The McGraw-Hill Companies

CFM-MH Professional Series in Finance

Investment Analysis and Portfolio Management

Third Edition

The McGraw·Hill Companies

CFM-MH Professional Series in Finance

Honorary Consulting Editor: Dr. Prasanna Chandra

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To
my readers
for their encouragement
and
to Padma for her support
and
Siddharth and Samarth
for their contribution

Preface

In the last five decades or so, the field of investments has received considerable attention from academic researchers keen on understanding issues like:

- How should risk be measured?
- What is the relationship between risk and return?
- How should financial assets be valued?
- How efficiently do financial markets function?
- What is the importance of asset allocation?
- How can financial derivatives like options and futures be valued?
- What is the role of derivatives in portfolio management?
- How successful are the various strategies followed by investment practitioners?

Scientific research has provided valuable insights into these issues and, even more important, has significantly shaped the practice of investment management. The effect has indeed been very profound and is vividly captured in the title of an exceptionally incisive and thought provoking book, *The Capital Ideas: The Improbable Origins of Wall Street*. In this book Peter Bernstein discusses how the insights provided by academic research have shaped the investment practice on Wall Street. The enthusiastic response to this book and the rapid evolution of investment practice prodded Peter Bernstein, undoubtedly today's foremost financial historian, to write an equally insightful sequel, *Capital Ideas Evolving*. This book tells the story of the remarkable success of a group of institutions who founded their strategies on a set of ideas and principles that emanated in the academic world.

No wonder the pioneers of modern finance and investments like Harry Markowitz, William Sharpe, James Tobin, Merton Miller, Robert Merton, and Myron Scholes went on to become Nobel Laureates in Economics. The ideas that have revolutionised investment management practice on Wall Street and elsewhere have become relevant in other capital markets, including the Indian capital market, which have in turn witnessed major transformation in recent times.

Investment Analysis and Portfolio Management seeks to capture the essence of modern developments in investments. It is an introductory book aimed primarily at two audiences:

- MBA students taking a course on Investments (popularly called Security Analysis and Portfolio Management or SAPM in most Indian universities).
- Investment practitioners like equity researchers, portfolio managers, investment counsellors, and corporate treasurers

Given its introductory nature, I have tried to present the material in an intuitive and non-mathematical manner as far as possible. Only elementary statistics and simple algebra are used. Thanks to its relatively non-technical nature, the book would also appeal to lay investors interested in managing their investments in a rational and systematic manner.

Investment Analysis and Porfolio Management provides a guided tour of the so-called 'complex' world of investments and seeks to improve your skills in managing investments. The book:

- Describes the characteristics of various investment alternatives available to investors.
- Discusses how the securities market functions.
- Explains the techniques used by professionals for analysing and valuing investment alternatives.
- Explores the implications of modern research in the field of investments.
- Explains how financial derivatives, viz. options and futures, are valued.
- Presents a framework for portfolio management.
- Provides insights into the strategies followed by investment wizards of the world.
- Sensitises the reader to the pitfalls in the investment game.
- Offers a set of guidelines for investors with varying inclinations.

Many people consider investing to be a daunting activity. They are bewildered by the profusion and proliferation of investment alternatives, rattled by the fluctuations in financial prices, overwhelmed by the presence of mighty institutional investors, confounded by exotic instruments and complicated investment strategies, confused by the intricacies of the tax system, and exasperated by the financial scams that periodically rock the market.

Notwithstanding these concerns, investing can be a fairly manageable, rewarding, and enjoyable experience, if you adhere to certain principles and guidelines. This book is based on the premise that an intelligent lay investor does not suffer any handicap vis-a-vis sophisticated professionals. As Warren Buffett, perhaps the most successful investor of our times, writes: "*To invest successfully over a lifetime does not require a stratospheric IQ, unusual business insights, or inside information. What's needed is a sound intellectual framework for making a decision and the ability to keep emotions from corroding that framework*."[1] This book seeks to discuss the intellectual framework for decision making. Of course, the necessary emotional discipline must be provided by you.

Changes in the Third Edition

The overwhelming response to the second edition of the book encouraged me to add new material and integrate spreadsheet analysis in the book.

New Material The following new material has been added to enrich the book.

- Two new chapters titled *Investment in Real Assets* (Chapter 20) and *International Investing* (Chapter 24) have been added.

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[1] Benjamin Graham, *The Intelligent Investor*, Revised Edition, New York: Harper Collins Publishers, 2003.

- 14 new sections have been included at different places. 'Buying on Margin and Short Sale,' 'Generally Accepted Accounting Principles,' 'Multifactor Models,' 'Stock Market as a Complex Adaptive System,' 'Free Cash Flow Model,' 'Sum of the Parts Method,' 'Strategy Analysis,' 'Accounting Analysis,' 'Excellent versus Unexcellent Companies,' 'Commodity Futures in India,' 'Tax Aspects of Mutual Funds', 'Benjamin Graham: The Quantitative Navigator', 'Philip Fisher: The Growth Stock Investor,' and 'India's Money Monarchs.'
- A number of boxes capturing valuable insights and important practices have been added.

Spreadsheet Analysis At a number of places spreadsheet analysis has been integrally woven into the book. This will help readers professionally as spreadsheet analysis is used extensively in practice.

Ancillary Materials

To enhance the utility of the book for students and instructors, the following ancillary materials are available.

Spreadsheet Templates Mr. Venugopal Unni developed the spreadsheet templates in Excel. They correlate with various concepts in the text and are meant to help students work through investment problems. These spreadsheet templates may be downloaded from http://highered.mcgraw-hill.com/sites0070656657.

Additional Problems A number of additional problems have been given for students who want to practice more. These may be downloaded from http://highered.mcgraw-hill.com/sites/0070656657.

Solutions Manual and Powerpoint Presentation A solution manual containing solutions to the end of the chapter problems and cases and powerpoint presentations of all chapters are hosted on the website of McGraw-Hill Education, India. This can be accessed by the instructors who adopt the book. They may contact McGraw-Hill Education, India for assistance in accessing the solutions manual and powerpoint.

Organisation of the Book

The book is organised into seven parts as follows.

Part I: Introduction Consisting of Chapters 1 through 3, Part I presents the investment setting. Chapter 1 provides an overview of the field of investments. Chapter 2 describes the features of various investment alternatives. Chapter 3 explains how the securities market functions.

Part II: Basic Concepts and Methods Part II covers basic concepts and methods useful in investments. Chapter 4 introduces the concepts of risk and return. Chapter 5 discusses the methods for analysing the time value of money. Chapter 6 explains the tools of financial statement analysis.

Part III: Modern Portfolio Theory Chapters 7 through 10 present the central ideas of modern investment theory and behavioural finance. Chapter 7 discusses the basic tenets of portfolio theory. Chapter 8 dwells on the equilibrium relationship between risk and return. Chapter 9 explains the efficient market hypothesis. Chapter 10 distills the essence of behavioural finance.

Part IV: Fixed Income Securities Part IV contains two chapters. Chapter 11 discusses bond prices and yields. Chapter 12 explains the basic tools of bond portfolio management.

Part V: Equity Shares Consisting of Chapters 13 through 16, Part V looks at equity shares. Chapter 13 discusses equity valuation models. Chapter 14 presents the basics of macroeconomic and industry analysis. Chapter 15 discusses the tools for fundamental analysis. Finally, Chapter 16 introduces technical analysis.

Part VI: Derivatives Part VI has two chapters that discuss financial derivatives. Chapter 17 explains the methods for valuing options and the strategies for using options. Chapter 18 looks at the valuation and use of futures.

Part VII: Other Investment Options Part VII has two chapters that cover other investment options. Chapter 19 discusses the operations and schemes of mutual funds. Chapter 20 describes and analyses investment in real assets.

Part VIII: Portfolio Management Consisting of Chapters 21 through 24, Part VIII focuses on portfolio management. Chapter 21 presents a framework for portfolio management. Chapter 22 dwells on the basic guidelines for investment decisions. Chapter 23 explains the strategies of the great masters. Chapter 24 discusses various issues in international investing.

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I eagerly look forward to receiving feedback from the readers for improving the book.

PRASANNA CHANDRA

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PART 1

Introduction

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   A Broad Map of the Territory
2. Investment Alternatives
   Choices Galore
3. Securities Market
   The Battlefield

Chapter 1

Overview
A Broad Map of the Territory

LEARNING OBJECTIVES

After studying this chapter you should be able to

- Distinguish the characteristics of an investor from that of a speculator.
- Describe various investment alternatives.
- Compare investment alternatives on key investment attributes.
- Identify different types of financial markets.
- Describe major steps in the portfolio management process.
- Describe the common errors committed by investors.

In its broadest sense, an investment is a sacrifice of current money or other resources for future benefits. Numerous avenues of investment are available today. You can deposit money in a bank account or purchase a long-term government bond or invest in the equity shares of a company or contribute to a provident fund account or buy a stock option or acquire a plot of land or invest in some other form.

The two key aspects of any investment are time and risk. The sacrifice takes place now and is certain. The benefit is expected in the future and tends to be uncertain. In some investments (like government bonds) the time element is the dominant attribute. In other investments (like stock options) the risk element is the dominant attribute. In yet other investments (like equity shares) both time and risk are important.

Almost everyone owns a portfolio of investments. The portfolio is likely to comprise financial assets (bank deposits, bonds, stocks, and so on) and real assets (car, house, and so on). The portfolio may be the result of a series of haphazard decisions or may be the result of deliberate and careful planning.

Your economic well-being in the long run depends significantly on how wisely or foolishly you invest. This book discusses the techniques and principles useful in systematic and rational investment management. It seeks to improve your abilities in the field of investments.

1.1 INVESTMENT VERSUS SPECULATION

While it is difficult to draw the line of distinction between investment and speculation, it is possible to broadly distinguish the characteristics of an investor from those of a speculator as follows:

	Investor	***Speculator***
Planning horizon	An investor has a relatively longer planning horizon. His holding period is usually at least one year.	A speculator has a very short planning horizon. His holding period may be a few days to a few months.
Risk disposition	An investor is normally not willing to assume more than moderate risk. Rarely does he knowingly assume high risk.	A speculator is ordinarily willing to assume high risk.
Return expectation	An investor usually seeks a modest rate of return which is commensurate with the limited risk assumed by him.	A speculator looks for a high rate of return in exchange for the high risk borne by him.
Basis for decisions	An investor attaches greater significance to fundamental factors and attempts a careful evaluation of the prospects of the firm.	A speculator relies more on hearsay, technical charts, and market psychology.
Leverage	Typically an investor uses his own funds and eschews borrowed funds.	A speculator normally resorts to borrowings, which can be very substantial, to supplement his personal resources.

Gambling Gambling is fundamentally different from speculation and investment in the following respects:

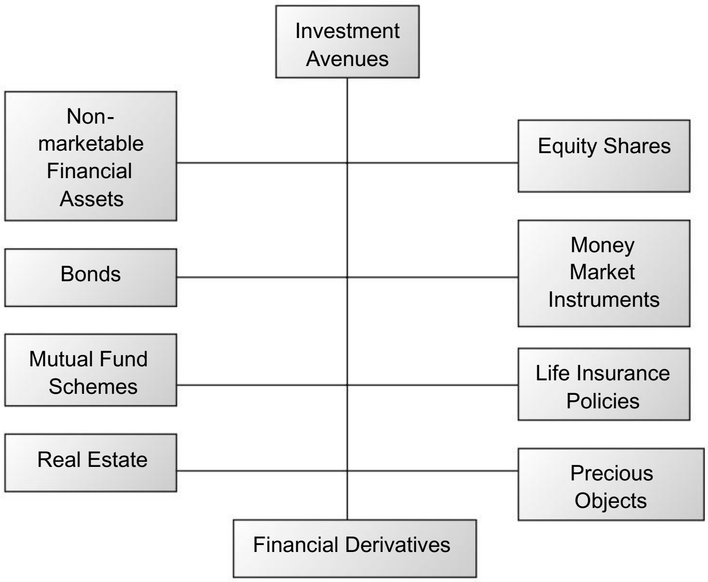
- Compared to investment and speculation, the result of gambling is known more quickly. The outcome of a roll of dice or the turn of a card is known almost immediately.
- Rational people gamble for fun, not for income.
- Gambling does not involve a bet on an economic activity. It is based on risk that is created artificially.
- Gambling creates risk without providing any commensurate economic return.

1.2 INVESTMENT ALTERNATIVES AND THEIR EVALUATION

Investment Alternatives

As an investor you have a wide array of investment avenues available to you. Sacrificing some rigour, they may be classified as shown in Exhibit 1.1

Exhibit 1.1 ***Investment Alternatives***



Non-marketable Financial Assets A good portion of financial assets is represented by non-marketable financial assets. They can be classified into the following broad categories:

- Bank deposits
- Post office deposits
- Company deposits
- Provident fund deposits

Equity Shares Equity shares represent ownership capital. As an equity shareholder, you have an ownership stake in the company. This essentially means that you have a residual interest in income and wealth. Perhaps the most romantic among various investment avenues, equity shares are classified into the following broad categories by stock market analysts:

- Blue chip shares
- Growth shares

- Income shares
- Cyclical shares
- Speculative shares

Traders, Speculators, and Investors

We may classify stock market participants into three broad categories: traders, speculators, and investors. Traders have a very short time horizon. They square off their positions within a day or within a week or within a month—their time horizon rarely exceeds a month. They usually work on margin in the derivatives markets (futures and options markets) and hence their positions are highly leveraged. Most of the traders rely on technical analysis.

Speculators have a time horizon that may extend upto six months. Samuel Nelson, in his classic book, *The ABC of Stock Speculation*, defined speculation as "a venture based on calculation." He distinguishes speculation from gambling by saying that the latter is not based on calculation.

Investors have a longer time horizon, typically spanning at least two years, often much longer. Generally, investors do not resort to margin trading and take fewer risks compared to traders or speculators. Investors, in general, rely on fundamental analysis.

Clearly the formula for investing is different from that used for trading and speculating. As Martin J. Pring put it: "The techniques practiced by traders and speculators are as different from investors' techniques as sprinter's training is different from that of a marathon runner. Both need to be disciplined and fit, but each has a different regimen."[1]

Bonds Bonds or debentures represent long-term debt instruments. The issuer of a bond promises to pay a stipulated stream of cash flow. Bonds may be classified into the following categories:

- Government securities
- Savings bonds
- Government agency securities
- PSU bonds
- Debentures of private sector companies
- Preference shares[2]

Money Market Instruments Debt instruments which have a maturity of less than one year at the time of issue are called money market instruments. The important money market instruments are:

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[1] Martin J. Pring, *Investment Psychology Explained: Classic Strategies to Beat the Markets*, New York: John Wiley & Sons, 1993.

[2] Preference shares are hybrid securities which partake features of bonds and equity shares. For the sake of simplicity, we include them under bonds.

- Treasury bills
- Commercial paper
- Certificates of deposit

Mutual Funds Instead of directly buying equity shares and/or fixed income instruments, you can participate in various schemes floated by mutual funds which, in turn, invest in equity shares and fixed income securities. There are three broad types of mutual fund schemes:

- Equity schemes
- Debt schemes
- Balanced schemes

Life Insurance[3] In a broad sense, life insurance may be viewed as an investment. Insurance premiums represent the sacrifice and the assured sum, the benefit. The important types of insurance policies in India are:

- Endowment assurance policy
- Money back policy
- Whole life policy
- Term assurance policy

Real Estate For the bulk of the investors the most important asset in their portfolio is a residential house. In addition to a residential house, the more affluent investors are likely to be interested in the following types of real estate:

- Agricultural land
- Semi-urban land
- Commercial property
- A resort home
- A second house

Precious Objects Precious objects are items that are generally small in size but highly valuable in monetary terms. The important precious objects are:

- Gold and silver
- Precious stones
- Art objects

Financial Derivatives A financial derivative is an instrument whose value is derived from the value of an underlying asset. It may be viewed as a side bet on the asset. The most important financial derivatives from the point of view of investors are:

- Options
- Futures

[3] Life insurance policies are also non-marketable financial assets. Given their distinctive character we have treated them as a separate category.

Criteria for Evaluation

For evaluating an investment avenue, the following criteria are relevant.

- Rate of return
- Risk
- Marketability
- Tax shelter
- Convenience

Rate of Return The rate of return on an investment for a period (which is usually a period of one year) is defined as follows:

$$\text{Rate of return} = \frac{\text{Annual income} + (\text{Ending price} - \text{Beginning price})}{\text{Beginning Price}}$$

To illustrate, consider the following information about a certain equity share:

- Price at the beginning of the year : Rs.60.00
- Dividend paid toward the end to the year : Rs.2.40
- Price at the end of the year : Rs.66.00

The rate of return on this share is calculated as follows:

$$\frac{2.40 + (66.0 - 60.00)}{60.00} = 0.14 \text{ or } 14 \text{ percent}$$

It is helpful to split the rate of return into two components, viz., current yield and capital gains/losses yield as follows:

$$\underbrace{\frac{\text{Annual income}}{\text{Beginning price}}}_{\text{Current yield}} + \underbrace{\frac{\text{Ending} - \text{Beginning price}}{\text{Beginning price}}}_{\text{Capital gains/losses yield}}$$

The rate of return of 14 percent in the example above may be broken down as follows:

$$\frac{2.40}{60.00} + \frac{(66.00 - 60.00)}{60.00} = \underbrace{4 \text{ percent}}_{\text{Current yield}} + \underbrace{10 \text{ percent}}_{\text{Capital gains yield}}$$

Risk The rate of return from investments like equity shares, real estate, silver, and gold can vary rather widely. The risk of an investment refers to the variability of its rate of return: How much do individual outcomes deviate from the expected value? A simple measure of dispersion is the range of values, which is simply the difference between the highest and the lowest values. Other measures used commonly in finance are as follows:

- Variance : This is the mean of the squares of deviations of individual returns around their average value

- Standard deviation : This is the square root of variance
- Beta : This reflects how volatile is the return from an investment relative to market swings.

Marketability An investment is highly marketable or liquid if: (a) it can be transacted quickly; (b) the transaction cost is low; and (c) the price change between two successive transactions is negligible.

The liquidity of a market may be judged in terms of its depth, breadth, and resilience. *Depth* refers to the existence of buy as well as sell orders around the current market price. *Breadth* implies the presence of such orders in substantial volume. *Resilience* means that new orders emerge in response to price changes. Generally, equity shares of large, well-established companies enjoy high marketability and equity shares of small companies in their formative years have low marketability.

High marketability is a desirable characteristic and low marketability is an undesirable one. Investors value liquidity because it allows them to change their minds. They can correct errors they might have made quickly and cheaply. Further, they can easily modify their investments in line with their changing circumstances and objectives.

However, liquidity can induce sloppiness in investment decisions. Since investors can easily modify their discussions, they may not rigorously develop their investment objectives and policies. Instead of deciding in a carefully thought out manner, they may decide in a cursory fashion. The mere fact that they can 'always change their minds' can lead to a casual approach to investment decisions.

How does one evaluate the 'marketability' of an investment like a provident fund deposit which is non-marketable by its very nature? In such a case, the relevant question to ask is: can withdrawals be made or loans be taken against the deposit? Such an investment may be regarded as highly 'marketable' if any of the following conditions is satisfied: (a) a substantial portion of the accumulated balance can be withdrawn without significant penalty; and (b) a loan (representing a significant portion of the accumulated balance) can be raised at a rate of interest that is only slightly higher than the rate of interest earned on the investment itself.

Tax Shelter Some investments provide tax benefits; others do not. Tax benefits are of the following three kinds.

Initial Tax Benefit An initial tax benefit refers to the tax relief enjoyed at the time of making the investment. For example, when you make a deposit in a Public Provident Fund Account, you get a tax rebate under Section 80 C of the Income Tax Act.

Continuing Tax Benefit A continuing tax benefit represents the tax shield associated with the periodic returns from the investment. For example, dividend income and income from certain other sources are tax-exempt, up to a certain limit, in the hands of the recipient.

Terminal Tax Benefit A terminal tax benefit refers to relief from taxation when an investment is realised or liquidated. For example, a withdrawal from a Public Provident Fund Account is not subject to tax.

Convenience Convenience broadly refers to the ease with which the investment can be made and looked after. Put differently, the questions that we ask to judge convenience are:

(a) can the investment be made readily? and
(b) can the investment be looked after easily?

The degree of convenience associated with investments varies widely. At one end of the spectrum is the deposit in a savings bank account that can be made readily and that does not require any maintenance effort. At the other end of the spectrum is the purchase of a property that may involve a lot of procedural and legal hassles at the time of acquisition and a great deal of maintenance effort subsequently.

How Do the Various Alternatives Compare?

How do various investment avenues like equity shares, fixed income securities, deposits, real assets, and so on compare? A summary evaluation of these investment avenues in terms of key investment attributes is given in Exhibit 1.2. It must be emphasised that within each investment category individual assets may display some variations.

1.3 FINANCIAL MARKETS

A financial market is a market for creation and exchange of financial assets. If you buy or sell financial assets, you will participate in financial markets in some way or the other.

Functions of Financial Markets Fnancial markets play a pivotal role in allocating resources in an economy by performing three important functions:

1. Financial markets *facilitate price discovery*. The continual interaction among numerous buyers and sellers who throng financial markets helps in establishing the prices of financial assets. Well-organised financial markets seem to be remarkably efficient in price discovery. That is why financial economists say: "If you want to know what the value of a financial asset is, simply look at its price in the financial market".
2. Financial markets *provide liquidity* to financial assets. Investors can readily sell their financial assets through the mechanism of financial markets. In the absence of financial markets which provide such liquidity, the motivation of investors to hold financial assets will be considerably diminished. Thanks to negotiability and transferability of securities through the financail markets, it is possible for companies (and other entities) to raise long-term funds from investors with short- term and medium-term horizons. While one investor is substituted by another when a security is transacted, the company is assured of long-term availability of funds.

Exhibit 1.2 ***Summary Evaluation of Various Investment Avenues***

	Return		Risk	Marketability/ Liquidity	Tax shelter	Convenience
	Current yield	Capital appreciation				
Equity Shares	Low	High	High	Fairly high	High	High
Non-convertible Debentures	High	Negligible	Low	Average	Nil	High
Equity Schemes	Low	High	High	High	High	Very high
Debt Schemes	Moderate	Low	Low	High	No tax on dividends	Very high
Bank Deposits	Moderate	Nil	Negligible	High	Low	Very high
Public Provident Fund	Nil	Moderate	Nil	Average	Section 80 C benefit	Very high
Life Insurance Policies	Nil	Moderate	Nil	Average	Section 80 C benefit	Very High
Residential House	Moderate	Moderate	Negligible	Low	High	Fair
Gold and Silver	Nil	Moderate	Average	High	Nil	Average

3. Financial markets considerably *reduce the cost of transacting*. The two major costs associated with transacting are search costs and information costs. *Search costs* comprise explicit costs such as the expenses incurred on advertising when one wants to buy or sell an asset and implicit costs such as the effort and time one has to put in to locate a customer. *Information costs* refer to costs incurred in evaluating the investment merits of financial assets.

Classification of Financial Markets There are different ways of classifying financial markets. One way is to classify financial markets by the type of financial claim. The **debt market** is the financial market for fixed claims (debt instruments) and the **equity market** is the financial market for residual claims (equity instruments).

A second way is to classify financial markets by the maturity of claims. The market for short-term financial claims is referred to as the **money market** and the market for long-term financial claims is called the **capital market**. Traditionally, the cut off between short-term and long-term financial claims has been one year - though this dividing line is arbitrary, it is widely accepted. Since short-term financial claims are almost invariably debt claims, the money market is the market for short-term debt instsruments. The capital market is the market for long-term debt instruments and equity instruments.

A third way to classify financial markets is based on whether the claims represent new issues or outstanding issues. The market where issuers sell new claims is referred to as the **primary market** and the market where investors trade outstanding securities is called the **secondary market**.

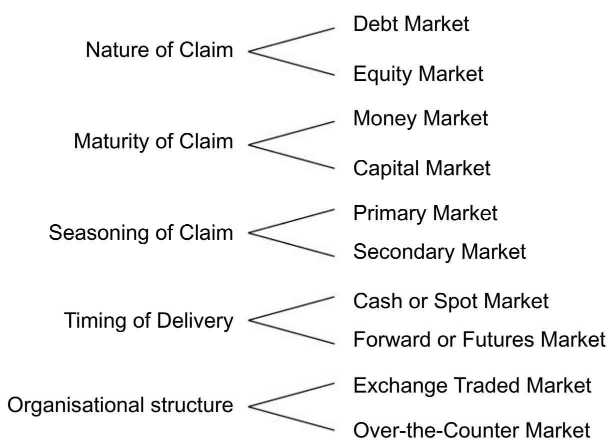
A fourth way to classify financial markets is by the timing of delivery. A cash or **spot market** is one where the delivery occurs immediately and a forward or **futures market** is one where the delivery occurs at a pre-determined time in future.

A fifth way to classify financial markets is by the nature of its organisational structure. An **exchange-traded market** is characterised by a centralised organisation with standardised procedures. An **over-the-counter market** is a decentralised market with customised procedures. Exhibit 1.3 presents a summary of the classification of financial markets.

Globalisation of Financial Markets There is a trend toward integration of financial markets throughout the world into a global or international financial market. Thanks to globalisation of financial markets, issuers and investors in any country need not confine themselves to their domestic financial markets. For example, Indian companies can raise money by issuing equity and debt in international markets; likewise Indian investors can invest in outside markets. Of course, such participation is regulated and limited in some ways.

Globalisation of financial markets is driven by three forces, in the main: (a) deregulation or liberalisation of financial markets in different parts of the world, (b) technological advances in computing, communication, and market structures, and (c) growing institutionalisation of financial markets. Indeed, these factors are interrelated.

Exhibit 1.3 ***Classification of Financial Markets***



Competitive Character of Financial Markets Financial markets are characterised by a high degree of competition. Thousands of intelligent, knowledgeable, and determined analysts constantly hunt for the best buys. Given such intense competition, it would be difficult to find "free lunches" or obvious bargains. The no-free-lunch proposition has two important implications.

