,000
(ii) Debtors (Rs 65,00,000 × 7)/52	8,75,000*
Total	11,75,000

(Contd.)



**Solution (Contd.)****(B) Current liabilities****(i) Lag in payment of expenses:**

Wages (Rs 19,50,000 × 1.5)/52	Rs 56,250	
Rent, etc. (Rs 1,00,000/2)	50,000	
Directors' and managers' salaries (Rs 3,60,000 ÷ 12)	30,000	
Travellers' and office salaries (Rs 4,55,000 × 2)/52	17,500	
Travellers' commission (Rs 2,00,000 × 3/12)	50,000	
Other overheads (Rs 6,00,000 × 2/12)	1,00,000	3,03,750

(ii) Payment to creditors (Rs 26,00,000/52 × 6) 3,00,000

**Total** 6,03,750

**(C) NWC (A – B)** 5,71,250

\*Cost of sales figure is not available.

The company should arrange for Rs 5,71,250 to meet its working capital needs. Overdraft limit of Rs 1,50,000 has not been taken into account for two reasons. First, the NWC should be financed from permanent or long-term sources. Secondly, some amount (not stated here) would also be required by the company as a precautionary margin.

**PS 13.7**

The board of directors of Nanak Engineering Company Private Ltd requests you to prepare a statement showing the working capital requirements for a level of activity at 1,56,000 units of production. The following information is available for your calculation:

	<i>Per unit</i>
(A) Raw materials	Rs 90
Direct labour	40
Overheads	75
Total	<u>205</u>
Profit	<u>60</u>
Selling price	<u>265</u>

- (B) (i) Raw materials are in stock, on average, for 1 month.  
(ii) Materials are in process, (50 per cent complete) on average for 4 weeks.  
(iii) Finished goods are in stock on average for 1 month  
(iv) Credit allowed by suppliers is 1 month.  
(v) Time lag in payment from debtors is 2 months.  
(vi) Average lag in payment of wages is 1.5 weeks.  
(vii) Average lag in payment of overheads is 1 month.  
(viii) 20 per cent of the output is sold against cash. Desired minimum cash in hand and in bank, Rs 60,000. It is to be assumed that production is carried on evenly throughout the year; wages and overheads accrue similarly, and a time period of 4 weeks is equivalent to a month.

**Solution***Statement showing determination of working capital***(A) Current assets**

- (i) Stock of raw materials (1,56,000 × Rs 90 × 1)/12 Rs 11,70,000  
(ii) Work-in-process  
(a) Material [(1,56,000 × Rs 90 × 4) × 0.50]/48 Rs 5,85,000

*(Contd.)*

**Solution (Contd.)**

(b) Labour $[(1,56,000 \times \text{Rs } 40 \times 4) \times 0.50]/48$	2,60,000	
(c) Overheads $[(1,56,000 \times \text{Rs } 75 \times 4) \times 0.50]/48$	4,87,500	13,32,500
(iii) Finished goods stock $(1,56,000 \times \text{Rs } 205 \times 1)/12$		26,65,000
(iv) Debtors $(1,24,800 \times \text{Rs } 205 \times 2)/12$		42,64,000
(v) Cash in hand and at bank		60,000
Total		94,91,500
(B) Current liabilities		
(i) Creditors $(1,56,000 \times \text{Rs } 90 \times 1)/12$		11,70,000
(ii) Time lag in payment of wages $(1,56,000 \times \text{Rs } 75 \times 1.5)/48$		1,95,000
(iii) Time lag in payment of overheads $(1,56,000 \times \text{Rs } 75 \times 1)/12$		9,75,000
Total		23,40,000
(C) NWC (A – B)		71,51,500

**PS 13.8**

Determine the working capital requirements from the following particulars

Annual budget for :	Amount (Rs in lakh)
Raw materials	360
Supplies and components	120
Manpower	240
Factory expenses	60
Administration	90
Sales	1,190

You are given the following additional information:

- Stock-levels planned: Raw materials, 30 days; supplies and components, 90 days.
- 50 per cent of the sales is for cash; for the remaining 20 days credit is normal.
- Finished goods are held in stock for a period of 7 days before they are released for sale.
- Goods remain in process for 5 days.
- The company employs 30 days credit facilities on 20 per cent of the purchases.
- Cash and bank balances had been planned to be kept at the rate of 1/2 month's budgeted expenses.

You may make assumptions as considered necessary and relevant in this connection.

**Solution**

Statement showing determination of net working capital

Current assets:	
Cash balance $(\text{Rs } 150 \text{ lakh}^1 \times 1/24)$	Rs 6,25,000
Raw materials $(\text{Rs } 360 \text{ lakh} \times 30/360)$	30,00,000
Supplies and components $(\text{Rs } 120 \text{ lakh} \times 90/360)$	30,00,000
Work-in-process $(\text{Rs } 870 \text{ lakh}^2 \times 5/360)$	12,08,333
Finished goods $(\text{Rs } 870 \text{ lakh} \times 7/360)$	16,91,667
Debtors $(\text{Rs } 435 \text{ lakh}^3 \times 20/360)$	24,16,667
Total	1,19,41,667
Current liabilities:	
Creditors <sup>4</sup> $(\text{Rs } 480 \text{ lakh} \times 0.2 \times 30/360)$	8,00,000
NWC	1,11,41,667

<sup>1</sup>Cash balance is in respect of factory and administrative expenses.

<sup>2</sup>Cost of production, Rs 870 lakhs, that is, Rs 360 lakh + Rs 120 lakh + Rs 240 lakh + Rs 60 lakh + Rs 90 lakh. WC requirement pertaining to work-in-process is to be with reference to total cost of production (including administrative costs).

<sup>3</sup>50 per cent of total cost of goods sold (in the absence of data of cost of goods sold is assumed equivalent to cost of goods produced).

<sup>4</sup>Consists of raw materials and supplies and components.

### PS 13.9

POR Ltd sells goods in domestic market on a gross profit of 25 per cent, not counting depreciation as a part of the 'cost of goods sold'. Its estimates for next year are as follows:

	Amount (Rs in lakh)
Sales – Home at 1 month's credit	1,200
Exports at 3 months' credit, selling price 10 per cent below home price	540
Materials used (suppliers extend 2 months' credit)	450
Wages paid, 1/2 month in arrears	360
Manufacturing expenses (cash) paid, 1 month in arrears	540
Depreciation on fixed assets	60
Administrative expenses, paid 1 month in arrears	120
Sales promotion expenses (payable quarterly—in advance)	60
Income-tax payable in 4 instalments of which one falls in the next financial year	150

The company keeps 1 month's stock of each of raw materials and finished goods and believes in keeping Rs 20 lakh as cash. Assuming a 15 per cent safety margin, ascertain the estimated working capital requirement of the company (ignore work-in-process).

### Solution

Statement showing determination of working capital

	Amount (Rs in lakh)
Current assets:	
Cash balance	20.00
Raw material (Rs 450 lakh $\times$ 1/12)	37.50
Finished goods (Rs 1,470 <sup>1</sup> lakh $\times$ 1/12)	122.50
Debtors	
Domestic market (Rs 1,200 lakh $\times$ 0.75 $\times$ 1/12)	75.00
Export market (Rs 600 lakh <sup>2</sup> $\times$ 0.75 $\times$ 3/12)	112.50
Sales promotion expenses (Rs 60 lakh $\times$ 3/12)	15.00
Total	382.50
Current liabilities:	
Raw materials (Rs 450 lakh $\times$ 2/12)	75.00
Wages ((Rs 360 lakh $\times$ 1/24)	15.00
Manufacturing expenses (Rs 540 lakh $\times$ 1/12)	45.00
Administrative expenses (Rs 120 lakh $\times$ 1/12)	10.00
Total	145.00
Net working capital	237.50

<sup>1</sup>Cost of production:

Materials used	Rs 450 lakh
Wages paid	360

Manufacturing expenses (cash)	540
Administrative expenses	120
	<u>1,470</u>

2. Rs 540 lakh/0.90 = Rs 600 lakh.

**Note:** Tax aspect is ignored as it is to be paid out of profits.

### PS 13.10

MA Ltd is commencing a new project to manufacture a plastic component. The following cost information has been ascertained for annual production of 12,000 units which is the full capacity.

Materials	Rs 40 per unit
Direct labour and variable expenses	20
Fixed manufacturing expenses	6
Depreciation	10
Fixed administration expenses	<u>4</u>
	80

The selling price per unit is expected to be Rs 96 and the selling expenses Rs 5 per unit, 80 per cent of which is variable. In the first 2 years of operations, production and sales are expected to be as follows:

Year	Production	Sales
1	6,000 units	5,000 units
2	9,000 units	8,500 units

To assess the working capital requirements, the following additional information is available:

- Stock of materials, 2.25 months average consumption.
  - Work-in-process, Nil.
  - Debtors, 1 month's average cost of sales.
  - Cash balance, Rs 10,000.
  - Creditors for materials, 1 month's average purchases during the year.
  - Creditors for expenses, 1 month's average of all expenses during the year.
- You are required to prepare a projected statement of working capital requirements for 2 years.

### Solution

*Projected statement to determine net working capital of MA Ltd for year 1 and 2*

	Year 1	Year 2
Current assets:		
(i) Stock of raw materials:		
(6,000 units × Rs 40 × 2.25/12) for year 1	Rs 45,000	
(9,000 units × Rs 40 × 2.25/12) for year 2		Rs 67,500
(ii) Finished goods:	80,000*	1,11,000**
<i>Cash cost of production</i>	<i>Year 1</i>	<i>Year 2</i>
Materials @ Rs 40 per unit	Rs 2,40,000	Rs 3,60,000
Direct labour and variable expenses @ Rs 20 per unit	1,20,000	1,80,000
Fixed manufacturing expenses (12,000 units × Rs 6)	72,000	72,000

(Contd.)

**Solution (Contd.)**

Fixed administrative expenses (12,000 units × Rs 4)	48,000	48,000		
Current cost (cash)	4,80,000	6,60,000		
Add opening stock at average cost (of Rs 80 per unit)	—	80,000		
Less closing stock at average cost				
Year 1 (Rs 4,80,000/6,000 units) × 1,000 units	80,000*			
Year 2 (Rs 7,40,000/10,000 units) × 1,500 units		1,11,000**		
Cost of goods sold (cash)	4,00,000	6,29,000		
(iii) Debtors:				
Year 1 (Rs 4,32,000/12)			36,000	
Year 2 (Rs 6,75,000/12)				56,250
Cost of goods sold (cash)	Rs 4,00,000	Rs 6,29,000		
Add variable expenses @ Rs 4 per unit sold	20,000	34,000		
Add total fixed selling expenses (Rs 12,000 × Rs. 1)	12,000	12,000		
Cost of sales (cash)	4,32,000	6,75,000		
Minimum desired cash balance			10,000	10,000
Total		1,71,000	2,44,750	
Current liabilities:				
(i) Creditors for supply of materials:				
Year 1 (Rs 2,85,000/12)			23,750	
Year 2 (Rs 3,82,500/12)				31,875
Materials purchased				
Materials consumed	Rs 2,40,000	Rs 3,60,000		
Add closing stock (equivalent to 2.25 month's average consumption)	45,000	67,500		
Less opening stock	—	(45,000)		
Purchases	2,85,000	3,82,500		
(ii) Creditors for expenses:				
Year 1 (Rs 2,72,000/12)			22,667	
Year 2 (Rs 3,46,000/12)				28,833
Direct labour and variable expenses	Rs 1,20,000	Rs 1,80,000		
Fixed manufacturing expenses	72,000	72,000		
Fixed administrative expenses	48,000	48,000		
Selling (fixed and variable)	32,000	46,000		
	2,72,000	3,46,000		
Total			46,417	60,708
NWC			1,24,583	1,84,042

**Note:** Working capital is required in respect of full amount of fixed overheads.

**PS 13.11**

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 deprecation 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  $\frac{1}{2}$  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 of 3 months.
  - (v) Average time lag in payment of wages is approximately  $\frac{1}{2}$  month and of overheads, 1 month.
  - (vi) Average time lag in payment of sales tax is  $1\frac{1}{2}$  months.
  - (vii) The credit period extended by various suppliers are:
    - Gypsum, 2 months
    - Coal, 1 month
    - Packing material,  $\frac{1}{2}$  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 <sup>1</sup> × 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

(Contd.)

**Solution (Contd.)**

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
Limestone (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)

**PS 13.12**

Crimson Industries Ltd is desirous of assessing its working capital requirements for the next year. The finance manager has collected the following information for the purpose.

*Estimated cost per unit of finished product*

Raw materials	Rs 90
Direct labour	50
Manufacturing and administrative overhead (excluding depreciation)	40
Depreciation	20
Selling overheads	30
Total cost	230

The product is subject to excise duty of 10 per cent (levied on cost of production) and is sold at Rs 300 per unit.

*Additional information*

- (i) Budgeted level of activity is 1,20,000 units of output for the next year.
- (ii) Raw material cost consists of the following:
 

Pig iron	Rs 65 per unit
Ferro alloys	15 per unit
Cast iron borings	10 per unit
- (iii) Raw materials are purchased from different suppliers, extending different credit period.
 

Pig iron, 2 months
Ferro alloys, 1/2 month
Cast iron borings, 1 month.
- (iv) Product is in process for a period of  $\frac{1}{2}$  month. Production process requires full unit (100 per cent) of pig iron and ferro alloys in the beginning of production; cast iron boring is required only to the extent of 50 per cent in

the beginning and the remaining is needed at a uniform rate during the process. Direct labour and other overheads accrue similarly at a uniform rate throughout production process.

- (v) Past trends indicate that the pig iron is required to be stored for 2 months and other materials for 1 month.
  - (vi) Finished goods are in stock for a period of 1 month.
  - (vii) It is estimated that one-fourth of total sales are on cash basis and the remaining sales are on credit. The past experience of the firm has been to collect the credit sales in 2 months.
  - (viii) Average time-lag in payment of all overheads is 1 month and  $\frac{1}{2}$  months in the case of direct labour.
  - (ix) Desired cash balance is to be maintained at Rs 10 lakh.
- You are required to determine the amount of net working capital of the firm. State your assumptions, if any.

### Solution

*Determination of net working capital of Crimson Industries Ltd.*

#### Current assets:

Minimum desired cash balance	Rs 10,00,000
Raw materials:	
Pig iron ( $1,20,000 \times \text{Rs } 65 \times 2/12$ )	13,00,000
Ferro alloys ( $1,20,000 \times \text{Rs } 15 \times 1/12$ )	1,50,000
Cast iron borings ( $1,20,000 \times \text{Rs } 10 \times 1/12$ )	1,00,000
Work-in-process ( $1,20,000 \times (\text{Rs } 132.5 \times 1/24)$ )	6,62,500 <sup>1</sup>
Finished goods ( $1,20,000 \times \text{Rs } 180 \times 1/12$ )	18,00,000
Debtors ( $1,20,000 \times 0.75 \times \text{Rs } 230 \times 2/12$ )	34,50,000 <sup>2</sup>
Total	<u>84,62,500</u>

#### Current liabilities:

Creditors:	
Pig iron ( $1,20,000 \times \text{Rs } 65 \times 2/12$ )	13,00,000
Ferro alloys ( $1,20,000 \times \text{Rs } 15 \times 1/24$ )	75,000
Cast iron borings ( $1,20,000 \times \text{Rs } 10 \times 1/12$ )	1,00,000
Wages ( $1,20,000 \times \text{Rs } 50 \times 1/24$ )	2,50,000
Total overheads ( $1,20,000 \times \text{Rs } 70 \times 1/12$ )	7,00,000
Total	<u>24,25,000</u>
NWC	<u>60,37,500</u>

#### Working notes

##### (1) Determination of work-in-process

Pig iron		Rs 65
Ferro alloys		15
Cast iron boring ( $0.50 \times \text{Rs } 10$ )		5
Other costs:		
Cast iron borings ( $0.50 \times \text{Rs } 5$ )	Rs 2.5	
Direct labour ( $0.5 \times \text{Rs } 50$ )	25	
Manufacturing and administrative overhead ( $0.50 \times \text{Rs } 40$ )	<u>20</u>	47.5

##### (2) Debtors

Raw material	90
Direct labour	50
Manufacturing and administrative overheads	40
Selling overheads	30
Excise duty ( $0.10 \times \text{Rs } 200$ )	<u>20</u>
	<u>230</u>



**PS 13.13**

Hypothetical Ltd has investigated the profitability of its assets and the cost of its funds. The results indicate:

- (i) Current assets (CA) earn, 0.06
- (ii) Fixed assets return, 0.13
- (iii) Current liabilities (CL) cost, 0.03
- (iv) Averages cost of long-term funds, 0.10

The current balance sheet is as follows:

<i>Liabilities</i>	<i>Amount</i>	<i>Assets</i>	<i>Amount</i>
Current liabilities (CL)	Rs 10,000	Current assets (CA)	Rs 20,000
Long-term funds	70,000	Fixed assets (FA)	60,000
	<u>80,000</u>		<u>80,000</u>

- (i) What is the net profitability?
- (ii) The company contemplating lowering its net working capital to Rs 7,000 by (a) either shifting Rs 3,000 of CA into fixed assets, or (b) shifting Rs 3,000 of its long-term funds into CL. Work out the profitability for each of these alternatives. Which one do you prefer? Why?
- (iii) Can both these alternatives be implemented simultaneously? How would it affect the net profitability?

***Solution***

(i) *Net profitability*

(a) Earning on CA ( $0.06 \times \text{Rs } 20,000$ )	Rs 1,200
Earnings on fixed assets ( $0.1 \times \text{Rs } 60,000$ )	7,800
Total earnings	<u>9,000</u>
(b) Cost of CL ( $0.03 \times \text{Rs } 10,000$ )	300
Cost of long-term funds ( $0.10 \times \text{Rs } 70,000$ )	7,000
Total costs	<u>7,300</u>
(c) Net profitability [Total earnings (a) – Cost (b)]	<u>1,700</u>

(ii) (a) *Shifting Rs 3,000 of CA into fixed assets (FA)*

Earnings on CA ( $0.06 \times \text{Rs } 17,000$ )	1,020
Earnings on FA ( $0.13 \times \text{Rs } 63,000$ )	8,190
Total earnings	<u>9,210</u>

(b) *Shifting of Rs 3,000 of its long term funds into CL*

Cost of CL ( $0.03 \times \text{Rs } 13,000$ )	390
Cost of long-term funds ( $0.10 \times \text{Rs } 67,000$ )	6,700
Total costs	<u>7,090</u>
Net profitability (Rs 9,210 – Rs 7,300)	<u>1,910</u>

(iii) *Yes, profitability would be more as a result of reduction of NWC. Net profitability would be Rs 2,120:*

Total earnings (ii) (a)	Rs 9,210
Less total costs (ii) (b)	7,090
	<u>2,120</u>

**PS 13.14**

In **PS 13.13** above, what would be the net profitability if Hypothetical Ltd could earn 10 per cent on current assets, and 8 per cent on fixed assets? The cost of current liabilities and long-term funds is 3 per cent and 10 per cent respectively. What recommendations would you make to the company? Why?