- There is a trade-off between risk and return. If you want to earn higher expected return, you will have to bear higher investment risk.
- Financial markets assimilate all relevant information about securities fairly quickly and efficiently. As a result, securities are generally priced fairly.

1.4 PORTFOLIO MANAGEMENT PROCESS

Investment management (or portfolio management) is a complex activity which may be broken down into the following steps:

1. **Specification of Investment Objectives and Constraints** The typical objectives sought by investors are current income, capital appreciation, and safety of principal. The relative importance of these objectives should be specified. Further, the constraints arising from liquidity, time horizon, tax, and special circumstances must be identified.
2. **Choice of the Asset Mix** The most important decision in portfolio management is the asset mix decision. Very broadly, this is concerned with the proportions of 'stocks' (equity shares and units/shares of equity-oriented mutual funds) and 'bonds' (fixed income investment vehicles in general) in the portfolio. The appropriate 'stock-bond' mix depends mainly on the risk tolerance and investment horizon of the investor.
3. **Formulation of Portfolio Strategy** Once a certain asset mix is chosen, an appropriate portfolio strategy has to be hammered out. Two broad choices are available: an active portfolio strategy or a passive portfolio strategy. An active portfolio strategy strives to earn superior risk-adjusted returns by resorting to market timing, or sector rotation, or security selection, or some combination of these. A passive portfolio strategy, on the other hand, involves holding a broadly diversified portfolio and maintaining a pre-determined level of risk exposure.
4. **Selection of Securities** Generally, investors pursue an active stance with respect to security selection. For stock selection, investors commonly go by fundamental analysis and/or technical analysis. The factors that are considered in selecting bonds (or fixed income instruments) are yield to maturity, credit rating, term to maturity, tax shelter, and liquidity.
5. **Portfolio Execution** This is the phase of portfolio management which is concerned with implementing the portfolio plan by buying and/ or selling specified securities in given amounts. Though often glossed over in portfolio management discussions, this is an important practical step that has a bearing on investment results.

6. **Portfolio Revision** The value of a portfolio as well as its composition—the relative proportions of stock and bond components—may change as prices of stocks and bonds fluctuate. Of course, the fluctuation in stock prices is often the dominant factor underlying this change. In response to such changes, periodic rebalancing of the portfolio is required. This primarily involves a shift from stocks to bonds or vice versa. In addition, it may call for sector rotation as well as security switches.
7. **Performance Evaluation** The performance of a portfolio should be evaluated periodically. The key dimensions of portfolio performance evaluation are risk and return and the key issue is whether the portfolio return is commensurate with its risk exposure. Such a review may provide useful feedback to improve the quality of the portfolio management process on a continuing basis.

1.5 APPROACHES TO INVESTMENT DECISION MAKING

The stock market is thronged by investors pursuing diverse investment approaches, which may be subsumed under four broad approaches:

- Fundamental approach
- Psychological approach
- Academic approach
- Eclectic approach

Fundamental Approach The basic tenets of the fundamental approach, which is perhaps most commonly advocated by investment professionals, are as follows :

- There is an intrinsic value of a security and this depends upon underlying economic (fundamental) factors. The intrinsic value can be established by a penetrating analysis of the fundamental factors relating to the company, industry, and economy.
- At any given point of time, there are some securities for which the prevailing market price will differ from the intrinsic value. Sooner or later, of course, the market price will fall in line with the intrinsic value.
- Superior returns can be earned by buying under-valued securities (securities whose intrinsic values exceed the market prices) and selling over-valued securities (securities whose intrinsic values are less than the market prices).

Psychological Approach The psychological approach is based on the premise that stock prices are guided by emotion, rather than reason. Stock prices are believed to be influenced by the psychological mood of the investors. When greed and euphoria sweep the market, prices rise to dizzy heights. On the other hand, when fear and despair envelop the market, prices fall to abysmally low levels. J.M. Keynes described this phenomenon in eloquent terms: "A conventional valuation which is established as the outcome of the mass psychology of a large number of ignorant individuals is liable to change violently as the result of a sudden fluctuation of opinion due to factors which do not really make much difference to the prospective yield."[4]

Since psychic values appear to be more important than intrinsic values, the psychological approach suggests that it is more profitable to analyse how investors tend to behave as the market is swept by waves of optimism and pessimism which seem to alternate. The psychological approach has been described vividly as the 'castles-in-the-air' theory by Burton G.Malkiel.

Those who subscribe to the psychological approach or the 'castles-in-the-air' theory generally use some form of technical analysis which is concerned with a study of internal market data, with a view to developing trading rules aimed at profit-making. The basic premise of technical analysis is that there are certain persistent and recurring patterns of price movements which can be discerned by analysing market data. Technical analysts use a variety of tools like bar chart, point and figure chart, moving average analysis, breadth of market analysis, and so on.

Academic Approach Over the last five decades or so, the academic community has studied various aspects of the capital market, particularly in the advanced countries, with the help of fairly sophisticated methods of investigation. While there are many unresolved issues and controversies stemming from studies pointing in different directions, there appears to be substantial support for the following tenets.

- Stock markets are reasonably efficient in reacting quickly and rationally to the flow of information. Hence, stock prices reflect intrinsic values fairly well. Put differently

$$\text{Market price} \simeq \text{Intrinsic value}$$

- Stock price behaviour corresponds to a random walk. This means that successive price changes are independent. As a result, past price behaviour cannot be used to predict future price behaviour.
- In the capital market, there is a positive relationship between risk and return. More specifically, the expected return from a security is linearly related to its systematic risk (also referred to as its market risk or non-diversifiable risk).

Eclectic Approach The eclectic approach draws on all the three different approaches discussed above. The basic premises of the eclectic approach are as follows:

- Fundamental analysis is helpful in establishing basic standards and benchmarks. However, since there are uncertainties associated with fundamental analysis, exclusive reliance on fundamental analysis should be avoided. Equally important, excessive refinement and complexity in fundamental analysis must be viewed with caution.
- Technical analysis is useful in broadly gauging the prevailing mood of investors and the relative strengths of supply and demand forces. However, since the

[4] J.M. Keynes, *The General Theory of Employment, Interest and Money*, New York: Harcourt Brace & World, 1936.

mood of investors can vary unpredictably excessive reliance on technical indicators can be hazardous. More important, complicated technical systems should ordinarily be regarded as suspect because they often represent figments of imagination rather than tools of proven usefulness.

- The market is neither as well-ordered as the academic approach suggests, nor as speculative as the psychological approach indicates. While it is characterised by some inefficiencies and imperfections, it seems to react reasonably efficiently and rationally to the flow of information. Likewise, despite many instances of mispriced securities, there appears to be a fairly strong correlation between risk and return.

The operational implications of the eclectic approach are as follows:

- Conduct fundamental analysis to establish certain value 'anchors'.
- Do technical analysis to assess the state of the market psychology.
- Combine fundamental and technical analyses to determine which securities are worth buying, worth holding, and worth disposing off.
- Respect market prices and do not show excessive zeal in 'beating the market'.
- Accept the fact that the search for a higher level of return often necessitates the assumption of a higher level of risk.

1.6 COMMON ERRORS IN INVESTMENT MANAGEMENT

Investors appear to be prone to the following errors in managing their investments.

- Inadequate comprehension of return and risk
- Vaguely formulated investment policy
- Naïve extrapolation of the past
- Cursory decision making
- Untimely entries and exits
- High costs
- Over-diversification and under-diversification
- Wrong attitude toward losses and profits

Inadequate Comprehension of Return and Risk What returns can one expect from different investments? What are the risks associated with these investments? Answers to these questions are crucial before you invest. Yet investors often have nebulous ideas about risk and return. Many investors have unrealistic and exaggerated expectations from investments, in particular from equity shares and convertible debentures. One often comes across investors who say that they hope to earn a return of 25 to 30 percent per year with virtually no risk exposure or even double their investment in a year or so. They have apparently been misled by one or more of the following: (a) tall and unjustified claims made by people with vested interests; (b) exceptional performance of some portfolio they have seen or managed, which may be attributable mostly to fortuitous factors; and (c) promises made by tipsters, operators, and others. In most of the cases, such expectations reflect investor naivete and gullibility.

By setting unrealistic goals, investors may do precisely the things that give poor results. They may churn their portfolios too frequently; they may buy dubious 'stories' from Dalal Street; they may pay huge premiums for speculative, fashionable stocks; they may discard sound companies because of temporary stagnation in earnings; they may try to outguess short-term market swings.

Vaguely Formulated Investment Policy Often investors do not clearly spell out their risk disposition and investment policy. This tends to create confusion and impairs the quality of investment decisions. Ironically, conservative investors turn aggressive when the bull market is near its peak in the hope of reaping a bonanza; likewise, in the wake of sharp losses inflicted by a bear market, aggressive investors turn unduly cautious and overlook opportunities before them. Ragnar D. Naess put it this way: "The fear of losing capital when prices are low and declining, and the greed for more capital gains when prices are rising, are probably, more than any other factors, responsible for poor performance."[5] If you know what your risk attitude is and why you are investing, you will learn how to invest well. A well articulated investment policy, adhered to consistently over a period of time, saves a great deal of disappointment.

Naive Extrapolation of Past Investors generally believe in a simple extrapolation of past trends and events and do not effectively incorporate changes into expectations. People generally adhere to the course they are currently following, unmindful of the countervailing forces.

The apparent comfort provided by extrapolating too far, however, is dangerous. As Peter Berntsein says: "Momentum causes things to run further and longer than we anticipate. The very familiarity of a force in motion reduces our ability to see when it is losing its momentum. Indeed, that is why extrapolating the present into the future so frequently turns out to be the genesis of an embarrassing forecast."[6]

Cursory Decision Making Investment decision making is characterised by a great deal of cursoriness. Investors tend to:

- Base their decisions on tips and fads, rather than on thoughtful, quantified assessment of business.
- Cavalierly brush aside various kinds of investment risk (market risk, business risk, and interest rate risk) as greed overpowers them.
- Uncritically follow others because of the temptation to ride the bandwagon or lack of confidence in their own judgment.

Untimely Entries and Exit Investors tend to follow an irrational start-and-stop approach to the market characterised by untimely entries (after a market advance has long been underway) and exits (after a long period of stagnation and decline).

High Costs Investors trade excessively and spend a lot on investment management. A good proportion of investors indulge in day trading in the hope of making quick

[5] Ragnar D. Naess, "The Enigma of Investment Management," *Readings in Financial Management*, Homewood, Illinois, 1963.

[6] Peter Bernstein, "Forecasts Will Be Wrong," *New York Times*, October 21,1973.

profits. However, more often than not the transaction costs wipe out whatever profits they may generate from frequent trading.

Over-Diversification and Under-Diversification A number of individual portfolios are either over-diversified or under-diversified. Many individuals have portfolios consisting of thirty to sixty, or even more, different stocks. Managing such portfolios is an unwieldy task.

Perhaps as common as over-diversification is under-diversification. Many individuals do not apparently understand the principle of diversification and its benefit in terms of risk reduction. A number of individual portfolios seem to be highly under-diversified, carrying an avoidable risk exposure.

Wrong Attitude Towards Losses and Profits Typically, an investor has an aversion to admit his mistake and cut losses short. If the price falls, contrary to his expectation at the time of purchase, he somehow hopes that it will rebound and he can break even (he may even buy some more shares at the lower price in a bid to reduce his average price). Surprisingly, such a belief persists even when the prospects look dismal and there may be a greater possibility of a further decline. This perhaps arises out of a disinclination to admit mistakes. The pain of regret accompanying the realisation of losses is sought to be postponed. And if the price recovers due to favourable conditions, there is a tendency to dispose of the share when its price more or less equals the original purchase price, even though there may be a fair chance of further increases. The psychological relief experienced by an investor from recovering losses seems to motivate such behaviour. Put differently, the tendency is to let the losses run and cut profits short, rather than to cut the losses short and let the profits run.

1.7 QUALITIES FOR SUCCESSFUL INVESTING

The game of investment, as any other game, requires certain qualities and virtues on the part of the investors, to be successful in the long run. What are these qualities? While the lists prescribed by various commentators tend to vary, the following qualities are found in most of the lists.

- Contrary thinking
- Patience
- Composure
- Flexibility and openness
- Decisiveness

Before we dwell on these qualities, one point needs to be emphasised. Cultivating these qualities distinctly improves the odds of superior performance but does not guarantee it.

Traits of the Great Masters

In a fascinating book, John Train studied the strategies employed by nine great masters. Based on his analysis, he prepared a list of traits common among them:

1. He is realistic
2. He is intelligent to the point of genius
3. He is utterly dedicated to his craft
4. He is disciplined and patient
5. He is a loner

Source: John Train, *The Money Masters,* New York: Harper & Row Publishers, Inc., 1981.

Contrary Thinking Investors tend to have a herd mentality and follow the crowd. Two factors explain this behaviour. First, there is a natural desire on the part of human beings to be part of a group. Second, in a complex field like investment, most people do not have enough confidence in their own judgment. This impels them to substitute others' opinion for their own.

Following the crowd behaviour, however, often produces poor investment results. Why? If everyone fancies a certain share, it soon becomes overpriced. Thanks to bandwagon psychology, it is likely to remain bullish for a period longer than what is rationally justifiable. However, this cannot persist indefinitely because sooner or later the market corrects itself. And when that happens the market price falls, sometimes very abruptly and sharply causing widespread losses.

Given the risk of imitating others and joining the crowd, you must cultivate the habit of contrary thinking. This may be difficult to do because it is so tempting and convenient to fall in line with others. Perhaps the best way to resist such a tendency is to recognise that investment requires a different mode of thinking than what is appropriate to everyday living. As James Gipson said: "Being a joiner is fine when it comes to team sports, fashionable clothes, and trendy restaurants. When it comes to investing, however, the investor must remain aloof and suppress social tendencies. When it comes to making money and keeping it, the majority is always wrong."[7]

The suggestion to cultivate 'contrary thinking' should not, of course, be literally interpreted to mean that you should always go against the prevailing market sentiment. If you do so, you will miss many opportunities presented by the market swings. A more sensible interpretation of the contrarian philosophy is this: go with the market during incipient and intermediate phases of bullishness and bearishness but go against the market when it moves towards the extremes.

[7] James Gipson, *Winning the Investment Game*, New York: McGraw-Hill Book Company, 1986.

Here are some suggestions to cultivate the contrary approach to investment:

- Avoid stocks which have a high price-earnings ratio. A high relative price-earnings ratio reflects that the stock is very popular with investors.
- Recognise that in the world of investment, many people have the temptation to play the wrong game.
- Sell to the optimists and buy from the pessimists. While the former hope that the future will be marvellous, the latter fear that it will be awful. Reality often lies somewhere in between. So it is a good investment policy to bet against the two extremes.

More specifically, remember the following rules which are helpful in implementing the contrary approach:

- Discipline your buying and selling by specifying the target prices at which you will buy and sell. Don't try overzealously to buy when the market is at its nadir or sell when the market is at its peak (these can often be known only with the wisdom of hindsight). Remember the advice of Baron Rothschild when he said that he would leave the 20 percent gains at the top as well as at the bottom for others as his interest was only on the 60 percent profit in the middle.
- Never look back after a sale or purchase to ask whether you should have waited. It is pointless to wonder whether you could have bought a share for Rs.10 less or sold it for Rs.20 more. What is important is that you buy at a price which will ensure profit and sell at a price where you realise your expected profit.

Counterintuitive Trading

Successful investors usually trade in a counterintuitive manner: they increase turnover when they are doing well, but patiently endure disappointments. This behaviour is at variance with human nature and the culture of most investment committees. If investments have fared well, it is human nature to complacently adhere to the strategy that has served well. Yet, investments that have performed well in the recent past, may no longer be attractively priced to generate good returns. Conversely, if investments have performed badly, human instincts prompt us to fix the problem by changing the portfolio. Yet, the portfolio may now be attractively priced to generate better returns.

Patience As a virtue, patience is strangely distributed among investors. Young investors, with all the time in the world to reap the benefits of patient and diligent investing, seem to be the most impatient. They look for instantaneous results and often check prices on a daily basis. Old investors, on the other hand, display a high degree of patience even though they have little chance of enjoying the fruits of patience.

Whatever may be the temperamental basis for the young to be impatient, in the field of investment there are compelling reasons for cultivating patience. The game of investment requires patience and diligence. In the short run, the factor of luck may be important because of randomness in stock price behaviour, which may be likened to the Brownian motion in physics. In the long run, however, investor performance depends mainly on patience and diligence, because the random movements tend to even out.

Composure Rudyard Kipling believed that an important virtue for becoming a mature adult is to keep your head when all around you are losing theirs. The ability to maintain composure is also a virtue required to be a successful investor. Conscious of this, as an investor you should try to (a) understand your own impulses and instincts towards greed and fear; (b) surmount these emotions that can warp your judgment; and (c) capitalise on the greed and fear of other investors.

While the above advice sounds simple, it is difficult to practice. Greed and fear are far more powerful forces than reason in influencing investment decisions. Rarely do you come across an investor who is immune to these emotions that are so pervasive in the market place. Greed and fear tend to be insidiously contagious. In your attempt to overcome them, you may find the following suggestions helpful.

- Maintain a certain distance from the market place. Your vulnerability to the contagious influences of greed and fear diminishes, if your contact with others caught in the whirlpool of market psychology decreases.
- Rely more on hard numbers and less on judgment (which is more prone to be influenced by the emotions of greed and fear). This is the advice given by Benjamin Graham, widely regarded as the father of security analysis.

Flexibility and Openness Nothing is more certain than change in the world of investments. Macroeconomic conditions change, new technologies and industries emerge, consumer tastes and preferences shift, investment habits alter, and so on. All these developments have a bearing on industry and company prospects on the one hand and investor expectations on the other.

Despite the inexorability of change, most of us adjust to it poorly. We often base our expectations assuming that the status quo will continue. As J.M. Keynes said: "The facts of the existing situation enter, in a sense disproportionately into the formation of our long-term expectations; our usual practice being to take the existing situation and project it into a future modified only to the extent that we have more or less definite reasons for expecting a change."[8]

We tend to compound the problem further by being over-protective of our judgment, mainly due to psychological reasons. This leads to a failure to absorb and interpret new formation with an open mind. This inability to consider new evidence blinds us to the flaws in our operating premises. As Arthur Zeikel said: "We tend to develop a 'defensive' interpretation of new developments, and this cripples our capacity to make good judgments about the future."[9]

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[8] J.M. Keynes, *The General Theory of Employment, Interest, and Money*, New York: Harcourt, Brace & Co, 1935.

[9] Arthur Zeikel, "On the Threat of Change", *Financial Analysts Journal*, vol.31 No.6, Nov-Dec. 1975.

Since an open mind, not blocked by prejudices and biases, is crucial for success in investing, conscious and deliberate efforts should be made to re-examine old premises, assimilate new information, and cultivate mental flexibility. Barton M. Briggs put it this way: "Flexibility of thinking and willingness to change is required for the successful investor. In the stock market, in investing, there is nothing permanent except change. The investment manager should try to cultivate a mix of healthy skepticism, open-mindedness, and willingness to listen."[10]

Decisiveness An investor often has to act in face of imperfect information and ambiguous signals. Investment decisions generally call for reaching conclusions on the basis of inadequate premises. To succeed in the investment game, the investor should be decisive. If he procrastinates, he may miss valuable opportunities; if he dillydallies, he may have to forego gains.

Decisiveness does not mean rashness. Rather, it refers to an ability to quickly weigh and balance a variety of factors (some well understood and some not-so-well understood), form a basic judgment, and act promptly. It reflects the ability to take decisions, after doing the necessary homework of course, without being overwhelmed by uncertainties characterising the investment situation. The most successful investors tend to be those who are willing to make bold positions consistent with their convictions. Vacillation and half-hearted commitments often produce lacklustre investment results.

1.8 PROVERBIAL INVESTMENT WISDOM

- The market is a discounting mechanism.
- A cynic knows the price of everything and the value of nothing.
- Money management is 10 percent inspiration and 90 percent perspiration.
- To err is human, to hedge divine.
- No stock is inherently good or bad, it is the price that makes it so.
- No price is too high for a bull or too low for a bear.
- Everytime a trade is made, somebody is wrong.
- Ride the winners and sell the losers.
- Buy on the rumour, sell on the news.
- You never understand a stock unless you are long (or short).
- Be long-term but watch the ticks.
- Never throw good money after the bad.
- To achieve superior performance, you have to be different from the majority.
- Two things cause a stock to move—the expected and the unexpected.

[10] Barton M. Biggs, "Investment Strategy, "*Morgan Stanley & Co. Letterhead*, New York, January 25, 1977.

- No tree grows to the sky.
- A pie doesn't grow through its slicing.
- Never confuse brilliance with a bull market.
- Successful money managers have brains, nerve, and luck.
- All generalisations are false, including this one.
- The market makes mountains out of molehills.
- Investigate, then invest.
- The memory of people in the stock market is proverbially short.
- Open-mindedness and independent thinking will pay big dividends in the stock market.
- The French say that it is only a step from the sublime to the ridiculous. So, too, it seems only a step from common stock investment to common stock speculation.
- The market is a pendulum that swings back and forth through the median line of rationality.
- The only way to beat the market is to discover and exploit other investors' mistakes.
- No money manager can perform successfully in all kinds of market. There is no man, for all seasons.
- Better is one forethought than two after.
- The greatest of all gifts is the power to estimate things at their true worth.
- Shallow men believe in luck, wise and strong men in cause and effect.
- An economist's guess is likely to be as good as anyone else's.
- I don't know what the seven wonders of the world are, but I know the eighth—compound interest.
- In the stock market, a good nervous system is more important than a good head.
- Time is the friend of stocks; the enemy of bonds.
- Portfolio diversification makes up for investor ignorance.
- Bulls make money. Bears make money. Pigs get slaughtered.
- There are two times in a man's life when he shouldn't speculate. When he can't afford it and when he can: Mark Twain.
- Men, it has been well said, think in herds; it will be seen that they go mad in herds while they only recover their senses slowly and one by one: Charles Mackay.
- October. This is one of the peculiarly dangerous months to speculate in stocks. The others are July, January, September, April, November, May, March, June, December, August and February: Mark Twain.
- It requires a great deal of boldness and a great deal of caution to make a great fortune.

SUMMARY

- The two key aspects of any investment are **time** and **risk.**
- As an investor you have a wide range of **investment avenues** available to you.
- For evaluating an investment avenue, the following attributes are relevant: rate of return, risk, marketability, tax shelter, and convenience.
- Financial markets facilitate **price discovery,** provide **liquidity**, and reduce the **cost of transacting.**
- Financial markets can be classified by the nature of claim (**debt market** versus **equity market),** maturity of claim (**money market** versus **capital market),** seasoning of claim (**primary market** versus **secondary market**)**,** timing of delivery (**spot market** versus **forward market),** and organisational structure (**exchange-traded market** versus **over-the-counter market**).
- Portfolio management may be broken down into the following steps: (i) specification of investment objectives and constraints, (ii) choice of asset mix, (iii) formulation of portfolio strategy, (iv) selection of securities, (v) portfolio execution, (vi) portfolio revision.
- Investors pursue four broad approaches: fundamental approach, psychological approach, academic approach, and eclectic approach.
- Investors are prone to various errors in managing their investments.
- Contrary thinking, patience, composure, flexibility, and decisiveness are important qualities to succeed in the game of investing.

QUESTIONS

1. Describe briefly the wide array of investment avenues.
2. Discuss the attributes that one should consider while evaluating an investment.
3. How do the following investments compare in terms of return, risk, marketability, tax shelter, and convenience: equity shares, bank deposits, public provident fund, residential house, and gold.
4. What are the key differences between an investor and a speculator?
5. Briefly describe the functions of financial markets.
6. Present a summary classification of financial markets.
7. Discuss briefly the key steps involved in the portfolio management process.
8. Describe briefly the following approaches to investment decision making: fundamental approach, and eclectic approach.
9. Discuss the common errors in investment management.
10. What qualities are required for successful investing?

APPENDIX 1A
THREE APPROACHES TO SUCCEED AS AN INVESTOR

It appears that there are three different ways of earning superior risk-adjusted returns on the stock market. The first is physically difficult, the second is intellectually difficult, and the third is psychologically difficult.

Physically Difficult Approach Many investors seem to follow this approach, wittingly or unwittingly. They look at newspapers and financial periodicals to learn about new issues, they visit the offices of brokers to get advice and application forms, and they regularly apply in the primary market. They follow the budget announcements intently, they read CMIE reports to learn about the developments in the economy and various industrial sectors, they read the columns in technical analysis, and they attend seminars and conferences. In a nutshell, they apply themselves assiduously, diligently, and even doggedly. They operate on the premise that if they can be a step ahead of others, they will outperform the market.

The physically difficult approach seems to have worked reasonably well for most of the investors in India since the late 1970s to the late 2000s, for three principal reasons:

1. Typically, issues in the primary market have been priced very attractively.
2. The secondary market, thanks to limited competition till almost 1991, was characterised by numerous inefficiencies that provided rewarding opportunities to the diligent investor.
3. An advancing price-earning multiple, in general, bailed out even inept investors.

Things, however, have changed from late 2000s. The opportunities for subscribing to issues in the primary market have substantially dried up as companies, quite understandably, are placing securities with institutional investors at prices that are fairly close to the prevailing market prices. Likewise, the scope for earning superior returns in the secondary market has diminished as the degree of competition and efficiency is increasing, thanks to emergence of hundreds of new institutional players (mutual funds, foreign institutional investors, merchant banking organisations, corporate bodies) and millions of new individual investors. Finally, the prospects of a fluctuating price-earnings multiple seem to be greater than the prospects of a rise in the price-earnings multiple.

Intellectually Difficult Approach The intellectually difficult approach to successful investing calls for developing a profound understanding of the nature of investments and hammering out a strategy based on superior insights. This approach has been followed mainly by the highly talented investors who have an exceptional ability, a rare perceptiveness, an unusual skill, or a touch of clairvoyance. Such a gift has been displayed by investors like Benjamin Graham, John Maynard Keynes, John Templeton, George Soros, Warren Buffett, Phil Fisher, Peter Lynch, and others.

Benjamin Graham, widely acclaimed as the father of modern security analysis, was an exceptionally gifted quantitative navigator who relied on hard financial facts and religiously applied the 'margin of safety' principle. John Maynard Keynes, arguably the most influential economist of the 20th Century, achieved considerable investment success on the basis of his sharp insights into market psychology. John Templeton had an unusual feel for bargain stocks and achieved remarkable success with the help of bargain stock investing. Warren Buffett, the most successful stock market investor of our times, is the quintessential long term value investor. George Soros, a phenomenally successful speculator, developed and applied a special insight which he labels as the 'reflexivity' principle. Phil Fisher, a prominent growth stock advocate, displayed a rare ability with regard to investing in growth stocks. Peter Lynch, perhaps the most widely read investment guru in recent years, has performed exceptionally well, thanks to a rare degree of openness and flexibility in his approach.

The intellectually difficult approach calls for a special talent that is diligently honed and nurtured over time. Obviously, it can be practised only by a select few and you should have the objectivity to discern whether you can join this elite club. Remember that many investors unrealistically believe that they have a rare gift because the stock market provides an exceptionally fertile environment for self-deception. Participants in this market can easily live in a world of make believe by accepting confirming evidence and rejecting contradictory evidence. As David Dreman says: "Under conditions of anxiety and uncertainty, with a vast interacting information grid, the market can become a giant Rorschach test, allowing the investor to see any pattern he wishes … experts cannot only analyse information incorrectly, they can also find relationships that aren't there—a phenomenon called illusory correlation."[1]

Psychologically Difficult Approach The stock market is periodically swayed by two basic human emotions, viz. greed and fear. When greed and euphoria sweep the market, prices rise to dizzy heights. On the other hand, when fear and despair envelop the market, prices fall to abysmally low levels. If you can surmount these emotions which can warp your judgment, create distortions in your thinking, and induce you to commit follies, you are likely to achieve superior investment results.

The psychologically difficult approach essentially calls for finding ways and means of substantially overcoming fear and greed. Its operational guidelines are as follows:

- Develop an investment policy and adhere to it consistently
- Do not try to forecast stock prices
- Rely more on hard numbers and less on judgment
- Maintain a certain distance from the marketplace
- Face uncertainty with equanimity

These guidelines look simple, but they are psychologically difficult to follow. Yet, for the bulk of the investors this appears to be the only sensible approach to improve the odds of their investment performance. You have to assiduously and consciously cultivate certain qualities, discussed in the preceding chapter, to follow this approach.

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[1] David Dreman, *Contrarian Investment Strategy: The Paradox of Stock Market Success*, Random House Inc., 1979.

Chapter **2**

Investment Alternatives

Choices Galore

LEARNING OBJECTIVES

After studying this chapter you should be able to

- Describe the features of financial assets, both marketable and non-marketable.
- Determine the suitability of mutual funds for your needs.
- Understand the key considerations that need to be borne in mind before buying a life insurance policy.
- Know the pros and cons of investing in real assets.

A bewildering range of investment alternatives is available. They fall into two broad categories, viz., financial assets and real assets. **Financial assets** are paper (or electronic) claims on some issuer such as the government or a corporate body. The important financial assets are equity shares, corporate debentures, government securities, deposits with banks, mutual fund shares, insurance policies, and derivative instruments.

Real assets are represented by tangible assets like residential house, commercial property, agricultural farm, gold, precious stones, and art objects. As the economy advances, the relative importance of financial assets tends to increase. Of course, by and large the two forms of investments are complementary and not competitive.

For sensible investing, you should be familiar with the characteristics and features of various investment alternatives before you. This chapter describes various investment alternatives. Since the emphasis of this book is on financial assets, they will be discussed in greater detail.

Although the discussion is fairly up to date, the rapid changes in the world of investments leads to the creation of new investment alternatives. If you understand the basic characteristics of major investment alternatives currently available, you will have the background to understand new alternatives as they appear.

2.1 NON-MARKETABLE FINANCIAL ASSETS

A good portion of the financial assets of individual investors is held in the form of non-marketable financial assets like bank deposits, post office deposits, company deposits, and provident fund deposits. A distinguishing feature of these assets is that they represent personal transactions between the investor and the issuer. For example, when you open a savings bank account at a bank, you deal with the bank personally. In contrast, when you buy equity shares in the stock market you do not know who the seller is and you do not care. The important non-marketable financial assets held by investors are briefly described below:

Bank Deposits Perhaps the simplest of investment avenues, by opening a bank account and depositing money in it one can make a bank deposit. There are various kinds of bank accounts: current account, savings account, and fixed deposit account. While a deposit in a current account does not earn any interest, deposits in other kinds of bank accounts earn interest. The important features of bank deposits are as follows:

- Deposits in scheduled banks are very safe because of the regulations of the Reserve Bank of India and the guarantee provided by the Deposit Insurance Corporation, which guarantees deposits upto Rs 100,000 per depositor of a bank.
- There is a ceiling on the interest rate payable on deposits in the savings account.
- The interest rate on fixed deposits varies with the term of the deposit. In general, it is lower for fixed deposits of shorter term and higher for fixed deposits of longer term.
- If the deposit period is less than 90 days, the interest is paid on maturity; otherwise it is generally paid quarterly.
- Bank deposits enjoy exceptionally high liquidity. Banks now offer customers the facility of premature withdrawals of a portion or whole of fixed deposits. Such withdrawals would earn interest rates corresponding to the periods for which they are deposited.
- Loans can be raised against bank deposits.
- For savings bank accounts, most banks calculate interest on the minimum deposit between the 10^{th} and the last date of the month. So the best way to maximise returns on your savings account is to treat it like a current account between the 1^{st} and the 10^{th}, and a fixed deposit for the rest of the month.

Post Office Savings Account A post office savings account is similar to a savings bank account. Its salient features are as follows:

- The interest rate is 3.5 percent per annum.
- The interest is tax exempt.
- The amount of first deposit should be at least Rs. 20 for an ordinary account and Rs. 250 for a checking account.
- The maximum balance that can be held is Rs. 50,000 for a single account and Rs. 100,000 for a joint account.

Post Office Time Deposits (POTDs) Similar to fixed deposits of commercial banks, POTDS have the following features:

- Deposits can be made in multiples of Rs. 50 without any limit.
- The interest rates on POTDs are, in general, slightly higher than those on bank deposits.
- The interest is calculated half-yearly and paid annually.
- No withdrawal is permitted upto six months.
- After six months, withdrawals are permitted. However, on withdrawals made between six months and one year, no interest is payable. On withdrawals after one year, but before the term of deposit, interest is paid for the period the deposit has been held, subject to a penal deduction of 2 percent.
- A POTD account can be pledged.
- Deposits in 10 years to 15 years Post Office Cumulative Time Deposit Account can be deducted before computing the taxable income under Section 80 C.

Monthly Income Scheme of the Post Office (MISPO) A popular scheme of the post office, the MISPO is meant to provide regular monthly income to the depositors. The salient features of this scheme are as follows:

- The term of the scheme is 6 years.
- The minimum amount of investment is Rs. 1,000. The maximum investment can be Rs. 300,000 in a single account or Rs. 600,000 in a joint account.
- The interest rate is 8.0 percent per annum, payable monthly. A bonus of 10 percent is payable on maturity.
- There is no tax deduction at source.
- There is a facility of premature withdrawal after one year, with 5 percent deduction before 3 years.

Kisan Vikas Patra (KVP) A scheme of the post office, the Kisan Vikas Patra has the following features:

- The minimum amount of investment is Rs. 1,000. There is no maximum limit.
- The investment doubles in 8 years and 7 months. Hence the compound interest rate works out to 8.4 percent.
- There is no tax deduction at source.
- KVPs can be pledged as a collateral security for raising loans.
- There is a withdrawal facility after 2 ½ years.

National Savings Certificate Issued at the post offices, National Savings Certificate has the following features:

- It comes in denominations of Rs. 100, Rs. 500, Rs. 1,000, Rs. 5,000 and Rs. 10,000.
- It has a term of 6 years. Over this period Rs. 100 becomes Rs. 160.1. Hence the compound rate of return works out to 8.16 percent.
- The investment in NSC can be deducted before computing the taxable income under Section 80 C.

- There is no tax deduction at source.
- It can be pledged as a collateral for raising loans.

Company Deposits Many companies, large and small, solicit fixed deposits from the public. Fixed deposits mobilised by manufacturing companies are regulated by the Company Law Board and fixed deposits mobilised by finance companies (more precisely non-banking finance companies) are regulated by the Reserve Bank of India. The key features of company deposits in India are as follows:

- For a manufacturing company the term of deposits can be one to three years, whereas for a non-banking finance company it can vary between 25 months to five years.
- A manufacturing company can mobilise, by way of fixed deposits, an amount equal to 25 percent of its worth from the public and an additional amount equal to 10 percent of its worth from its shareholders. A non-banking finance company, however, can mobilise a higher amount.
- The interest rates on company deposits are higher than those on bank fixed deposits.
- Company deposits have to be necessarily credit-rated.
- Depositors don't get any tax benefit on company deposits. However no income tax is deducted at source if the interest income is upto Rs. 5,000 in a financial year.
- Companies offer some incentives like facility for premature withdrawal or free personal accident insurance cover to attract deposits.

Employee Provident Fund Scheme A major vehicle of savings for salaried employees, the provident fund scheme has the following features:

- Each employee has a separate provident fund account in which both the employer and employee are required to contribute a certain minimum amount on a monthly basis.
- The employee can choose to contribute additional amounts, subject to certain restrictions.
- While the contribution made by the employer is fully tax exempt (from the point of view of the employee), the contributions made by the employee can be deducted before computing the taxable income under Section 80 C.
- Provident fund contributions currently earn a compound interest rate of 8.5 percent per annum that is totally exempt from taxes. The interest however is accumulated in the provident fund account and not paid annually to the employee.
- The balance in the provident fund account is fully exempt from wealth tax. Further, it is not subject to attachment under any order or decree of a court.
- Within certain limits, the employee is eligible to take a loan against the provident fund balance pertaining to his contributions only.

Public Provident Fund Scheme One of the most attractive investment avenues available in India, the Public Provident Fund (PPF) scheme has the following features :

- Individuals and HUFs can participate in this scheme. A PPF account may be opened at any branch of the State Bank of India or its subsidiaries or at specified branches of the other public sector banks.
- Though the period of a PPF account is stated to be 15 years, the number of contributions has to be 16. This is because the 15 year period is calculated from the financial year following the date on which the account is opened. Thus, a PPF account matures on the first day of the 17th year.
- The subscriber to a PPF account is required to make a minimum deposit of Rs. 100 per year. The maximum permissible deposit per year is Rs 70,000.
- Deposits in a PPF account can be deducted before computing the taxable income under Section 80 C.
- PPF deposits currently earn a compound interest rate of 8.0 percent per annum, which is totally exempt from taxes. The interest, however, is accumulated in the PPF account and not paid annually to the subscriber.
- The balance in a PPF account is fully exempt from wealth tax. Further, it is not subject to attachment under any order or decree of a court.
- The subscriber to a PPF account is eligible to take a loan from the third year to the sixth year after opening the PPF account. The amount of loan cannot exceed 25 percent of the balance standing to the credit of the PPF account at the end of the second preceding financial year. The interest payable on such a loan is 1 percent higher than the PPF account interest rate.
- The subscriber to a PPF account can make one withdrawal every year from the sixth year to the fifteenth year. The amount of withdrawal cannot exceed 50 percent of the balance at the end of the fourth preceding year or the year immediately preceding the year of withdrawal, whichever is lower, less the amount of loan, if any. The withdrawal can be put to any use and is not required to be refunded.
- On maturity, the credit balance in a PPF account can be withdrawn. However, at the option of the subscriber, the account can be continued for three successive block periods of five years each, with or without deposits. During the extensions the account holder can make one withdrawal per year, subject to the condition that the total amount withdrawn during a 5-year block does not exceed 60 percent of the balance to the credit of the account at the beginning.

2.2 MONEY MARKET INSTRUMENTS

Debt instruments, which have a maturity of less than one year at the time of issue are called money market instruments. These instruments are highly liquid and have negligible risk. The major money market instruments are Treasury bills, certificates of deposit, commercial paper, and repos. The money market is dominated by the government, financial institutions, banks, and corporates. Individual investors scarcely participate in the money market directly. A brief description of money market instruments is given below.

Treasury Bills Treasury bills are the most important money market instrument. They represent the obligations of the Government of India which have a primary tenor like 91 days and 364 days. They are sold on an auction basis every week in certain minimum denominations by the Reserve Bank of India. They do not carry an explicit interest rate (or coupon rate). Instead, they are sold at a discount and redeemed at par. Hence the implicit yield of a Treasury bill is a function of the size of the discount and the period of maturity.

Though the yield on Treasury bills is somewhat low, they have appeal for the following reasons:

- They can be transacted readily and there is a very active secondary market for them.
- Treasury bills have nil credit risk and negligible price risk (thanks to their short tenor).

Certificates of Deposits Certificates of deposits (CDs) represent short term deposits which are transferable from one party to another. Banks and financial institutions are the major issuers of CDs. The principal investors in CDs are banks, financial institutions, corporates, and mutual funds. CDs are issued in bearer or registered form. They generally have a maturity of 3 months to 1 year. CDs carry a certain interest rate.

CDs are a popular form of short-term investment for mutual funds and companies for the following reasons:

- Banks are normally willing to tailor the denominations and maturities to suit the needs of the investors.
- CDs are generally risk-free.
- CDs generally offer a higher rate of interest than Treasury bills or term deposits.
- CDs are transferable.

Commercial Paper Commercial paper represents short-term unsecured promissory notes issued by firms that are generally considered to be financially strong. Commercial paper usually has a maturity period of 90 days to 180 days. It is sold at a discount and redeemed at par. Hence the implicit rate is a function of the size of discount and the period of maturity.

Repos The term "repo" is used as an abbreviation for Repurchase Agreement or Ready Forward. A "repo" involves a simultaneous "sale and repurchase" agreement.

A "repo" works as follows. Party *A* needs short-term funds and Party *B* wants to make a short-term investment. Party *A* sells securities to Party *B* at a certain price and simultaneously agrees to repurchase the same after a specified time at a slightly higher price. The difference between the sale price and the repurchase price represents the interest cost to Party *A* and conversely the interest income for Party *B*.

A "reverse repo" is the opposite of a "repo"—it involves an initial purchase of an asset followed by a sale. It is a safe and convenient form of short-term investment.

2.3 BONDS OR DEBENTURES

Bonds or debentures represent long-term debt instruments. The issuer of a bond promises to pay a stipulated stream of cash flows. This generally comprises of periodic interest payments over the life of the instrument and principal payment at the time of redemption(s).

This section discusses the following instruments: Government securities, RBI savings bonds, private sector debentures, PSU bonds, and preference shares.

Government Securities Debt securities issued by the central government, state government, and quasi-government agencies are referred to as government securities or gilt-edged securities. Three types of instruments are issued.

- An investment that resembles a company debenture. It carries the name of the holder(s) and is registered with the Public Debt Office (PDO). For transfer, it has to be lodged with the PDO along with a duly completed transfer deed. The PDO pays interest to the holders registered with it on the specified date of payment.
- A promissory note, issued to the original holder, which contains a promise by the President of India (or the Governor of State) to pay as per a given schedule. It can be transferred to a buyer by an endorsement by the seller. The current holder has to present the note to the government Treasury (or a designated authorised agency) to receive interest and other payments.
- A bearer security, where the interest and other payments are made to the holder of the security.

Government securities have maturities ranging from 3 to 20 years and carry interest rates that usually vary between 7 and 10 percent. Even though these securities carry some tax advantages, they have traditionally not appealed to individual investors because of low rates of interest and long maturities and somewhat illiquid retail markets. They are typically held by banks, financial institutions, insurance companies, and provident funds mainly because of safety and certain statutory compulsions.

Savings Bonds[1] A popular instrument, RBI Savings Bonds have the following features:

- Individuals, HUFs, and NRIs can invest in these bonds.
- The minimum amount of investment is Rs. 1,000. There is no maximum limit.
- The maturity period is 5 years from the date of issue.
- There are two options: the cumulative option and the non-cumulative option.
- The interest rate is 8.0 percent per annum, payable half-yearly. Under the cumulative option Rs. 1,000 becomes Rs. 1,480 after 5 years.

[1] Technically they are called Government of India Savings Bonds. Since they are issued by the Reserve Bank of India, they are popularly referred to as RBI Savings Bonds.

- The interest earned is taxable. The bonds are exempt from wealth tax without any limit.
- The bonds are issued in the form of Bond Ledger Account or in the form of Promissory Notes. Bond Ledger Account can be opened in the name of the investors at the receiving offices (designated offices of banks) and at the Public Debt Offices of RBI. Bonds in the form of Promissory Notes are issued only at RBI offices.
- The bonds are transferable. The Bond Ledger Account is transferable, wholly or in part, by execution of a prescribed transfer deed. Promissory Notes are transferable by endorsement and delivery.
- Nomination facility is available.
- The bonds can be offered as security to banks for availing loans.

Private Sector Debentures Akin to promissory notes, debentures are instruments meant for raising long term debt. The obligation of a company towards its debenture holders is similar to that of a borrower who promises to pay interest and principal at specified times. The important features of debentures are as follows:

- When a debenture issue is sold to the investing public, a trustee is appointed through a deed. The trustee is usually a bank or a financial institution. Entrusted with the role of protecting the interest of debentureholders, the trustee is responsible for ensuring that the borrowing firm fulfils its contractual obligations.
- Typically, debentures are secured by a charge on the immovable properties, both present and future, of the company by way of an equitable mortgage.
- All debenture issues with a maturity period of more than 18 months must be necessarily credit-rated. Further, for such debenture issues, a Debenture Redemption Reserve (DRR) has to be created. The company should create a DRR equivalent to at least 50 percent of the amount of issue before redemption commences.
- Previously the coupon rate (or interest rate) on debentures was subject to ceiling fixed by the Ministry of Finance. No such ceiling applies now. A company is free to choose the coupon rate. Further, the rate may be fixed or floating. In the latter case it is periodically determined in relation to some benchmark rate.
- Earlier the average redemption period for non-convertible debentures was required to be about seven years. Now there is no such restriction. A company has freedom to choose the redemption (maturity) period.
- Debentures sometimes carry a 'call' feature which provides the issuing company with an option to redeem the debentures at a certain price before the maturity date. Sometimes, the debentures may have a 'put' feature which gives the holder the right to seek redemption at specified times at predetermined prices.
- Debentures may have a convertible clause which gives the debentureholder the option to convert the debentures into equity shares on certain terms and conditions that are pre-specified.

Public Sector Undertaking Bonds Public Sector Undertakings (PSUs) issue debentures that are referred to as PSU bonds. There are two broad varieties of PSU bonds: taxable bonds and tax free bonds. While PSUs are free to set the interest rates on taxable bonds, they cannot offer more than a certain interest rate on tax-free bonds which is fixed by the Ministry of Finance. More important, a PSU can issue tax-free bonds only with the prior approval of the Ministry of Finance.

In general, PSU bonds have the following investor-friendly features: (a) there is no deduction of tax at source on the interest paid on these bonds, (b) they are transferable by mere endorsement and delivery, (c) there is no stamp duty applicable on transfer, and (d) they are traded on the stock exchanges. In addition, some institutions are ready to buy and sell these bonds with a small price difference.

Preference Shares Preference shares represent a hybrid security that partakes some characteristics of equity shares and some attributes of debentures. The salient features of preference shares are as follows:

- Preference shares carry a fixed rate of dividend.
- Preference dividend is payable only out of distributable profits. Hence, when there is inadequacy of distributable profits, the question of paying preference dividend does not arise.
- Dividend on preference shares is generally cumulative. Dividend skipped in one year has to be paid subsequently before equity dividend can be paid.
- Preference shares are redeemable- the redemption period is usually 7 to 12 years.
- Currently preference dividend is tax-exempt.

2.4 EQUITY SHARES

Equity capital represents ownership capital. Equity shareholders collectively own the company. They bear the risk and enjoy the rewards of ownership. Of all the forms of securities, equity shares appear to be the most romantic. While fixed income investment avenues may be more important to most of the investors, equity shares seem to capture their interest the most. The potential rewards and penalties associated with equity shares make them an interesting, even exciting, proposition. No wonder, equity investment is a favourite topic of conversation in parties and get-togethers.

Terminology The amount of capital that a company can issue as per its memorandum represents the *authorised capital*. The amount offered by the company to the investors is called the *issued capital*. That part of the issued capital that has been subscribed to by the investors is called the *subscribed capital*; the actual amount paid is called the *paid-up capital*. Typically, the issued, subscribed, and paid-up capital are the same.

The *par value* is stated in the memorandum and written on the share scrip. The par value of equity shares is generally Rs. 10 or Re 1. Infrequently, one comes across par values like Rs. 5, Rs. 50, and Rs. 1,000.There is a proposal to make the par value uniformly at Re 1. The issue price is the price at which the equity share is issued. When the *issue price* exceeds the par value, the difference is referred to as the share premium.

Note that the issue price cannot be, as per law, lower than the par value. The *book value* of an equity share is equal to:

$$\frac{\text{Paid-up equity capital + Reserves and surplus}}{\text{Number of outstanding equity shares}}$$

Quite naturally, the book value of an equity share tends to increase as the ratio of reserves and surplus to the paid-up equity capital increases. The *market value* of an equity share is the price at which it is traded in the market. This price can be easily established for a company that is listed on the stock market and actively traded. For a company that is listed on the stock market but traded very infrequently, it is difficult to obtain a reliable market quotation. For a company that is not listed on the stock market, one can merely conjecture as to what its market price would be if it were traded.

Rights of Equity Shareholders As owners of the company, equity shareholders enjoy the following rights:

- Equity shareholders have a residual claim to the income of the firm. This means that the profit after tax less preference dividend belongs to equity shareholders. However, the board of directors has the prerogative to decide how it should be split between dividends and retained earnings. Dividends provide current income to equity shareholders and retained earnings tend to increase the intrinsic value of equity shares. Note that equity dividends are presently tax-exempt in the hands of the recipient. The company paying the dividend is required to pay the dividend distribution tax.
- Equity shareholders elect the board of directors and have the right to vote on every resolution placed before the company. The board of directors, in turn, appoints the top management of the firm. Hence, equity shareholders, in theory, exercise an indirect control over the operations of the firm. In practice, however, equity shareholders—scattered, ill-organised, passive, and indifferent as they often are –fail to exercise their collective power effectively.
- Equity shareholders enjoy the pre-emptive right which enables them to maintain their proportional ownership by purchasing the additional equity shares issued by the firm. The law requires companies to give existing equity shareholders the first opportunity to purchase, on a pro rata basis, additional issue of equity capital. For example, if you own, 1,000 equity shares in a company that has 1,000,000 outstanding shares, you are entitled to subscribe to 200 shares if the company proposes to issue 200,000 additional shares. The equity shareholders of the company may, however, forfeit this right partially or totally, to enable the company to make a public issue.
- As in the case of income, equity shareholders have a residual claim over the assets of the company in the event of liquidation. Claims of all others—debenture holders, secured lenders, unsecured lenders, preferred shareholders, and other creditors—are prior to the claim of equity shareholders.

Stock Market Classification In stock market parlance, it is customary to classify equity shares as follows:

Blue-chip Shares	Shares of large, well-established, and financially strong companies with an impressive record of earnings and dividends.
Growth Shares	Shares of companies that have a fairly entrenched position in a growing market and which enjoy an above average rate of growth as well as profitability.
Income Shares	Shares of companies that have fairly stable operations, relatively limited growth opportunities, and high dividend payout ratios.
Cyclical Shares	Shares of companies that have a pronounced cyclicality in their operations.
Defensive Shares	Shares of companies that are relatively unaffected by the ups and downs in general business conditions.
Speculative Shares	Shares that tend to fluctuate widely because there is a lot of speculative trading in them.

Note that the above classification is only indicative. It should not be regarded as rigid and straitjacketed. Often you can't pigeonhole a share exclusively in a single category. In fact, many shares may fall into two (or even more) categories.

Peter Lynch's Classification[2] There are different ways of classifying shares. Here is Peter Lynch's classification of companies (and, by derivation shares).

Slow Growers	Large and ageing companies that are expected to grow slightly faster than the gross national product.
Stalwarts	Giant companies that are faster than slow growers but are not agile climbers.
Fast Growers	Small, aggressive new enterprises that grow at 10 to 25 percent a year.
Cyclicals	Companies whose sales and profit rise and fall in a regular, though not completely predictable, fashion.
Turnarounds	Companies which are steeped in accumulated losses but which show signs of recovery. Turnaround companies have the potential to make up lost ground quickly.
Asset Plays	Companies that have valuable assets which have been somewhat overlooked by the stock market.

Nature of Equity Shares Benjamin Graham aptly said that equity shares (referred to as common stocks in the U.S.) have one important investment characteristic and one important speculative characteristic. The investment value and average market price of equity shares tend to rise persistently but irregularly over time as their net worth increases on account of retained earnings. The speculative characteristic of equity shares is manifested in the irrational and excessive price fluctuation caused by the tendency of most people to gamble under the influence of hope, fear, and greed.

[2] Peter lynch, *One Upon the Wall Street*, Penguin, 1990.

2.5 MUTUAL FUND SCHEMES

If you find it difficult or cumbersome to invest directly in equity shares and debt instruments, you can invest in these financial assets indirectly through a mutual fund. A mutual fund represents a vehicle for collective investment. When you participate in a scheme of a mutual fund, you become a part-owner of the investments held under that scheme.

Till 1986 the Unit Trust of India was the only mutual fund in India offering a small number of schemes. As the mutual fund sector was liberalised, new entrants came into the field. At present, there are about 30 mutual funds offering over 1000 schemes.

In India, the following entities are involved in a mutual fund operation: the sponsor, the mutual fund, the trustees, the asset management company (AMC), the custodian, and the registrars and transfer agents.