***Solution***

*Net profitability*

(i) Earnings on current assets ( $0.10 \times \text{Rs } 20,000$ )	Rs 2,000
Earnings on fixed assets ( $0.08 \times \text{Rs } 60,000$ )	4,800
Total earnings	6,800
(ii) Cost of current liabilities ( $0.03 \times \text{Rs } 10,000$ )	300
Cost of long-term funds ( $0.10 \times \text{Rs } 70,000$ )	7,000
Total costs	7,300
(iii) Net loss (Total cost – Total earnings)	(500)

The company should continue with the existing plan.

**PS 13.15**

Hypothetical Ltd estimates its requirements of funds for the coming year to be constant at a level of Rs 1,00,000. If the cost of both current liabilities and long-term financing are 8 per cent, calculate the cost, using the hedging and conservative approaches, and discuss your preference with respect to applying either of them to finance the firm.

***Solution***

*The cost would be the same under both the plans. Preference should be given to a plan involving long-term financing. The cost would be Rs 8,000 ( $\text{Rs } 1,00,000 \times 0.08$ ).*

**PS 13.16**

Hypothetical Ltd has forecast its total fund requirements for the coming year as follows:

Month	Amount (Rs in lakh)	Month	Amount (Rs in lakh)
January	30	July	200
February	30	August	180
March	40	September	110
April	60	October	70
May	100	November	40
June	150	December	20

The firm's cost of short-term and long-term financing is expected to be 4 per cent and 10 per cent respectively.

- Calculate the cost of financing, using the hedging approach.
- Calculate the cost of financing, using the conservative approach.
- Discuss the basic profitability risk trade-off associated with each of these plans.

**Solution**

*Estimated total funds requirements of Hypothetical Ltd for the year (amount in lakh of rupees)*

Month	Hedging approach			Trade-off approach	
	Total funds	Permanent	Seasonal	Total	Seasonal
January	30	20	10	110	0
February	30	20	10	110	0
March	40	20	20	110	0
April	60	20	40	110	0
May	100	20	80	110	0
June	150	20	130	110	40
July	200	20	180	110	90
August	180	20	160	110	70
September	110	20	90	110	0
October	70	20	50	110	0
November	40	20	20	110	0
December	20	20	0	110	0
			790		200

*(i) Cost of financing under hedging approach*

Average annual short-term loan = (Rs 790 ÷ 12) = Rs 65.83 lakh

(a) Cost of short-term funds (Rs 65.83 lakh × 0.04) Rs 2.63 lakh

(b) Cost of long-term funds (Rs 20 lakh × 0.10) 2.00

Total costs 4.63

*(ii) Cost of financing under conservative approach*

(Annual average loan × Long-term rate of interest) = 200 lakh × 0.10 = Rs 20 lakh

(iii) Requirements of funds under the trade-off plan would be an average of maximum funds requirements and minimum funds requirements, that is, (Rs 200 lakh + Rs 20 lakh)/2 = Rs 110 lakh.

(1) Cost of long-term funds (Rs 110 lakh × 0.10) 11 lakh

(2) Cost of short-term funds (Rs 200 lakh/12) × 0.04 0.67

Total cost 11.67

**EXERCISES**

**E.13.1** ABC Ltd has the following selected assets and liabilities:

Cash	Rs 45,000
Retained earnings	1,60,000
Equity share capital	1,50,000
Debtors	60,000
Inventory	1,11,000
Debentures	1,00,000
Provision for taxation	57,000
Expenses outstanding	21,000
	<i>(Contd.)</i>

*(Contd.)*

Land and building	3,00,000
Goodwill	50,000
Furniture	25,000
Creditors	39,000

You are required to determine (i) gross working capital, and (ii) net working capital.

**E.13.2** While preparing a project report on behalf of a client, you have collected the following data. Estimate the net working capital required for that project. Add 10 per cent to your computed figure to allow for contingencies.

*Estimated cost per unit of production*

Raw material	Rs 80
Direct labour	30
Overheads (exclusive of depreciation)	60
Total	170

*Additional information*

Selling price, Rs 200 per unit

Level of activity, 1,04,000 units of production per annum

Raw material in stock, average 4 weeks

Work-in-progress (assume 50 per cent completion stage), average 2 weeks

Finished goods in stock, average 4 weeks

Credit allowed by suppliers, average 4 weeks

Credit allowed by debtors, average 8 weeks

Lag in payment of wages, average 1.5 weeks

Cash in bank is expected to be Rs 25,000.

You may assume that the production is carried on evenly throughout the year (52 weeks) and wages and overheads accrue similarly. All sales are on credit.

**E.13.3** The balance sheet of X Ltd stood as follows as on March 31 of the current year.

<i>Liabilities</i>		<i>Assets</i>	
Current liabilities (CL)	Rs 2,000	Current assets (CA)	Rs 8,000
Long-term funds	22,000	Fixed assets (FA)	16,000
	24,000		24,000

If CA earn 2 per cent, FA earn 14 per cent, CL cost 4 per cent and long-term funds cost 10 per cent, calculate (a) total profits on assets and the ratio of CA to total assets, (b) the cost of financing and the ratio of CL to total assets, and (c) net profitability of the current financial plan.

**E.13.4** Prudential Ltd has investigated the profitability of its assets and the cost of its funds. The results indicate:

- (i) Current assets earn 1 per cent
- (ii) Fixed assets earn 13 per cent
- (iii) Current liabilities cost 3 per cent
- (iv) Average cost of long-term funds, 10 per cent

The current balance sheet is as follows:

<i>Liabilities</i>		<i>Assets</i>	
Current liabilities	Rs 5,000	Current assets	Rs 10,000
Long-term funds	35,000	Fixed assets	30,000
	40,000		40,000

- (a) What is the net profitability?  
 (b) The company is contemplating lowering its net working capital to Rs 3,500 by (i) either shifting current assets into fixed assets, or (ii) shifting Rs 1,500 of its long-term funds into current liabilities. Work out the profitability for each of these alternatives. Which do you prefer? Why?  
 (c) Can both these alternatives be implemented simultaneously? How would it affect the net profitability?

**E.13.5** A newly formed company has forecast its total fund requirements for the coming year as follows:

<i>Month</i>	<i>Total funds required</i>	<i>Permanent requirements</i>	<i>Seasonal requirements</i>
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
			<u>11,600</u>

The firm's cost of short-term and long-term financing is expected to be 10 and 15 per cent, respectively. Calculate the cost of financing using the (i) hedging approach, (ii) conservative approach and (iii) trade-off approach.

## ANSWERS

- E.13.1** (i) Rs 2,16,000,  
 (ii) 99,000.  
**E.13.2** Rs 49,66,000.  
**E.13.3** (a) Rs 2,400; 0.33,  
 (b) Rs 2,280; 0.08,  
 (c) Rs 120.  
**E.13.4** (a) Rs 350  
 (b) (i) Rs 530 (ii) Rs 455; Profitability is more under alternative (b) (i),  
 (c) Rs 635.  
**E.13.5** (i) Rs 1,131.67  
 (ii) Rs 1,350  
 (iii) Rs 1,215.

# 14 **CASH MANAGEMENT**

## BASIC THEORY

### INTRODUCTION

Management of cash is an important decision-area in working capital management. The cash budget is an important tool in planning cash management. Among cash management techniques, concentration banking and lock-box system are noteworthy.

### CASH BUDGET

The cash budget is the most important tool in planning cash resources. It is a device which helps a firm plan for, and control, the use of cash. It is a statement showing the estimated cash inflows and outflows over the cash planning horizon (period). The principal aim of cash budget, as a tool for predicting cash flows over a period of time, is to ascertain whether, at any time, there is likely to be an excess or shortage of cash.

The preparation of a cash budget involves several steps. The first element of a cash budget is the selection of the period of the budget, that is, the planning horizon. The planning horizon of a cash budget should be determined in the light of the circumstances and requirements of a particular case. The second element of the cash budget is the selection and identification of factors that have a bearing on the cash flows. The factors that generate cash are generally divided into two broad categories; namely (i) operating and (ii) financial.

Exhibits 14.1 and 14.2 summarise the main items of operating and financial cashflows respectively.

#### **EXHIBIT 14.1** *Operating Cash Flow Items*

<i>Cash Inflows /Receipts</i>	<i>Cash Outflows /Disbursements</i>
1 Cash sales	1 Accounts payable/payable payments
2 Collection of accounts/bills 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

#### **EXHIBIT 14.2** *Financial Cash Flow Items*

<i>Cash Inflows or Receipts</i>	<i>Cash Outflows or Payments</i>
1 Loans/borrowings	1 Income tax/tax payments
2 Sale 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 tax	
7 Issue of new shares and securities	

The difference between cash inflows and outflows represents the cash balance. If there is surplus cash, the task of the finance manager would be to invest the same on a temporary basis. In case of shortage of cash, he has to arrange for cash to meet the payment requirements.

The format of cash budget is summarised in Exhibit 14.3.

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**EXHIBIT 14.3** *Cash Budget*


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**(A) Cash Inflows:**

- Cash sales
- Collection from debtors (specify month-wise)
- Other sources (say, interest/dividends received, rent received, sale of securities, etc.)

Total

**(B) Cash Outflows:**

- Cash purchases of raw material and finished goods
- Payment to creditors (specify month-wise)
- Direct labour
- Variable manufacturing overheads (item-wise)
- Cash fixed manufacturing overheads (item-wise)
- Selling and administrative overheads (item-wise)
- Interest paid
- Dividends paid
- Taxes paid
- Purchase of plant and machinery or any other fixed assets
- Any other stipulated payment (redemption of securities)

Total

**(C) Surplus and (Deficiency) [A – B]**

- Beginning balance
  - Closing balance
  - Desired minimum cash balance
  - Budgeted (borrowings)/surplus
- 

**CONCENTRATION BANKING AND LOCK-BOX SYSTEM**

The financial evaluation would be based on comparison of the cost of operations and benefits in terms of earnings on the yearly release of funds.

The incremental analysis whether to use concentration banking or lock-box system is summarised in Exhibit 14.4.

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**EXHIBIT 14.4** *Concentration Banking and Lock-box System*


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Savings in financial costs (interest) due to release of funds (Funds released × Interest rate)	
Less cost of concentration banking/lock-box system	
Net advantage (costs)	

---

**Recommendation:** If net advantage is positive, implement / introduce the system, otherwise not.

## SOLVED PROBLEMS

### PS 14.1

ABC Ltd wishes to arrange for overdraft facilities with its bankers during the period April to June of a particular year when it will be manufacturing mostly for stock.

Prepare a cash budget for the above period from the following data, indicating the extent of bank facilities the company will require at the end of the each month.

(a)

Month	Sales	Purchases	Wages
February	Rs 1,80,000	Rs 1,24,000	Rs 12,000
March	1,92,000	1,44,000	14,000
April	1,08,000	2,43,000	11,000
May	1,74,000	2,46,000	10,000
June	1,26,000	2,68,000	15,000

(b) 50 per cent of the credit sales are realised in the month following the sales, and the remaining sales in the second month following; creditors are paid in the month following the purchase.

(c) Cash in bank on April 1 (estimated) Rs 25,000.

### Solution

*Cash budget of ABC Ltd: April-June*

	April	May	June
(A) <i>Cash inflows: collections</i>			
(i) During month of sale	—	—	—
(ii) During second month (0.50)	Rs 90,000	Rs 96,000	Rs 54,000
(iii) During third month (0.50)	96,000	54,000	87,000
Total	1,86,000	1,50,000	1,41,000
(B) <i>Cash outflows</i>			
Purchase (one month time-lag)	1,44,000	2,43,000	2,46,000
Wages (paid same month)	11,000	10,000	15,000
Total	1,55,000	2,53,000	2,61,000
(C) <i>Net cash receipts (deficits)</i>	31,000	(1,03,000)	(1,20,000)
Cash at start of month (overdraft)	25,000	56,000	(47,000)
Cash balance (overdraft) (cumulative)	56,000	(47,000)	(1,67,000)
(Overdraft) facilities required	—	(47,000)	(1,20,000)

### PS 14.2

A large retail store makes 25 per cent of its sales in cash, and the remainder on 30 days' terms. Due to faulty collection practice, there have been losses from bad debts to the extent of 1 per cent of credit sales on an average in the past. The experience of the firm is that normally 60 per cent of credit sales are collected in the month following sales; 25 per cent in the second following month, and 14 per cent in the third following month. Sales in the preceding 3 months have been as follows:

January	Rs 80,000
February	1,00,000
March	1,40,000



Sales for the next 3 months are estimated as:

April	Rs 1,50,000
May	1,10,000
June	1,00,000

Prepare a schedule of the expected cash collections during the months of April, May and June for presentation to the finance manager.

What will be the cash receipts, if the credit policy is enforced strictly so that there are no overdue accounts and bad debts?

### ***Solution***

#### *Schedule of cash receipts*

	January	February	March	April	May	June
<i>Relevant information</i>						
Total sales	Rs 80,000	Rs 1,00,000	Rs 1,40,000	Rs 1,50,000	Rs 1,10,000	Rs 1,00,000
Cash sales (0.25 × total sales)	20,000	25,000	35,000	37,500	27,500	25,000
Credit sales (0.75 × credit sales)	60,000	75,000	1,05,000	1,12,500	82,500	75,000
(A) <i>Required information: cash inflows (1% bad debts)</i>						
Cash sales				37,500	27,500	25,000
Collection from credit sales						
(i) First month following sales (0.60)				63,000	67,500	49,500
(ii) Second month following sales (0.25)				18,750	26,250	28,125
(iii) Third month following sales (0.14)				8,400	10,500	14,700
Total estimated cash receipts				1,27,650	1,31,750	1,17,325
(B) <i>Cash inflows (no bad debts)</i>						
Cash sales				37,500	27,500	25,000
Collection from credit sales						
(i) First month following sales (0.60)				63,000	67,500	49,500
(ii) Second month following sales (0.25)				18,750	26,250	28,125
(iii) Third month following sales (0.15)				9,000	11,250	15,750
Total estimated cash receipts				1,28,250	1,32,500	1,18,375

### **PS 14.3**

A new company commences business on July 1 and deposits Rs 10,000 in the bank. This sum will be insufficient to finance its operations over a period of 6 months, and you are asked to prepare a cash budget from July to December to determine the monthly overdraft limits to seek from the company bankers. Data supplied is:

- Sales are made to one distributor only on 30-day terms, 3 per cent discount, and cheques are received on the first day of the month following the due date.
- Plant purchases totalling Rs 5,000 are to be made in July.
- Budgeted figures are:

	July	August	September	October	November	December
Purchases	Rs 5,000	Rs 4,000	Rs 3,000	Rs 4,000	Rs 4,000	5,000
Wages	4,000	5,000	4,000	4,000	5,000	4,000
Cash expenses	400	500	400	400	500	400
Sales	6,000	7,000	8,000	8,000	9,000	12,000

All purchases are made on net 30 days terms and cheques are posted to creditors on the last day of the due month.

**Solution***Cash budget (July to December)*<sup>`</sup>

	July	August	Sept	Oct	Nov	Dec
(A) <i>Cash inflows</i>						
Receipts from distributor (Sales – 3% discount)	—	Rs 5,820	Rs 6,790	Rs 7,760	Rs 7,760	Rs 8,730
(B) <i>Cash outflows</i>						
Payment to creditors <sup>@</sup> (one month's time lag)	—	5,000	4,000	3,000	4,000	4,000
Wages (paid in the same month)	4,000	5,000	4,000	4,000	5,000	4,000
Cash expenses (paid in the same month)	400	500	400	400	500	400
Plant purchases	5,000	—	—	—	—	—
Total cash payments	9,400	10,500	8,400	7,400	9,500	8,400
(C) <i>Net cash receipts (deficits) (A-B)</i>	(9,400)	(4,680)	(1,610)	360	(1,740)	330
Balance (overdraft) at the start of the month (cumulative)	10,000	600	(4,080)	(5,690)	(5,330)	(7,070)
(Overdraft) required (month-wise)		(4,080)	(1,610)	—	(1,740)	—

<sup>@</sup>Payment will be possible only in the following month as cheques are posted on the last day.

**PS 14.4**

The accountant of a company is preparing the cash budget for 6 months (January-June) and obtains the following information:

Sales on credit, variable costs and wages are budgeted as follows (the November and December figures of the previous year being the actual figures of those months):

Month	Credit sales	Variable costs	Wages
November	Rs 10,000	Rs 7,000	Rs 1,000
December	12,000	7,500	1,100
January	14,000	8,000	1,200
February	13,000	7,700	1,000
March	10,000	7,000	1,000
April	12,000	7,500	1,100
May	13,000	7,750	1,200
June	16,000	8,750	1,300

Fixed expenses amount to Rs 1,500 net per month, and the half year's preference dividend of Rs 1,400 net is due on June 30. Tax amounting to Rs 8,000 is payable in January and progress payment under a building contract are due as follows: March 31, Rs 5,000, and May 31, Rs 6,000.

The terms on which goods are sold are net cash in the month following delivery. Variable costs are payable in the month following that in which they are incurred, and 50 per cent are subject to 2.5 per cent discount, and the balance are net. It is found that 75 per cent of debtors to whom sales are made pay within the period of credit, and the remainder do not pay until the following month. The company pays all its accounts promptly.

Prepare the cash budget.

**Solution***Cash budget (January to June)*

	January	February	March	April	May	June
(A) <i>Cash inflows</i>						
<i>Collection from credit sales</i>						
(i) First month following sales (0.75 × sales)	Rs 9,000	Rs 10,500	Rs 9,750	Rs 7,500	Rs 9,000	Rs 9,750
(ii) Second month following sales (0.25 × sales)	2,500	3,000	3,500	3,250	2,500	3,000
Total cash receipts	11,500	13,500	13,250	10,750	11,500	12,750
(B) <i>Cash outflows</i>						
Fixed expenses	1,500	1,500	1,500	1,500	1,500	1,500
Preference dividend	—	—	—	—	—	1,400
Tax	8,000	—	—	—	—	—
Progress payment under building contract	—	—	5,000	—	6,000	—
Variable costs (VC):						
(i) 2.5% discount on 50% VC	3,656.25	3,900	3,753.75	3,412.50	3,656.25	3,778.13
(ii) No discount on 50% VC	3,750	4,000	3,850	3,500	3,750	3,875
Wages (assumed to have been paid same month)	1,200	1,000	1,000	1,100	1,200	1,300
Total cash payments	18,106.25	10,400	15,103.75	9,512.50	16,106.25	11,853.13
(C) <i>Surplus (deficiency) (A – B)</i>	(6,606.25)	3,100	(1,853.75)	1,237.50	(4,606.25)	896.87

**PS 14.5**

Krishna Company Ltd has been approached by its bankers to ascertain the requirement for overdraft facilities during the coming year. You are given the following information in connection with the preparation of a forecast for the current year ending December 31.