Mutual fund schemes invest in three broad categories of financial assets, viz. stocks, bonds, and cash. Stocks refer to equity and equity-related instruments. Bonds are debt instruments that have a maturity of more than one year. Cash represents bank deposits and debt instruments that have a maturity of less than one year.

Depending on the asset mix, mutual fund schemes are classified into three broad types, viz. equity schemes, hybrid schemes, and debt schemes. Equity schemes invest the bulk of their corpus, 85-95 percent or even more, in stocks and the balance in cash. Hybrid schemes, also referred to as balanced schemes, invest in a mix of stocks and debt instruments. Debt schemes invest in bonds and cash. Within each of these broad categories, there are several variants as shown in the accompanying box.

Schemes Galore

I. Equity Schemes
- Diversified equity schemes
- Index schemes
- Sectoral schemes
- Tax planning schemes

II. Hybrid (Balanced) Schemes
- Equity-oriented schemes
- Debt-oriented schemes
- Variable asset allocation schemes

III. Debt Schemes
- Gilt schemes
- Mixed schemes
- Floating rate debt schemes
- Cash (liquid) schemes

Mutual funds in India are comprehensively regulated under the SEBI (Mutual Funds) Regulation, 1996. Some of the important provisions of this regulation are as follows:

- A mutual fund shall be constituted in the form of a trust executed by the sponsor in favour of the trustees.
- The sponsor or, if so authorised by the trust deed, the trustees shall appoint an asset management company (AMC).
- The mutual fund shall appoint a custodian.
- No scheme shall be launched by the AMC unless it is approved by the trustees and a copy of the offer document has been filed with SEBI.
- The offer document and advertisement materials shall not be misleading.
- No guaranteed return shall be provided in a scheme unless such returns are fully guaranteed by the sponsor or the AMC.
- The moneys collected under any money market scheme of a mutual fund shall be invested only in money market instruments in accordance with directions issued by the Reserve Bank of India.
- The mutual fund shall not borrow except to meet temporary liquidity needs.
- The net asset value (NAV) and the sale and repurchase price of mutual fund schemes must be regularly published in daily newspapers.
- Every AMC shall keep and maintain proper books of accounts, records, and documents for each scheme.
- The investments of a mutual fund are subject to several restrictions relating to exposure to stocks of individual companies, debt instruments of individual issuers, so on and so forth.
- Costs associated with mutual fund investing such as initial expenses, loads (entry and exit), and annual recurring expenses are subject to certain ceilings.

For most of the individual investors, mutual funds represent an excellent vehicle for investing indirectly in stocks, bonds, and cash. However, there are some disadvantages as well. The pros and cons of mutual fund investing are summarised below.

Pros	*Cons*
■ Diversification	■ Expenses
■ Professional management	■ Lack of thrill
■ Liquidity	
■ Tax advantages	
■ Comprehensive regulation	
■ Transparency	

2.6 FINANCIAL DERIVATIVES

A derivative is an instrument whose value depends on the value of some underlying asset. Hence, it may be viewed as a side bet on that asset. From the point of view of investors and portfolio managers, futures and options are the two most important financial derivatives. They are used for hedging and speculation. Trading in these derivatives began in India about a decade back.

Futures A futures contract is an agreement between two parties to exchange an asset for cash at a predetermined future date for a price that is specified today. The party which agrees to purchase the asset is said to have a *long position* and the party which agrees to sell the asset is said to have a *short position*.

The party holding the long position benefits if the price increases, whereas the party holding the short position loses if the price increases and vice versa. To illustrate this point, consider a futures contract between two parties, viz., *A* and *B*. *A* agrees to buy 1000 shares of Acme Chemicals at Rs. 100 from *B* to be delivered 90 days hence. *A* has a long position and *B* has a short position. On the 90th day, if the price of Acme Chemicals happens to be Rs. 105, *A* gains Rs. 5,000 [$1000 \times (105 - 100)$] whereas *B* loses Rs. 5000. On the other hand, if the price of Acme Chemicals on the 90th day happens to be Rs. 95, *A* loses Rs. 5000 [$1000 \times (95 - 100)$] whereas *B* gains Rs. 5000.

Options An option gives its owner the right to buy or sell an underlying asset (our focus here will be on equity shares) on or before a given date at a predetermined price. Note that options represent a special kind of financial contract under which the option holder enjoys the right (for which he pays a price), but has no obligation, to do something.

There are two basic types of options: call options and put options. A call option gives the option holder the right to buy a fixed number of shares of a certain stock, at a given exercise price on or before the expiration date. To enjoy this option, the option buyer (holder) pays a premium to the option writer (seller) which is non-refundable. The writer (seller) of the call option is obliged to sell the shares at the specified price, if the buyer chooses to exercise the option.

A put option gives the option holder the right to sell a fixed number of shares of a certain stock at a given exercise price on or before the expiration date. To enjoy this right, the option buyer (holder) pays a non-refundable premium to the option seller (writer). The writer of the put option is obliged to buy the shares at the specified price, if the option holder chooses to exercise the option.

2.7 LIFE INSURANCE[3]

The basic customer needs met by life insurance policies are protection and savings. Policies that provide protection benefits are designed to protect the policyholder (or his dependents) from the financial consequence of unwelcome events such as death or long-term sickness/disability. Policies that are designed as savings contracts allow the policyholder to build up funds to meet specific investment objectives such as income in retirement or repayment of a loan. In practice, many life insurance policies provide a mixture of savings and protection benefits.

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[3] This section has been contributed by Dr K. Sriram.

The common types of life insurance and annuity policies are:

- Endowment Assurance
- Money Back Plan
- Whole Life Assurance
- Unit Linked Plan
- Term Assurance
- Immediate Annuity
- Deferred Annuity
- Riders

Endowment Assurance There are basically two variants of this policy: (a) Non Participating (Without Profit) Endowment Assurance. (b) Participating (With Profit) Endowment Assurance.

Non-Participating Endowment Assurance This policy offers a guaranteed amount of money (the "sum assured") at the maturity date of the policy in exchange for a single premium at the start of the policy or series of regular premiums throughout the term of the policy. If the policyholder dies before the maturity date then usually the same sum assured is paid on death. Of course, the policy can be structured with a sum assured paid on death, which is different from that paid at maturity.

The policyholder may be allowed to surrender the policy before maturity and receive a lump sum (surrender value or cash value) at the time, on guaranteed or non-guaranteed terms. If the policyholder wishes to keep the policy in force without paying further premiums, a reduced sum assured (paid up value or paid up sum assured) may be granted. There is usually a provision to take a loan up to 90% of the surrender value.

Participating Endowment Assurance The structure of this policy is similar to that of the non-participating policy except that the initial sum assured under the policy is expected to be augmented with addition of bonuses or dividends. Such bonuses or dividends are declared from the distributable profits attributable to all policies issued under his category. In the Indian context, bonuses usually take the form of additions to the initial sum assured (referred to as reversionary bonus) and is payable on occurrence of the insured event i.e., survival up to the maturity date or earlier death. However, some life insurance companies also offer a cash bonus option (in lieu of reversionary bonus) and the policyholder can use the cash bonus to offset the future premiums payable under the policy.

Money Back Plan This is a popular variant of the endowment assurance policy because it provides lump sum at periodic intervals. For example, given an initial sum assured of Rs. 1000 and a term of 20 years, the policy may provide for part payment of the sum assured as follows:

- 20% at the end of 5 years
- 20% at the end of 10 years
- 20% at the end of 15 years
- 40% at the end of 20 years

These periodic payouts are usually increased by a guaranteed addition to the initial sum assured every year.

The money back policy illustrated above is a non-participating policy. The policy can also be offered in the "participating" format in which case the guaranteed additions will be replaced by "bonuses".

As with endowment assurance, a surrender value on guaranteed or non-guaranteed terms may be paid if the policyholder chooses to withdraw from policy. Alternatively the policyholder may have the option of converting the policy into a paid-up policy. Usually there is no loan facility attached to this policy.

Whole Life Assurance This policy provides a benefit on the death of the policyholder whenever that might occur. Basically it provides long-term financial protection to the dependents. It is particularly useful as a means of protecting some of the expected wealth transfer that a parent would be aiming to make to his or her children when he or she died. Without this policy, the wealth transfer is likely to be very small if the parent died young. Such policies can also be a tax efficient way of transferring wealth at any age depending on legislation (often reducing the liability to inheritance tax).

There are both non-participating and participating versions of this policy. Non-participating policies offer a guaranteed sum assured on death. Under participating policies, the initial guaranteed sum assured may be increased by bonuses or cash refunds may be given.

With endowment assurance, a benefit may be paid if the policyholder chooses to withdraw from the policy. Similarly, there may be a "paid up" policy option. The policyholder may also have the option of taking a loan up to say 90% of the surrender value.

Unit Linked Plan A unit-linked plan [referred to as Variable Universal Life in North American Markets] is also a savings oriented life insurance policy. The premiums net of charges are invested in a fund selected by the policyholder. Typically unit linked plans offer three fund options: a debt fund, a balanced fund, and an equity fund. The accumulation in the fund is determined by the investment performance of the underlying assets. These policies offer a fixed amount of death benefit.

Term Assurance This is a pure protection policy, which provides a benefit only on the death of the policyholder within a specified term, say 5 years or 10 years or 20 years or whatever. Premiums may be paid regularly over the term of the policy (or some shorter period)or as a single premium at the outset. Generally, there is no payment if the policyholder survives to the end of the policy. However, there are term assurance policies, which offer some proportion of premiums paid on survival at the end of the policy term.

A popular variant of the term assurance policy is the decreasing term assurance policy under which the sum assured decreases over the term of the policy. This type of policy can be used to meet two such specific needs. First, it can be used to repay the balance outstanding under a loan (like house mortgage) in the event of death of the policyholder. Secondly, it can be used to provide an income for the family of the deceased policyholder from the time of death up to the end of the policy term.

Term assurance policies are typically offered in the non-participating format. These policies do not offer any surrender value if premium payments are discontinued during the term of the policy. Premium rates are lower for term insurance policies for other life insurance policies like endowment assurance issued on the same basis. This is because term insurance policies terminate with no maturity values.

Immediate Annuity This policy meets the policyholder's need for a regular income, for example, after his or her retirement. The policy can also be structured to provide an income for a limited period, for example to pay the school fees of the policyholder's children. The regular income is purchased by paying a single premium at the inception of the policy. Typically the regular income will cease on the death of the policyholder. There are however variants of this policy under which a (reduced) income may be paid to the spouse (of the policyholder) over his or her lifetime; or the single premium may be returned to the dependents of the deceased policyholder.

Immediate annuities can be offered either in the non-participating format or in the participating format. In the case of a participating annuity the income paid to the policyholder will be equal to the guaranteed amount plus a bonus declared by the insurance company.

Deferred Annuity The usual structure of this policy is that the policyholder pays regular premiums for a period up to the specified "vesting date". These premiums buy amounts of regular income, payable to the policyholder from the vesting date. A single premium at the start of the policy is a possible alternative to regular premiums.

A deferred annuity enables the policyholder to build up a pension that becomes payable on his or her retirement from gainful employment. At the vesting date of the annuity, the alternative of a lump sum may be offered in lieu of part or all of the pension, thereby meeting any need for a cash sum at that point, for example to payoff a housing loan.

Riders Riders are add-ons to the life insurance policies described above. These add-ons can be purchased with the base policy on payment of a small additional premium. The commonly offered riders in the Indian context are:

- Accidental Death Benefit (ADB) Rider
- Critical Illness (CI) Rider
- Waiver of Premium (WoP) Rider
- Term Insurance Rider

Tax Breaks At the time of writing, the tax breaks from a policyholder's perspective are as follows:

- The premium payable under a life insurance policy can be deducted from taxable income under Section 80 C of the Income Tax Act, 1961. The amount of premium which can be deducted from the taxable income is restricted to 20 percent of the initial assured sum. Note that insurance premium is only one of the eligible investments qualifying for deduction under Section 80C. The maximum deduction under this section is restricted to Rs. 100,000.

- The premium paid by an individual under a pension plan offered by a life insurance company can be deducted from the taxable income of that individual under Section 80CCC of the Income Tax Act. The deduction under this section is restricted to Rs. 100,000.
- If the insurance policy qualifies for deduction under both Section 80C and Section 80CCC, the deduction can be claimed under only one of these sections.
- Any sum received under a life insurance policy, including the sum allocated by way of bonus on such policy is exempt from tax under Section 10 (10D) of the Income Tax Act.

Considerations in Choosing a Policy Bear in mind the following considerations in choosing a policy.

- Review your own insurance needs and circumstances. Choose the kind of policy that has benefits that most closely fit your needs. A life insurance agent or a financial advisor can help you in this task.
- Be sure that you can handle premium payments. Can you afford the initial premium? If the premium increases later and you still need insurance, can you still afford it?
- Don't buy life insurance unless you intend to stick with your plan. It may be very costly if you quit during the early years of the policy's term.
- If you are thinking of surrendering your insurance policy or replacing it with a new one, you should carefully assess the surrender value and the rights and benefits of the new policy vis-à-vis the existing policy.

2.8 REAL ASSETS

Unlike financial assets, real assets are tangible or physical in nature. The major types of real assets are as follows:

A. Real Estate
   - Residential house
   - Commercial property
   - Urban and semi-urban land
   - Agricultural farm
   - Time share in a holiday resort

B. Precious Metals
   - Gold
   - Silver

C. Precious Stones
   - Diamonds
   - Others

D. Art Objects and Collectibles
- Paintings
- Sculpture
- Antiques
- Others

The pros and cons of investing in real assets are as follows:

Pros	*Cons*
■ Inflation hedge	■ Illiquid markets
■ Efficient diversification	■ High spread and commissions
■ Psychic pleasure	■ Maintenance effort
■ Safe haven	

SUMMARY

- The bewildering range of investments fall into two broad categories, viz., **financial assets** and **real assets.**
- The important financial assets are bank deposits, provident fund deposits, government securities, equity shares, mutual fund shares, insurance policies, and financial derivatives. The important real assets are residential house, commercial property, agricultural land, and precious objects.
- Equity shares represent ownership capital. It is customary to classify them as follows: blue chip shares, growth shares, income shares, cyclical shares, defensive shares, and speculative shares.
- A **mutual fund** is a vehicle for collective investment. Mutual fund schemes are broadly classified as follows: equity schemes, balanced schemes, and debt schemes.
- A **derivative** is an instrument whose value depends on the value of some underlying asset. **Futures** and **options** are the two most important financial derivatives.
- A **futures** contract is an agreement between two parties to exchange an asset for cash at a predetermined future date for a price that is specified today.
- An **option** gives its owner the right to buy or sell an underlying asset on or before a given date at a predetermined price.
- The important types of **insurance policies** in India are: endowment assurance policy, money back policy, whole life policy, and term policy.

QUESTIONS

1. Describe the features of the following investment alternatives: bank deposits, monthly income scheme of the post office, Kisan Vikas Patras, National Savings Certificate, and company deposits.
2. Describe the features of the employee provident fund scheme and the public provident fund scheme.
3. Describe briefly the features of money market instruments in India.
4. Describe briefly the features of the following fixed income instruments: Government securities, Savings bonds, private sector corporate debentures, PSU bonds, and preference shares.
5. What is the popular stock market classification of equity shares?
6. How does Peter Lynch classify companies (and, by derivation, shares)?
7. List the important types of mutual fund schemes.
8. What are the important provisions of SEBI's regulations over mutual funds?
9. What are the pros and cons of mutual funds?
10. What is a futures contract?
11. What is an option?
12. Describe briefly the various types of life insurance policies in India.
13. What are the major types of real assets? What are the pros and cons of investing in real assets?

▪ ▪

Chapter 3

Securities Market

The Battlefield

Learning Objectives

After studying this chapter you should be able to

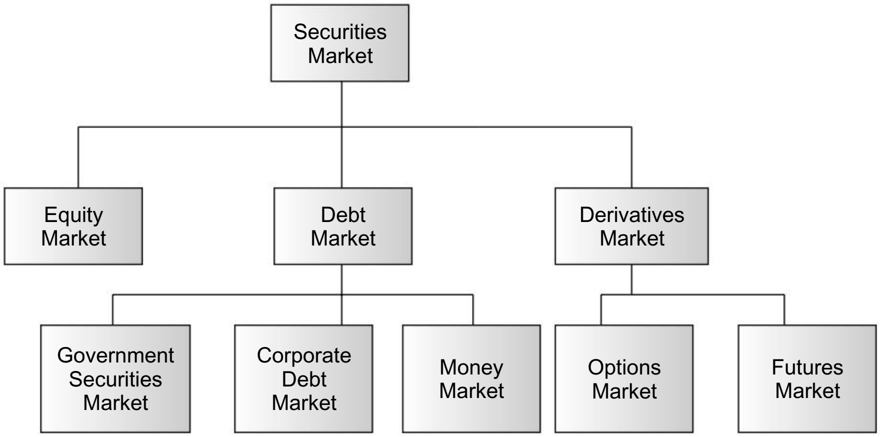
- Discuss the different ways in which a company may raise equity capital in the primary market.
- Explain the functioning of the stock market in India.
- Describe the distinctive features of the National Stock Exchange and the Bombay Stock Exchange.
- Read stock market quotations and describe the construction of stock market indices.
- Explain the functioning of the government securities market, corporate debt market, and money market in India.

The Sensex falls by 360 points in a day of hectic trading. The Reserve Bank of India lowers the repo rate by 25 basis points. The Government of India raises 4500 crore rupees by issuing bonds with a maturity of 10 years. So on and so forth. All these are examples of securities market at work. Most people are aware that this market has an important bearing on modern life and glibly speak of "Dalal Street," the "gilt-edged market," and the "Nifty" with a somewhat vague understanding of these terms. This chapter explains how the securities market works.

The securities market is the market for equity, debt, and derivatives. The debt market, in turn, may be divided into three parts, viz., the government securities market, the corporate debt market, and the money market. The derivatives market, in turn, may be divided into two parts, viz., the options market and the futures market. The structure of the securities market is shown in Exhibit 3.1.

Except the derivatives market, each of the above markets has two components, viz., the primary market and the secondary market. The market where new securities are issued is called the primary market and the market where outstanding securities are traded is called the secondary market. This chapter focuses on the equity market and the debt market.

Exhibit 3.1 ***Structure of the Securities Market***



3.1 PARTICIPANTS IN THE SECURITIES MARKET

The Indian securities market comprises of a number of participants as described below:

Regulators The key agencies that have a significant regulatory influence, direct or indirect, over the securities market are currently as follows:

- The Company Law Board (CLB) which is responsible for the administration of the Companies Act, 1956.
- The Reserve Bank of India (RBI) which is primarily responsible, inter alia, for the supervision of banks, money market, and government securities market.
- The Securities and Exchange Board of India (SEBI) which is responsible for the regulation of the capital market.
- The Department of Economic Affairs (DEA), an arm of the government, which, inter alia, is concerned with the orderly functioning of the financial markets as a whole.
- The Ministry of Company Affairs (MCA), an arm of the government, which is responsible for the administration of corporate bodies.

Stock Exchanges A stock exchange is an institution where securities that have already been issued are bought and sold. Presently there are 23 stock exchanges in India, the most important ones being the NSE and BSE.

Listed Securities Securities that are listed on various stock exchanges and hence eligible for being traded there are called listed securities. Presently about 10,000 securities are listed on all the stock exchanges in India put together.

Depositories A depository is an institution which dematerialises physical certificates and effects transfer of ownership by electronic book entries. Presently there are two depositories in India ,viz., the National Securities Depository Limited (NSDL) and the Central Securities Depository Limited (CSDL).

Brokers Brokers are registered members of the stock exchanges through whom investors transact. There are about 10,000 brokers in India.

Foreign Institutional Investors Institutional investors from abroad who are registered with SEBI to operate in the Indian capital market are called foreign institutional investors. There are about 600 of them and they have emerged as a major force in the Indian market.

Merchant Bankers Firms that *inter alia* specialise in managing the issue of securities are called merchant bankers. They have to be registered with SEBI.

Primary Dealers Appointed by the RBI, primary dealers serve as underwriters in the primary market and as market makers in the secondary market for government securities.

Mutual Funds A mutual fund is a vehicle for collective investment. It pools and manages the funds of investors. There are about 30 mutual funds in India.

Custodians A custodian looks after the investment back office of a mutual fund. It receives and delivers securities, collects income, distributes dividends, and segregates the assets between schemes.

Registrars and Transfer Agents A registrar and transfer agent is employed by a company or a mutual fund to handle all investor-related services.

Underwriters An underwriter agrees to subscribe to a given number of shares (or any other security) in the event the public subscription is inadequate. The underwriter, in essence, stands guarantee for public subscription.

Bankers to an Issue The bankers to an issue collect money on behalf of the company from the applicants.

Debenture Trustees When debentures are issued by a company, a debenture trustee has to be appointed to ensure that the borrowing firm fulfills its contractual obligations.

Venture Capital Funds A venture capital fund is a pool of capital which is essentially invested in equity shares or equity-linked instruments of unlisted companies.

Credit Rating Agencies A credit rating agency assigns ratings primarily to debt securities.

3.2 PRIMARY EQUITY MARKET

Although the equity market in India has been functioning since the late nineteenth century, the primary equity market, also called the new issues market, remained rather dull and inactive, barring occasional but brief bursts of activity, till 1991. In 1992, the Control of Capital Issues Act was abolished and SEBI was entrusted with the responsibility of regulating the primary market. A series of initiatives taken by SEBI, along with a more conducive environment that emerged in the wake of economic reforms, imparted a strong fillip to the primary market. Some of the important changes introduced by SEBI are worth mentioning.

- **Free Pricing** Companies have been given freedom in pricing their equity shares and determining the interest rate structure on their debt securities.
- **Disclosure and Investor Protection (DIP) Guidelines** Issues of securities have to conform to fairly elaborate disclosure requirements, so that investors can take more informed decisions. DIP guidelines and their continual improvement have made Indian disclosure requirements comparable to the best international practices. Of course, this has made the offer document quite voluminous.
- **Efficient Delivery Mechanism** SEBI has made it mandatory for all new IPOs to be issued only in the dematerialised form. Further, the time lapse between the closure of an issue and the listing of shares has been compressed.

There are three ways in which a company may raise equity capital in the primary market:

- Public issue
- Rights issue
- Private placement

Public Issue

By far the most important method of issuing securities, a public issue involves sale of securities to the public at large. Public issues in India are governed by the provisions of the Companies Act, 1956, SEBI Guidelines on Investor Protection, and the listing agreement between the issuing company and the stock exchanges. The Companies Act describes the procedure to be followed in offering shares to the public and the type of information to be disclosed in the prospectus and the SEBI guidelines impose certain conditions on the issuers besides specifying the additional information to be disclosed to the investors.

The issue of securities to members of the public involves a fairly elaborate process comprising of the following steps:

- Approval of the board of directors
- Approval of shareholders
- Appointment of the lead manager
- Due diligence by the lead manager
- Appointment of other intermediaries like co-managers, advisors, underwriters, bankers, brokers, and registrars

- Preparation of the draft prospectus
- Filing of the draft prospectus with SEBI
- Application for listing in stock exchanges
- Filing of the prospectus (after incorporating any modifications suggested by SEBI) with the Registrar of Companies
- Promotion of the issue
- Printing and distribution of applications
- Statutory announcement
- Collection of applications
- Processing of applications
- Determination of the liability of underwriters
- Finalisation of allotment
- Giving of demat credit and refund orders
- Listing of the issue

The merchant banker handling a public issue plays a multifaceted role. The merchant banker advises the issuing company, performs due diligence on the company, coordinates the work of all agencies involved in the issue, serves as a watchdog for statutory compliance, and protects the interest of investors in a fiduciary capacity.

Public Issues in the US

In the US, public offerings of both stocks and bonds are typically marketed by investment bankers who perform the role of underwriters. Generally, the lead investment banker forms an underwriting syndicate with other investment bankers to share the responsibility for the issue.

The key steps in a public offer are as follows:

- The firm engages investment bankers by negotiation or competitive bidding.
- Investment bankers advise the firm on the terms on which it should try to sell securities.
- The firm files a preliminary registration statement (preliminary prospectus) with the Securities Exchange Commission (SEC). It is also called a *red herring* as it includes a statement printed in red stating that the company is not attempting to sell the security before SEC approves its registration statement.
- Once the SEC approves the registration statement, it becomes the prospectus and the public offer price of the securities is announced.
- The underwriting syndicate buys the securities from the issuing firm at the public offer price less a spread that serves as compensation for underwriting. (Alternatively, investment bankers do not actually buy the securities but only agree to help the firm sell the issue to the public on a best efforts basis.)
- The underwriting syndicate resells purchased securities at the offer price.

As an investor, you should be familiar with the following aspects of public issues:

1. A company making a public issue informs the public about it through statutory announcements in the newspapers, makes application forms available through stock brokers and others, and keeps the subscription open for a period of three to seven days. Investors can now download the application forms from the websites of brokers or other distributors like Karvy Consultancy (Karvy.com—New Issues) and Capital Market (capitalmarket.com / - IPO centre).
2. If the issue is over-subscribed, the pattern of allotment is decided in consultation with the stock exchange where the issue is proposed to be listed. After the allotment pattern is finalised, the company mails the allotment advice/ letter along with refund order, if any. This is supposed to be done within a few weeks of the closure of subscription.
3. If the full amount is not asked for at the time of allotment, the balance is called in one or two calls later. The letter of allotment is exchangeable for share certificates (or debenture certificates, as the case may be), after it is duly stamped by the bank where the balance payment is made. Of course, if the allottee wants, he can sell the letter of allotment itself by transmitting it along with a transfer deed.
4. If the allottee fails to pay the call monies as and when called by the company, the shares are liable to be forfeited. In such a case, the allottee is not eligible for any refund of the amounts already paid.
5. When a company issues new shares by way of public issues (or, for that matter, a rights issue or a bonus issue), these shares may be entitled for dividend only from the date of allotment. As per a central government directive, there is to be only one quotation in the stock exchanges for the existing shares of a company and new shares arising out of the further issues made by the same company. The new shares, are, however, permitted to be traded and delivered *pari passu* with the existing shares against the quotation subject to deduction of the dividend amount, if any, of the previous year.
6. Public issues may be made at predetermined prices (fixed price issues) or at prices determined on the basis of bids received from potential investors (book built issues). In India, historically public issues have been fixed price issues. In recent years, SEBI has allowed companies to make book built issues and this has been a very significant development as almost all public issues now are book built issues. The mechanism of book building works as follows:
    - The company announces the public issue giving an indicative price band which is determined in consultation with its lead merchant bankers.
    - Investors interested in the issue submit a bid-cum-application form, mentioning their price and volume options to syndicate members, who are on an electronic linked platform across the country. The electronic platforms of BSE and NSE are used for this purpose. When a bid is submitted, it is uploaded on the NSE/BSE system. The status of the book can be seen on the bidding terminals by investors. Investors can revise their bids any number of time before the bidding period closes.