- Sales in January are expected to be Rs 50,000 rising by Rs 4,000 per month until July 31, and then falling by Rs 2,000 per month to December 31.
- Wages will be Rs 8,000 per month until May 31, and then rise to Rs 9,200 per month for the rest of the year.
- Overhead expenses will be Rs 2,200 per month until August 31, and then fall to Rs 2,000 per month.
- The company makes a standard 25 per cent gross profits on sales, before deducting wages, and aims to have sufficient stock at the end of each month to cover the next 2 months sale.
- Debtors take an average of 2 months to pay. Creditors have to be paid in the month following that in which goods are purchased.
- On December 31 last year, trade creditors were Rs 44,000, expenses, Rs 21,000, debtors, Rs 94,000 including Rs 46,000 outstanding from November, stock on hand, Rs 78,000, and bank overdraft, Rs 42,000.

You are required to prepare cash budget on a monthly basis showing the maximum overdraft facilities during the current year ending December 31. Ignore interest.

**Solution***Cash budget (month-wise) for the current year*

	January	February	March	April	May	June	July	August	September	October	November	December
	1	2	3	4	5	6	7	8	9	10	11	12
Total sales (assumed to be credit sales)	Rs 50,000	Rs 54,000	Rs 58,000	Rs 62,000	Rs 66,000	Rs 70,000	Rs 74,000	Rs 72,000	Rs 70,000	Rs 68,000	Rs 66,000	Rs 64,000
Cost of goods sold (Opening stock + purchases – closing stock or (sales – 25%))	37,500	40,500	43,500	46,500	49,500	52,500	55,500	54,000	52,500	51,000	49,500	48,000
(A) <i>Cash inflows</i>												
Collection from debtors: 2 months after sale	46,000	48,000	50,000	54,000	58,000	62,000	66,000	70,000	74,000	72,000	70,000	68,000
(B) <i>Cash outflows</i>												
Wages	8,000	8,000	8,000	8,000	8,000	9,200	9,200	9,200	9,200	9,200	9,200	9,200
Overhead expenses	2,200	2,200	2,200	2,200	2,200	2,200	2,200	2,200	2,000	2,000	2,000	2,000
Payment to creditors (see working notes)	44,000	43,500	46,500	49,500	52,500	55,500	54,000	52,500	51,000	49,500	48,000	51,000
Total cash payments	54,200	53,700	56,700	59,700	62,700	66,900	65,400	63,900	62,200	60,700	59,200	62,200
(C) <i>Surplus (deficit) (A – B)</i>	(8,200)	(5,700)	(6,700)	(5,700)	(4,700)	(4,900)	600	6,100	11,800	11,300	10,800	5,800
Opening cash (overdraft)	(42,000)	(50,200)	(55,900)	(62,600)	(68,300)	(73,000)	(77,900)	(77,300)	(71,200)	(59,400)	(48,100)	(37,300)
Cumulative overdraft (at the end of the month)	(50,200)	(55,900)	(62,600)	(68,300)	(73,000)	(77,900)	(77,300)	(71,200)	(59,400)	(48,100)	(37,300)	(31,500)

**Working notes***Purchase budget*

	January	February	March	April	May	June	July	August	September	October	November
Desired ending inventory	Rs 84,000	Rs 90,000	Rs 96,000	Rs 1,02,000	Rs 1,08,000	Rs 1,09,500	Rs 1,06,500	Rs 1,03,500	Rs 1,00,500	Rs 7,500	Rs 99,000
Add cost of goods sold	37,500	40,500	43,500	46,500	49,500	52,500	55,500	54,000	52,500	51,000	49,500
Total requirements	1,21,500	1,30,500	1,39,500	1,48,500	1,57,500	1,62,000	1,62,000	1,57,500	1,53,000	1,48,500	1,48,500
Less beginning inventory	(78,000)	(84,000)	(90,000)	(96,000)	(1,02,000)	(1,08,000)	(1,09,500)	(1,06,500)	(1,00,500)	(1,03,500)	(97,500)
Purchases	43,500	46,500	49,500	52,500	55,500	54,000	52,500	51,000	49,500	48,000	51,000

**PS 14.6**

The following information is available in respect of ABC Ltd:

- (1) Materials are purchased and received 1 month before being used and payment is made to suppliers 2 months after receipt of materials.
- (2) Cash is received from customers 3 months after finished goods are sold and delivered to them.
- (3) No time-lag applies to payments of wages and expenses.
- (4) The following figures apply to recent and future months:

<i>Month</i>	<i>Materials received</i>	<i>Sales</i>	<i>Wages and expenses</i>
January	Rs 20,000	Rs 30,000	Rs 9,500
February	22,000	33,000	10,000
March	24,000	36,000	10,500
April	26,000	39,000	11,000
May	28,000	42,000	11,500
June	30,000	45,000	12,000
July	32,000	48,000	12,500
August	34,000	51,000	13,000

- (5) Cash balance at the beginning of April is Rs 10,000.
  - (6) All products are sold immediately they have been made and materials used and sums spent on wages and expenses during any particular month relate strictly to the sales made during that month.
- Prepare cash flow forecast month by month from April to July.

**Solution**

*Cash flow forecast (cash budget) from April to July*

<i>Particulars</i>	<i>April</i>	<i>May</i>	<i>June</i>	<i>July</i>
<b>Cash inflows:</b>				
Collection from customers (with time-lag of 3 months)	Rs 30,000	Rs 33,000	Rs 36,000	Rs 39,000
Total	<u>30,000</u>	<u>33,000</u>	<u>36,000</u>	<u>39,000</u>
<b>Cash outflows:</b>				
Payment to suppliers (with time-lag of 2 months)	22,000	24,000	26,000	28,000
Wages and expenses (paid in the same month)	11,000	11,500	12,000	12,500
Total	<u>33,000</u>	<u>35,500</u>	<u>38,000</u>	<u>40,500</u>
Surplus (deficiency)	(3,000)	(2,500)	(2,000)	(1,500)
Beginning balance	10,000	7,000	4,500	2,500
Closing balance	<u>7,000</u>	<u>4,500</u>	<u>2,500</u>	<u>1,000</u>

**PS 14.7**

M/s Up-to-date Ltd has instructed you to prepare a cash budget for October to December from the following particulars:

- |  |                 |
|--|-----------------|
| (a) Cash and bank balances as on October 1 | Rs 20,000       |
| (b) Actual and budgeted sales              |                 |
| June                                       | 60,000 (actual) |
| July                                       | 65,000 (actual) |

(Contd.)

**PS 14.7 (Contd.)**

August	70,000 (actual)
September	75,000 (actual)
October	80,000 (budgeted)
November	82,000 (budgeted)
December	89,000 (budgeted)
(c) Purchases—Actual and budgeted	
June	36,000 (actual)
July	40,000 (actual)
August	48,000 (actual)
September	44,000 (actual)
October	48,000 (budgeted)
November	40,000 (budgeted)
December	50,000 (budgeted)
(d) Wages and other expenses—actual and budgeted:	

<i>Months</i>	<i>Wages</i>	<i>Expenses</i>
August (actual)	Rs 15,000	Rs 5,000
September (actual)	15,000	6,000
October (budgeted)	18,000	6,000
November (budgeted)	18,000	8,000
December (budgeted)	20,000	8,000

(e) Other information:

(i) Advance income tax, Rs 5,000 is to be paid in November.

(ii) Rs 10,000 has to be spent on plant and equipment in October.

(f) Rs 300 rent is payable in advance every month.

(g) 10 per cent of purchases and sales are on cash terms.

(h) Trade creditors are paid in the month following the purchases, while collection from debtors are made 2 months after the date of sales.

(i) Time-lag in payment of wages is  $\frac{1}{2}$  month. 75 per cent of expenses are paid in the same month and the balance in the following month.

**Solution***Cash budget (October to December)*

	<i>October</i>	<i>November</i>	<i>December</i>
(A) <i>Cash inflows</i>			
Cash sales ( $0.10 \times$ total sales)	Rs 8,000	Rs 8,200	Rs 8,900
Collection from debtors ( $0.90 \times$ total sales):			
2 months after sale	63,000	67,500	72,000
Total cash receipts	71,000	75,700	80,900
(B) <i>Cash outflows</i>			
Advance income tax	—	5,000	—
Plant purchased	10,000	—	—
Rent payable in advance (for next month)	300	300	300
Cash purchases ( $0.10 \times$ total purchases)	4,800	4,000	5,000
Payment to creditors (1 month time-lag)	40,500	43,200	36,000
Wages: (50% of preceding month)	7,500	9,000	9,000
(50% of current month)	9,000	9,000	10,000

(Contd.)

**Solution (Contd.)**

Expenses: (25% of preceding month)	1,500	1,500	2,000
(75% of current month)	4,500	6,000	6,000
Total cash payments	78,100	78,000	68,300
(C) <i>Cash surplus/(deficit)</i> (A – B)	(7,100)	(2,300)	12,600
Cash balance in the beginning	20,000	12,900	10,600
Cash balance at the end	12,900	10,600	23,200

**PS 14.8**

From the following particulars of a firm prepare a cash budget for the 6 months: January–June. Also, state, if any information is missing.

(A) *Balance sheet as on December 31*

<i>Liabilities</i>		<i>Assets</i>	
Share capital	Rs 10,000	Cash	Rs 16,000
Reserves	90,000	Accounts receivable	10,000
		Inventory	20,000
		Fixed assets	Rs 59,000
		Less depreciation	5,000
	1,00,000		54,000
			1,00,000

(B) *Sales forecast*

January	Rs 20,000	April	Rs 60,000
February	40,000	May	90,000
March	50,000	June	50,000
		July	10,000

(C) *Salary expenses*

January	Rs 3,000	April	Rs 9,000
February	5,000	May	11,000
March	7,000	June	6,000

(D) Monthly selling and distributive expenses are expected to be 10 per cent of sales. Depreciation charges are 1 per cent per month.

(E) The firm operates on the following terms:

- Sales are on a 30-day basis, but payments are not received until the next month.
- The firm purchases enough inventory each month to cover the following month's sales.
- A minimum cash balance of Rs 10,000 is maintained.

(F) *Additional information*

New equipment purchased for Rs 5,000 is scheduled for delivery on March 1; payment is to be made at the time of delivery.

**Solution***Cash budget of a firm from January to June*

Particulars	January	February	March	April	May	June
<b>Cash inflows:</b>						
Collections from debtors during the month following sales	Rs 10,000	Rs 20,000	Rs 40,000	Rs 50,000	Rs 60,000	Rs 90,000
<b>Total</b>	<u>10,000</u>	<u>20,000</u>	<u>40,000</u>	<u>50,000</u>	<u>60,000</u>	<u>90,000</u>
<b>Cash outflows:</b>						
Purchases	40,000	50,000	60,000	90,000	50,000	10,000
New equipment	—	—	5,000	—	—	—
Salary	3,000	5,000	7,000	9,000	11,000	6,000
Selling and distribution expenses (0.10 × sales)	2,000	4,000	5,000	6,000	9,000	5,000
<b>Total</b>	<u>45,000</u>	<u>59,000</u>	<u>77,000</u>	<u>1,05,000</u>	<u>70,000</u>	<u>21,000</u>
Surplus (Deficiency)	(35,000)	(39,000)	(37,000)	(55,000)	(10,000)	69,000
Beginning balance	16,000	10,000	10,000	10,000	10,000	10,000
Ending balance	(19,000)	(29,000)	(27,000)	(45,000)	Nil	79,000
Borrowings required (Minimum cash balance + deficiency – surplus)	29,000	39,000	37,000	55,000	10,000	—
Repayments possible	—	—	—	—	—	69,000
Closing balance (actually now estimated)	10,000	10,000	10,000	10,000	10,000	10,000

*Information missing:*

- Gross profit margin on sales due to which purchases figures are higher.
- Interest on borrowings.
- Payment terms of salary, and selling and distribution expenses. It is assumed that the payment is made in the month in which they are incurred.

**PS 14.9**

The following data pertains to a shop. The owner has made sales forecasts for the first 5 months of the coming year as under:

January	Rs 40,000
February	45,000
March	55,000
April	60,000
May	50,000

Other data are as follows:

- 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

- 40 per cent sales are on cash basis. Credit sales are collected in the month following the sale.



- (c) Cost of sales is 60 per cent of sales.
- (d) The only other variable cost is a 5 per cent commission to sales agents. Sales commission is paid in the month after it is earned.
- (e) Inventory is kept equal to sales requirements for the next 2 months' budgeted sales.
- (f) Trade creditors are paid in the month following the purchases.
- (g) Fixed costs are Rs 5,000 per month, including Rs 2,000 depreciation.

You are required to prepare a cash budget for each of the first 3 months of the coming year.

### Solution

*Cash budget for the coming year (month-wise)*

	Month		
	January	February	March
(A) <i>Cash inflows</i>			
Cash sales ( $0.40 \times$ total sales)	Rs 16,000	Rs 18,000	Rs 22,000
Collection from debtors (1 month after sale)	30,000	24,000	27,000
Total cash receipts	<u>46,000</u>	<u>42,000</u>	<u>49,000</u>
(B) <i>Cash outflows</i>			
Paid to trade creditors for purchases (see working notes on purchase budget)	14,000	33,000	36,000
Sales commission (5% of prior month sales)	3,500	2,000	2,250
Fixed costs (Rs 5,000 – Rs 2,000 depreciation)	3,000	3,000	3,000
Total cash payments	<u>20,500</u>	<u>38,000</u>	<u>41,250</u>
(C) <i>Surplus or deficiency (A) – (B)</i>	25,500	4,000	7,750
Beginning balance	7,500	33,000	37,000
Ending balance (indicated)	<u>33,000</u>	<u>37,000</u>	<u>44,750</u>

### 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	<u>84,000</u>	<u>96,000</u>	<u>99,000</u>
Less beginning inventory	51,000	– 60,000	– 69,000
Purchases	<u>33,000</u>	<u>36,000</u>	<u>30,000</u>

### PS 14.10

ABC Ltd produces a single product that sells for Rs 75 per unit. Cost data is:

- (a) Variable manufacturing costs are Rs 35 per unit.
- (b) Variable selling and administrative expenses are Rs 5 per unit.
- (c) Fixed manufacturing costs requiring cash are Rs 2,50,000 per month. Fixed selling and administrative expenses are Rs 2,00,000 per month, all requiring cash. Depreciation is Rs 60,000 per month.
- (d) Other relevant data are:
  - (1) The firm has a policy of maintaining a 2-months supply of finished products. The opening inventory (January, 1) is 42,000 units.
  - (2) The firm does not hold raw materials inventory, and purchases raw materials as needed. The cost of raw materials is included in the variable manufacturing cost of Rs 35.
  - (3) The firm has a practice of making all sales on credit, collecting 30 per cent in the month of sale and the balance in the following month. There are no bad debts and overdue accounts. The beginning debtors balance is Rs 7,00,000.

- (4) The firm pays all manufacturing costs in the month of production.
- (5) The firm pays four-fifths of selling and administrative expenses in the month of sale, and the balance one-fifth is paid in the following month. On January 1, the firm owed Rs 30,000 for December expenses.
- (6) The minimum desired cash balance is Rs 80,000, which is also the amount the firm has on January 1. Borrowings are possible and can be made in multiples of Rs 10,000. It must borrow at the beginning of a month and repay at the end if sufficient cash is available. The interest rate is 10 per cent and the firm pays interest when it repays loans, or portions of them.
- (7) The sales budget for the first 6 months (in units) is: January, 20,000; February, 26,000; March, 30,000; April, 32,000; May, 30,000; June, 28,000.

You are required to prepare a cash budget for the first 3 months of the year, month-wise and in total.

### Solution

#### Cash budget — 3 months

	January	February	March	Total
<i>Sales</i>	Rs 1,50,000	Rs 19,50,000	Rs 22,50,000	Rs 57,00,000
(A) <i>Cash inflows:</i>				
Beginning balance	80,000	80,000	81,000	80,000
<i>Collection from sales:</i>				
(i) Current month (0.30 × total sales)	4,50,000	5,85,000	6,75,000	17,10,000
(ii) First month following sales (0.70 × sales)	7,00,000	10,50,000	13,65,000	31,15,000
Total cash receipts	12,30,000	17,15,000	21,21,000	49,05,000
(B) <i>Cash outflows:</i>				
Production costs (see production budget)	14,40,000	13,70,000	13,00,000	41,10,000
Selling and administrative expenses (fixed)	2,00,000	2,00,000	2,00,000	6,00,000
Selling and administrative expenses (variable):				
(i) Current month (0.80)	80,000	1,04,000	1,20,000	3,04,000
(ii) 1 month after (0.20)	30,000	20,000	26,000	76,000
Total cash payments	17,50,000	16,94,000	16,46,000	50,90,000
(C) <i>Surplus (deficiency):</i> indicated	(5,20,000)	21,000	4,75,000	(1,85,000)
Minimum desired balance	80,000	80,000	80,000	80,000
Surplus/(deficiency)	(6,00,000)	(59,000)	3,95,000	(2,65,000)
Borrowings	6,00,000	60,000		6,60,000
Repayments made (principal)			3,80,000	3,80,000
Interest*			9,500	9,500
Ending balance	80,000	81,000	85,500	85,500

\*(Rs 38,00,000 × 0.10) × 3/12

### Working notes

#### Purchase budget

	January	February	March	Total
Desired ending inventory (units)	56,000	62,000	62,000	62,000
Plus cost of goods sold	20,000	26,000	30,000	76,000
Total requirements	76,000	88,000	92,000	1,38,000
Less beginning inventory	42,000	56,000	62,000	42,000
Production inventory	34,000	32,000	30,000	96,000
Production costs at Rs 35 per unit:				
(Variable)	Rs 11,90,000	Rs 11,20,000	Rs 10,50,000	Rs 33,60,000
(Fixed)	2,50,000	2,50,000	2,50,000	7,50,000
Total production cost	14,40,000	13,70,000	13,00,000	41,10,000

**PS 14.11**

From the following information prepare the 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 per cent, 30 per cent, 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  $2\frac{1}{2}$  times the following month's budgeted sales.

(c) The firm is entitled to 2 per cent discount on all of its purchases if bills are paid within 15 days and the firm avails of all such discounts.

(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.

Other data is as under:

<i>Sales</i>	<i>Amount</i>
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 purchase in March, Rs 1,00,000

Selling, general and administrative expenses budgeted for April are Rs 45,000 (which include Rs 10,000 depreciation).