- Once the bidding period is over, the lead manager ascertains the demand function and decides the issue price and the pattern of allocation in consultation with the issuer. Pricing is generally aimed at ensuring that there is a healthy demand overhang leading to a post-listing price that is higher than the issue price. The idea is to 'leave something on the table' for the investors. As far as the allotment is concerned, under the existing regulations a minimum of 25 percent has to be allotted to individuals bidding up to 1000 shares, a minimum of 15 percent has to be allotted to corporates, HNIs (High Networth Individuals) and individual investors bidding in excess of 1000 shares, and a maximum of 60 percent may be allotted to QIBs (Qualified Institutional Buyers such as FIIs, banks, and so on). In the event of over-subscription, allotment has to be done on a proportionate basis.

Indian Public Issue Market Has Arrived June 2007 marked a watershed in the Indian public issue market. During this month companies raised Rs. 22,503 crore through initial public offerings and follow-on public offerings. India seems to have arrived in the big league. This is suggested by the following: (a) World's leading investment bankers like Merrill Lynch, Goldman Sachs and Morgan Stanley have entered India or are entering India in a big way. (b) Appetite for good quality paper is very strong and huge mobilisations in the primary market have not dented the secondary market. (c) In recent years, the quality of issuances has improved significantly, thanks to stringent entry norms of SEBI, better vetting by SEBI, compulsory participation of Qualified Institutional Buyers, and the involvement of two national level exchanges. (d) In 1990s, small and numerous issues by relatively unknown promoters dominated the primary market. Today the issues are larger and fewer and are offered by established companies.

IPO Grading by Credit Rating Agencies (CRAs)

Traditionally, credit rating agencies (CRAs) focused on the rating of debt instruments. In recent years, IPO grading by CRAs has begun. The factors normally considered for such grading are business prospects of the company and the industry, financial risks, managerial competence, corporate governance, and accounting quality.

It must be emphasised that the purpose of IPO rating is to assess the fundamental strength of the company and not the investment attractiveness of the issue. The latter would depend on fundamental strength as well as the issue price. As the old investment adage goes: "No stock is inherently good or bad, it is the price which makes it so."

Rights Issue

A rights issue involves selling securities in the primary market by issuing rights to the existing shareholders. When a company issues additional equity capital, it has to be offered in the first instance to the existing shareholders on a *pro rata* basis. This is required under Section 81 of the Companies Act 1956. The shareholders, however, may by a special resolution forfeit this right, partially or fully, to enable a company to issue additional capital to the general public or to selected investors on a preferential basis.

Procedure for Rights Issue A company making a rights issue sends a 'letter of offer' along with a composite application form consisting of four forms (*A*, *B*, *C* and *D*) to the shareholders. Form *A* is meant for the acceptance of the rights and application for additional shares. This form also shows the number of rights shares the shareholder is entitled to. It also has a column through which a request for additional shares may be made. Form *B* is to be used if the shareholder wants to renounce the rights in favour of someone else. Form *C* is meant for application by the renouncee in whose favour the rights have been renounced by the original allottee, through Form *B*. Form *D* is to be used to make a request for split forms. The composite application form must be mailed to the company within a stipulated period, which is usually 30 days.

Private Placement

A private placement is an issue of securities to a select group of persons not exceeding 49. Private placement of shares and convertible debentures by a listed company can be of two types.

Preferential Allotment When a listed company issues shares or debentures to a select group of persons in terms of the provisions of Chapter XIII of SEBI (DIP) Guidelines it is referred to as a private placement. The issuer has to comply with various provisions, relating to pricing, disclosures, lock-in period and so on, apart from the requirements of the Companies Act. The price at which a preferential allotment of shares is made should not be lower than the higher of the average of the weekly high and low of the closing prices of the shares quoted on the stock exchange during the six months period before the relevant date or during the two weeks period before the relevant date.

Qualified Institutional Placement (QIP) A QIP is an issue of equity shares or convertible securities to Qualified Institutional Buyers in terms of the provisions of Chapter XIIIA of SEBI (DIP) Guidelines.

3.3 SECONDARY EQUITY MARKET (STOCK MARKET)

The origin of the stock market in India goes back to the end of the eighteenth century when long-term negotiable securities were first issued. However, for all practical purposes, the real beginning occurred in the middle of the nineteenth century after the enactment of the Companies Act in 1850, which introduced the feature of limited liability and generated investor interest in corporate securities.

An important early event in the development of the stock market in India was the formation of the Native Share and Stock Brokers' Association at Bombay in 1875, the precursor of the present day Bombay Stock Exchange. This was followed by the formation of associations/ exchanges in Ahmedabad (1894), Calcutta (1908), and

Madras (1937). In addition, a large number of ephemeral exchanges emerged mainly in buoyant periods only to recede into oblivion during depressing times subsequently.

In order to check such aberrations and promote a more orderly development of the stock market, the central government introduced a legislation called the Securities Contracts (Regulation) Act, 1956. Under this legislation, it is mandatory on the part of a stock exchange to seek governmental recognition. As of October 2007 there were 23 stock exchanges recognised by the central government. They are located at Ahmedabad, Bangalore, Baroda, Bhubaneshwar, Kolkata (formerly Calcutta), Chennai (formerly Madras), Cochin, Coimbatore, Delhi, Guwahati, Hyderabad, Indore, Jaipur, Kanpur, Ludhiana, Mangalore, Mumbai (The Bombay Stock Exchange), Mumbai (the National Stock Exchange or NSE), Mumbai (OTC Exchange of India), Mumbai (the Interconnected Stock Exchange of India), Patna, Pune, and Rajkot.

The most important development in the Indian stock market was the establishment of the National Stock Exchange (NSE) in 1994. Within a short period, it emerged as the largest stock exchange in the country surging ahead of the Bombay Stock Exchange (BSE) which was historically the dominant stock exchange in India.

The NSE has cast its shadow over most of the regional stock exchanges, jeopardising their very existence. In a bid to survive, the regional stock exchanges have set up subsidiaries which in turn have become institutional members of NSE as well as BSE. For example, the Bangalore Stock Exchange has set up a subsidiary called the BGSE Financial Services Limited which is an institutional member of NSE as well as BSE. Members of the Bangalore Stock Exchange can trade on NSE as well as BSE through the BGSE Financial Services Limited.

At present, NSE and BSE account for almost 100 percent of the total turnover on the Indian stock market, thanks to three factors: advent of automated trading and the nation wide reach of NSE and BSE; introduction of a common rolling settlement system; and abolition of regional listing requirement.

Since the National Stock Exchange and the Bombay Stock Exchange loom large over the Indian stock market, it may be instructive to learn about their distinctive features.

The National Stock Exchange

Inaugurated in 1994, the National Stock Exchange seeks to (a) establish a nation-wide trading facility for equities, debt, and hybrids, (b) facilitate equal access to investors across the country, (c) impart fairness, efficiency, and transparency to transactions in securities, (d) shorten settlement cycle, and (e) meet international securities market standards. The distinctive features of NSE, as it functions currently, are as follows:

- The NSE is a ringless, national, computerised exchange.
- The NSE has two segments: the Capital Market segment and the Wholesale Debt Market segment. The Capital Market segment covers equities, convertible debentures, and retail trade in non-convertible debentures. The Wholesale Debt Market segment is a market for high value transactions in government securities, PSU bonds, commercial papers, and other debt instruments.

- The trading members in the Capital Market segment are connected to a central computer in Mumbai through a satellite link-up, using VSATs (Very Small Aperture Terminals). Incidentally, NSE is the first exchange in the world to employ the satellite technology. This enabled NSE to achieve a nation-wide reach. The trading members in the Wholesale Debt Market segment are linked through dedicated high speed lines to the central computer at Mumbai.
- The NSE has opted for an order-driven system. When an order is placed by a trading member, the computer automatically generates a unique order number and the member can take a print of order confirmation slip containing this number.
- When a trade takes place, a trade confirmation slip is printed at the trading member's work station. It gives details like quantity, price, code number of counterparty, and so on.
- The identity of a trading member is not revealed to others when he places an order or when his pending orders are displayed. Hence, large orders can be placed on the NSE.
- Members are required to deliver securities and cash by a certain day. The payout day is the following day.
- All trades on NSE are guaranteed by the National Securities Clearing Corporation (NSCC). This means that when A buys from B, NSCC becomes the counterparty to both legs of the transaction. In effect, NSCC becomes the seller to A and the buyer from B. This eliminates counterparty risk.

The Bombay Stock Exchange

Established in 1875, the Bombay Stock Exchange (BSE) is one of the oldest organised exchanges in the world with a long, colourful, and chequered history. Its distinctive features are as follows:

- The BSE switched from an open outcry system to a screen-based system in 1995 which is called BOLT (which is an acronym for BSE On Line Trading). It accelerated its computerisation programme in response to the threat from the NSE.
- To begin with, BOLT was a 'quote-driven' as well as an 'order-driven' system, with jobbers (specialists) feeding two-way quotes and brokers feeding buy or sell orders This hybrid system reflected the historical practice of BSE where jobbers played an important role. A jobber is a broker who trades on his own account and hence offers a two-way quote or a bid-ask quote. The **bid** price reflects the price at which the jobber is willing to buy and the **ask** price represents the price at which the jobber is willing to sell. From August 13, 2001, however, BSE, like NSE, became a completely order-driven market.
- In October 1996 SEBI permitted BSE to extend its BOLT network outside Mumbai. In 2002, subsidiary companies of 13 regional exchanges became members of BSE and through them members of regional exchanges now serve as sub-brokers of BSE. This has expanded the reach of BSE considerably.

Demutualisation

Keen competition among stock exchanges all over the world has been reshaping their organisation. Till early 1990s almost all stock exchanges were mutual ventures, owned cooperatively by members who enjoyed trading privileges. In general, the owners (members) did not have much incentive to modernise the exchanges, as more efficient trading could diminish their profits. From 1993 onwards, however, a number of smaller exchanges resorted to demutualisation. They transformed themselves into profit-making companies, and issued shares to outsiders. With shareholders expecting profits, the stock exchanges have a stronger incentive to offer new products and services, increase trading volumes, and reduce costs.

The idea of demutualisation was gradually accepted by bigger exchanges like the London Stock Exchange, NASDAQ, Tokyo Stock Exchange, and the New York Stock Exchange.

The phenomenal success of the National Stock Exchange, which was started *ab initio* as a profit-oriented company promoted by institutional investors, provided the stimulus for demutualisation of stock exchanges in India. Indeed, SEBI has now mandated that all the stock exchanges in India should be demutualised.

3.4 TRADING AND SETTLEMENT

Trading

Each stock exchange has certain listed securities and permitted securities which are traded on it. Members of the exchange alone are entitled to the trading privileges. Investors interested in buying or selling securities should place their orders with the members (also called brokers) of the exchange.

There are two ways of organising the trading activity: the open outcry system and the screen-based system.

Open Outcry System As the nomenclature suggests, under the open outcry system, traders shout and resort to signals on the trading floor of the exchange which consists of several 'notional' trading posts for different securities. A member (or his representative) wishing to buy or sell a certain security reaches the trading post where the security is traded. Here, he comes in contact with others interested in transacting in that security. Buyers make their bids and sellers make their offers and bargains are closed at mutually agreed-upon prices. In stocks where jobbing is done, the jobber plays an important role. He stands ready to buy or sell on his account. He quotes his bid (buying) and ask (selling) prices. He provides some stability and continuity to the market.

Screen-based System In the screen-based system, the trading ring is replaced by the computer screen and distant participants can trade with each other through a computer network. A large number of participants, geographically separated, can trade simultaneously at high speeds. The screen-based trading system (a) enhances the informational efficiency of the market as more participants trade at a faster speed; (b) permits the market participants to get a full view of the market, which increases their confidence in the market; and (c) establishes transparent audit trails. While computerised trading is more efficient, it decidedly lacks the vibrancy and vitality of the traditional floor trading. Technology seems to have its own way of pushing colourful traditions and practices into oblivion!

Block Deals and Bulk Deals

A block deal is a deal involving a minimum quantity of five lakh shares or a minimum value of Rs. 5 crore. There is a separate window for block deals on BSE and NSE. These deals can take place only between 9.55 a.m and 10.25 a.m. Block deals involve simultaneous large scale buy and sell transactions at a predetermined price. This is different from the usual price discovery mechanism in which a number of buyers and sellers compete against each other. The purpose of having a separate window and mechanism for block deals is to check intra-day volatility and prevent disruption of normal trading. In essence, block deals are negotiated transactions outside the exchange. However, they are given effect in a predetermined manner on the exchange, primarily for reporting purposes.

A bulk deal is a transaction that involves the transfer of more than 0.5 percent of the number of equity shares of any company listed on the stock exchange.

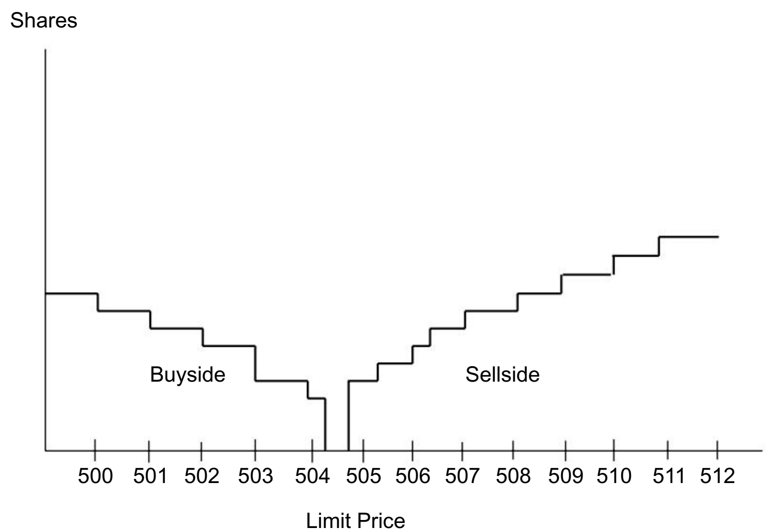
Till 1994, trading on the stock market in India was based on the open outcry system. With the establishment of the National Stock Exchange in 1994, India entered the era of screen-based trading. Within a short span of time, screen-based trading has supplanted the open outcry system on all the stock exchanges in the country, thanks to SEBI's initiative in this respect. No country has achieved such a transformation so rapidly. The kind of screen-based trading system adopted in India is referred to as the open electronic limit order book (ELOB) market system. The key features of this system are as follows:

- Buyers and sellers place their orders on the computer. These orders may be limit orders or market orders. A **limit order** pre-specifies the price limit. For example, a limit order to buy at a price of Rs. 90 means that the trader wants to buy at a price not greater than Rs. 90. Likewise, a limit order to sell at a price of Rs. 95 means that the trader wants to sell at a price not less than Rs. 95. A **market order** is an order to buy or sell at the best prevailing price. A market order to sell will be executed at the highest bid price whereas a market order to buy will be executed as the lowest ask price.

- The computer constantly tries to match mutually compatible orders. The matching is done on a price-time priority, implying that price is given preference over time in the process of matching. A buy order at a higher limit price is accorded precedence over a buy order at a lower limit price. By the same token, a sell order at a lower limit price is given priority over a sell order at a higher limit price. Between two limit orders placed at the same price, the limit order placed earlier is accorded priority over the limit order placed later.
- The limit order book, i.e., the list of unmatched limit orders is displayed on the screen. Put differently, it is open for inspection to all traders.

Limit Order Book

Because limit orders may not be executed immediately on submission, at any given time there are active limit orders. A limit order book is the current set of active limit orders, arranged first by price and then by time. This means that high-priced buy orders and low-priced sell orders have the highest priority. Limit orders with the same limit price are arranged in such a way that orders submitted earlier are given priority over orders submitted later. Graphically, the cumulative limit order book may look as follows.



Is the Screen Based Trading Always Advantageous?

Is the screen based trading always advantageous? Does the growing popularity of screen based trading suggest the eventual disappearance of intermediaries in the secondary markets? This may not happen because there is a flip side to the transparency associated with screen based trading. Since transparency allows everyone to get a better idea of buy and sell orders, institutional investors who trade in large quantities may suffer adverse price impacts. Even though their trades are often not motivated by private information, they may not be able to communicate their innocuousness to the market. Hence they tend to suffer adverse price impacts. A large sell order, presumably originating from an institutional investor having private information, depresses the price to the detriment of the institutional seller. Likewise a large buy order from an institution raises the price and hurts the buyer. Such adverse market impacts prod large-size traders to trade elsewhere. As Ravi Anshuman says: "No wonder, large-size traders still prefer specialised markets (e.g., the upstairs market in the NYSE) to screen based trading systems. Institutional investors (portfolio managers) may move their trades back to an intermediated centralised marketplace that is less transparent."

V. Ravi Anshuman "IT and the changing Face of Indian Stock Exchanges" ETIT, January – February, 1999

Settlement

Traditionally, trades in India were settled by physical delivery. This means that the securities had to physically move from the seller to the seller's broker, from the seller's broker to the buyer's broker (through the clearing house of the exchange or directly), and from the buyer's broker to the buyer. Further, the buyer had to lodge the securities with the transfer agents of the company and the process of transfer took one to three months. This led to high paperwork cost and created bad paper risk.

To mitigate the costs and risks associated with physical delivery, security transactions in developed markets are settled mainly through electronic delivery facilitated by depositories. A depository is an institution which dematerialises physical certificates and effects transfer of ownership by electronic book entries.

To enable the creation of depositories to facilitate dematerialised trading in India, the central government promulgated the Depository Ordinance, 1995 which was followed by the Depositories Act, 1996. The highlights of the Depositories Act are as follows:

- Every depository will be required to be registered with the Securities and Exchange Board of India.
- Investors will have the choice of continuing with the existing share certificates or opt for the depository mode.
- Investors opting to join the depository mode are required to register with the agents of the depositories. These will be custodial agencies like banks, financial institutions, and large brokerage firms.

- While the depository will be the registered owner in the register of the company, the investor will enjoy the economic benefits as well as the voting rights on the share concerned.
- Shares in the depository mode will be fungible. This means that they will cease to have distinctive numbers.
- Investors having entered the depository mode can leave the system and get share certificates from the company as registered owners in the books of the company.
- Ownership changes in the depository system will be made automatically on the basis of delivery against payment. Further, there will be no stamp duty on transfer of ownership.
- Any loss caused to the beneficial owners due to the negligence of the depository or the participant will be indemnified by the depository.

The National Securities Depository Limited (NSDL), India's first depository, was set up in 1996. It was followed by the Central Securities Depositories Limited (CSDL). Both the depositories, the NSDL in particular, have recorded a significant growth in their operations.

SEBI has made dematerialised trading compulsory for all the stock exchanges in the country. This means that if you want to buy or sell shares on any exchange you have to do it only in the dematerialised form. Of course, two parties can engage in an off-market spot transaction that can be settled through the delivery of shares in physical form. There is a transfer duty of 0.50 percent on physical transfer.

Shift to Rolling Settlement Earlier share transactions in India were settled on the basis of a weekly account period. (On the Bombay Stock Exchange the account period was Monday to Friday and on the National Stock Exchange the account period was Wednesday to Tuesday). This meant that purchases and sales during an account period could be squared up and, at the end of the account period, transactions could be settled on a net basis. For example, if you bought 100 shares of Infosys on Bombay Stock Exchange on a Monday at Rs. 5,000 a share and sold 95 shares of Infosys at Rs. 5050 on the Friday of that week, you were required to take delivery for only 5 shares by paying Rs. 20,250 (Purchase consideration of Rs. 500,000—Sale consideration of Rs. 479,750) at the end of account period.

The weekly settlement system along with the badla system of carrying forward transactions from one account period to the next, according to many informed observers of the Indian stock market, led to unbridled speculative activity and periodic market crises. So, SEBI decided to introduce rolling settlement in a phased manner from 2002. Under the compulsory rolling system now in vogue, every day represents a new settlement period. Put differently, the trading cycle which was earlier one week has been reduced to one day. This means that you have to square an open position the same day; otherwise, you have to take or give delivery, depending on your position.
Presently, the settlement of all trades is on a T + 2 basis and the settlement cycle is as follows:

Settlement Cycle (T + 2)

Day	*Activity For the Day*
T	Trade
T + 1	Custodial confirmation & final obligation
T + 2	Pay-in/ Pay-out of funds & securities
T + 3	Auction for shortages
T + 4	-
T + 5	Pay-in/ Pay-out of funds & securities for auction

Note: The table depicts a typical settlement cycle for the T + 2 market segment. The days prescribed for the above activities may be change in case of factors like holidays, bank closing, etc.

Transaction Costs

Transaction costs may be divided into three broad headings: trading costs, clearing costs, and settlement costs.

Trading Costs Trading costs consist of brokerage cost, market impact cost, and securities transaction tax. *Brokerage cost* is the brokerage paid to the broker. Due to heightened competition in stock broking, brokerage cost has fallen significantly.

Market impact cost is the difference between the actual transaction price and the "ideal price", the latter being defined as the price at which the trade will occur if the market for the stock were perfectly liquid or infinitely deep. To illustrate this, suppose that the best buy and best sell price for a stock are Rs. 49.50 and Rs. 50.50 respectively at a given point of time. If the market were perfectly liquid, the "ideal price" would be say Rs. 50. Thus, a person who wants to buy immediately has to pay Rs. 50.50, suffering a buy-side market impact cost of Rs. 0.50 or 1 percent. Likewise, a person who wants to sell immediately will get only Rs. 49.50, suffering a sell-side market impact cost of Rs. 0.50 or 1 percent. Thanks to the deepening of the Indian stock market, particularly for the large and medium capitalisation stocks, the market impact cost has come down substantially.

Securities transaction tax (STT) is a levy on securities transactions. Currently for delivery based trades in equity the levy is 0.25 percent and the same is to be split equally between the buyer and the seller. This means that for a transaction worth Rs. 100, the buyer and seller have to pay 12.5 paise each. For transactions on which STT is paid the new tax treatment on capital gains will apply. For non-delivery based trades (day trades and arbitrage trades) in equity the levy is only 0.025 percent, and the same has to be paid by the seller. Day traders and arbitrageurs can claim deduction of STT for computing taxable profit.

Clearing Costs When a negotiated trade takes place, the counterparty may default or when a trade takes place on an exchange, the exchange may default in its payout. Clearing costs are costs experienced in resolving such defaults.

Historically, clearing costs in India were high. Thanks to the establishment of the clearing corporation at NSE (a clearing corporation becomes the legal counterparty to the net settlement obligations of each broker) and clearing houses on other exchanges, clearing costs in India have been virtually eliminated.

Settlement Costs A trade is finally consummated when securities and funds actually change hands. Settlement costs are costs associated with such transfer. With the advent of dematerialisation, elimination of stamp duty on dematerialised trades, and improvement of banking technology, settlement costs have come down substantially.

Thanks to the introduction of screen-based trading and electronic delivery, the stock market has been veritably transformed. Their combined effect has been to reduce the transaction costs in India's stock market dramatically. As of mid-1993, according to Ajay Shah and Susan Thomas, the total transaction cost in Indian market was 5.00 percent; presently it is around 0.50 percent. The details are given below:

	Mid—1993	**Today**
Trading	3.75%	0.40%
Brokerage cost	3.00%	0.25%
Market impact cost	0.75%	0.15%
Clearing		
Counterparty risk	Present	Absent
Settlement	1.25%	0.10%
Paperwork cost	0.75%	0.10%
Badpaper risk	0.50%	0.00%
Total	5.00% (+ risk)	0.50%

Role of the Clearing Corporation

While the stock exchange provides the trading platform, the clearing corporation looks after the post-trade activities such as clearing all trades, determining the obligations of members, arranging for pay-in of funds/securities, arranging for pay-out of funds/securities to members, guaranteeing settlement, and collecting and maintaining margins/collateral/base capital/other funds. The clearing corporation is connected to the exchange, the clearing banks, depositories, custodians, and members electronically.

3.5 BUYING AND SELLING SHARES

• Procedure for Buying Shares

Buying shares and debentures involves the following steps:

Locating a Broker Typically, shares are bought through a stock broker, who is a licensed member of a recognised stock exchange. So, when you want to buy shares, you should locate a broker. Ask your friends, who have experience, to recommend some names and meet the suggested brokers personally and make a first-hand assessment. Basically, satisfy yourself that the broker you select can render prompt and efficient service and protect your interest.

For doing business with the broker, you have to submit a client registration form as well as a member-constituent form (or a sub-broker client agreement form). The latter contains the terms and conditions relating to order/trade confirmation, brokerage charged by a trading member/registered sub-broker, and delivery of securities and funds.

Placement of Order After locating a suitable broker, place your order to buy. Your order should clearly specify the name of the company and the type of securities (equity shares, preference shares, or debentures). Note that all transactions through a stock exchange are now settled through the depositories. So you must have a demat account with an authorised depository before you place an order.

You can place a limit order or a market order. A limit order specifies the quantity to be traded, the highest price (the limit price) that the buyer is willing to accept, and the length of time the order is valid. A *day order* remains valid only for the day when it is placed. If the order is not executed on that day, it automatically lapses. A *week order* is one which is valid for a week. A *month order* is an order which is valid for one month. An *open order* remains valid in effect until it is executed or cancelled. For example, you may submit a limit order to buy 100 shares of Reliance Industries until the close of the trading on a particular day at a price less than or equal to the limit price of Rs. 2500.