***Solution***

*Cash budget for the month of April*

<b>(A) Cash inflows</b>	
Balance in the beginning (April 1)	Rs 30,000
<i>Collection from sales:</i>	
(i) Cash sales ( $0.20 \times \text{Rs } 1,70,000$ )	34,000
(ii) Collection from debtors:	
For February sales ( $0.20 \times \text{Rs } 96,000$ )	24,000
For March sales ( $0.30 \times \text{Rs } 1,20,000$ )	36,000
For April sales ( $0.40 \times \text{Rs } 1,36,000$ )	54,400
Total cash receipts	<u>1,78,400</u>
<b>(B) Cash outflows:</b>	
<i>Payment for purchases:</i>	
March ( $\text{Rs } 1,00,000 \times 0.98$ ) $\times 1/2$	49,000
April ( $\text{Rs } 29,400$ )/2	14,700
Selling, general and administrative expenses ( $\text{Rs } 45,000 - \text{Rs } 10,000$ )	35,000
Total cash outflows	<u>98,700</u>
<b>(C) Budgeted cash balance (end of April)</b>	<u>79,700</u>

**Working note***Purchase budget (April)*

	<i>Gross</i>	<i>Net</i>
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

**PS 14.12**

Prepare (i) a budgeted income statement and (ii) a cash budget for the first quarter April-June for AB Industries Ltd from the following information for the coming year:

- (a) The company produces two products and their unit sales prices and material contents are as under:

	<i>Sale price</i>	<i>Material content</i>
Product A	Rs 75,000	60% of sales price
Product B	25,000	60% of sales price

- (b) The production target has been fixed as under:

	<i>Product A</i>	<i>Product B</i>
April	50	50
May	60	60
June	70	50

Production for January, February, and March was at 80 per cent level of April production.

- (c) The monthly expenses are as under:

- Salaries and wages, Rs 7,50,000 payable in the following month.
- Variable overheads, 5 per cent of sales payable in the following month.
- Fixed overheads, Rs 2,00,000 payable 50 per cent in the current month and 50 per cent in the following month.

- (d) Payment for material is made in the third month from the month of procurement.

- (e) The company maintains a constant level of inventory. No stock of finished goods is kept and the entire production is invoiced the same month. The company gives 30 days' credit to its customers.

- (f) Company's products attract excise duty @ 15 per cent. Sales tax @ 2 per cent is payable in the following month. These are to be borne by the buyer. The selling price of products is exclusive of these levies.

- (g) The company enjoys a cash credit facility from its banker to the extent of Rs 35 lakh, which is fully drawn. The interest payable is @ 17 per cent which is charged every quarter, that is, June, September, December and March. The company carries its banking operations presently through a current account.

**Solution**

- (i) *Budgeted income statement of AB Industries Ltd for the first quarter (amount in lakh of rupees)*

<i>Particulars</i>	<i>April</i>	<i>May</i>	<i>June</i>	<i>April-June</i>
<i>Sales revenue</i>				
Product A	37.5	45.0	52.5	135.0
Product B	12.5	15.0	12.5	40.0
Total	50.0	60.0	65.0	175.0

(Contd.)

**Solution (Contd.)****Less variable costs**

Material cost (0.60)	30.0	36.0	39.0	105.0
Variable overheads (0.05)	2.5	3.0	3.25	8.75
Total	<u>32.5</u>	<u>39.0</u>	<u>42.25</u>	<u>113.75</u>
Total contribution	<u>17.5</u>	<u>21.0</u>	<u>22.75</u>	<u>61.25</u>

**Less fixed costs**

Salaries and wages	7.5	7.5	7.5	22.5
Overheads	2.0	2.0	2.0	6.0
Interest on bank borrowings (Rs 35 lakh $\times$ 0.17 $\times$ 1/12)	0.5	0.5	0.5	1.5
Total	<u>10.0</u>	<u>10.0</u>	<u>10.0</u>	<u>30.0</u>
Profit	<u>7.5</u>	<u>11.0</u>	<u>12.75</u>	<u>31.25</u>

**Working notes and assumptions**

- 1 Material cost ratio (material cost /sales) is determined on basis of the sales price of Rs 75,000 for product A and Rs 25,000 for product B.
- 2 Sale tax is charged on sales price plus excise duty.
- 3 Statement showing basic data (amount in lakh of rupees)

Particulars	January	February	March	April	May	June
<b>Units produced and sold:</b>						
Product A	40	40	40	50	60	70
Product B	40	40	40	50	60	70
Sales revenue	Rs 40	Rs 40	Rs 40	Rs 50	Rs 60	Rs 65
Excise duty (0.15)	6	6	6	7.5	9.0	9.75
Billed price of sales	46	46	46	57.5	69.0	74.75
Sales tax (0.02)	0.92	0.92	0.92	1.15	1.38	1.50
Gross sales value	46.92	46.92	46.92	58.65	70.38	76.25
Material content (0.60)	24	24	24	30	36	39

4 No repayment of bank loan is made.

(ii) Cash budget of AB Industries for (April-June) (amount in lakh of rupees)

Particulars	April	May	June	April-June
<b>Cash inflows</b>				
Collection from debtors (A)	<u>46.92</u>	<u>58.65</u>	<u>70.38</u>	<u>175.95</u>
<b>Cash outflows</b>				
Payment to creditors for material	24.0	24.0	30.0	78.0
Salaries and wages	7.5	7.5	7.5	22.5
Variable overheads	2.0	2.5	3.0	7.5
Fixed overheads excluding depreciation	2.0	2.0	2.0	6.0
Excise duty	6.0	7.5	9.0	22.5
Sales tax	0.92	1.15	1.38	3.45
Interest on bank deposit	—	—	1.5	1.5
Total cash outflows (B)	<u>42.42</u>	<u>44.65</u>	<u>54.38</u>	<u>141.45</u>
Surplus (A – B)	<u>4.50</u>	<u>14.00</u>	<u>16.00</u>	<u>34.50</u>

**Comment:** The firm's operations are expected to generate a cash surplus of Rs 34.50 lakh during the quarter. This surplus should be used to pay-off the bank loan.

**PS 14.13**

The following information is available relating to the PQR Ltd.:

1 *Sales forecast*

May	Rs 75,000	September	Rs 3,00,000
June	75,000	October	1,50,000
July	1,50,000	November	1,50,000
August	2,25,000	December	1,37,500
		January	75,000

2 *Raw materials*

May	Rs 37,500	September	Rs 1,27,500
June	37,500	October	97,500
July	52,500	November	67,500
August	3,67,500	December	37,500

3 *Collection estimates:*

- (1) Within the month of sale, 5 per cent
- (2) During the month following sale, 80 per cent
- (3) During the second month the following sale, 15 per cent.

4 *Payment for raw materials:*

During the month following the month in which purchase take place.

5 *Miscellaneous:*

- (1) General and administrative salary, Rs 11,250 per month.
- (2) Monthly lease payment, Rs 3,750.
- (3) Monthly depreciation charges, Rs 15,000.
- (4) Monthly miscellaneous expenses, Rs 1,150.
- (5) Income tax, Rs 26,250 each in September and December.
- (6) Payment for research in October, Rs 75,000.
- (7) Opening balance of cash on July 1, Rs 55,000.
- (8) Minimum cash balance of Rs 37,500 throughout the cash budget period.

*Prepare:*

- (1) a monthly cash budget for 6 months — July to December
- (2) an estimate of excess cash or shortage of cash for each month.

## ***Solution***

*Cash budget from July to December*

Particulars	July	August	September	October	November	December
<b>Cash inflows:</b>						
<i>Collection from debtors</i>						
Within the month of sale (0.05)	Rs 7,500	Rs 11,250	Rs 15,000	Rs 7,500	Rs 7,500	Rs 6,875
First month following sales (0.8)	60,000	1,20,000	1,80,000	2,40,000	1,20,000	1,20,000
Second month following sales (0.15)	11,250	11,250	22,500	33,750	45,000	22,500
<b>Total</b>	<b>78,750</b>	<b>1,42,500</b>	<b>2,17,500</b>	<b>2,81,250</b>	<b>1,72,500</b>	<b>1,49,375</b>
<b>Cash outflows:</b>						
Payment for raw materials	37,500	52,500	3,67,500	1,27,500	97,500	67,500
Salary (general and administrative)	11,250	11,250	11,250	11,250	11,250	11,250
Lease payment	3,750	3,750	3,750	3,750	3,750	3,750
Miscellaneous expenses	1,150	1,150	1,150	1,150	1,150	1,150

(Contd.)

**Solution (Contd.)**

Income tax	—	—	26,250	—	—	26,250
Research	—	—		75,000	—	—
Total	53,650	68,650	4,09,900	2,18,650	1,13,650	1,09,900
Surplus (deficiency)	25,100	73,850	(1,92,400)	62,600	58,850	39,475
Beginning balance	55,000	80,100	1,53,950	37,500	37,500	45,500
Ending balance (deficiency)	80,100	1,53,950	(38,450)	1,00,100	96,350	84,975
Minimum cash balance	37,500	37,500	37,500	37,500	37,500	37,500
Excess cash balance	42,600	1,16,450	—	62,600	58,850	47,475
Borrowings required	—	—	75,950	—	—	—
Repayments made	—	—	—	62,600	13,350	—
Closing balance (actually now estimated)	80,100	1,53,950	37,500	37,500	45,500	84,975

**PS 14.14**

Ram, Arun and Kailash, chartered accountants, are partners in a firm 'Renuka Associates'. The revenue of the firm is increasing steadily over the years. For the first 6 months of the current year, the following projections related to profit were made:

Projected profit forecasts for the 6 months (Figs Rs '000)

Particulars	April	May	June	July	August	September
<b>Receipts:</b>						
Internal and corporate audit	60	60	60	60	60	60
Taxation	30	45	40	50	40	60
Project consultancy	30	50	30	40	60	40
Total	120	155	130	150	160	160
<b>Expenses:</b>						
Depreciation	10	10	10	10	10	10
Rent	5	5	5	5	5	5
Stipend	15	15	15	15	15	15
Telephone	5	7	8	9	13	15
Office expenses and salaries	35	45	50	35	40	42
Training	5	6	4	10	12	13
Travel and conveyance	10	12	13	14	15	15
Partners and assistants' salaries	20	30	35	35	40	40
Total	105	130	140	133	150	155
Profit	15	25	(10)	17	10	5

The following additional information is relevant:

- Rent is payable in advance on the last day of the previous quarter.
- Stipend will be paid in the same month.
- Telephone will be paid every 2 months in arrears (April and May will be paid in June).
- Office expenses and salaries will be paid in the following month.
- Travel and training expenses will be paid in the same month.
- Partners' and assistants' salaries will be paid in the following month.
- The firm is planning to invest a sum of Rs 50,000 in July for acquiring a computer.
- The firm expects to pay a self assessment tax of Rs 5,000 and advance tax of Rs 15,000 in August.
- The firm is planning to open a branch and spend a sum of Rs 20,000 in September in this regard.

- (j) Internal and corporate audit fees will be collected in the following month. Taxation: 50 per cent in the same month and 50 per cent in the following month. Consultancy charge is normally received after 2 months.
- (k) The firm's cash balance as on July 1 was Rs 25,000.
- Prepare a cash budget for each of the 3 months (July, August and September).

### Solution

*Cash budget for Renuka Associate from July to September*

Particulars	July	August	September
<b>Cash inflows:</b>			
Collection of fees			
— Internal, corporate, audit (in the following month)	Rs 60,000	Rs 60,000	Rs 60,000
— Taxation			
— same month (0.50)	25,000	20,000	30,000
— following month (0.50)	20,000	25,000	20,000
— Consultancy charges (with time-lag of two months)	50,000	30,000	40,000
Total	1,55,000	1,35,000	1,50,000
<b>Cash outflows:</b>			
Rent	—	—	15,000
Stipend	15,000	15,000	15,000
Telephone	—	17,000	—
Office expenses and salaries	50,000	35,000	40,000
Training	10,000	12,000	13,000
Travel and conveyance	14,000	15,000	15,000
Partners' and assistants' salaries	35,000	35,000	40,000
Tax (including advance)	—	20,000	—
Branch expenses	—	—	20,000
Investment (to buy computer)	50,000	—	—
Total	1,74,000	1,49,000	1,58,000
Surplus (deficiency)	(19,000)	(14,000)	(8,000)
Beginning balance	25,000	6,000	(8,000)
Closing balance (overdraft)	6,000	(8,000)	(16,000)

### PS 14.15

Prepare a cash budget of XYZ Ltd for the 6 months, commencing April, on the basis of the following information:

- Costs and prices remain unchanged.
- Cash sales are 25 per cent of the total sales and balance 75 per cent are credit sales.
- 60 per cent of credit sales are collected in the month following the sales, balance 30 per cent and 10 per cent in the two following months, respectively. No bad debts are anticipated.
- Sales forecast is as follows:

January	Rs 12,00,000	June	Rs 8,00,000
February	14,00,000	July	12,00,000
March	16,00,000	August	10,00,000
April	6,00,000	September	8,00,000
May	8,00,000	October	12,00,000

- Gross profit margin, 20 per cent.

(Contd.)



**PS 14.15 (Contd.)**

(vi) Anticipated purchases:

April	Rs 6,40,000
May	6,40,000
June	9,60,000
July	8,00,000
August	6,40,000
September	9,60,000

(vii) Wages and salaries to be paid:

April	Rs 1,20,000
May	1,60,000
June	2,00,000
July	2,00,000
August	1,60,000
September	1,40,000

(viii) Interest @ 6 per cent on debentures of Rs 20,00,000 is paid quarterly and is payable in June and September.

(ix) Excise duty due in July, Rs 2,00,000.

(x) Capital expenditure for plant and machinery planned for September, Rs 1,20,000.

(xi) Company has a cash balance of Rs 4,00,000 as on March 31. This is the minimum desired cash balance per month.

(xii) The company can borrow on monthly basis. Ignore interest on borrowings.

(xiii) Rent is Rs 8,000 per month.

**Solution***Cash budget of XYZ Ltd from April to September (figures are in thousands of rupees)*

Particulars	January	February	March	April	May	June	July	August	September
Total sales	1,200	1,400	1,600	600	800	800	1,200	1,000	800
Cash sales (0.25)	300	350	400	150	200	200	300	250	200
Credit sales (0.75)	900	1,050	1,200	450	600	600	900	750	600
<b>Cash inflows:</b>									
Cash sales				150	200	200	300	250	200
<b>Collection from debtors:</b>									
In the month following sales (0.60)				720	270	360	360	540	450
In the 3rd month from sales (0.30)				315	360	135	180	180	270
In the 4th month from sales (0.10)				90	105	120	45	60	60
<b>Total</b>				<u>1,275</u>	<u>935</u>	<u>815</u>	<u>885</u>	<u>1,030</u>	<u>980</u>
<b>Cash outflows:</b>									
Purchases (paid in the same month)				640	640	960	800	640	960
Wages and salaries (paid in the same month)				120	160	200	200	160	140
Interest (Rs 20 lakh $\times$ 0.06 $\times$ 3/12)				—	—	30	—	—	30
Excise duty				—	—	—	200	—	—
Plant and machinery				—	—	—	—	—	120
Rent				8	8	8	8	8	8
<b>Total</b>				<u>768</u>	<u>808</u>	<u>1,198</u>	<u>1,208</u>	<u>808</u>	<u>1,258</u>
<b>Surplus (deficiency)</b>				<u>507</u>	<u>127</u>	<u>(383)</u>	<u>(323)</u>	<u>222</u>	<u>(278)</u>
Beginning cash balance				400	907	1,034	651	400	550
Closing cash balance				<u>907</u>	<u>1,034</u>	<u>651</u>	<u>328</u>	<u>622</u>	<u>272</u>
Proposed borrowings (repayment)				—	—	—	72	(72)	128
<b>Ending balance (actually now estimated)</b>				<u>907</u>	<u>1,034</u>	<u>651</u>	<u>400</u>	<u>550</u>	<u>400</u>

**PS 14.16**

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

<i>Liabilities</i>	<i>Amount</i>	<i>Assets</i>	<i>Amount</i>
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		
	<u>3,400</u>		<u>3,400</u>

The projected P & L A/c for the first 4 months (April-July) of the next year shows the following (Rs in lakh):

<i>Particulars</i>	<i>April</i>	<i>May</i>	<i>June</i>	<i>July</i>
Sales	800	800	900	900
Excise duty recoveries	80	80	90	90
	<u>880</u>	<u>880</u>	<u>990</u>	<u>990</u>
<i>Materials:</i>				
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	<u>600</u>	<u>600</u>	<u>660</u>	<u>720</u>
Expenses	180	180	200	200
Excise duty	80	84	88	92
	<u>860</u>	<u>864</u>	<u>948</u>	<u>1,012</u>
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 years 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
<b>Cash inflows:</b>				
Cash sales	88	88	99	99
Collection from debtors: in the month following sales	700	792	792	891
<b>Total</b>	<b>788</b>	<b>880</b>	<b>891</b>	<b>990</b>
<b>Cash outflows:</b>				
Payment to creditors (in the month following purchases)	600	600	660	720
Interest ( $0.12 \times \text{Rs } 900 \text{ lakh} \times 1/4$ )	—	—	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
<b>Total</b>	<b>828</b>	<b>840</b>	<b>1,221</b>	<b>1,039</b>
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

**PS 14.17**

A firm is contemplating various actions, each of which will have different effects on the average age of inventory, accounts receivables and accounts payable. Which of the following 4 plans is better if the changes indicated below are expected?

Plan	Change in average age		
	Inventory (days)	Accounts receivable (days)	Accounts payable (days)
A	+ 30	– 20	+ 35
B	–10	0	–20
C	0	–30	+ 5
D	–15	+ 10	+ 15

**Solution***Change in cash cycle*

	Change in average age			Total change + (increase) – (decrease) (days)
	Inventory (days)	Debtors (days)	Creditors (days)	
A	+ 30	–20	+ 35	–25
B	–10	0	–20	+ 10
C	0	–30	+ 5	–35
D	–15	+ 10	+ 15	–20

Plans A and C are better than other plans (B, D) because they reduce the cash cycle by 25 days. Between plans A and C, plan C should be preferred because in plan A, the average age of inventory increases by 30 days, whereas in plan C, there is no increase at all; carrying the inventory also involves costs other than interest.

**PS 14.18**

The following information is available about a firm:

- On an average, accounts receivable are collected after 80 days; inventories have an average of 100 days and accounts payable are paid approximately 60 days after they arise.
- The firm spends a total of Rs 1,81,20,000 annually at a constant rate.
- It can earn 8 per cent on investments.

Calculate: (i) the firm's cash cycle and cash turnover assuming a 360-days year; (ii) minimum amount of cash to be maintained to meet payments as they become due; (iii) savings by reducing the average age of inventories to 70 days.

**Solution**

- Cash cycle:  $80 \text{ days} + 100 \text{ days} - 60 \text{ days} = 120 \text{ days}$
  - Cash turnover =  $360 \div 120 \text{ days} = 3$
- Minimum operating cash = Total operating annual outlay/Cash turnover =  $\text{Rs } 1,81,20,000 \div 3 = \text{Rs } 60,40,000$
- Cash cycle =  $120 \text{ days} - 10 \text{ days} = 110 \text{ days}$   
Cash turnover =  $360/110 = 3.273$   
Minimum operating cash =  $\text{Rs } 1,81,20,000/3.273 = \text{Rs } 55,36,713$   
Reduction in investment =  $(\text{Rs } 60,40,000 - \text{Rs } 55,36,713) = \text{Rs } 5,03,287$   
Savings =  $0.08 \times \text{Rs } 5,03,287 = \text{Rs } 40,263$ .

**PS 14.19**

Hypothetical Ltd 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 4 days and would cost annually Rs 1,20,000.

- How much would cash be released with the concentration banking system?
- How much money can be saved due to reduction in the collection period by 2 days? Should the firm institute the concentration banking system?
- How much would cash be freed by lock-box system?
- How much can be saved with lock-box?
- 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) Savings =  $0.08 \times \text{Rs } 80,00,000 = \text{Rs } 6,40,000$ .  
 The firm should institute concentration banking system. It costs only Rs 75,000 while the expected savings 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) Savings in lock-box system:  $0.08 \times \text{Rs } 1,60,00,000 = \text{Rs } 12,80,000$ .  
 (v) Lock-box system is better. Its net savings, Rs 11,60,000 (Rs 12,80,000 – Rs 1,20,000) are higher *vis-a-vis* of concentration banking.

**PS 14.20**

The undermentioned facts about XYZ Ltd are available:

- (a) Cash turnover rate is 4.5.  
 (b) Annual cash outflow is Rs 1,75,000, and  
 (c) Accounts payable can be stretched by 20 days.  
 (i) What would be the effect of stretching accounts payable on the minimum operating cash requirements? (ii) Assuming the firm can earn 8 per cent on its investment, what would be the saving on cost?

**Solution**

(i) Cash cycle =  $360 \text{ days} / 4.5 = 80 \text{ days}$  (present). Cash cycle, when accounts payables can be stretched by 20 days, would be 60 days. Cash turnover would be 6.

Minimum operating cash requirement:

- (a) Current =  $\text{Rs } 1,75,000 / 4.5 = \text{Rs } 38,889$   
 (a) Proposed =  $\text{Rs } 1,75,000 / 6 = \text{Rs } 29,166$   
 (ii) Reduction in investment:  $(\text{Rs } 38,889 - 29,166) = \text{Rs } 9,723$   
 Savings in cost =  $0.08 \times \text{Rs } 9,723 = \text{Rs } 777.84$ .

**EXERCISES**

**E.14.1** ABC Ltd sells its 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 company finds that some of its customers delay payments for up to 90 days. Its experience has been that on 20 per cent of sales, the payment is made during the month in which the sales are made; on 70 per cent of the sales, payment is made during the second month after sales, and on 10 per cent of sales, payment is made during the third month.

The raw materials required for production amount to 70 per cent of the sales, and are bought in the month before the company expects to sell its finished products. The purchase terms allow it to delay payment on its purchases for 1 month.

The credit sales of the firm are: (*Rs in lakh*)

May	10	August	30	November	20
June	10	September	40	December	10
July	20	October	20	January	10

You are required to prepare a work sheet on monthly basis, showing total collections and total payments.

**E.14.2** Hypothetical Ltd adopts a 6-monthly time span, sub-divided into monthly intervals, for its cash budget.

(A) The following information is available about its operations: (*Rs in lakh*)

	<i>Months</i>					
	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>
1 Sales	40	50	60	60	60	40
2 Purchases	1	1.50	2	2	2	1
3 Direct labour	6	7	8	8	8	6
4 Manufacturing expenses	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 – Rs 1 lakh in month 6 – Rs 1 lakh.
- 2 Dividend received during months 3 and 6 is Rs 2 lakh each.
- 3 Sale of shares in month 6 amounts to Rs 160 lakh.

(b) *Outflows*

- 1 Interest paid during the month is Rs 40 lakh.
- 2 Dividends paid during months 1 and 4 is Rs 2 lakh each.
- 3 Instalment payment on machine in month 6 is Rs 20 lakh.
- 4 Repayment of loan in month 6 is Rs 80 lakh.

(C) Assume that 10 per cent of each month's sales are in cash and 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.

**E.14.3** The following information is available in respect of Alfa Ltd.

(A) *Balance sheet as on March 31*

<i>Liabilities</i>		<i>Assets</i>	
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
	<u>68,000</u>		<u>57,000</u>
			68,000

\*Consists of Rs 2,000 minimum inventory plus Rs 6,000 of inventory scheduled to be sold next month. The company maintains a gross profit ratio of 40 per cent of sales.

(B) *Sales forecast*

April	Rs 10,000	July	Rs 50,000
May	20,000	August	40,000
June	30,000	September	20,000



# 15

## BASIC THEORY

### INTRODUCTION

Another important area in working capital management is the management of receivables. Trade credit management includes trade-off between costs and benefits in three areas: (i) credit standards, (ii) credit terms, and (iii) collection policies. An alternative to in-house management of receivables is factoring.

### CREDIT STANDARDS

Credit standards represent the minimum criterion for the extension of credit to customers. To illustrate the trade-off between benefits and cost, credit standards are divided into: (i) tight, and (ii) liberal, the purpose being to show what happens to the trade-off when credit standards are relaxed/tightened. The trade-off with respect to credit standards cover: (i) collection cost, (ii) average collection period/investment in receivables, (iii) bad debts, and (iv) level of sales. These factors should be considered while deciding whether to relax or tighten the credit standards.

### CREDIT TERMS

The second decision-area in receivables management is the credit terms defined as the stipulations under which goods are sold on credit. These relate to the payment of amounts under the credit sale. In other words, they 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 basis of the cost benefit trade-off in these three components.

### COLLECTION POLICIES

The third area involved in management of receivables is collection policies. They refer to the procedure followed to collect the receipts when they become due after expiry of the credit period. To illustrate the effect of collection effort, the collection policies may be classified into (i) strict, and (ii) lenient/liberal. A tight collection policy has implications which effect the cost benefit trade-off. The effects of tightening the collection policy would be: (i) decline in bad debts, (ii) decline in collection period, (iii) increase in collection cost, and (iv) decline in sales. The effects of a lenient policy would be exactly the opposite.

The framework of decision-analysis relating to liberal or relaxed and tight/strict receivables management policies is summarised in Exhibits 15.1 and 15.2 respectively.

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#### **EXHIBIT 15.1** *Decision-Analysis for Liberal/Relaxed Receivables Management Policies*

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Incremental sales revenue

Less incremental costs:

— Variable costs

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(Contd.)



**Exhibit 15.1** *(Contd.)*

- 
- Cost of additional investment in receivables (debtors) and other components of working capital due to increase in sales
  - Bad debts
  - Collection costs

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Incremental profit (loss)

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**EXHIBIT 15.2** *Decision Analysis for Tight/Strict Receivables Management Policies*


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Incremental benefits:

- Decrease in bad debts
- Decrease in collection costs
- Decrease in cost of additional investment in receivables and other components of working capital

Less incremental costs:

- Decrease in contribution due to less sales revenue

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Incremental profit (loss)

---

**FACTORING**

An alternative to in-house management of receivables is factoring services. Factoring is an arrangement in which receivables are sold by a firm (client) to a factor (financial intermediary) as a result of which the factor becomes responsible for all credit control, sales accounting and debt collection. Whether a firm should manage receivables in-house or avail of factoring service would depend upon a consideration of relative costs associated with the two alternatives of receivables management. They are summarised in Exhibits 15.3 and 15.4.

**EXHIBIT 15.3** *Decision Analysis: In-House Receivables Management*

- 
- Cash discount
  - Cost of funds in receivables
  - Bad debt losses
  - Lost contribution on foregone sales
  - Avoidable administrative overheads

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Total cost

---

**EXHIBIT 15.4** *Decision Analysis: Factoring Alternative*

- 
- Factoring commission
  - Discount charge
  - Cost of long term funds in receivables

---

Total cost

---

The alternative with lower cost will be preferred.

**SOLVED PROBLEMS****PS 15.1**

Hypothetical Ltd has currently an annual credit sales of Rs 8,00,000. Its average age of accounts receivable is 60 days. It is contemplating a change in its credit policy that is expected to increase sales to Rs 10,00,000, and increase the average age of accounts receivable to 72 days.

Its sale price is Rs 25 per unit, the variable cost per unit is Rs 12 and the average cost per unit is Rs 8,00,000 sales volume is Rs 17. Assuming a 360-days year, calculate the following:

- What is the average accounts receivable with both the present and the proposed plans?
- What is the average cost per unit with the proposed plan?
- What are the marginal investments in accounts receivable resulting from the proposed change?
- What is the cost of marginal investment, if the assumed rate of return is 15 per cent?

### ***Solution***

- (i) Average investment in accounts receivable = [Cost of goods sold (Number of units sold  $\times$  variable cost, VC per unit) + Total fixed cost (TFC)]/Debtors turnover

Present plan =  $[(32,000 \times \text{Rs } 12) + \text{Rs } 1,60,000]/6$  (360 days  $\div$  60 days) = Rs 90,667

Proposed plan =  $[(40,000 \times \text{Rs } 12) + \text{Rs } 1,60,000]/5$  (360 days  $\div$  72 days) = Rs 1,28,000

\*Total fixed costs: =  $[(\text{Rs } 17 \text{ (total cost)} - \text{Rs } 12 \text{ (VC)}) \times \text{Number of units sold, Rs } 5 \times 32,000 = \text{Rs } 1,60,000$

- Average cost per unit (proposed plan) =  $\text{Rs } 6,40,000/40,000 \text{ units (Rs } 10,00,000 \div \text{Rs } 25) = \text{Rs } 16$ .
- Marginal investments in receivables =  $\text{Rs } 1,28,000 - \text{Rs } 90,667 = \text{Rs } 37,333$
- Cost of marginal investments =  $0.15 \times \text{Rs } 37,333 = \text{Rs } 5,600$ .

### **PS 15.2**

A small sized firm feels that its credit sales are too high. It is contemplating to tighten the credit standards, as a result of which it is expected that bad debt losses will reduce to 1 per cent from the present level of 4 per cent. However, tightening of credit standards is likely to cause a fall in sales from Rs 20 lakh per year to Rs 18 lakh per year.

Should the firm tighten its credit standards, assuming its contribution to volume ratio is 40 per cent, its total fixed costs are Rs 2 lakh and the average investment in debtors (receivables) does not change?

### ***Solution***

*Incremental analysis whether to tighten credit standards or not*

Particulars	Amount
<i>Savings in bad debts:</i>	
Present (Rs.20 lakh $\times$ 0.04) =	Rs 80,000
Proposed (Rs.18 lakh $\times$ 0.01)	18,000
	Rs 62,000
Contribution lost due to tightening of credit terms (0.40 $\times$ Rs 2 lakh)	80,000
Net loss	(18,000)

**Recommendation:** The firm should not tighten the credit standards.

### **PS 15.3**

XYZ Ltd has credit sales amounting to Rs 32,00,000. The sale price per unit is Rs 40, the variable cost is Rs 25 per unit while the average cost per unit is Rs 32. The average age of accounts receivable of the firm is 72 days.

The firm is considering to tighten the credit standards. It will result in a fall in sales to Rs 28,00,000, and the average age of accounts receivable to 45 days.

Assume 20 per cent rate of return. Is the proposal under consideration feasible?

**Solution***Incremental analysis (tightening credit standards or not)*

	<i>Present plan</i> (80,000 units)	<i>Proposed plan</i> (70,000 units)	<i>Differential revenues</i> <i>and costs (decrease)</i>
Sales revenue	Rs 32,00,000	Rs 28,00,000	Rs (4,00,000)
Less: variable costs @ Rs 25 per unit	20,00,000	17,50,000	(2,50,000)
fixed costs	5,60,000	5,60,000	—
investment cost (working notes)	1,02,400	57,750	(44,650)
Savings (deficiency)	5,37,600	4,32,250	(1,05,350)

**Recommendation:** The firm should not adopt more strict credit collection policy, as it will decrease profits by Rs 1,05,350.

**Working notes***Investments in accounts receivable:*

Present plan: =  $[(80,000 \text{ units} \times \text{Rs } 25 \text{ (VC)} + \text{TFC (Rs } 7 \times 80,000)]/5$  (360 days ÷ 72 days) = Rs 5,12,000

Proposed plan:  $[(70,000 \text{ units} \times \text{Rs } 25) + \text{Rs } 5,60,000]/8$  (360 days ÷ 45 days) = Rs 2,88,750

*Cost of investment:*

Present plan : Rs 5,12,000 × 0.20 = Rs 1,02,400

Proposed plan : 2,88,750 × 0.20 = Rs 57,750

**PS 15.4**

Hypothetical Ltd is examining the question of relaxing its credit policy. It sells at present 20,000 units at a price of Rs 100 per unit, the variable cost per unit is Rs 88 and average cost per unit at the current sales volume is Rs 92. All the sales are on credit, the average collection period being 36 days.

A relaxed credit policy is expected to increase sales by 10 per cent and the average age of receivables to 60 days. Assuming 15 per cent return, should the firm relax its credit policy?

**Solution***Incremental analysis (relaxation in credit terms or not)*

	<i>Present plan</i> (20,000 units)	<i>Proposed plan</i> (22,000 units)	<i>Differential costs</i> <i>and revenues</i>
Sales revenue	Rs 20,00,000	Rs 22,00,000	Rs 2,00,000
Less: variable cost	17,60,000	19,36,000	1,76,000
fixed costs (20,000 units × 4)	80,000	80,000	
investment cost (working notes)	27,600	50,400	22,800
Income (deficiency)	1,32,400	1,33,600	1,200

**Recommendation:** The firm should relax its credit policy as it increases profit by Rs 1,200.

**Working notes***Cost of investments in accounts receivable:*

Present plan: Rs 18,40,000/10 (360 days ÷ 36 days) Rs 1,84,000

Cost = (0.15 × Rs 1,84,000) 27,600

Proposed plan = Rs 20,16,000/6 (360 days ÷ 60 days) 3,36,000

Cost = (0.15 × Rs 3,36,000) 50,400

**PS 15.5**

Udar Ltd believes that it is possible to increase sales if credit terms are relaxed. The profit plan, based on the old credit terms, envisages projected sales at Rs 10,00,000, a 30 per cent profit volume ratio, fixed costs at Rs 50,000, bad debts of 1 per cent and an accounts receivable turnover of 10 times. The relaxed credit policy is expected to increase sales to Rs 12,00,000. However, bad debts will rise to 2 per cent of sales, and accounts receivable turnover will decrease to 6 times.

Should the company adopt the new (relaxed) credit policy, assuming the company's target rate of return is 20 per cent?

**Solution**

*Incremental analysis (relaxation in credit terms or not)*

	<i>Present plan</i>	<i>Proposed plan</i>	<i>Differential revenue and costs</i>
Sales	Rs 10,00,000	Rs 12,00,000	Rs 2,00,000
Less: variable costs	7,00,000	8,40,000	1,40,000
bad debts	10,000	24,000	14,000
fixed costs	50,000	50,000	—
investment cost (working notes)	15,000	29,666	14,666
Income (deficiency)	2,25,000	2,56,334	31,334

**Recommendation:** The firm should relax its credit terms, as it will augment income by Rs 31,334.

**Working notes**

*Cost of investments in accounts receivable:*

Present plan : (Rs 7,00,000 + Rs 50,000)/10 Rs 75,000

Cost = (Rs 75,000 × 0.20) 15,000

Proposed plan : (Rs 8,40,000 + Rs 50,000)/6 1,48,333

Cost = (Rs 1,48,333 × 0.20) 29,666

**PS 15.6**

The credit manager of ABC Ltd has to decide on a proposal for liberal extension of credit which would result in a slowing process of the average collection period from 1 to 2 months. The company's product is sold for Rs 20 per unit, of which Rs 15 represents the variable costs (including credit department cost). The current actual sales amounted to Rs 24 lakh, represented entirely by credit sales. The average total cost per unit is Rs 18.

The relaxation in credit policy is expected to result in 25 per cent increase in sales, that is, Rs 30 lakh annually. The corporate management aims at a return of 25 per cent on additional investment.

Make relevant calculations to help the credit manager in examining the financial implications of liberalising the credit policy.

**Solution**

*Incremental analysis (extension of credit terms)*

	<i>Present plan</i>	<i>Proposed plan</i>	<i>Differential costs and revenues</i>
Sales	Rs 24,00,000	Rs 30,00,000	Rs 6,00,000
Less: variable costs	18,00,000	22,50,000	4,50,000

(Contd.)

**Solution (Contd.)**

fixed costs	3,60,000	3,60,000	—
investment cost (working notes)	45,000	1,08,750	63,750
Income (deficiency)	1,95,000	2,81,250	86,250

**Recommendation:** The firm is advised to liberalise its credit policy as it augments profit by Rs 82,250.

**Working notes**

*Cost of investments in accounts receivable:*

Present plan : Rs 21,60,000/12 times = Rs 1,80,000, its cost is Rs 1,80,000 × 0.25 = Rs 45,000

Proposed plan : Rs 26,10,000/6 times = Rs 4,35,000, its cost is Rs 4,35,000 × 0.25 = Rs 1,08,750.

**PS 15.7**

ABC Ltd is now extending 1 month's credit to its selected customers. It sells its products at Rs 100 each, and has an annual sales volume of 60,000 units. At current level of production, which matches with sales, the product has a total cost of Rs 90 per unit and a variable cost of Rs 80 per unit. The company is considering a plan to grant more liberal terms by extending the duration of credit from 1 month to 2 months and expects the sales to the customer group to go up by 25 per cent. In the background of a normal expectation of a 20 per cent return on investment, will this relaxation in credit standard justify itself?

**Solution**

(i) *Profit on additional sales*

Selling price per unit	Rs 100	
Less variable cost per unit	80	
Marginal contribution/unit	20	
Number of additional units to be sold	× 15,000	
		Rs 3,00,000

(ii) *Cost of additional investment in receivables*

(a) Average investments in receivables:

Present plan = (60,000 units × Rs 90)/Debtors turnover,  $12(12 \div 1) = \text{Rs } 4,50,000$

Proposed plan:  $[(60,000 \text{ units} \times \text{Rs } 90) + (15,000 \text{ units} \times \text{Rs } 80)]/6(12 \div 2) = \text{Rs } 11,00,000$

(b) Additional investments in receivables = Rs 11,00,000 – Rs 4,50,000 = Rs 6,50,000

(c) Cost of additional investments in receivables =  $0.20 \times \text{Rs } 6,50,000 = \text{Rs } 1,30,000$ .