When you submit a limit order, you run the risk of delayed execution as well as the risk that the order will not be executed. Those who place active limit orders essentially stand ready to trade at the discretion of the other market participants. Hence they *supply liquidity* to the market, just as a market maker (who is ready to buy when investors want to sell and to sell when investors want to buy) does.

When you submit a market order, you merely specify the quantity that you want to buy at the best available price. For example, you may submit a market order for 100 shares of Reliance Industries. A market order guarantees execution; however, the trade price is not known beforehand. Those who place market orders essentially require liquidity from the market. Put differently, they *demand liquidity* from the market.

Execution of Order On receiving your order, the broker will feed the same on his terminal. Once the order is executed, the broker will inform you and send a 'contract note'. Representing the documentary evidence of the transaction, the 'contract note' contains relevant details of the transactions. Preserve it for tax and other purposes.

You are expected to pay for your purchase within a stipulated period specified by the broker. After you have effected the payment the broker will transfer the shares electronically to your depository participant account.

Procedure for Selling

Once you have located a broker, the steps involved in selling shares are as follows:

Placement of Order You have to place a 'sale order' with your broker. You may place a limit order wherein you specify the minimum price acceptable to you; or you may place a market order, which means that you instruct your broker to sell at the best available market price. Before placing the order, make sure that the shares you want to sell are to your credit in your depository account.

Execution of Order On receiving your 'sale order', your broker will feed the same in his terminal. Once the order is executed the broker will inform you and send you a 'contract note', the documentary evidence of the transaction. You will then have to issue a depository participant cheque for the shares that you have sold in favour of the broker. This cheque transfers the shares from your depository account to the broker's depository account, just the way a bank cheque transfers money from the payer's account to the payee's account. You will receive payment from the broker in a few days.

Internet Trading

February 2000 witnessed the introduction of stock trading on the internet in India. Currently, ICICI Webtrade, Sharekhan, Kotakstreet, Geogit Securities, Investmart, and others offer internet trading.

To do internet trading, you have to register yourself as a client with the internet broker, apart from having a computer, a modem, and a telephone connection. You also have to keep a minimum deposit in the bank account with the internet broker which the broker can directly debit or credit. For example, for ICICI Webtrade, you should open a bank account as well as a demat account with ICICI Bank. You can feel the NSE terminal and BSE terminal on your computer screen and you can key your buy and sell orders directly. Within the limits assigned by your internet broker, your orders will get logged directly on the trading platform.

The linked 3-in-1 account (savings bank account, depository account, and trading account) permits security, instant order confirmation, easy transfer of funds and securities, and transparency. In addition, the 3-in-1 account service provider offers fundamental and technical information and market updates free of cost.

Important Points to Remember

When you 'buy' or 'sell' shares (or debentures) of a company, bear in mind the following points.

1. As per the amended guidelines for listing, a company is supposed to:
   (a) Close its transfer books only once in a year at the time of annual general meeting and to have record dates for other purposes like bonus issues, rights issues, etc;
   (b) Have uniform dates of book closing and record dates either on 1st or 6th of any month and to give to the exchange notice in advance of at least 42 days or of as many days as the exchange may from time to time reasonably prescribe;

(c) Accept registration for transfers that are lodged with the company up to the date of closure of the transfer books (or, when the transfer books are not closed, up to the record date) and defer, until the transfer books have re-opened, registration of any transfers which may be received after the closure of the transfer books; and

(d) Issue letters of allotment or letters of rights within six weeks of the record date or date of reopening of the transfer books, after their closure for the purpose of making a bonus or rights issue.

2. On the stock market, the shares become ex-dividend (or ex-bonus or ex-rights as the case may be) several days before the book closure date (record date). The cut-off date for 'ex-dividend' transactions is normally fixed by the stock exchange authorities. For example, in a certain case, the share may become ex-dividend on say, August 10. This is indicated by the abbreviation 'xd' affixed after the price of the share. Similarly, 'xb' stands for 'ex-bonus', 'cb' for 'cum-bonus', 'xr' for 'ex-rights', and 'cr' for 'cum-rights'.
3. If you buy the shares 'xd' (or 'xb' or 'xr') you are not entitled to dividend (or bonus shares or rights) for which the books are about to be closed.

Architectural Deficiencies

The Indian market is more volatile than the US market because of the following architectural deficiencies:

Dominance of Single-Stock Futures A major architectural defect of the Indian stock market is the dominance of single stock futures over index futures. This is in contrast with what happens in all major future exchanges in the world where index futures dominate single stock futures. Curiously, Dr R.H. Patil, former managing director of NSE, where single stock index futures were introduced during his tenure, is now a critic of this system. In an article that appeared in the *Economic and Political Weekly* he states: "All the major futures exchanges of the world in the US or Europe consider that individual stock futures are not only highly unsafe but also they do not serve any justifiable purpose... they have been introduced in a hurry in our country."

Unrestricted Day Trading Day traders in India are not required to take and give delivery. In the US, for example, a person who buys and sells on the same day is first required to pay for the shares before he can sell them. Unrestricted day trading undoubtedly has contributed to speculative excesses and high volatility.

Absence of Market Making Market makers (called specialists in the US) stand ready to buy and sell on their account. They contribute to orderly price behaviour and ensure liquidity, even for mid-cap and small-cap shares. Absence of market making in India contributes to volatility to some extent.

4. If you buy the shares 'cd' (or 'cb'or 'cr' as the case may be), you are entitled to the dividend (or bonus shares or rights) for which the books are about to be closed.
5. You can obtain information about book closure dates from your broker or from the stock exchange. Financial newspapers like *The Economic Times* and *The Financial Express* and investment magazines like *Capital Market* and *Dalal Street Journal* also provide this information.

3.6 BUYING ON MARGIN AND SHORT SALE

Buying on Margin

You can buy shares on margin. This means that you provide a portion of the purchase value as margin and the rest is given by the broker as a loan to you. For example, if you have a margin account with kotaksecurities.com, you can get a loan upto 75 percent of the purchase value. So, if your margin account has a balance of Rs. 25,000, you can buy shares upto Rs. 100,000.

The **percentage margin** is equal to: equity in the account/market value of the shares. Suppose you pay a margin of Rs. 10,000 and purchase shares worth Rs. 25,000, borrowing Rs. 15,000 from the broker. The **initial percentage margin** is:

$$\frac{\text{Equity in the account}}{\text{Value of the shares}} = \frac{\text{Rs. } 10{,}000}{\text{Rs. } 25{,}000} = 40 \text{ percent}$$

A rise in the value of the shares augments your equity in the account and a fall in the value of shares diminishes your equity in the account. Suppose the value of the shares falls to Rs. 20,000. Your equity in the account becomes Rs. 5,000 and the **percentage margin** becomes:

$$\frac{\text{Rs. } 5{,}000}{\text{Rs. } 20{,}000} = 25 \text{ percent}$$

If the value of the shares falls below Rs. 15,000, your equity in the account would turn negative. To guard against such a thing, the broker prescribes a **maintenance margin.** Should the percentage margin fall below the maintenance margin, the broker will issue a margin call asking you to infuse more cash in the margin account. If you fail to do so, the broker is entitled to sell securities from the account to collect enough of the loan so that the percentage margin is restored to an acceptable level.

When you buy on margin, your upside potential as well as the downside risk are magnified. To see how, suppose you deposit Rs. 10,000 in a margin account and buy shares worth Rs. 40,000, borrowing Rs. 30,000 from the broker. If the shares appreciate by 25 percent to Rs. 50,000 you earn a 100 percent return (Rs. 10,000/Rs. 10,000), ignoring the cost of borrowing. If the shares fall by 25 percent to Rs. 30,000, you lose 100 percent, not counting the borrowing cost.

Short Sale

A short sale is a sale of shares that one does not have. A short seller expects the price of the shares to fall in future so that he can square his position at a profit. Of course, the price can rise, inflicting a loss on the short seller.

A short sale is arranged by the broker who borrows shares from another customer or broker so that the short seller can effect delivery. The short seller has to buy back the shares in future to replace the borrowed shares and also repay any dividend that may have been paid on the shares. Thus the cash flows associated with the short sale of shares are as follows:

Time	*0*	*1*
Action	Borrow shares and sell them	Buy shares for replacement and pay dividend
Cash flow	+ Initial price	- [Ending price + Dividend, if any]

Since a short sale entails risk, the broker insists on a margin which may be 25 percent to 50 percent. Suppose you want to make a short sale of 1000 shares of Alpha Company at Rs. 100 and your broker requires a margin of 40 percent. You must have a balance of Rs. 40,000 in your account with the broker to do the short sale. The margin is meant to protect the broker, should you start losing money on your account.

Suppose the shares of Alpha fall to Rs. 80, in line with your expectation. You buy 1000 shares, square your position, and book a profit of Rs. 20,000.

What happens if the price of Alpha shares rises to Rs. 120, contrary to your expectation? In this case, your initial margin or equity position reduces from Rs. 40,000 to Rs. 20,000.

Initial margin (equity)	Rs. 40,000
Loss	– Rs. 20,000
Current margin (equity)	Rs. 20,000

The broker would insist on a certain minimum maintenance margin. Suppose this is 25 percent. This means that your equity position must be at least equal to 25 percent of the **current value** of the stock which has been sold short. In the present example it should be Rs. 30,000 (25 percent of Rs. 120,000). Since your equity position is only Rs. 20,000 you have to post an additional margin of Rs. 10,000.

3.7 STOCK MARKET QUOTATIONS AND INDICES

Information on stock market activity is reported in various media. It is covered by newspapers, business periodicals, other publications, radio, and television. For most of the investors the coverage in *The Economic Times* or *The Financial Express* is reasonably adequate.

Investors are interested in knowing what is happening to individual stocks and what is happening to the market as a whole. Let us see how the information about these aspects is reported.

Individual Stock Quotations

The manner in which daily newspapers provide information on stock prices may be illustrated with the help of the following quotations for Bajaj Auto for January 9, 2008 as given in *The Economic Times*. Note that it is a combined share quotation of the BSE and NSE. The BSE quotes are given first and the NSE quotes follow in italics.

Co., (Prev.Cl.), Open, High, Low, Close [Vol.,Val. Rs'000s, Trades]	P/E	M Cap.	52-Wk H/L
Bajaj Auto (932.65), 937, 948, 931, 932.85 [46436, 43591.29, 1384]	12.7	9438.6	1200/692
(932.80), 940, 949, 931, 933.20 [138630, 130216.84, 4404]	*12.7*	*9438.6*	*1200/692*

The first column provides information on prices, volume, value, and trade. The number in the brackets to the right of the company's name, which in the case of Bajaj Auto is Rs. 932.65, represents the previous closing quotation. The set of four unbracketed prices after this represent the opening price, the highest price, the lowest price, and the closing price. For Bajaj Auto these are Rs. 937, Rs. 948, Rs. 931, and Rs. 932.85 respectively. After the stock price quotations, there is a square bracket containing three numbers. The first number, 46436, reflects the volume of shares traded; the second number, 43591.29, the value (Rs. in '000) of shares traded; the third number, 1384, the number of trades.

The second column reflects the diluted P/E, i.e., the ratio of the share's market price to the fully diluted earnings per share. For Bajaj Auto it is 12.7. The third column represents the market capitalisation (Rs. in crores) of the company, which for Bajaj Auto is Rs. 9438.6 crore. Finally, the fourth column shows the highest and lowest prices during the immediately preceding 52 weeks, after adjusting for bonus and rights issues of equity shares, which are Rs. 1200 and Rs. 692.

The important abbreviations used in stock exchange quotations are as follows:

con – convertible
xd – ex (excluding) dividend
cd – cum (with) dividend
xr – ex (excluding) right
sl – small lot

The Types of Stock Market Indices

Investors often ask the question: How is the market doing? This interest in the broad market movement stems from the general observation that prices of most of the stocks tend to move together, a fact that has a fairly strong empirical underpinning. The general movement of the market is typically measured by indices representing the entire market or important segments thereof. Most of the stock market indices used in practice are of three types:

Price-weighted Index A price-weighted index is an index reflecting the sum of the prices of the sample stocks on a certain date in relation to a base date. The price-weighted index assumes that the investor buys one share of each stock included in the index.

Equal-weighted Index An equal-weighted index is an index reflecting the simple arithmetic average of the price relatives of the sample stocks on a certain date in relation to a base date. An equal-weighted index assumes that the investor invests an equal amount of money in each stock included in the index.

Value-weighted Index A value-weighted index is an index reflecting the aggregate market capitalisation of the sample stocks on a certain date in relation to a base date. A value-weighted index assumes that the investor allocates money across various stocks included in the index in such a way that the weights assigned to various stocks are proportional to their market capitalisation.

To illustrate the nature of these three types of indices, consider the data for a sample of five stocks for two dates, the base date and day t, given in Exhibit 3.2.

Assuming that the base date index value is 100, the index values for day t for the different types of indices are as follows:

$$\text{Price-weighted index: } \frac{314}{225} \times 100 = 140$$

$$\text{Equal-weighted index: } \frac{915}{500} \times 100 = 183$$

$$\text{Value-weighted index: } \frac{4550}{2850} \times 100 = 160$$

Exhibit 3.2 ***Data for Constructing Stock Market Indices***

Share	Price on Base Date (Rs)	Price on Day *t*	Price Relative	No. of Outstanding Shares (in mln)	Market Capitalisation on the Base date (Rs in mln) (1x4)	Market Capitalisation on Day *t* (Rs in mln) (2x4)
	1	2	3	4	5	6
A	50	70	140	10	500	700
B	40	50	125	20	800	1000
C	100	90	90	5	500	450
D	20	80	400	15	300	1200
E	15	24	160	50	750	1200
Sum	225	314	915		2850	4550

To illustrate the nature of different types of indices, we expressed the current value in relation to the value on the base date. In practice the index value for a particular day is calculated with reference to the index value for the previous day. For example, the value-weighted index for day t is calculated as follows:

$$\text{Index value}_{t} = \text{Index value}_{t\text{-}1} \times \frac{\text{Market capitalisation}_{t}}{\text{Market capitalisation}_{t\text{-}1}}$$

Stock Market Indices in India

A number of stock market indices are constructed in India: Sensex, S&P CNX Nifty Index, RBI Share Price Index, BSE-100 Natex, BSE-500, BSE Dollex, S&P CNX Nifty Junior, and so on. Out of these, the most popular indices are S&P CNX Nifty Index and Sensex and so they will be discussed in some length.

S&P CNX Nifty Arguably the most rigorously constructed stock market index in India, the *Nifty* reflects the price movement of 50 stocks selected on the basis of market cap and liquidity (impact cost). The base date selected for *Nifty* is April 1, 1995. The base value of *Nifty* has been set at 1,000. *Nifty* is a value-weighted index, in which the weights of constituents reflect the relative market caps of the companies that constitute the index.

The manner in which *Nifty* is reported in *Economic Times* is shown in Exhibit 3.3—of course, to save space only a segment of what is reported in *Economic Times* is shown in this exhibit.

Exhibit 3.3 ***NIFTY***

Company	*Days close*	*% Change*	*Mcap (Rs. cr.)*	*Day's Weight*	*PE*
NIFTY	4479.25	0.10	2322476	100	20.27
Reliance Ind	1972.90	0.76	274926	11.84	23.7
ONGC	832.60	-1.00	178085	7.67	11.0
Bharti Airtel	858.30	-1.29	162832	7.01	35.0

Source: *Economic Times,* September 5, 2007

Sensex Perhaps the most widely followed stock market index in India, the Bombay Stock Exchange Sensitive Index, popularly called the *Sensex,* reflects the movement of 30 sensitive shares from the A group. Sensex is a value-weighted index. The base date for Sensex is April 1, 1979, although the Sensex came into existence on January 1, 1986 when its value was computed at 598.53 (the base date value being 100).

Till August 31, 2003, *Sensex* was constructed on the basis of full market cap. From September 1, 2003, *Sensex* is being constructed on the basis of free float market cap. Free float represents the non-promoter, non-strategic shareholding. For example the free float of ONGC is not even 15 percent because the rest is owned by the Government of India and public sector companies. This change from full market cap to free float market cap was effected to conform to the best global practice.

With the growing dominance of institutional investors interested in holding a broadly diversified portfolio, the relevant criteria for judging an index are: Can the index be used as a benchmark for portfolio construction (investability)? Can the index be used as a benchmark for comparing performance in terms of return and risk (volatility)? In terms of these criteria, a free float cap weighted index is better than a market cap weighted index.

Issues in Constructing the Index

The important issues in constructing a stock market index are: Are indices based on samples reliable? What is the tradeoff between diversification and liquidity? Should we choose a value-weighted index like *Sensex* or an equal-weighted index like the Economic Times Index of Ordinary Share Prices?

Reliability Indices based on samples (even when samples are as small as 30) are fairly reliable because of the tendency of all stocks to move together. When the purpose of an index is to represent the changes in the value of stocks, one can have great confidence in a small sample of large companies because relatively few companies account for a large proportion of the value of all companies.

Tradeoff Diversifying the index reduces risk, but at a diminishing rate. Increasing the sample size from 10 stocks to 20 stocks reduces risk sharply, but going from 50 stocks to 100 stocks brings only a marginal reduction in risk. While the risk reduction benefit diminishes, a serious problem arises if illiquid stocks have to be included. Since prices of such illiquid stocks are contaminated, they may worsen the quality of the index. Hence, constructing a good index involves a tradeoff between diversification and liquidity.

Choice If the objective is to indicate changes in the aggregate value of all stocks, a value-weighted index is appropriate. On the other hand, if the purpose of the index is to reflect price movements of typical or average stocks, an equal-weighted index is more appropriate.

Stock Market Indices around the World

The most popular stock market indices around the world are the Dow Jones Industrial Average, the Standard & Poor's Composite 500 Index, Nikkei 225, and FTSE (pronounced "footsie").

- The Dow Jones Industrial Average (DJIA) is based on 30 large, "blue-chip" corporations in the US. It is a price-weighted index.
- The Standard & Poor's Composite 500 (S & P 500) stock index is a broad based index of 500 US stocks. It is a market value-weighted index.
- The Nikkei 225 is based on the largest 225 stocks of Tokyo Stock Exchange. It is a price-weighted average.
- FTSE published by the Financial Times of London is based on 100 large London Stock Exchange stocks. It is a value-weighted index.

3.8 SEBI AND FUTURE CHALLENGES

Before the establishment of the Securities and Exchange Board of India (SEBI), the principal legislations governing the securities market in India were the Capital Issues Control Act, 1956 (governing the primary market) and the Securities Contracts (Regulations) Act, 1956 (governing the secondary market). The regulatory powers were vested with the Controller of Capital Issues (for the primary market) and the Stock Exchange Division (for the secondary market) in the Ministry of Finance, Government of India.

In 1989, SEBI was created by an administrative fiat of the Ministry of Finance. Since then, SEBI has gradually been granted more and more powers. With the repeal of the Capital Issues Control Act and the enactment of the SEBI Act in 1992, the regulation of the primary market has become the preserve of SEBI. Further, the Ministry of Finance, Government of India, has transferred most of the powers under the Securities Contracts (Regulations) Act, 1956 to SEBI.

SEBI's principal tasks are to:

- Regulate the business in stock exchanges and any other securities markets.
- Register and regulate the working of capital market intermediaries (brokers, merchant bankers, portfolio managers, and so on).
- Register and regulate the working of mutual funds.
- Promote and regulate self-regulatory organisations.
- Prohibit fraudulent and unfair trade practices in securities markets.
- Promote investors' education and training of intermediaries of securities markets.
- Prohibit insider trading in securities.
- Regulate substantial acquisition of shares and takeovers of companies.
- Perform such other functions as may be prescribed.

Initiatives

SEBI has taken a number of steps in the last few years to reform the Indian capital market. It has covered the entire gamut of capital market activities through nearly 30 legislations. The important initiatives are mentioned below.

Freedom in Designing and Pricing Instruments Companies now enjoy substantial freedom in designing the instruments of financing as long as they fully disclose the character of the same. More important, they enjoy considerable latitude in pricing the same.

Ban on Badla The financial irregularities of 1992 highlighted the deficiencies of the 'badla' system which permitted excessive leveraging. To rectify the defects in trading practices, the 'badla' system has been banned.

Screen-based Trading Thanks to the competition posed by the National Stock Exchange and the insistence or prodding done by SEBI, all the exchanges have switched to screen-based trading.

Electronic Transfer The traditional method of transfer by endorsement on security and registration by issuer has been supplanted by electronic transfer in book entry form by depositories.

Risk Management A comprehensive risk management system that covers capital adequacy, limits on exposure and turnover, margins based on VAR (value at risk), client level gross margining, and online monitoring of positions has been introduced.

Rolling Settlement The trading cycle, which was previously one week, has been reduced to one day and the system of rolling settlement has been introduced.

Corporate Governance Code A new code of corporate governance, based on the recommendations of the Kumaramangalam Birla Committee report, has been defined. It has been operationalised by inserting a new clause (clause 49) in the Listing Agreement—the agreement that a listed company enters into with the stock exchange where its securities are listed.

Change in Management Structure Stock exchanges earlier were broker dominated. SEBI now requires 50 percent non-broker directors. Further, it has mandated that a non-broker professional be appointed as the Executive Director.

Registration and Regulation of Intermediaries Capital market intermediaries such as merchant bankers, underwriters, bankers to the issue, registrars and transfer agents, brokers, and sub-brokers are required to be registered with SEBI. Regulations for these intermediaries have been prescribed.

Redressal of Investor Grievances Investor grievances have been on the rise. Thanks to the steps taken by SEBI the redressal ratio (the ratio of complaints resolved to complaints received) has improved.

Regulation of Mutual Funds Mutual funds have been brought under the purview of SEBI and SEBI has issued the regulatory guidelines for this purpose.

Regulation of Foreign Portfolio Investment The government welcomes foreign portfolio investment in the Indian capital market. SEBI has formulated guidelines to permit this investment through broad-based funds (such as mutual funds, pension funds, and country funds) referred to as foreign institutional investors.

Development of a Code for Takeover Takeovers are gaining importance in India. SEBI has developed a code for regulating them.

Introduction of Equity Derivatives SEBI has allowed the introduction of equity derivatives like stock index futures, stock index options, individual stock options, and individual stock futures.

Integrated Market Surveillance System SEBI has launched an IMSS from December 2006. IMSS integrates data from stock exchanges, depositories, and clearing corporations/houses and comes up with alerts, based on certain pre-specified parameters. Such integration of data has been done for the first time in any market in the world. Thanks to IMSS, officials of SEBI can detect capital market offences like market domination and control, artificial rigging, and creation of false market. IMSS is meant to curb wash sales, matched orders, synchronised trading, front running, cornering of free float, pumping and dumping (inflating share prices and then unloading the same on unsuspecting investors), and other forms of demand and supply manipulation.

Thrust of SEBI's Regulation

Primary Market

Access	:	Restricted
Instruments	:	Multiplied
Pricing	:	Relaxed
Disclosure norms	:	Tightened
Responsibility of merchant bankers	:	Enhanced
Method	:	Book building

Secondary Market

Trading	:	Computerised
Settlement mode	:	Electronic
Transaction costs	:	Lowered
Transparency	:	Enhanced
Markets	:	Integrated
Globalisation	:	Encouraged
Risk management	:	Strengthened
Exchange management	:	Improved
Settlement period	:	Shortened

Future Challenges

While SEBI has done a great deal, it has a long way to go in accomplishing its mission. It has to address several challenges such as the following:

Preponderance of Speculative Trading and Skewed Distribution of Turnover There is a preponderance of speculative trading where the primary motive is to derive benefit from short-term fluctuations. Only a small fraction of trades results in delivery. Earlier when the account period was one week and the facility of badla was allowed, nearly 90 percent of the trades were squared up within the account period or carried forward. After the introduction of rolling settlement, intra-day squaring has become common. After the ban of badla, individual stock futures, which are cash-settled, have become very popular.

An allied problem is that the distribution of trading is highly skewed. About 10 scrips account for nearly 80 percent of the turnover on the stock market. Thanks to such skewed distribution of trading, most shares are traded infrequently and, hence, lack liquidity.

L.C. Gupta[1] argues that the over-speculative character of the Indian market is evident from the following: (i) There is an extremely high concentration of trading in a small number of shares to the neglect of the remaining shares. (ii) The trading velocity is absurdly high for 'speculative counters'—the trading velocity of a share is defined as: Total trading volume in the share during a year divided by its market capitalisation. (iii) Hardly 10 to 15 percent of the transactions are genuine investment transactions, the balance being speculative transactions.

To mitigate excessive speculation in the cash market and promote liquidity across the board, the following steps may be taken:

- Introduce margin trading wherein investors put up a certain amount for purchase of securities, the balance being lent by brokerage firms.
- Encourage market making by jobbers
- Provide lines of credit to brokerage firms.

Market Abuses Insider trading, market manipulation, and price rigging continue to impair the quality of the market. Insiders, who are privy to price-sensitive information, may use such information to their advantage. Often, companies issuing securities in the domestic market or international capital market artificially rig up prices. Cartels of powerful brokers tend to play manipulative games on the market.

It is virtually impossible to eliminate market abuses because the ingenuity of manipulators manifests itself in unanticipated ways. Nevertheless a vigilant regulatory body, well-managed exchanges, and severe penalties can go a long way in mitigating market abuses. Though some progress has been made in that direction, a lot more has to be done.

[1] L.C. Gupta, *Stock Exchanges in India: Agenda for Reform* New Delhi: Society for Capital Market Research & Development, 1992.

Improved Disclosure Standards

Disclosure standards in India have improved significantly in the last decade or so. The standards for what, when, and where of disclosure have been specified in the Companies Act, Disclosure and Investment Protection Guidelines (DIPG), listing agreement, takeover code, regulations relating to insider trading, and so on.

Disclosures relate to financial performance, shareholding pattern, insider trading, acquisitions, related party transactions, audit qualifications, share buybacks, corporate governance, director remuneration, risk management, utilisation of issue proceeds, and so on.

Disclosures are made through various documents like prospectuses, quarterly statements, annual reports, and so on, and are disseminated through various media, company websites, exchange websites, and EDIFAR (Electronic Data Information Filing and Retrieval) System maintained by SEBI.

Thanks to these improvements, disclosure standards in India are world class.

3.9 STOCK MARKET ABROAD

It is instructive to have a glimpse into the leading stock markets abroad.

Stock Market in the US

The two largest stock exchanges in the US, as well as the world, are the New York Stock Exchange (NYSE) and the NASDAQ.

New York Stock Exchange The world's biggest stock exchange in terms of market capitalisation, the NYSE has fairly stringent listing requirements which seek to ensure that only large, financially strong companies get listed.

Trading on the NYSE takes place through a system of brokers and specialists. Brokers serve as a link between the investors and the market. Specialists play a dual role: (i) They match buy and sell orders when prevailing prices permit them to do so. (ii) They buy and sell stocks on their own account when they cannot match customer orders.

NASDAQ NASDAQ is a short form for National Association of Securities Dealers Automated Quotation System. While the market capitalisation of NASDAQ is less than that of NYSE, NASDAQ is the biggest exchange of the world in terms of turnover. The success of NASDAQ is mainly due to investor interest in technology stocks, a high proportion of which has been listed on this exchange. For example, technology heavyweights like Cisco, Intel, and Microsoft have their listing only on NASDAQ. The light listing requirements of NASDAQ attracts young technology companies and the low listing costs at NASDAQ keeps them with that exchange when they have grown.

NASDAQ is a dealer market which has substantial human involvement. Market makers post the prices at which they are willing to buy and sell on the screens of brokers, who in turn choose among competing market makers to handle the desired trade.

Over 500 market makers compete to make markets in over 5000 issues via a screen-based system of competing quotes. NASDAQ requires that all listed shares must have at least two market makers. The average number of market makers per stock is about 10 and some of the large capitalisation stocks have about 40 market makers. Yet, there is a criticism that there is inadequate competition among market makers, particularly for small capitalisation stocks.

Electronic Communications Networks Large institutional investors may prefer to trade with one another directly, rather than send a large order to the floor of the exchange where they tend to suffer market impact costs. One way to do is through electronic communication networks (ECNs), which are electronic trading systems that match buy and sell orders at specified prices.

In 1997, the Securities Exchange Commission allowed trading through ECNs. ECNs—Instinct and Island ECN being the two most prominent ECNs—have captured nearly 35-40 percent of the Nasdaq-listed stock volume and represent an important source of competition.

Stock Market in the UK

The stock market in the UK underwent a radical reform in 1986, referred to popularly as the 'big bang', which led to the amalgamation of all the exchanges in UK and Ireland into the 'International Stock Exchange of UK and Ireland' headquartered in London. This has led to the emergence of a single electronic national market of UK and the closure of regional exchanges. Investors can access this market through local brokers or local branches of national brokers. Equities are traded on this market using the Stock Exchange Automatic Quotation (SEAQ) System, a 'quote-driven' system or the Stock Exchange Automatic Execution Facility (SEAF), an 'order-driven' system. Under the 'quote driven' mechanism, market makers provide two-way quotes via SEAQ. Based on these quotes, market participants contact the market makers to negotiate and trade. Under the 'order-driven' mechanism, clients give their orders to brokers which are fed to the SAEF. These are automatically executed according to certain rules.

Informed observers believe that the 'big bang' has veritably transformed the stock market in the UK. It has led to significant improvement in terms of turnover, liquidity, amount of capital raised, and lowering of the bid-ask spread. Volatility, however, has not changed.

Stock Market in Japan

The Tokyo Stock Exchange (TSE) is the dominant stock exchange in Japan, accounting for about four-fifths of total trading. The TSE divides stocks into two sections. The First Section consists of about 1200 most actively traded stocks; the Second Section consists of about 400 less actively traded stocks. Trading in the larger stocks of the First Section occurs on the floor of the exchange. The remaining stocks in the First Section and the Second Section are traded electronically.

The TSE relies on *saitories* who match orders but do not trade on their own account. A *saitori* maintains a public limit order book, matches market and limit orders, and slows down price movements when simple matching of orders would result in price changes greater than what is prescribed by the exchange.

Emerging Stock Markets

The term emerging stock markets (ESMs), as defined by the International Finance Corporation, refers to stock markets in developing countries. ESMs received prominence in the 1980s when the former socialistic economies and developing countries embraced the market based system in place of centralised planning and closed or inward-looking system. ESMs may be classified into three groups:

- The first group represents markets in Africa (Kenya, Zimbabwe), Eastern Europe (Hungary and Poland), and former Soviet Union (Belarus and Ukraine). These markets are in the early stages of development and are characterised by few quoted companies, low capitalisation, high concentration, poor liquidity, and high volatility.
- The second group represents markets in countries like Brazil, India, Philippines, Pakistan, and China. These markets are fairly developed with a large number of listed companies, good liquidity, and reasonable participation by foreign investors.
- The third group represents more mature markets like Hong Kong, South Korea, and Singapore. These markets are comparable to those in the west in terms of liquidity, trading activity, and equity risk premium.

3.10 SHOULD TRADING BE REGULATED?

Many informed observers of the capital market have argued that there is a case for regulating the volume of trading in the capital market to check excessive speculation. Notable among them are John Maynard Keynes, James Tobin, and Warren Buffett. John Maynard Keynes, perhaps the most influential economist of the twentieth century, made a fine distinction between 'industry' and 'finance'. *Industry* refers to the activities involved in procuring, manufacturing, and marketing goods and services; money flows associated with industry may be referred to as 'industrial circulation'. *Finance* refers to the business of holding and exchanging titles to wealth; money flows involved in such activities may be referred to as 'financial circulation'. John Maynard Keynes believed that a fair balance must be maintained between industrial circulation and financial circulation. If there is excessive 'financial circulation' on account of undue speculation it may lead to distortion in the economy. Echoing a similar view, James Tobin, a Nobel

Laureate in economics, proposed some kind of tax on financial transactions in order to keep money flows within reasonable bounds. In a similar vein, Warren Buffett, perhaps the most successful investor of our times, suggested that each investor should be given a card containing a certain number of holes to be punched and each time the investor trades a hole should be punched. The idea is to induce circumspection in trading and check speculative tendencies.

While the views of John Maynard Keynes, James Tobin, and Warren Buffett seem to make sense, they have not been implemented .Why? Apparently there are four reasons. First, it curtails a person's freedom to engage in a legitimate economic activity. Second, it may be administratively impractical. Third, and perhaps most important, it may impair the efficiency of the process of price discovery in financial markets. Many financial economists believe that the primary function of financial markets is to discover prices. To perform this function the market aggregates the information and judgment of millions of players who participate in the market through their trading activities. Fourth, a certain amount of speculation—and one does not know how much—is essential for liquidity in financial markets. A liquid market induces investors to save and invest which in turn is necessary for economic growth. Hence speculation, even though it may appear unpalatable to many, has to be permitted. Perhaps, it is a necessary evil. This point was grudgingly admitted even by J.M. Keynes.[2] While he felt that the purchase of an investment should be made permanent, he realised that the liquidity of investment markets facilitates the cause of new investments.

Leo Melamed, President and Chairman Emeritus, Chicago Mercantile Exchange offers a strong justification for speculation. He says: "The more trading and smaller the spread, the more market prices will migrate toward their true values. The more investors are confident that market prices reflect a high degree of accurate information, the more willing they are to commit capital with a smaller premium for uncertainty."

3.11 GOVERNMENT SECURITIES MARKET

The government securities (G-secs) market is the largest segment of the long-term debt market in India, accounting for nearly two-thirds of the issues in the primary market and more than four-fifths of the turnover in the secondary market.

From 1990 onwards, the G-secs market in India has witnessed significant developments such as:

- Introduction of auction-based price determination.
- Development of the RBI's yield curve for marking to market the G-secs portfolios of the banks.

[2] J.M. Keynes, *op. cit*.

- Introduction of the system of primary dealers.
- Introduction of DVP (delivery versus payment) for settlement.
- Increase in the number of players in the G-secs market with the facility for non-competitive bidding in auctions.
- Establishments of gilt-oriented mutual funds.
- Re-emergence of repos as an instrument of short-term liquidity management.
- Phenomenal growth in the volume of secondary market transactions in G-secs.
- Emergence of self-regulating bodies such as the Primary Dealers Association of India (PDAI) and Fixed Income and Money Market Dealers Association (FIMMDA).
- Setting up of the screen-based trading system linked to the Negotiated Dealing System.
- Establishment of the Clearing Corporation of India Limited (CCIL).

Primary Issue

The issue of G-secs is regulated by the Reserve Bank of India under the Public Debt Act (which is to be replaced by the Government Securities Act).

G-secs are issued through an auction mechanism. The Reserve Bank of India (RBI), which essentially serves as the merchant banker to the central and state governments, announces the auction of G-secs through a press notification and invites bids from prospective investors like banks, insurance companies, mutual funds, and so on. The RBI opens the sealed bids at an appointed time and makes allotment on the basis of the cut-off price decided by it.

Two systems of treasury auctions are widely used all over the world: (a) French auction (or variable price auction). (b) Dutch auction (or uniform price auction).

In a French auction, successful bidders pay the actual price (yield) they bid for whereas in a Dutch auction successful bidders pay a uniform price which is usually the cut off price (yield). Generally, the RBI follows the French auction; occasionally, it adopts the Dutch auction.

Certain categories of prospective investors can submit non-competitive bids. Those who submit such bids receive allotment (from a small portion reserved for them) at the weighted average price of all successful bids.

Participants in the G-secs Market Banks are the largest holders of G-secs. About one-third of the net demand and time liabilities of the banks are invested in G-secs mainly to meet statutory liquidity requirements and partly for investment purposes. Apart from banks, insurance companies and provident funds have substantial holdings of G-secs - almost one-fifth of the outstanding G-secs are held by these institutions. Other investors in G-secs include mutual funds, primary and satellite dealers, and trusts.

SGL Account The RBI provides the facility of Subsidiary General Ledger (SGL) account to large banks and financial institutions so that they can hold their investment in G-secs and treasury bills in the electronic book entry form. These institutions can settle their trades in securities through a DVP (delivery versus payment) mechanism, which ensures a simultaneous transfer of funds and securities. Investors who do not have access to the SGL account system can open a constituent SGL account with entities authorised by the RBI for this purpose.

Primary Dealers Introduced in 1995, primary dealers are important intermediaries in the G-secs market. They are appointed by the RBI. Presently there are about 20 primary dealers. They serve as underwriters in the primary debt market, act as market makers in the secondary debt market, and enable investors to access the SGL account. Primary dealers have access to the call market and repo market for funds.

Secondary Market for G-secs

As soon as they are issued, G-secs are deemed to be listed and eligible for trading. The National Stock Exchange (NSE) has a Wholesale Debt Market (WDM) segment which is a fully automated screen based trading system meant primarily for banks, institutions, dealers, and corporates who do high value transactions in debt securities. Long-term instruments such as bonds and debentures as well as short-term instruments such as treasury bills and commercial paper can be traded in the WDM segment of NSE.

Historically, government securities were traded on the stock exchanges. Later, the trading shifted to an over-the-counter market in which trades were done directly between the buyer and the seller, or, more commonly through brokers. Indeed, broker-intermediated trading was the norm for many years.

However, broker-intermediated trading suffers from certain weaknesses. (i) It generally takes more time to conclude a deal. (ii) It lacks adequate transparency. (iii) It entails higher transaction costs because of larger bid/offer spreads and broker commission.

NDS and Electronic Trading Given the shortcomings of broker-intermediated trading, there is a worldwide trend toward electronic trading. In India, the first step toward electronic trading in bonds was taken when RBI's Negotiated Dealing System (NDS) was introduced in February 2002. NDS was meant to be used for bidding in the primary auctions of G-secs conducted by RBI as well as for trading and reporting of secondary market transactions. However, in the initial years, due to some technical difficulties, NDS was used mainly for placing bids in the primary market. As far as the secondary market was concerned, the role of NDS was limited to being a reporting platform, while the trading continued to be broker-intermediated.

RBI, therefore, decided to introduce a screen-based anonymous order matching system, integrated with NDS. This system, referred to briefly as NDS-OM, was operationalised from August 1, 2005. Initially, only banks and primary dealers could trade on the NDS-OM. Subsequently, it has been gradually expanded to cover other players like insurance companies and mutual funds.

Presently, the trades done between banks and primary dealers are settled through the Clearing Corporation of India Limited (CCIL)—other trades have to be settled separately.

Thanks to its speed, transparency, and lower costs as well as the facility of straight through processing (STP) using the CCIL's clearing and settlement system, NDS-OM has been gaining popularity. As a result, broker-intermediated telephone-based transactions are losing their market share.

Delivery versus Payment Trades in the secondary market are settled through a system of "delivery versus payment" (DVP): this involves a more or less simultaneous transfer of the security by the seller to the buyer and payment by the buyer to the seller. As far as trades between CCIL's members (banks and primary dealers) are concerned the settlement function is performed by CCIL. CCIL settled trades account for almost 95 percent of the total trades.

Trading Volumes and Market Liquidity In recent years secondary market trading has picked up. However, the bulk of the trading occurs in a small number of G-Secs and T-bills. In general, less than half a dozen or so, out of more than hundred outstanding government securities, account for nearly 80 percent of the turnover. Further, the primary dealers are the most active players in the secondary market.

Retail Participation Retail investors can buy G-secs from a primary dealer or a commercial bank. Individuals can now hold G-secs in demat form, just the way they hold shares in a demat form.

If you want to buy G-secs contact a primary dealer (like PNB Gilts), convey your requirement in terms of amount and maturity period, and obtain quotes for various G-secs that match your need. Suppose you wish to buy G-secs that mature in 2008. Some of the G-secs maturing in 2008 are 11.40% GOI 2008, 12.00% GOI 2008, and 12.25% GOI 2008. G-secs are identified by their coupon rates and year of maturity.

If you inform the primary dealer about the particular G-sec in which you are interested, the primary dealer will give you a rate. Once you and the primary dealer agree on the rate, you have to fill up a simple form which furnishes your demat account and issue a cheque. After your cheque is realised, the primary dealer will issue instructions to transfer the G-secs from his demat account to your demat account.

For G-secs the settlement amount includes two parts - the principal amount and the interest for the broken period. The buyer of a G-sec has to pay interest for the period the G-sec was held by the seller. This is because interest on G-secs is paid semi-annually by RBI to the holder of the G-secs on the interest payment date. For G-secs the interest calculation is based on 360 days for a year and 30 days for a month.

Thus, when you buy G-secs you have to pay the rate that has been agreed upon plus the interest accrued for the broken period.

You have to follow a similar procedure for selling G-secs. Get the rate from the primary dealer. Once you and the primary dealer agree on the rate, instruct your depository participant to transfer G-secs from your demat account to the demat account of the primary dealer. After the G-secs are credited to the demat account of the primary dealer, you will receive payment (for principal and broken period interest) by cheque or demand draft.

Bond Market Indices Just as stock market indices reflect the performance of the stock market, a bond market index measures the performance of the bond market. I-Sec, J.P. Morgan, CRISIL, CCIL, and NSE are the major entities that provide bond price indices in India. I-Sec BOND INDEX (i-BEX) is perhaps the most popular bond market index in India. There are two versions of i-BEX.

- *Total return index* This tracks the total returns. It captures interest payment (accrued and actual) and capital gains/losses.
- *Principal return index* This index reflects movement of net prices in the market, that is prices quoted in the market exclusive of accrued interest.

A major problem in constructing a bond market index is that it is hard to get reliable, up-to-date prices of many bonds as they trade infrequently. In practice, it may be necessary to estimate some prices using bond valuation models. These prices, called matrix prices, may be different from true market prices.

3.12 CORPORATE DEBT MARKET

Corporate debt market is the market for bonds issued by financial institutions, banks, public sector undertakings, (PSUs), and private sector companies. Unlike the stock market and the G-sec market which have become very modern and dynamic, the corporate debt market in India has remained underdeveloped. Hopefully, with the initiatives that are now under way, this market will also become more vibrant and sophisticated.

Primary Market

The issuance of corporate debt securities is regulated by SEBI. Chapter X (Guidelines for Issue of Debt Instruments) of SEBI Guidelines for Disclosure and Investment Protection, 2000 deals with debt instruments.

Debentures are offered to the public or issued on a rights basis or privately placed. The mechanics for a public issue of debentures are much the same as that of a public issue of equity. However, there are some differences:

- Pure debt securities are typically offered through the 100 percent retail route because the book building route is not appropriate for them.
- Debt securities are generally secured against the assets of the issuing company and that security should be created within six months of the close of the issue of debentures.

- A debt issue cannot be made unless credit rating from a credit rating agency is obtained and disclosed in the offer document.
- It is mandatory to create a debenture redemption reserve for every issue of debentures.
- It is necessary for a company to appoint one or more debenture trustees before a debenture issue.

Presently, corporate debentures in India are mostly placed privately. The private placement of a debenture issue is managed by a lead arranger, who is also the advisor and investment banker for the issue. Book building mechanism is commonly employed. There is also a virtual book building portal called debtonnet, a joint venture of NSE and ILFS, through which investors can bid for issues. While other investors can hold debentures in paper or electronic form, RBI requires that banks, financial institutions, primary dealers, and secondary dealers must hold debentures, privately placed or otherwise, only in demat form.

From 1995 onwards private placement of debentures thrived, thanks to minimal regulation. Corporates, financial institutions, infrastructure companies, and others depended considerably on privately placed debentures which were subscribed to mainly by mutual funds, banks, insurance organisations, and provident funds. Information and disclosures to be included in the private placement memoranda were not defined, credit rating was not mandatory, listing was not compulsory, and banks and financial institutions could subscribe to these issues without too many constraints.

The regulatory framework changed significantly in late 2003 when SEBI and RBI tightened their regulations over the issuance of privately placed debentures and the subscription of the same by banks and financial institutions. The key features of the new regulatory dispensation are:

- The disclosure requirements for privately placed debentures are similar to those of publicly offered debentures.
- Debt securities shall carry a credit rating of not less than investment grade from a credit rating agency registered with SEBI.
- Debt securities shall be issued and traded in demat form.
- Debt securities shall be compulsorily listed.
- The trading in privately placed debt shall take place between QIBs (Qualified Institutional Buyers) and HNIs (High Networth Individuals) in standard denomination of Rs. 10 lakh.
- Banks should not invest in non-SLR securities of original maturity of less than one year other than commercial paper and certificates of deposits which are covered under RBI guidelines.
- Banks should not invest in unrated non-SLR securities.

Shelf Registration In India, SEBI allows public sector banks, scheduled commercial banks, and public financial institutions the facility of *shelf registration* for debt securities. A bank or institution that wants to avail of this facility has to file a *shelf prospectus* with SEBI which discloses, inter alia, the aggregate amount proposed to be raised over a period of time. Once the shelf prospectus is filed and approved by SEBI, the bank or institution can raise money in stages, with minimal paperwork. Shelf registration provides flexibility to raise money as and when it is convenient or attractive to do so.

• Secondary Market

While the equity market in India has witnessed reasonably high trading volumes and liquidity, the secondary market for corporate debt instruments historically has been very dull for several reasons: (a) Debt has been subscribed to by investors who have typically pursued a buy and hold strategy. (b) Debt instruments do no appeal to the speculative traders who dominate the secondary market.

Things, however, are changing for the good. The following developments suggest that trading volumes in corporate debt would rise in future: (a) In the last few years corporates have raised substantial sums by way of debt and this should provide stimulus to trading in secondary market. (b) Bombay Stock Exchange has put in place a system to make the switchover from the OTC (over-the counter) market to an exchange-traded market for corporate bonds. (c) Individual debt issues are increasing in size and institutional investors, who are likely to be more active in trading, are participating heavily in these issues.

Every effort should be made by regulators, stock exchanges, and other concerned parties to realise the potential of debt market. Stamp duty on transfer should be standardised across the country or should be done away with completely. Tax benefits may also be granted for investment in corporate debt.

Key Weaknesses of the Corporate Debt Market in India The corporate debt market in India is characterised by the following weaknesses: (a) The bulk of corporate debt is issued through private placement, where the investor base is restricted to 49. As a result, the secondary market for corporate debt is virtually non-existent. (b) While no stamp duty is payable on the issue or transfer of government securities, corporate bonds attract stamp duty—further the duty varies widely from state to state. (c) The valuation and pricing of corporate debt is opaque. In effect, there is no yield curve that informs the market about the price at which corporate debt with varying ratings and different tenors should trade at. (d) Medium and low rated companies have no access to the corporate bond market.

3.13 MONEY MARKET

Money market is the market for short-term debt funds. It comprises of the call and notice money market, repo market, and the market for debt instruments such as treasury bills that have an original maturity of less than one year.

The money market does not exist in a specific physical location or follow a single set of rules or post a single set of prices. Rather, it represents a web of borrowers and lenders, linked by telephones and computers, dealing with short-term debt funds. Banks, financial institutions, companies, and governments are the key participants in the money market. At the centre of this web is the central bank whose policies have an important bearing on the interest rates in the money markets.

The money market provides an equilibrating mechanism for evening out the demand and supply of short-term funds and serves as a focal point for the intervention by the central bank (RBI in India) for influencing the liquidity and interest rates in the financial system.

Repo Market In a repo transaction, a holder of securities sells them with an agreement to repurchase the same after a certain period at a predetermined price which is higher than the sale price. In essence it means that the two parties exchange securities and cash with a simultaneous agreement to reverse the transaction after a given period. Thus a repo represents a collateralised short-term lending transaction. The party which lends securities (or borrows cash) is said to be doing the repo and the party which lends cash (or borrows securities) is said to be doing the reverse repo.

The salient features of repo transactions are as follows:

- Repos are generally done for a period not exceeding 14 days, though there is no restriction on the maximum period for which a repo can be done.
- G-secs, treasury bills, and select PSU and institutional bonds are the instruments used as collateral security for repo transactions.
- While banks and primary dealers can do repos as well as reverse repos, other participants such as institutions and corporates can only lend funds in the repo market. Recent policy changes seek to do away with this restriction and promote a phased expansion of the repo market. Such an expansion, however, would call for creating an enabling infrastructure such as a clearing corporation and a facility for electronic settlement of transactions.
- Repos are settled on DVP basis on the same day. So, the participants in a repo transaction must hold SGL account and current account with the RBI.
- Repos are reported in the negotiated trade segment of the WDM segment of the NSE.

Treasury Bills Treasury bills are short-term debt instruments of the central government. Presently 91-day and 364-day treasury bill are issued. Treasury bills are sold through an auction process according to a fixed auction calendar announced by RBI. Banks and primary dealers are the major bidders in the competitive auction process. Provident funds and other investors can make non-competitive bids. RBI makes allocation to non-competitive bidders at a weighted average yield arrived at on the basis of the yields quoted in accepted competitive bids.

Treasury bills are issued at a discount and redeemed at par. Hence the implicit yield on a treasury bill is a function of the size of the discount and the period of maturity.

Treasury bills are largely held by banks. Provident funds, trusts, and mutual funds have also in recent years become important investors in treasury bills. Most buyers of treasury bills hold them till maturity and hence the secondary market activity is quite limited.

Commercial Paper Commercial paper (CP) is an instrument of short-term unsecured borrowing issued by non-banking companies. CPs are issued at a discount and redeemed at par. CPs are meant primarily to finance working capital needs of corporates and hence form part of the working capital limits set by banks.

CP issues are regulated by RBI guidelines issued from time to time. According to October 2001 guidelines:

- Corporates, all-India financial institutions (FIs), Primary Dealers and Satellite Dealers can issue CPs. A corporate is eligible if its tangible net worth is at least Rs. 4 crore, if it has a sanctioned working capital limit from a bank or financial institution, and if its borrowal account is a standard asset.
- The minimum credit rating shall be P-2 of CRISIL or an equivalent thereof.
- The maturity period is 15 days to 1 year.
- The denomination is Rs. 5 lakh or a multiple thereof.
- Only a scheduled bank can act as an IPA (Issuing and Paying Agent).
- CP can be issued as a promissory note or in a demat form.

The RBI has now mandated that all further issues of CPs should be in a demat form.

Certificates of Deposit Certificates of deposits (CDs) represent short term deposits which are transferable from one party to another. Banks and financial institutions are the major issuers of CDs—they use them as short-term funding instruments. The principal investors in CDs are banks, financial institutions, corporates, and mutual funds. CDs are issued in bearer or registered form. They generally have a maturity of 3 months to 1 year and are freely transferable after an initial lock-in period. On maturity, the final holder is paid the face value along with interest.

Presently the secondary market in CDs is not active because: (a) Investors in CDs tend to hold them till maturity. (b) As CDs are issued in physical form they attract stamp duty on transfer.

SUMMARY

- The securities market is market for equity, debt, and derivatives.
- There are three ways in which a company may raise equity capital in the primary market: public issue, rights issue, and preferential allotment.
- The National Stock Exchange (**NSE**), and the Bombay Stock Exchange (**BSE**) are the leading stock exchanges in the country.
- In 1994, NSE introduced **screen-based trading**. In 1995, **electronic delivery** facilitated by depositories was introduced. From 2002, **rolling settlement** was introduced in a phased manner. These three major developments transformed the character of the Indian stock market.
- Most of the stock market indices used in practice are of three types: price-weighted index, equal-weighted index, and value-weighted index.
- **Sensex** and **Nifty** are the two most popular stock market indices in India.