(iii) *Summary*

Profits on additional sales	Rs 3,00,000
Less increased cost of investments	1,30,000
Net increase in profits	1,70,000

Thus, the relaxation of credit standards is justified.

**PS 15.8**

Super Sports Ltd, dealing in sports goods, has an annual sale of Rs 50 lakh and is currently extending 30 day's 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 company is, therefore, considering shifts in credit policy. The following information is available:

The average collection period is now 30 days; variable costs: 80 per cent on sales; fixed cost: Rs 6 lakh per annum; and required (pre-tax) return on investment: 20 per cent.

<i>Credit policy</i>	<i>Average collection period (days)</i>	<i>Annual sales (Rs lakh)</i>
A	45	56
B	60	60
C	75	62
D	90	63

Determine which policy should the company adopt?

### ***Solution***

*Evaluation of proposed credit policies (amount in Rs lakh)*

	<i>Present</i>	<i>Proposed (number of days)</i>			
	(30)	A(45)	B(60)	C(75)	D(90)
(a) Sales revenue	50	56	60	62	63
Less variable costs (VC)	40	44.8	48	49.6	50.4
Total contribution	10	11.2	12	12.4	12.6
Less fixed costs (FC)	6	6	6	6	6
Profit	4	5.2	6	6.4	6.6
Increase in profits due to increase in total contribution (0.20 × sales) compared to present profits	—	1.2	2	2.4	2.6
(b) <i>Investment in debtors/receivables</i>					
[Total costs (VC + FC)]/Debtors	46	50.8	54	55.6	56.4
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) <i>Incremental profit [(a) – (b)]</i>	—	0.70	0.97	0.85	0.55

**Recommendation:** Policy B (average collection period 60 days) should be adopted as it yields maximum profit.

### **PS 15.9**

Royal Industries Ltd currently makes all sales on credit and offers no cash discount. It is considering a 2 per cent discount for payment within 10 days (terms offered are '2/10 net 30'). The firm's current average collection period is 30 days, sales are 10,000 units, selling price is Rs 100 per unit and variable cost per unit is Rs 50; its existing total fixed costs are Rs 2,00,000 which are likely to remain unchanged with production/sales volume of 12,000 units.

It is expected that the offer of cash discount will result in an increase in sales to 11,000 units and the average collection period will be 20 days as a result. However, due to increased sales, increased working capital required will be for Rs 20,000 (without taking into account the effect of 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**

*Incremental analysis whether cash discount should be offered*

Particulars	Amount
Incremental sales revenue (1,000 units × Rs 100)	Rs 1,00,000
Less variable costs (1,000 units × Rs 50)	50,000
Incremental contribution	50,000
Add savings in cost due to decrease in investment in debtors (see working note 1)	3,333
Less cost of additional working capital required (Rs 20,000 × 0.20)	(4,000)
Less cash discount (0.02 × 11,000 units × 0.5 × Rs 100)	11,000
Incremental profit	38,333

**Recommendation:** It is advised that the firm should offer cash discount.

**Working notes**

- 1 *Savings due to decrease in collection period:*

Present investment in debtors (without cash discount) =  $[(10,000 \times \text{Rs } 50) + \text{Rs } 2,00,000]/12$  (360 days/30)  
= Rs 58,333.

Expected investment in debtors (with cash discount) =  $[11,000 \times \text{Rs } 50) + \text{Rs } 2,00,000]/18$  (360 days/20)  
= Rs 41,667

Decrease in investment in debtors = Rs 58,333 – Rs 41,667 = Rs 16,666

Savings in interest cost (Rs 16,666 × 0.20) = Rs 3,333.

**PS 15.10**

Determine the effective cost of discount to Royal Industries Ltd for data contained in **PS 15.9**.

**Solution**

Effective cost of discount =  $[\text{Discount} \times 100 \times 365 \text{ days}]/[(100 - \text{Discount rate}) \times \text{Time (days)}] = (\text{Rs } 2 \times 100 \times 365)/(\text{Rs } 98 \times 20) = 37.2 \text{ per cent.}$

**PS 15.11**

XYZ Corporation Ltd is considering relaxing its present credit policy and is in the process of evaluating 2 proposed policies. Currently the firm has annual credit sales of Rs 50 lakh, and accounts receivable turnover 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?

	Present policy	Policy option 1	Policy option 2
Annual credit sales	Rs 50,00,000	Rs 60,00,000	Rs 67,50,000
Accounts receivable turnover (times)	4	3	2.4
Bad debts losses	1,50,000	3,00,000	4,50,000

**Solution**

*Liberalisation of credit terms: choice between policy option 1 and policy option 2*

	<i>Present policy</i>	<i>Policy option 1</i>	<i>Policy option 2</i>
Sales revenue	Rs 50,00,000	Rs 60,00,000	Rs 67,50,000
Less variable costs	35,00,000	42,00,000	47,25,000
Contribution (manufacturing)	15,00,000	18,00,000	20,25,000
Less other relevant costs:			
Bad debts losses	1,50,000	3,00,000	4,50,000
Investment cost (working note)	2,18,750	3,50,000	4,92,188
Contribution (final)	11,31,250	11,50,000	10,82,812

**Recommendation:** The firm is advised to adopt policy option 1 (extend credit terms to 4 months).

**Working notes**

Investment in accounts receivable should be determined with reference to total cost of goods sold on credit. Since fixed costs are not known, it is not possible to determine total cost. It is, therefore, assumed that there are no fixed costs and investment in debtors is determined with reference to variable cost only.

*Present policy* : Rs 35,00,000/4 = Rs 8,75,000, its cost  $(0.25 \times \text{Rs } 8,75,000) = \text{Rs } 2,18,750$

*Policy option 1* : Rs 42,00,000/3 = Rs 14,00,000, its cost  $(0.25 \times \text{Rs } 14,00,000) = \text{Rs } 3,50,000$

*Policy option 2* : Rs 47,25,000/2.4 = Rs 19,68,750, its cost  $(0.25 \times \text{Rs } 19,68,750) = \text{Rs } 4,92,188$ .

**PS 15.12**

ABC Ltd is considering certain relaxation in its credit policy. The management has evaluated 2 new policies. From the following details, advise which policy should be adopted by ABC Ltd.

(i) Annual credit sales at present (Rs lakh)	87.5
(ii) Proposed credit sales (Rs lakh):	
Alternative I	105
Alternative II	118
(iii) Accounts receivable turnover (times):	
Existing	6
Alternative I	5.25
Alternative II	4.2
(iv) Bad debts (Rs lakh):	
Existing	2.63
Alternative I	5.25
Alternative II	7.88
(v) Required rate of return on the investment in new accounts receivable	20
(vi) P/V ratio (per cent)	30

**Solution**

*Evaluation of proposed credit policies*

<i>Particulars</i>	<i>Existing</i>	<i>Proposed alternatives</i>	
		<i>I</i>	<i>II</i>
Sales revenue	Rs 87,50,000	Rs 1,05,00,000	Rs 1,18,00,000
Less variable cost (0.70)	61,25,000	73,50,000	82,60,000

(Contd.)



**Solution (Contd.)**

Contribution (manufacturing)	26,25,000	31,50,000	35,40,000
Less other relevant costs:			
Bad debt losses	2,63,000	5,25,000	7,88,000
Cost of investment in debtors (see working note)	2,04,167	2,80,000	3,93,333
Contribution (final)	21,57,833	23,45,000	23,58,667

**Recommendation:** The firm is advised to adopt alternative II as it maximises contribution.

**Working notes**

Cost of investment in receivables/debtors:

*Present policy* : Rs 61,25,000/6 times = Rs 10,20,833; cost (Rs 10,20,833 × 0.2) = Rs 2,04,167

*Alternative I* : Rs 73,50,000/5.25 times = Rs 14,00,000; cost (Rs 14 lakh × 0.2) = Rs 2,80,000

*Alternative II* : Rs 82,60,000/4.2 times = Rs 19,66,667; cost (Rs 19,66,667 × 0.2) = Rs 3,93,333

**PS 15.13**

The Udar Ltd sells goods on credit. Its current annual credit sales (turnover) amount to Rs 810 lakh. The credit terms of Udar Ltd are 2/10, net 30. On the current level of sales, the bad debts are 1 per cent. The past experience has been that 50 per cent of the customers avail of the cash discount; the remaining customers pay on an average 70 days after the date of sale.

The book debts (receivables) of Udar Ltd are at present being financed on a 67:33 basis by a mix of bank borrowings and owned funds which cost per annum 25 per cent and 28 per cent respectively.

As an alternative to the in-house management of receivables, Udar Ltd is contemplating the use of full advance non-recourse factoring deal with the Fairgrowth Factors Ltd. The main elements of such a deal structured by the factor are (i) factor reserve, 15 per cent; (ii) guaranteed payment date, 24 days after the date of purchase; (iii) discount charge, 22 per cent and (iv) commission for other services, 4 per cent of the value of receivables.

The finance manager of Udar Ltd seeks your advice, as a consultant, on the cost-benefit of the factoring arrangement. What advice would you give? You can make your own assumptions, where necessary.

**Solution***Decision analysis: in-house management alternative*

Relevant costs	Amount (Rs lakh)
Cash discount	8.10 (Rs 810 × 0.02 × 0.5)
Cost of funds in receivables	23.39 (see working note 1)
Bad debt losses	8.10 (Rs 810 × 0.01)
Total	39.59

*Decision analysis; non-recourse factoring alternative*

Relevant cost	Amount (Rs lakh)
Factoring commission	32.40 (Rs 810 × 0.04)
Discount charge	9.69 (working note 2)
Cost of owned funds invested in receivables	2.78 (Rs 810 lakh – Rs 660.96 lakh) × 0.28 × 24/360
Total	44.87

**Working notes**1 *Cost of funds invested in receivables:*

Average collection period =  $(10 \text{ days} \times 0.5) + (70 \text{ days} \times 0.5) = 40 \text{ days}$

Average investment in debtors =  $\text{Rs } 810 \text{ lakh} / 9 = \text{Rs } 90 \text{ lakh}$

Cost of bank funds =  $(\text{Rs } 90 \text{ lakh} \times 0.67 \times 0.25) = \text{Rs } 15.075 \text{ lakh}$

Cost of owned funds =  $(\text{Rs } 90 \text{ lakh} \times 0.33 \times 0.28) = \text{Rs } 8.316 \text{ lakh}$

Total cost =  $\text{Rs } 15.075 \text{ lakh} + \text{Rs } 8.316 \text{ lakh} = \text{Rs } 23.39 \text{ lakh}$

2. Eligible amount of advance =  $0.85 \times (\text{Rs } 810 \text{ lakh} - \text{Rs } 32.4 \text{ lakh}) = \text{Rs } 660.96 \text{ lakh}$ 

Discount charge =  $(\text{Rs } 660.96 \text{ lakh} \times 0.22 \times 24/360) = \text{Rs } 9.69 \text{ lakh}$

*Decision analysis: cost benefit of non-recourse factoring*

	<i>Amount (Rs in lakh)</i>
Benefits/savings of cost with in-house management alternative	39.59
Cost (of non-recourse factoring alternative)	44.87
Net loss	(5.28)

**Recommendation:** Udar Limited should not go for factoring alternative.

**PS 15.14**

The following facts relate to the Avon Industries Ltd (AIL):

- Annual credit turnover in the current financial year, Rs 1,200 lakh;
- Average collection period, 75 days;
- Cost of funds, 0.21 per annum;
- Annual credit and collection expenditure, Rs 20 lakh of which three-fourths is avoidable;
- Bad debts, 1 per cent of sales

The Foremost Factors Ltd offers a factoring deal to the AIL. It proposes to charge a commission as percentage of the value of book debts of 2 per cent for recourse factoring and 3.5 per cent for non-recourse factoring. In addition, it would charge 22 per cent per annum as discount/interest for pre-payment (advance against uncollected and not due receivables) to the extent of 80 per cent of the value of the receivables. The guaranteed payment/collection date is 60 days.

Making your own assumption where necessary, what advice would you give to AIL, to continue with the in-house management of receivables or accept the factoring arrangement?

**Solution***Decision analysis: in-house management alternative*

<i>Relevant costs</i>	<i>Amount (Rs in lakh)</i>
Annual credit and collection expenditure	20.00
Bad debts	12.00 $(0.01 \times 1,200)$
Cost of funds in receivables	52.50 (see working note 1)
Total	84.50

*Decision analysis; non-recourse factoring alternative*

<i>Relevant cost</i>	<i>Amount (Rs in lakh)</i>
Factoring commission	42.00 $(1,200 \times 0.035)$
Discount charge	33.97 (see working note 2)
Cost of owned funds invested in receivables	9.58 $(1,200 - \text{Rs } 926.40) \times 0.21 \times 60/360$
Total	85.55

**Working notes**1 *Cost of funds invested in receivables:*

Average investment in debtors = Rs 1,200 lakh/4.8 = Rs 250 lakh

Cost of funds = (Rs 250 lakh  $\times$  0.21) = Rs 52.5 lakh2 Eligible amount of advance =  $0.80 \times (\text{Rs } 1,200 \text{ lakh} - \text{Rs } 42 \text{ lakh}) = \text{Rs } 926.40 \text{ lakh}$ Discount charge = (Rs 926.40 lakh  $\times$  0.22  $\times$  60/360) = Rs 33.97 lakh*Decision analysis: cost benefit of non-recourse factoring alternative*

	<i>Amount (Rs in lakh)</i>
Benefits (15 + 12 + 52.50)	79.50
Cost (of non-recourse factoring alternative)	85.55
Net loss	(6.05)

*Cost of recourse factoring alternative*

<i>Relevant cost</i>	<i>Amount (Rs in lakh)</i>
Factoring commission	24.00 (1,200 $\times$ 0.02)
Discount charge	34.50 (working note 3)
Cost of owned funds invested in receivables	9.07 (1,200 – Rs 940.80) $\times$ 0.21 $\times$ 60/360
Total	67.57

3 Eligible amount of advance =  $0.80 \times (\text{Rs } 1,200 \text{ lakh} - \text{Rs } 24 \text{ lakh}) = \text{Rs } 940.80 \text{ lakh}$ Discount charge = (Rs 940.80 lakh  $\times$  0.22  $\times$  60/360) = Rs 34.50 lakh*Decision analysis: recourse factoring alternative*

	<i>Amount (Rs lakh)</i>
Benefits (15 + 52.50)	67.5
Cost of recourse factoring alternative	67.57
Net loss	(0.07)

**EXERCISES**

**E.15.1** Mega Ltd is currently selling a product @ Rs 10 per unit. The most recent annual sales (all credit) were 30,000 units. The variable costs per unit is Rs 6 and the average cost per unit, given a sales volume of 30,000 units, is Rs 8. 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 unit sales; the average collection would increase to 45 days, with no change in bad debt expenses. The increase in collection expenses may be assumed to be negligible. The firm's required return on investment is 15 per cent.

Should the firm relax the credit standard?

**E.15.2** Undar Ltd is contemplating stricter collection policies. The following details are available:

- (A) 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. The average collection period is 58 days, and collection expenses amount to Rs 10,000. Bad debts amount to 3 per cent.
- (B) If the collection procedures are tightened, additional collection charges amounting to Rs 20,000 would be required. Bad debt will be 1 per cent, the collection period will be 40 days, and 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?

**E.15.3** Hypothetical Ltd is contemplating an increase in the credit period from 30 days 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 will increase from the current level of 1 to 3 per cent of the 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 are Rs 6 and 10 per unit, respectively. Assume, that the firm expects a rate of return of 15 per cent. Should the firm extend the credit period?

**E.15.4** MNQ Ltd wants to relax its credit on sales from the current level of 1 month to 2 months. Due to this, sales would increase to Rs 72 lakh from the present level of Rs 60 lakh per annum but the percentage of bad debt losses which is now at 3 per cent is likely to go up by 2 per cent of sales. The company's variable cost is 75 per cent of sales and fixed expenses are Rs 12 lakh per annum. Advise the company on the implications of revising the credit policy. Interest on the additional funds required to extend credit is estimated to be 15 per cent.

## ANSWERS

**E.15.1** Yes, it will increase profits by Rs 15,993.75.

**E.15.2** Yes, there would be a net gain of Rs 10,418.

**E.15.3** Yes, there would be a net gain of Rs 6,806.25.

**E.15.4** The relaxation will yield additional profits of Rs 1,20,000.

# 16

## BASIC THEORY

### INTRODUCTION

There are four major decision-areas in inventory management: (i) classification problem, (ii) order quantity problem, (iii) order point problem, and (iv) safety stock.

### CLASSIFICATION PROBLEM

The first step in the inventory planning/control process is the classification of different types of inventory to determine the type and degree of control required for each. The ABC system is a widely-used classification technique for the purpose. On the basis of the cost involved, the various items are classified into three categories: (i) **A**, consisting of items with the largest 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.

### ORDER QUANTITY PROBLEM

The second key inventory problem relates to determination of the size/quantity of inventory which would be acquired. This is the order quantity problem. The economic order quantity, or economic lot size (EOQ) is that level of inventory order which minimises the total cost associated with inventory management. Stated with reference to cost perspective, EOQ refers to the level of inventory at which the total cost of inventory comprising (i) order/setup cost, and (ii) carrying costs is the minimum. Symbolically,

$$EOQ = \sqrt{\frac{2AB}{C}} \quad (16.1)$$

where  $A$  = Annual usage of inventory in units  
 $B$  = Buying cost per order  
 $C$  = Carrying cost per unit.

### ORDER POINT PROBLEM

Yet another important question relating to inventory planning and control is: When should the order to procure inventory be placed? It is what is called the order point problem. 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 or procurement time.

$$\text{Re-order level} = (\text{daily usage} \times \text{lead time}) + \text{safety stock} \quad (16.2)$$

### SAFETY STOCKS

These are the minimum additional inventory which serve as a safety margin to meet an unanticipated increase in usage. This increase may be due to an unusually high demand or because of uncontrollable late receipt of incoming inventory. The following steps are involved in determining the level of safety stocks:

- (i) The first step 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.
- (ii) After the determination of the size and probability of stock-out, the next step is the calculation of the stock-out cost. The stock-out cost can be found out by multiplying the stock-out by the cost per unit, and the probability of stock-out.
- (iii) Then, the carrying costs should be calculated. The carrying cost are equal to the safety stock multiplied by the carrying costs per unit.
- (iv) Finally, the carrying costs and the expected stock-out costs at each safety level should be added. The optimum safety stock would be that level of inventory at which the total of these two costs is the lowest.

## SOLVED PROBLEMS

### PS 16.1

From the following data, determine the EOQ.

- (i) Annual requirement, 12,00,000 units
- (ii) Purchase price, Rs 3 per unit
- (iii) Ordering cost, Rs 50 per order
- (iv) Carrying cost of inventory, 10 per cent of cost

### *Solution*

$$\begin{aligned} \text{EOQ} &= \sqrt{\frac{2AB}{C}} \\ &= \sqrt{(2 \times 12,00,000 \times 50) / 0.30} = \sqrt{40,00,000} = 20,000 \text{ units} \end{aligned}$$

### Working notes

Total carrying cost =  $0.10 \times (12,00,000 \times \text{Rs } 3) = \text{Rs } 3,60,000$

Carrying cost per unit =  $\text{Rs } 3,60,000 \div 12,00,000 = \text{Rs } 0.30$

### PS 16.2

The following relations to inventory costs have been established for ABC Ltd:

- (a) Orders must be placed in multiples of 100 units.
- (b) Requirements for the year are 3,00,000 units.
- (c) The purchase price per unit is Rs 3.
- (d) Carrying cost is 25 per cent of the purchase price of goods.
- (e) Cost per order placed is Rs 20.
- (f) Desired safety stock is 10,000 units; this amount is on hand initially.
  - (i) Calculate the EOQ.
  - (ii) How many orders should the company place each year?

(iii) At what inventory level should an order be placed?

### Solution

$$(i) \text{EOQ} = \sqrt{2AB/C} = \sqrt{(2 \times 3,00,000 \times \text{Rs } 20)/0.75} = \sqrt{8,000 \times 2,000} = 4,000 \text{ units}$$

### Working notes

$$C = (\text{Rs. } 3,00,000 \times 3 \times 25)/(100 \times 3,00,000) = 0.75$$

$$(ii) \text{Number of orders} = \text{Annual usage}/\text{EOQ quantity} = 3,00,000/4,000 = 75$$

$$(iii) \text{Re-order level} = \text{safety stock} + (\text{daily usage} \times \text{lead time}) = 10,000 + (3,00,000/360) \times 3 = 10,000 + 2,500 = 12,500 \text{ units.}$$

### PS 16.3

Your factory buys and uses a component for production at Rs 10 per piece. The annual requirement is 2,000 numbers. Carrying cost of inventory is 10 per cent per annum, and ordering cost is Rs 40 per order. The purchase manager argues that as the ordering cost is very high, it is advantageous to place a single order for the entire annual requirement. He also says that if we order 2,000 at a time, we can get a 3 per cent discount from the supplier. Evaluate this proposal and make your recommendation.

### Solution

*Statement showing total cost under one single order and five orders (based on EOQ)*

	Single order	Orders based on EOQ
1 Size of order (units)	2,000	400
2 Number of orders	1	5
3 Cost per order (Rs)	40	40
4 Total ordering cost (2 × 3)	40	200
5 Carrying cost per unit (Rs)	1	1
6 Average inventory (size of order ÷ 2)	1,000	200
7 Total carrying cost (5 × 6)	1,000	200
8 Savings in the form of discount on aggregate purchases under single order (2,000 × Rs 10 × 0.03)	(600)	—
9 Total cost (4 + 7 – 8)	440	400

It is recommended that purchases of pieces should be made in size of EOQ.

**Note:** 3 per cent discount factor on purchases has been ignored from the point of view of determining carrying cost per unit.

### Working notes

$$\text{EOQ} = \sqrt{2AB/C} = \sqrt{(2 \times 2,000 \times 40)/1} = \sqrt{1,60,000} = 400$$

$$\text{Carrying cost (total)} = (2,000 \times \text{Rs } 10) \times 0.10 = \text{Rs } 2,000$$

$$\text{Carrying cost (per unit)} = \text{Rs } 2,000 \div 2,000 \text{ units} = \text{Rs } 1.$$

### PS 16.4

- (i) From the following data, determine the EOQ.
  - (a) List price of product X is Rs 800 per gross.
  - (b) 40 per cent trade discount is allowed on list price on purchases in gross lots.

- (c) Freight cost is Rs 20 per gross from the transport company to the factory premises.
- (d) Annual usage of product X: 36 gross per year.
- (e) Cost of placing an order is Rs 10, the cost of receiving an order is Rs 20.
- (f) Carrying cost is 20 per cent of the effective purchase price of goods per year.
- (g) Insurance and taxes are approximately 12 per cent of the net delivered cost of inventory.
- (ii) Determine the total annual cost of inventory based on uniform order lot sizes of 1, 2, 3, 4, 5 and 6 gross of product X.
- (iii) Determine the minimum stock re-order point of product X, given the following: (a) Working days: 240; (b) Normal delivery time to receive an order: 20 working days from the date of purchase request is initiated; (c) Safety stock: 1 gross.

### Solution

(i) EOQ (in gross lots) =  $\sqrt{(2 \times 36 \times 30)/112}$

=  $\sqrt{19.28} = 4.4$  or 4 gross (as purchases are allowed in gross lots). The figure is not revised upward (as is normally done to 5) as it will require 7.2 orders ( $36 \div 5$ ).

### Working notes

B = Cost of placing an order	Rs 10
Plus cost of receiving an order	20
Total buying cost per order	30
C = List price per gross	800
Less 40 per cent trade discount	320
Net price	480
Plus freight cost per gross	20
Plus insurance and taxes ( $0.12 \times \text{Rs } 500$ )	60
Effective purchase price per gross	560
Carrying cost per gross = $0.20 \times \text{Rs } 560$	112

(ii) Statement showing total annual cost of inventory

1 Size of quantity order (gross)	1	2	3	4	5	6
2 Number of orders	36	18	12	9	8*	6
3 Cost per order (Rs)	30	30	30	30	30	30
4 Total order cost ( $2 \times 3$ )	1,080	540	360	270	240	180
5 Carrying cost per gross (Rs)	112	112	112	112	112	112
6 Average inventory (size of order $\div 2$ )	0.5	1	1.5	2	2.5	3
7 Total carrying cost ( $5 \times 6$ )	56	112	168	224	280	336
8 Total annual cost ( $4 + 7$ )	1,136	652	528	494	520	516

\*More than 7 orders are to be placed to have 36 gross quantity and, therefore, 8 orders.

(iii) Re-order level (minimum stock): = Safety stock + (daily usage  $\times$  lead time) = 1 gross + ( $36 \text{ gross}/240 \text{ days}$ )  $\times 20$  days = 4 gross.

### PS 16.5

Product Y is sold in packages of 12 units for Rs 20 per package. After a number of years, it has been found that the demand for the product is at a constant rate of 2,000 packages per month. The cost price per package of the company is Rs 10. The company requires a 3-day lead time from date of order to date of delivery. The ordering cost is Rs 1.20 per order and the carrying cost is 10 per cent per annum.

You are required to calculate the following: (i) EOQ and (ii) Number of orders needed per year.



**Solution**

- (i)  $EOQ = \sqrt{(2 \times 24,000 \times \text{Rs } 1.2)/1} = \sqrt{57,600} = 240$  packages  
 (ii) Number of orders = Annual usage/EOQ equity =  $24,000/240 = 100$

**Working notes**

Total carrying cost =  $0.10 \times (\text{Rs } 2,000 \times 10 \times 12) = \text{Rs } 24,000$ ; Carrying cost per package =  $\text{Rs } 24,000 \div 24,000$  packages = Rs 1.

**PS 16.6**

- (i) From the following information determine the EOQ.  
 (a) Per month consumption: 75 units  
 (b) List price per unit: Rs 4  
 (c) Trade discount: 25 per cent from the list price  
 (d) Per order cost: Rs 10  
 (e) Carrying cost: Rs 0.20 per unit  
 (f) The usage is assumed to be uniform throughout the year.  
 (ii) Determine the value per order.

**Solution**

- (i)  $EOQ = \sqrt{(2 \times 900 \times \text{Rs } 10)/0.20} = \sqrt{90,000} = 300$  units  
 (ii) Value per order (based on EOQ):

List price (Rs 4 × 300 units)	Rs 1200
Less trade discount (0.25)	300
Effective value per order	900

**PS 16.7**

- (i) A company predicts that 3,000 units of certain material will be needed next year. Each unit costs Rs 6. Past experience indicates that the storage costs are approximately equal to 10 per cent of the inventory investment. The cost to place an order amounts to Rs 9.  
 (ii) Determine the economic order quantity so as to enable the company to balance its ordering and storage costs. How many orders will the company place in a year based upon EOQ?

**Solution**

- (i)  $EOQ = \sqrt{(2 \times 3,000 \times \text{Rs } 9)/0.60} = \sqrt{90,000} = 300$  units  
 Total carrying cost =  $0.10 \times (3,000 \times \text{Rs } 6) = \text{Rs } 1,800$   
 Carrying cost per unit =  $\text{Rs } 1,800 \div 3,000 = \text{Rs } 0.60$   
 (ii) Number of orders based upon EOQ: Annual usage/EOQ =  $3,000/300 = 10$ .

**PS 16.8**

ABC Ltd has several items of inventory. The average number of each of these as well as their unit costs is listed below:

Item	Average inventory (units)	Average cost per unit	Item	Average inventory (units)	Average cost per unit
1	4,000	Rs 1.96	11	1,800	Rs 25
2	200	10	12	130	2.70
3	440	2.40	13	4,400	9.50
4	2,000	16.80	14	3,200	2.60
5	20	165	15	1,920	2
6	800	6	16	800	1.20
7	160	76	17	3,400	2.20
8	3,000	3	18	2,400	10
9	1,200	1.90	19	120	21
10	6,000	0.50	20	320	4

The company wishes to adopt an ABC inventory system. How should the items be classified into A, B and C?

**Solution**

ABC analysis

Item	Units	Per cent of total	Unit cost	Total cost	Per cent of total	Classification
11	1,800	5.02	Rs 2.5	Rs 45,000	21.27	A
13	4,400	12.29	9.5	41,800	19.75	
4	2,000	5.58	16.8	33,600	15.88	
18	2,400	6.7	10	24,000	11.34	
7	160	0.44	76	12,160	5.75	
8	3,000	8.37	3	9,000	4.25	B
14	3,200	8.93	2.6	8,320	3.93	
1	4,000	11.17	1.96	7,840	3.71	
17	3,400	9.49	2.2	7,480	3.53	
15	1,920	5.36	2	3,840	1.81	
5	20	0.05	165	3,300	1.56	C
10	6,000	16.76	0.5	3,000	1.42	
19	120	0.33	21	2,520	1.19	
9	1,200	3.35	1.9	2,280	1.08	
2	200	0.56	10	2,000	0.94	
6	300	0.83	6	1,800	0.85	
20	320	0.89	4	1,280	0.60	
3	440	1.23	2.4	1,056	0.50	
16	800	2.23	1.2	960	0.45	
12	130	0.36	2.7	351	0.16	
Total	35,810	100		2,11,587	100	

**PS 16.9**

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 the following for each component: (a) Re-order level, (b) Minimum level, (c) Maximum level, (d) Average stock level.

**Solution**

(a) Re-order level = (maximum usage  $\times$  maximum delivery time)

$$A = 75 \times 6 \text{ weeks} = 450 \text{ units}$$

$$B = 75 \times 4 \text{ weeks} = 300 \text{ units}$$

(b) Minimum level = Re-order level – (normal usage  $\times$  average delivery time in weeks)

$$A = 450 \text{ units} - (50 \text{ units} \times 5 \text{ weeks}) = 200 \text{ units}$$

$$B = 300 \text{ units} - (50 \text{ units} \times 3 \text{ weeks}) = 150 \text{ units}$$

(c) Maximum level = Re-order level – (minimum usage  $\times$  minimum delivery time) + re-order quantity

$$A = 450 \text{ units} - (25 \times 4) + 300 \text{ units} = 650 \text{ units}$$

$$B = 300 \text{ units} - (25 \times 2) + 500 \text{ units} = 750 \text{ units}$$

Average stock level = minimum level + re-order quantity/2

$$A = 200 + 300/2 = 350 \text{ units}$$

$$B = 150 + 500/2 = 400 \text{ units}$$

**PS 16.10**

A firm's annual requirement of inventory is 30,000 units. The acquisition costs amount to Rs 150 per order. The carrying costs are likely to be Rs 1.20 per unit. Assume the following order sizes: (a) 30,000 units, (b) 15,000 units, (c) 6,000 units, (d) 3,000 units, (e) 1,500 units, and (f) 750 units.

Determine (i) ordering cost, (ii) carrying cost, (iii) average inventory and (iv) EOQ.

**Solution**

*Statement of inventory cost for different order quantities*

1 Size of order (units)	30,000	15,000	6,000	3,000	1,500	750
2 Number of orders	1	2	5	10	20	40
3 Cost per order (Rs)	150	150	150	150	150	150
4 Total ordering cost (2 $\times$ 3)	150	300	750	1,500	3,000	6,000
5 Carrying cost per unit (Rs)	1.20	1.20	1.20	1.20	1.20	1.20
6 Average inventory (units)	15,000	7,500	3,000	1,500	750	375
7 Total carrying cost (5 $\times$ 6)	18,000	9,000	3,600	1,800	900	450
8 Total cost (4 + 7)	18,150	9,300	4,350	3,300	3,900	6,450

The total costs are the lowest for the order size of 3,000 units. This, therefore, is the economic order quantity.

**PS 16.11**

The following information is available relating to the stock-out of a firm:

<i>Stock-out (units)</i>	<i>Number of months</i>
800	2
600	3
400	5
200	10
0	30
	50

The selling price of each unit is Rs 200. The carrying costs are Rs 19 per unit. The stock-out costs are Rs 50 per unit.

- (i) If the firm wishes to never miss a sale, what should be its safety stock? What is the total cost associated with this level of safety stock? What are the associated costs with safety stock of 300, 200, 100 and 20 units, respectively?
- (ii) What is the optimal safety stock level?

**Solution**

(i) *Computation of expected stock-out costs*

<i>Safety stock level</i>	<i>Stock-out (units)</i>	<i>Stock-out costs (Rs 50 per unit )</i>	<i>Probability of stock-out</i>	<i>Expected stock-out cost at this level</i>	<i>Total expected stock-out costs</i>
800	0	0	0	0	0
600	200	Rs 10,000	0.04	Rs 400	Rs 400
400	400	20,000	0.04	800	
	200	10,000	0.06	600	1,400
200	600	30,000	0.04	1,200	
	400	20,000	0.06	1,200	3,400
	200	10,000	0.10	1,000	
0	800	40,000	0.04	1,600	
	600	30,000	0.06	1,800	
	400	20,000	0.10	2,000	7,400
	200	10,000	0.20	2,000	

(ii) *Computation of total safety costs*

<i>Safety stock (units)</i>	<i>Expected stock-out costs</i>	<i>Carrying cost (Rs 19 per unit)</i>	<i>Total safety stock cost</i>
0	Rs 7,400	0	Rs 7,400
200	3,400	Rs 3,800	7,200
400	1,400	7,600	9,000
600	400	11,400	11,800
800	0	15,200	15,200

- (i) The safety stock should be 800 units if the firm never wishes to miss a sale. The total cost associated with this level of safety stock is Rs 15,200.
- (ii) The optimal safety stock is 200 units.

## EXERCISES

**E.16.1** Good Luck Ltd 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?

**E.16.2** A manufacturer buys casting equipment from outside suppliers @ Rs 30 per unit. Total annual needs are 800 units. The following data is also available:

Annual return on investment	0.10
Rent, insurance, taxes per unit per year	Re 1
Cost of placing an order	100

Determine the economic order quantity.

**E.16.3** Peekay Company Ltd has been buying a given item in lots of 1,200 units, which is its 6 months' supply. The cost per unit 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 economic lot quantities.

**E.16.4** The Ganges Pump Company Ltd uses about 75,000 valves per year, and the usage is fairly constant at 6,250 valves per month.

The valve cost is Rs 1.5 per unit when bought in large quantities, and the carrying cost is estimated to be 20 per cent of the average inventory investment on an annual basis. The cost of placing an order and processing 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: (i) The most economic order quantity and frequency of orders; (ii) The order point; (iii) The most economic order quantity if the valves cost Rs 4.50 each instead of Rs 1.50 each.

**E.16.5** The Precision Engineering Ltd 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, storage costs Rs 1,000 per year for 50,000 units. Calculate the EOQ.

**E.16.6** XYZ Ltd has 7 different items in its inventory. The average number of each of these items held, along with their unit costs, is listed below.

<i>Item number</i>	<i>Average number of units in inventory</i>	<i>Average cost per unit</i>
1	20,000	Rs 60.8
2	10,000	102.4
3	32,000	11
4	28,000	10.28
5	60,000	3.4
6	30,000	3
7	20,000	1.3

The company wishes to introduce an ABC inventory system. Suggest a break down of the items into A, B, and C classifications.

**E.16.7** The experience of a firm being out of stock is summarised below:

(a)	<i>Stock-out (number of units)</i>	<i>Number of times</i>
	500	1 (1)
	400	2 (2)
	250	3 (3)
	100	4 (6)
	50	10 (10)
	0	80 (80)
	Total	100 (100)

The figures in brackets represent the percentage of times 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 optimal level of stock-out inventory.

## ANSWERS

- E.16.1** (i) 1,068 units,  
(ii) After 10 days.  
**E.16.2** 200 units.  
**E.16.3** Rs 1,469 (EOQ 114 units).  
**E.16.4** (i) 3,000 units  
(ii) 1,262 units  
(iii) 1,733 units  
**E.16.5** 4,226 units  
**E.16.6** Items 1 and 2 (A category), item 3 and 4 (B category), items 5 to 7 (C category); the respective percentage value are A (70%), B(20%) and C (10%).  
**E.16.7** 50 units (total safety stock costs Rs 2,620).

# APPENDICES

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	1.110
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

(Contd.)

TABLE A-1 The Compound Sum of One Rupee (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

(Contd.)



TABLE A-1 The Compound Sum of One Rupee (Contd.)

Year	21%	22%	23%	24%	25%	26%	27%	28%	29%	30%
1	1.210	1.220	1.230	1.240	1.250	1.260	1.270	1.280	1.290	1.300
2	1.464	1.488	1.513	1.538	1.562	1.588	1.613	1.638	1.664	1.690
3	1.772	1.816	1.861	1.907	1.953	2.000	2.048	2.097	2.147	2.197
4	2.144	2.215	2.289	2.364	2.441	2.520	2.601	2.684	2.769	2.856
5	2.594	2.703	2.815	2.932	3.052	3.176	3.304	3.436	3.572	3.713
6	3.138	3.297	3.463	3.635	3.815	4.001	4.196	4.398	4.608	4.827
7	3.797	4.023	4.259	4.508	4.768	5.042	5.329	5.629	5.945	6.275
8	4.595	4.908	5.239	5.589	5.960	6.353	6.767	7.206	7.669	8.157
9	5.560	5.987	6.444	6.931	7.451	8.004	8.595	9.223	9.893	10.604
10	6.727	7.305	7.926	8.594	9.313	10.086	10.915	11.806	12.761	13.786
11	8.140	8.912	9.749	10.657	11.642	12.708	13.862	15.112	16.462	17.921
12	9.850	10.872	11.991	13.215	14.552	16.012	17.605	19.343	21.236	23.298
13	11.918	13.264	14.749	16.386	18.190	20.175	22.359	24.759	27.395	30.287
14	14.421	16.182	18.141	20.319	22.737	25.420	28.395	31.691	35.339	39.373
15	17.449	19.742	22.314	25.195	28.422	32.030	36.062	40.565	45.587	51.185
16	21.113	24.085	27.446	31.242	35.527	40.357	45.799	51.923	58.808	66.541
17	25.547	29.384	33.758	38.740	44.409	50.850	58.165	66.461	75.862	86.503
18	30.912	35.848	41.523	48.038	55.511	64.071	73.869	85.070	97.862	112.454
19	37.404	43.735	51.073	59.567	69.389	80.730	93.813	108.890	126.242	146.190
20	45.258	53.357	62.820	73.863	86.736	101.720	119.143	139.379	162.852	190.047
21	54.762	65.095	77.268	91.591	108.420	128.167	151.312	178.405	210.079	247.061
22	66.262	79.416	95.040	113.572	135.525	161.490	192.165	228.358	271.002	321.178
23	80.178	96.887	116.899	140.829	169.407	203.477	244.050	292.298	349.592	417.531
24	97.015	118.203	143.786	174.628	211.758	256.381	309.943	374.141	450.974	542.791
25	117.388	144.207	176.857	261.539	326.698	403.040	493.628	600.901	731.756	892.627
30	304.417	389.748	497.904	634.810	807.793	1025.904	1300.477	1645.488	2078.208	2619.936
35	789.716	1053.370	1401.749	1861.020	2465.189	3258.053	4296.547	5653.840	7423.988	9727.598
40	2048.309	2846.941	3946.340	5455.797	7523.156	10364.879	14195.051	19426.418	26520.723	36117.754
45	5312.758	7694.418	11110.121	15994.316	22958.844	32859.457	46897.973	66748.500	94739.937	134102.187
50	13779.844	20795.680	31278.301	46889.207	70064.812	104354.562	154942.687	229345.875	338440.000	497910.125

(Contd.)

TABLE A-1 The Compound Sum of One Rupee (Contd.)

Year	31%	32%	33%	34%	35%	36%	37%	38%	39%	40%
1	1.310	1.320	1.330	1.340	1.350	1.360	1.370	1.380	1.390	1.400
2	1.716	1.742	1.769	1.796	1.822	1.850	1.877	1.904	1.932	1.960
3	2.248	2.300	2.353	2.406	2.460	2.515	2.571	2.628	2.686	2.744
4	2.945	3.036	3.129	3.224	3.312	3.421	3.523	3.627	3.733	3.842
5	3.858	4.007	4.162	4.320	4.484	4.653	4.826	5.005	5.189	5.378
6	5.054	5.290	5.535	5.789	6.053	6.328	6.612	6.907	7.213	7.530
7	6.621	6.983	7.361	7.758	8.172	8.605	9.058	9.531	10.025	10.541
8	8.673	9.217	9.791	10.395	11.032	11.703	12.410	13.153	13.935	14.758
9	11.362	12.166	13.022	13.930	14.894	15.917	17.001	18.151	19.370	20.661
10	14.884	16.060	17.319	18.666	20.106	21.646	23.292	25.049	26.924	28.925
11	19.498	21.199	23.034	25.012	27.144	29.439	31.910	34.567	37.425	40.495
12	25.542	27.982	30.635	33.516	36.644	40.037	43.716	47.703	52.020	56.694
13	33.460	36.937	40.745	44.912	49.469	54.451	59.892	65.830	72.308	79.371
14	43.832	48.756	54.190	60.181	66.784	74.053	82.051	90.845	100.509	111.119
15	57.420	64.358	72.073	80.643	90.158	100.712	112.410	125.366	139.707	155.567
16	75.220	84.953	95.857	108.061	121.713	136.968	154.002	173.005	194.192	217.793
17	98.539	112.138	127.490	144.802	164.312	186.277	210.983	238.747	269.927	304.911
18	129.086	148.022	169.561	194.035	221.822	253.337	289.046	329.471	375.198	426.875
19	169.102	195.389	225.517	260.006	299.459	344.537	395.993	454.669	521.525	597.625
20	221.523	257.913	299.937	348.408	404.270	468.571	542.511	627.443	724.919	836.674
21	290.196	340.446	398.916	466.867	545.764	637.256	743.240	865.871	1007.637	1171.343
22	380.156	449.388	530.558	625.601	736.781	866.668	1018.238	1194.900	1400.615	1639.878
23	498.004	593.192	705.642	838.305	994.653	1178.668	1394.986	1648.961	1946.854	2295.829
24	652.385	783.013	938.504	1123.328	1342.781	1602.988	1911.129	2275.564	2706.125	3214.158
25	854.623	1033.577	1248.210	1505.528	1812.754	2180.063	2618.245	3140.275	3761.511	3499.816
30	3297.081	4142.008	5194.516	6503.285	8128.426	10142.914	12636.086	15716.703	19517.969	24201.043
35	12719.918	16598.906	21617.363	28096.695	36448.051	47190.727	60983.836	78660.188	101276.125	130158.687
40	49072.621	66519.313	89962.188	121388.437	163433.875	219558.625	294317.937	393684.687	525508.312	700022.688

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	8.997	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	271.028
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

(Contd.)

TABLE A-2 The Compound Value of an Annuity of One Rupee (Contd.)

Year	21%	22%	23%	24%	25%	26%	27%	28%	29%	30%
1	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2	2.210	2.220	2.230	2.240	2.250	2.260	2.270	2.280	2.290	2.300
3	3.674	3.708	3.743	3.778	3.813	3.848	3.883	3.918	3.954	3.990
4	5.446	5.524	5.604	5.684	5.766	5.848	5.931	6.016	6.101	6.187
5	7.589	7.740	7.893	8.048	8.207	8.368	8.533	8.700	8.870	9.043
6	10.183	10.442	10.708	10.980	11.259	11.544	11.837	12.136	12.442	12.756
7	13.321	13.740	14.171	14.615	15.073	15.546	16.032	16.534	17.051	17.583
8	17.119	17.762	18.430	19.123	19.842	20.588	21.361	22.163	22.995	23.858
9	21.714	22.670	23.669	24.712	25.802	26.940	28.129	29.369	30.664	32.015
10	27.274	28.657	30.113	31.643	33.253	34.945	36.723	38.592	40.556	42.619
11	34.001	35.962	38.039	40.238	42.566	45.030	47.639	50.398	53.318	56.405
12	42.141	44.873	47.787	50.895	54.208	57.738	61.501	65.510	69.780	74.326
13	51.991	55.745	59.778	64.109	68.760	73.750	79.106	84.853	91.016	97.624
14	63.909	69.009	74.528	80.496	86.949	93.925	101.465	109.611	118.411	127.912
15	78.330	85.191	92.669	100.815	109.687	119.346	129.860	141.302	153.750	167.285
16	95.779	104.933	114.983	126.010	138.109	151.375	165.922	181.867	199.337	218.470
17	116.892	129.019	142.428	157.252	173.636	191.733	211.721	233.790	258.145	285.011
18	142.439	158.403	176.187	195.993	218.045	242.583	269.885	300.250	334.006	371.514
19	173.351	194.251	217.710	244.031	273.556	306.654	343.754	385.321	431.868	483.968
20	210.755	237.986	268.783	303.598	342.945	387.384	437.568	494.210	558.110	630.157
21	256.013	291.343	331.603	377.461	429.681	489.104	556.710	633.589	720.962	820.204
22	310.775	356.438	408.871	469.052	538.101	617.270	708.022	811.993	931.040	1067.265
23	377.038	435.854	503.911	582.624	673.626	778.760	900.187	1040.351	1202.042	1388.443
24	457.215	523.741	620.810	732.453	843.032	982.237	1144.237	1332.649	1551.634	1805.975
25	554.230	650.944	764.596	898.082	1054.791	1238.617	1454.180	1706.790	2002.608	2348.765
30	1445.111	1767.044	2160.459	2640.881	3227.172	3941.953	4812.891	5873.172	7162.785	8729.805
35	3755.314	4783.520	6090.227	7750.094	9856.746	12527.160	15909.480	20188.742	25596.512	32422.090
40	9749.141	12936.141	17153.691	22728.167	30088.621	39791.957	52570.707	69376.562	91447.375	120389.375
45	25294.223	34970.230	48300.660	66638.937	91831.312	126378.937	173692.875	238384.312	326686.375	447005.062

(Contd.)

TABLE A-2 The Compound Value of an Annuity of One Rupee (Contd.)

Year	31%	32%	33%	34%	35%	36%	37%	38%	39%	40%
1	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2	2.310	2.320	2.330	2.340	2.350	2.360	2.370	2.380	2.390	2.400
3	4.026	4.062	4.099	4.136	4.172	4.210	4.247	4.284	4.322	4.360
4	6.274	6.362	6.452	6.542	6.633	6.725	6.818	6.912	7.008	7.104
5	9.219	9.398	9.581	9.766	9.954	10.146	10.341	10.539	10.741	10.946
6	13.077	13.406	13.742	14.086	14.438	14.799	15.167	15.544	15.930	16.324
7	18.131	18.696	19.277	19.876	20.492	21.126	21.779	22.451	23.142	23.853
8	24.752	25.678	26.638	27.633	28.664	29.732	30.837	31.982	33.167	34.395
9	33.425	34.895	36.429	38.028	39.696	41.435	43.247	45.135	47.103	49.152
10	44.786	47.062	49.451	51.958	54.590	57.351	60.248	63.287	66.473	69.813
11	59.670	63.121	66.769	70.624	74.696	78.998	83.540	88.335	93.397	98.739
12	79.167	84.320	89.803	95.636	101.840	108.437	115.450	122.903	130.882	139.234
13	104.709	112.302	120.438	129.152	138.484	148.474	159.166	170.606	182.842	195.928
14	138.169	149.239	161.183	174.063	187.953	202.925	219.058	236.435	255.151	275.299
15	182.001	197.996	215.373	234.245	254.737	276.978	301.109	327.281	355.659	386.418
16	239.421	262.354	287.446	314.888	344.895	377.690	413.520	452.647	495.366	541.985
17	314.642	347.307	383.303	422.949	466.608	514.658	567.521	625.652	689.558	759.778
18	413.180	459.445	510.792	567.751	630.920	700.935	778.504	864.399	959.485	1064.689
19	542.266	607.467	680.354	761.786	852.741	954.271	1067.551	1193.870	1334.683	1491.563
20	711.368	802.856	905.870	1021.792	1152.220	1298.809	1463.544	1648.539	1856.208	2089.188
21	932.891	1060.769	1205.807	1370.201	1556.470	1767.380	2006.055	2275.982	2581.128	2925.862
22	1223.087	1401.215	1604.724	1837.068	2102.234	2404.636	2749.294	3141.852	3588.765	4097.203
23	1603.243	1850.603	2135.282	2462.669	2839.014	3271.304	3767.532	4336.750	4989.379	5737.078
24	2101.247	2443.795	2840.924	3300.974	3833.667	4449.969	5162.516	5985.711	6936.230	8032.906
25	2753.631	3226.808	3779.428	4424.301	5176.445	6052.957	7073.645	8261.273	9642.352	11247.062
30	10632.543	12940.672	15737.945	19124.434	23221.258	28172.016	34148.906	41357.227	50043.625	60500.207

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	.806	.372	.228	.141	.087	.054	.034	.021	.013	.009

(Contd.)

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

(Contd.)



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

(Contd.)

**TABLE A-3 The Present Value of One Rupee (Contd.)**

[illegible]

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

(Contd.)

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	6.303	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	5.723	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

(Contd.)

TABLE A-4 The Present Value of an Annuity of One Rupee (Contd.)

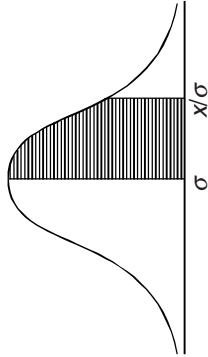
Year	21%	22%	23%	24%	25%	26%	27%	28%	29%	30%
1	8.26	.820	.813	.806	.800	.794	.787	.781	.775	.769
2	1.509	1.492	1.474	1.457	1.440	1.424	1.407	1.392	1.376	1.361
3	2.074	2.042	2.011	1.981	1.952	1.923	1.896	1.868	1.842	1.816
4	2.540	2.494	2.448	2.404	2.362	2.320	2.280	2.241	2.203	2.166
5	2.926	2.864	2.803	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	4.002	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

(Contd.)

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



$x/\sigma$	.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	.1870
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2518	.2549
0.7	.2580	.2612	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3135
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-6 Relationship Between Nominal and Effective Rates of Interest and Discount

<i>Effective Interest rate</i>	$i^{(2)}$	$i^{(4)}$	$i^{(12)}$	$d$	$d^{(2)}$	$d^{(4)}$	$d^{(12)}$
0.01	0.0100	0.0100	0.0100	0.0099	0.0099	0.0099	0.0099
0.02	0.0199	0.0199	0.0198	0.0196	0.0197	0.0198	0.0198
0.03	0.0298	0.0297	0.0296	0.0291	0.0293	0.0294	0.0295
0.04	0.0396	0.0394	0.0393	0.0385	0.0388	0.0390	0.0392
0.05	0.0494	0.0491	0.0489	0.0476	0.0482	0.0485	0.0487
0.06	0.0591	0.0587	0.0584	0.0566	0.0574	0.0578	0.0581
0.07	0.0688	0.0682	0.0678	0.0654	0.0665	0.0671	0.0675
0.08	0.0785	0.0777	0.0772	0.0741	0.0755	0.0762	0.0767
0.09	0.0881	0.0871	0.0865	0.0826	0.0843	0.0853	0.0859
0.10	0.0976	0.0965	0.0957	0.0909	0.0931	0.0942	0.0949
0.11	0.1071	0.1057	0.1048	0.0991	0.1017	0.1030	0.1039
0.12	0.1166	0.1149	0.1139	0.1071	0.1102	0.1117	0.1128
0.13	0.1260	0.1241	0.1228	0.1150	0.1186	0.1204	0.1216
0.14	0.1354	0.1332	0.1317	0.1228	0.1268	0.1289	0.1303
0.15	0.1448	0.1422	0.1406	0.1304	0.1350	0.1373	0.1390
0.16	0.1541	0.1512	0.1493	0.1379	0.1430	0.1457	0.1475
0.17	0.1633	0.1601	0.1580	0.1453	0.1510	0.1540	0.1560
0.18	0.1726	0.1690	0.1667	0.1525	0.1589	0.1621	0.1644
0.19	0.1817	0.1778	0.1752	0.1597	0.1666	0.1702	0.1727
0.20	0.1909	0.1865	0.1837	0.1667	0.1743	0.1782	0.1809
0.21	0.2000	0.1952	0.1921	0.1736	0.1818	0.1861	0.1891
0.22	0.2091	0.2039	0.2005	0.1803	0.1893	0.1940	0.1972
0.23	0.2181	0.2125	0.2088	0.1870	0.1967	0.2017	0.2052
0.24	0.2271	0.2210	0.2171	0.1935	0.2039	0.2094	0.2132
0.26	0.2450	0.2379	0.2334	0.2063	0.2183	0.2246	0.2289
0.28	0.2627	0.2546	0.2494	0.2188	0.2322	0.2394	0.2443
0.30	0.2804	0.2712	0.2653	0.2308	0.2459	0.2539	0.2595
0.32	0.2978	0.2875	0.2809	0.2424	0.2592	0.2682	0.2744
0.34	0.3152	0.3036	0.2963	0.2537	0.2723	0.2822	0.2891
0.36	0.3324	0.3196	0.3115	0.2647	0.2850	0.2960	0.3036
0.38	0.3495	0.3354	0.3264	0.2754	0.2975	0.3095	0.3178
0.40	0.3664	0.3510	0.3412	0.2857	0.3097	0.3227	0.3318

Table A-6 Relationship Between Nominal and Effective Rates of Interest and Discount

<i>i</i> /effective rate <i>Interest</i>	$i/i^{(2)}$	$i/i^{(4)}$	$i/i^{(12)}$	$i/d^{(2)}$	$i/d^{(4)}$	$i/d^{(12)}$
0.01	1.0025	1.0037	1.0046	1.0075	1.0062	1.0054
0.02	1.0050	1.0075	1.0091	1.0150	1.0125	1.0108
0.03	1.0074	1.0112	1.0137	1.0224	1.0187	1.0162
0.04	1.0099	1.0149	1.0182	1.0299	1.0249	1.0215
0.05	1.0123	1.0816	1.0227	1.0373	1.0311	1.0269
0.06	1.0148	1.0222	1.0272	1.0448	1.0372	1.0322
0.07	1.0172	1.0259	1.0317	1.0522	1.0434	1.0375
0.08	1.0196	1.0295	1.0362	1.0596	1.0495	1.0428
0.09	1.0220	1.0331	1.0406	1.0670	1.0556	1.0481
0.10	1.0244	1.0368	1.0450	1.0744	1.0618	1.0534
0.11	1.0268	1.0404	1.0495	1.0818	1.0679	1.0586
0.12	1.0292	1.0439	1.0539	1.0892	1.0739	1.0639
0.13	1.0315	1.0475	1.0583	1.0965	1.0800	1.0691
0.14	1.0339	1.0511	1.0626	1.1039	1.0861	1.0743
0.15	1.0362	1.0546	1.0670	1.1112	1.0921	1.0795
0.16	1.0385	1.0581	1.0714	1.1185	1.0981	1.0847
0.17	1.0408	1.0617	1.0757	1.1258	1.1042	1.0899
0.18	1.0431	1.0652	1.0800	1.1331	1.1102	1.0950
0.19	1.0454	1.0687	1.0843	1.1404	1.1162	1.1002
0.20	1.0477	1.0722	1.0887	1.1477	1.1222	1.1053
0.21	1.0500	1.0756	1.0929	1.1550	1.1281	1.1104
0.22	1.0523	1.0791	1.0972	1.1623	1.1341	1.1155
0.23	1.0545	1.0825	1.1015	1.1695	1.1400	1.1206
0.24	1.0568	1.0860	1.1057	1.1768	1.1460	1.1257
0.26	1.0612	1.0928	1.1142	1.1912	1.1578	1.1359
0.28	1.0657	1.0996	1.1226	1.2057	1.1696	1.1460
0.30	1.0701	1.1064	1.1310	1.2201	1.1814	1.1560
0.32	1.0745	1.1131	1.1393	1.2345	1.1931	1.1660
0.34	1.0788	1.1197	1.1476	1.2488	1.2047	1.1759
0.36	1.0831	1.1264	1.1559	1.2631	1.2164	1.1859
0.38	1.0874	1.1330	1.1641	1.2774	1.2280	1.1957
0.40	1.0916	1.1395	1.1722	1.2916	1.2395	1.2055