- **i-BEX** is the most popular bond market index in India.
- The Securities and Exchange Board of India (**SEBI**), the regulatory body for the capital market, has taken a number of steps in the last 15 years to reform the capital market in India.
- **NYSE** and **NASDAQ** are the world's biggest exchanges respectively in terms of market capitalisation and market turnover.
- The stock market in the UK underwent a radical reform in 1986, referred to as the 'big bang,' which led to the emergence of a single electronic national market and the closure of regional exchanges.
- Tokyo Stock Exchange is the largest exchange in Japan.
- While many informed observers of the capital market have argued for regulating the volume of trading, the idea has not been found practical.
- The government securities (**G-secs**) market is the largest segment of the long-term debt market in India.
- G-secs are issued through an **auction** mechanism and transactions in G-secs are settled through **delivery versus payment** mode.
- Presently, corporate debentures in India are mostly privately placed and the secondary market for them is very dull.
- The **money market** is the market for short-term funds. It comprises of call and notice money, Treasury bills, commercial paper, and certificates of deposits.

QUESTIONS

1. What steps are involved in a public issue?
2. As an investor what aspects of public issues should you be familiar with?
3. What is book building?
4. Describe the procedure for a rights issue.
5. How is a public issue made in the US?
6. What is a preferential allotment?
7. Describe the features of ELOB market system.
8. What are the highlights of the Depository Ordinance, 1995?
9. What has been the combined effect of screen-based trading and electronic delivery on the transaction cost?
10. What are the key features of the National Stock Exchange and the Bombay Stock Exchange?
11. Describe the procedure for buying shares and selling shares.
12. What is buying on margin? What is a short sale?
13. What is the difference between a price weighted index, an equal-weighted index, and a value-weighted index?
14. Describe briefly the Bombay Stock Exchange Sensitive Index (Sensex) and the S&P CNX Nifty Index (Nifty).

15. Are indices based on samples reliable?
16. When is a value-weighted index more appropriate and when an equal-weighted more appropriate?
17. What are the principal tasks of SEBI?
18. Describe briefly the key initiatives taken by SEBI.
19. What are the key challenges that lie ahead of SEBI?
20. Briefly describe the working of NYSE and NASDAQ.
21. What has been the impact of the Big Bang in the U.K.?
22. What are the views of John Maynard Keynes, James Tobin, and Warren Buffett on regulating stock market trading? Why have their views not been implemented?
23. List the key developments in the G-secs market in India from 1990 onwards.
24. Briefly describe the primary market and the secondary market for G-secs in India.
25. Discuss the features of the corporate debt market in India.
26. What are the salient features of repo transactions in India?

SOLVED PROBLEM

1. Consider the data for a sample of 4 shares for two years, the base year and year *t*:

Share	*Price in base year (Rs.)*	*Price in year t (Rs.)*	*Number of outstanding shares (in million)*
A	40	30	3
B	60	75	12
C	20	40	6
D	75	90	5

What is the price weighted index, equal weighted index, and value weighted index for year *t*?

Solution:

Share	*Price in base year (Rs.)*	*Price in year t (Rs.)*	*Price relative (2/1 × 100)*	*No.of outstanding shares (in million)*	*Market capitalisation in the base year (1 × 4)*	*Market capitalisation in year t (2 × 4)*
	1	2	3	4	5	6
A	40	30	75	3	120	90
B	60	75	125	12	720	900
C	20	40	200	6	120	240
D	75	90	120	5	375	450
	195	235	520		1335	1680

The price weighted index for year *t* is $\frac{235}{195} \times 100 = 121$

The equal weighted index for year *t* is $\frac{520}{400} \times 100 = 130$

The value weighted index for year t is $\frac{1680}{1335} \times 100 = 126$

PROBLEMS

1. Consider the data for a sample of 5 shares for two years, the base year and year t.

Share	*Price in base year (Rs.)*	*Price in year t (Rs.)*	*No. of outstanding shares (in million)*
M	12	16	10
N	18	15	5
O	35	60	6
P	20	30	40
Q	15	6	30

What is the price weighted index, equal weighted index, and value weighted index for year t ?

2. Consider the data for a sample of 3 shares for two years, the base year and year t.

Share	*Price in base year (Rs.)*	*Price in year t (Rs.)*	*No. of outstanding shares (in million)*
X	80	100	15
Y	40	30	20
Z	30	?	50

The value weighted index for year t is given to be 115. What is the price of share Z in year t?

■ ■

PART

2

Basic Concepts and Methods

Chapter 4

Risk and Return

Two Sides of the Investment Coin

Learning Objectives

After studying this chapter you should be able to

- Calculate the total return, return relative, and cumulative wealth index.
- Compute the arithmetic mean and geometric mean of a return series.
- Explain the rationale for using standard deviation as the principal measure of risk.
- Measure the expected (ex ante) return and risk of a security.

Investment decisions are influenced by various motives. Some people invest in a business to acquire control and enjoy the prestige associated with it. Some people invest in expensive yatchs and famous villas to display their wealth. Most investors, however, are largely guided by the pecuniary motive of earning a return on their investment.

For earning returns investors have to almost invariably bear some risk. In general, risk and return go hand in hand. While investors like returns they abhor risk. Investment decisions, therefore, involve a tradeoff between risk and return. Since risk and return are central to investment decisions, we must clearly understand what risk and return are and how they should be measured.

4.1 RETURN

Return is the primary motivating force that drives investment. It represents the reward for undertaking investment. Since the game of investing is about returns (after allowing for risk), measurement of realised (historical) returns is necessary to assess how well the investment manager has done. In addition, historical returns are often used as an important input in estimating future (prospective) returns.

The return of an investment consists of two components:

Current Return The first component that often comes to mind when one is thinking about return is the periodic cash flow (income), such as dividend or interest, generated by the investment. Current return is measured as the periodic income in relation to the beginning price of the investment.

Capital Return The second component of return is reflected in the price change called the capital return—it is simply the price appreciation (or depreciation) divided by the beginning price of the asset. For assets like equity stocks, the capital return predominates.

Thus, the total return for any security (or for that matter any asset) is defined as:

$$\text{Total return} = \text{Current return} + \text{Capital return}$$

The current return can be zero or positive, whereas the capital return can be negative, zero, or positive.

4.2 RISK

You cannot talk about investment return without talking about risk because investment decisions invariably involve a trade-off between the two.

Risk refers to the possibility that the actual outcome of an investment will differ from its expected outcome. More specifically, most investors are concerned about the actual outcome being less than the expected outcome. The wider the range of possible outcomes, the greater the risk.

Sources of Risk Risk emanates from several sources. The three major ones are: business risk, interest rate risk, and market risk. While a detailed treatment of these sources of risk is woven throughout the book, a brief discussion is given here.

Business Risk As a holder of corporate securities (equity shares or debentures), you are exposed to the risk of poor business performance. This may be caused by a variety of factors like heightened competition, emergence of new technologies, development of substitute products, shifts in consumer preferences, inadequate supply of essential inputs, changes in governmental policies, and so on. Often, of course, the principal factor may be inept and incompetent management. The poor business performance definitely affects the interest of equity shareholders, who have a residual claim on the income and wealth of the firm. It can also affect the interest of debenture holders if the ability of the firm to meet its interest and principal payment obligation is impaired. In such a case, debenture holders face the prospect of default risk.

Interest Rate Risk The changes in interest rate have a bearing on the welfare of investors. As the interest rate goes up, the market prices of existing fixed income securities fall, and vice versa. This happens because the buyer of a fixed income security would not buy it at its par value or face value if its fixed interest rate is lower than the prevailing interest rate on a similar security. For example, a debenture that has a face value of Rs.100 and a fixed rate of 12 percent will sell at a discount if the interest rate moves up from, say, 12 percent to 14 percent. While the changes in interest rate have a direct bearing on the prices of fixed income securities, they affect equity prices too, albeit somewhat indirectly. The changes in the relative yields of debentures and equity shares influence equity prices.

Market Risk Even if the earning power of the corporate sector and the interest rate structure remain more or less unchanged, prices of securities, equity shares in particular, tend to fluctuate. While there can be several reasons for this fluctuation, a major cause appears to be the changing sentiment of the investors. There are periods when investors become bullish and their investment horizons lengthen. Investor optimism, which may border on euphoria during such periods, drives share prices to great heights. The buoyancy created in the wake of this development is pervasive, affecting almost all shares. On the other hand, when a wave of pessimism (which often is an exaggerated response to some unfavourable political or economic development) sweeps the market, investors turn bearish and myopic. Prices of almost all equity shares register decline as fear and uncertainty pervade the market.

The market tends to move in cycles. An John Train says "You need to get deeply into your bones the sense that any market, and certainly the stock market, moves in cycles, so that you will infallibly get wonderful bargains every few years, and have a chance to sell again at ridiculously high prices a few years later."[1]

The cycles are caused by mass psychology. As John Train explains: "The ebb and flow of mass emotion is quite regular: Panic is followed by relief, and relief by optimism; then comes enthusiasm, then euphoria and rapture, then the bubble bursts, and public feeling slides off again into concern, desperation, and finally a new panic."

One would expect large scale participation of institutions to dampen the price fluctuations in the market. After all institutional investors have core professional expertise to do fundamental analysis and greater financial resources to act on fundamental analysis. However, nothing of this kind has happened. On the contrary, price fluctuations seem to have become wider after the arrival of institutional investors in larger numbers.

Why? Perhaps the institutions and their analysts have not displayed more prudence and rationality than the general investing public and have succumbed in equal measure to the temptation to speculate. As John Maynard Keynes had argued, factors that contribute to the volatility of the market are not likely to diminish when expert professionals supposedly possessing better judgment and knowledge compete in the market place. Why? According to Keynes, even these people are concerned with *speculation* (the activity of forecasting the psychology of the market) and not *enterprise* (the activity of forecasting the prospective yield of assets over their whole life).

Types of Risk Modern portfolio theory looks at risk from a different perspective. It divides total risk as follows.

$$\text{Total risk} = \text{Unique risk} + \text{Market risk}$$

The *unique* risk of a security represents that portion of its total risk which stems from firm-specific factors like the development of a new product, a labour strike, or the emergence of a new competitor. Events of this nature primarily affect the specific firm and not all firms in general. Hence, the unique risk of a stock can be washed away by combining it with other stocks. In a diversified portfolio, unique risks of different stocks tend to cancel each other—a favourable development in one firm may offset an adverse

[1] John Train, *The Money Masters*, New York: Harper and Row Publishers, Inc., 1981.

happening in another and vice versa. Hence, unique risk is also referred to as diversifiable risk or unsystematic risk.

The *market* risk of a security represents that portion of its risk which is attributable to economy-wide factors like the growth rate of GDP, the level of government spending, money supply, interest rate structure, and inflation rate. Since these factors affect all firms to a greater or lesser degree, investors cannot avoid the risk arising from them, however diversified their portfolios may be. Hence, it is also referred to as systematic risk (as it affects all securities) or non-diversifiable risk.

4.3 MEASURING HISTORICAL RETURN

The total return on an investment for a given period is:

$$\text{Total return} = \frac{\text{Cash payment received during the period} + \text{Price change over the period}}{\text{Price of the investment at the beginning}}$$

All items are measured in rupees. The rupee cash payment received during the period may be positive or zero. The rupee price change over the period is simply the difference between the ending price and the beginning price. This can be positive (ending price exceeds the beginning price) or zero (ending price equals the beginning price) or negative (ending price is less then the beginning price).

In formal terms

$$R = \frac{C + (P_E - P_B)}{P_B} \tag{4.1}$$

where R is the total return over the period, C is the cash payment received during the period, P_E is the ending price of the investment, and P_B is the beginning price.

To illustrate, consider the following information for an equity stock:

- Price at the beginning of the year : Rs.60.00
- Dividend paid at the end of the year : Rs. 2.40
- Price at the end of the year : Rs.69.00

The total return on this stock is calculated as follows:

$$\frac{2.40 + (69.00 - 60.00)}{60.00} = 0.19 \text{ or } 19 \text{ percent}$$

It is helpful to split the total return into two components, viz., current yield and capital gains/loss yield as follows:

$$\underbrace{\frac{\text{Cash payment}}{\text{Beginning price}}}_{\text{Current return}} + \underbrace{\frac{\text{Ending price} - \text{beginning price}}{\text{Beginning price}}}_{\text{Capital return}}$$

The total return of 19 percent in our example may be broken down as follows:

$$\frac{2.40}{60.00} + \frac{69.00 - 60.00}{60.00} = \frac{4 \text{ percent}}{\text{Current return}} + \frac{15 \text{ percent}}{\text{Capital return}}$$

Thus, the total return concept is all-inclusive (as it includes the current yield as well as the price change) and measures the total return per rupee of original investment. Hence it can be used for comparing investment returns over a specified period.

Return Relative Often it is necessary to measure returns in a slightly different manner. This is particularly true when a cumulative wealth index or a geometric mean has to be calculated, because in such calculations negative returns cannot be used. The concept of *return relative* is used in such cases. The *return relative* is defined as:

$$\text{Return relative} = \frac{C + P_E}{P_B} \tag{4.2}$$

Put differently

Return relative = 1 + Total return in decimals

In our example the return relative is: 1 + 0.19 = 1.19

Note that even though the total return may be negative, the return relative cannot be negative. At worst it is zero.

Cumulative Wealth Index A return measure like total return reflects changes in the level of wealth. For some purposes it is more useful to measure the level of wealth (or price) rather than the change in the level of wealth. To do this, we must measure the cumulative effect of returns over time, given some stated initial amount, which is typically one rupee.

The cumulative wealth index captures the cumulative effect of total returns. It is calculated as follows:

$$CWI_n = WI_0\ (1 + R_1)\ (1 + R_2)\ \ldots\ (1 + R_n) \tag{4.3}$$

where CWI_n is the cumulative wealth index at the end of n years, WI_0 is the beginning index value which is typically one rupee and R_i is the total return for year i ($i = 1, \ldots n$).

To illustrate, consider a stock which earns the following returns over a five year period: $R_1 = 0.14$, $R_2 = 0.12$, $R_3 = -0.08$, $R_4 = 0.25$, and $R_5 = 0.02$.

The cumulative wealth index at the end of the five year period, assuming a beginning index value of one rupee, is:

$$CWI_5 = 1\ (1.14)\ (1.12)\ (0.92)\ (1.25)\ (1.02) = 1.498$$

Thus, one rupee invested at the beginning of year 1 would be worth Re. 1.498 at the end of year 5.

You can use the values for the cumulative index to obtain the total return for a given period, using the following equation:

$$R_n = \frac{CWI_n}{CWI_{n-1}} - 1 \tag{4.3a}$$

where R_n is the total return for period n and CWI is the cumulative wealth index.

Summary Statistics While total return, return relative, and wealth index are useful measures of return for a given period of time, in investment analysis we also need statistics that summarise a series of total returns. The two most popular summary statistics are arithmetic mean and geometric mean.

Arithmetic Mean The most popular summary statistic is the arithmetic mean. Hence the word *mean* refers to the arithmetic mean, unless otherwise specified. The arithmetic mean of a series of total returns is defined as:

$$\bar{R} = \frac{\sum_{i=1}^{n} R_i}{n} \tag{4.4}$$

where $\bar{R}$ is the arithmetic mean, R_i is the value of the total return ($i = 1, \ldots n$) and n is the number of total returns.

To illustrate, suppose the total returns from stock A over a five year period are as follows:

Year	*Total return (percentage)*
1	19.0
2	14.0
3	22.0
4	-12.0
5	5.0

The arithmetic mean for stock A is

$$\bar{R} = \frac{19 + 14 + 22 - 12 + 5}{5} = 9.6 \text{ percent}$$

Geometric Mean When you want to know the central tendency of a series of returns, the arithmetic mean is the appropriate measure. It represents the typical performance for a single period. However, when you want to know the average compound rate of growth that has actually occurred over multiple periods, the arithmetic mean is not appropriate. This point may be illustrated with a simple example. Consider a stock whose price is 100 at the end of the year 0. The price declines to 80 at the end of year 1 and recovers to 100 at the end of year 2. Assuming that there is no dividend payment during the two year period, the annual returns and their arithmetic mean are as follows:

$$\text{Return for year 1} = \frac{80 - 100}{100} = \text{-0.20 or } -20 \text{ percent}$$

$$\text{Return for year 2} = \frac{100 - 80}{80} = 0.25 \text{ or } 25 \text{ percent}$$

$$\text{Arithmetic mean return} = \frac{-20 + 25}{2} = 2.5 \text{ percent}$$

Thus we find that though the return over the two year period is nil, the arithmetic mean works out to 2.5 percent. So, this measure of average return can be misleading. In a multi-period context, the geometric mean describes accurately the "true" average return. The geometric mean is defined as follows:

$$GM = [(1+ R_1)\ (1+ R_2)\ldots.(1+ R_n)\ ]^{1/n} -1 \qquad (4.5)$$

where GM is the geometric mean return, R_i is the total return for period i (i =1,….,n), and n is the number of time periods.

Notice that the geometric mean is the nth root of the product resulting from multiplying a series of return relatives minus one.

To illustrate, consider the total return and return relative for stock *A* over a 5- year period:

Year	*Total return (%)*	*Return relative*
1	19	1.19
2	14	1.14
3	22	1.22
4	– 12	0.88
5	5	1.05

The geometric mean of the returns over the 5 year period is:

$$GM = [(1.19)\ (1.14)\ (1.22)\ (0.88)\ (1.05)]^{1/5} - 1$$
$$= 1.089 - 1 = 0.089 \text{ or } 8.9 \text{ percent}$$

The geometric mean reflects the compound rate of growth over time. In the above illustration stock *A* has generated a compound rate of return of 8.9 percent over a period of 5 years. This means that an investment of one rupee produces a cumulative ending wealth of Rs.1.532 [1(1.089)^5]. Notice that the geometric mean is lower than the arithmetic mean [9.6 percent] .

The geometric mean is always less than the arithmetic mean, except when all the return values being considered are equal. The difference between the geometric mean and the arithmetic mean depends on the variability of the distribution. The greater the variability, the greater the difference between the two means. The relationship between the geometric mean and the arithmetic mean is approximated by the following formula:

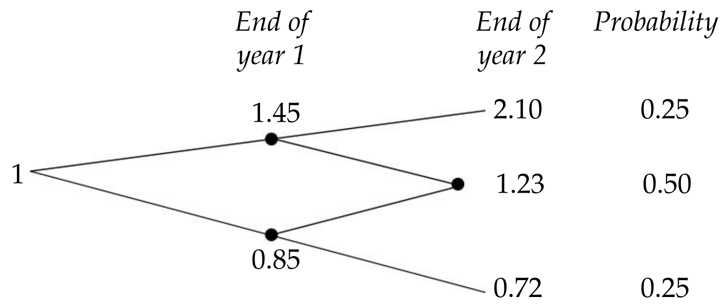
$$(1+ \text{Geometric mean})^2 \simeq (1+ \text{Arithmetic mean})^2 - (\text{Standard deviation})^2$$

In the above formula, you will find a new term viz., standard deviation, which is the most popular measure of variability. It is explained in the following section.

Arithmetic Mean versus Geometric Mean In the world of investments, the focus is mostly on knowing the central tendency of a series of returns. Hence arithmetic mean is commonly employed. Why should, you may ask, the arithmetic mean be preferred to the geometric mean?

To answer this question, let us consider an example. Suppose the equity share of Modern Pharma has an expected return of 15 percent in each year with a standard deviation of 30 percent. Assume that there are two equally possible outcomes each year, + 45 percent and -15 percent (that is, the mean plus or minus one standard deviation). The arithmetic mean of these returns is 15 percent, (45-15)/2, whereas the geometric mean of these returns is 11.0 percent, $[(1.45)\ (0.85)]^{1/2} - 1$.

An investment of one rupee in the equity share of Modern Pharma would grow over a two year period as follows:



Notice that the median (middle outcome) and mode (most common outcome) are given by the geometric mean (11.0 percent), which over a two-year period compounds to 23 percent ($1.11^2 = 1.23$). The expected value of all possible outcomes, however, is equal to:

$$(0.25 \times 2.10) + (0.50 \times 1.23) + (0.25 \times 0.72) = 1.32$$

Now 1.32 is equal to $(1.15)^2$. This means that the expected value of the terminal wealth is obtained by compounding up the arithmetic mean, not the geometric mean. Hence the arithmetic mean is the appropriate discount rate.

Put differently, the arithmetic mean is the appropriate mean because an investment that has uncertain returns will have a higher expected terminal value than an investment that earns its compound or geometric mean with certainty every year. In the above example, compounding at the rate of 11 percent for two years produces a terminal value of Rs.1.23, for an investment of Re 1.00. But holding the uncertain investment which yields high returns (45 percent per year for two years in a row) or middling returns (45 percent in year 1 followed by – 15 percent in year 2 or vice versa) or low returns (-15 percent per year for two years in a row), yields a higher expected terminal value, Re. 1.32. This happens because the gains from higher-than-expected returns are greater than the losses from lower-than-expected returns. It must be emphasised that in investment markets, returns are described by a probability distribution. Since arithmetic mean is the measure that accounts for uncertainty, it is the appropriate measure for estimating the discount rate.

Real Returns The returns discussed so far are nominal returns, or money returns. To convert nominal returns into real returns, an adjustment has to be made for the factor of inflation:

$$\text{Real return} = \frac{1 + \text{Nominal return}}{1 + \text{Inflation rate}} - 1$$

Example The total return for an equity stock during a year was 18.5 percent. The rate of inflation during that year was 5.5 percent. Thus the real (inflation-adjusted) total return was:

$$\frac{1.185}{1.055} - 1 = 0.123 \text{ or } 12.3 \text{ percent}$$

Global Equity Returns

A study titled *Triumph of the Optimists: 101 Years of Global Investment Returns* authored by P. Marsh and M. Staunton and published by Princeton University Press in 2002 found that in the first half of the 20^{th} century the arithmetic average annual real return on the world equity index was 5.1 percent, whereas it was 8.4 percent over the period 1950 – 2002.

What explains larger equity returns in the second half of the 20^{th} century compared to the first half. P. Marsh and M. Staunton attribute it to the following factors:

1. Unprecedented growth in productivity and efficiency, thanks to rapid technological changes.
2. Enhancement in the quality of management and corporate governance.
3. Reduced transaction and monitoring costs.
4. Decline in inflation rates.
5. Fall in the required rate of return, thanks to diminished business and investment risks.

4.4 MEASURING HISTORICAL RISK

Risk refers to the possibility that the actual outcome of an investment will differ from the expected outcome. Put differently, risk refers to variability or dispersion. If an asset's return has no variability, it is riskless.

Suppose you are analysing the total return of an equity stock over a period of time. Apart from knowing the mean return, you would also like to know about the variability in returns.

Variance and Standard Deviation The most commonly used measure of risk in finance is variance or its square root the standard deviation. The variance and the standard deviation of a historical return series are defined as follows:

$$\sigma^2 = \left(\frac{\sum_{i=1}^{n} \left(R_i - \bar{R}\right)^2}{n-1} \right) \tag{4.6}$$[1]

$$\sigma = \sqrt{\sigma^2} \tag{4.6a}$$

where σ^2 is the variance of return, σ is the standard deviation of return, R_i is the return from the stock in period i (i =1,…., n), $\bar{R}$ is the arithmetic return, and n is the number of periods.

To illustrate, consider the returns from a stock over a 6 year period:

R_1 = 15%, R_2 = 12%, R_3 = 20%, R_4 = -10%, R_5 = 14%, and R_6 = 9%

The variance and standard deviation of returns are calculated below:

Period	*Return* R_i	*Deviation* $(R_i - \bar{R})$	*Square of deviation* $(R_i - \bar{R})^2$
1	15	5	25
2	12	2	4
3	20	10	100
4	-10	-20	400
5	14	4	16
6	9	-1	1
	$\Sigma R_i = 60$ $\bar{R} = 10$		$\Sigma(R_i - \bar{R})^2 = 546$

$$\sigma^2 = \left(\frac{\sum \left(R_i - \bar{R}\right)^2}{n-1} \right) = 109.2 \qquad \sigma = \left(\frac{\sum \left(R_i - \bar{R}\right)^2}{n-1} \right)^{1/2} = \left(\frac{546}{6-1} \right)^{1/2} = 10.4$$

Looking at the above calculations, we find that:

- The differences between the various values and the mean value are squared. This means that values which are far away from the mean value have a much more impact on standard deviation than values which are close to the mean value.
- The standard deviation is obtained as the square root of the average of squared deviations. This means that the standard deviation and the mean are measured in the same units and hence the two can be directly compared.

---

[1] Note that

$$\sum_{i=1}^{n} \left(R_i - \bar{R}\right)^2$$

is divided by $n-1$ not n. This is done technically to correct for the loss of one degree of freedom.

Spreadsheet Application A spreadsheet like Excel™ has many handy tools for calculation of various financial functions. To calculate standard deviation of the returns given in the above table, proceed as follows.

Open an Excel worksheet. It has rows numbered 1,2,3,4……… and columns labeled A,B,C,D,………… The location of a cell is specified by the column and row on which it is located. For example, the very first cell at the top left hand side of the sheet , which is at the intersection of column labeled A and row numbered 1, is designated as A1. The cell adjacent to it to the right is B1. The cell just below B1 is B2 etc. Key in the given data viz. period and return in cells B1 to G2. To get the standard deviation in cell G4, type the formula =STDEV(B2:G2) inside that cell and press enter. The built in function in Excel automatically calculates the standard deviation and the value 10.45 appears in the cell. Alternatively, you can first click on the cell G4 (also called selecting G4), type = and then click on the menu item Insert. From the dialogue box that opens, first select 'Function' and out of the various functions, select the 'Financial' function STDEV. An argument box opens wherein, in the space provided, key in the data range B2 to G2 by typing B2:G2 or by just moving the cursor from B2 to G2 and click on OK. If you wish to know the mean of the returns, type =AVERAGE(B2:G2) in cell G3 and press enter. The mean value automatically appears in cell G3.

	A	B	C	D	E	F	G
1	Period	1	2	3	4	5	6
2	Return (R_i)	15	12	20	(10)	14	9
3	Mean	= AVERAGE (B2:G2)				→	10.00
4	Standard deviation	= STDEV (B2:G2)				→	10.45

Criticism of Variance (and Standard Deviation) as a Measure of Risk Though widely used in finance, there are two criticisms of the use of variance as a measure of risk:

1. Variance considers all deviations, negative as well as positive. Investors, however, do not view positive deviations unfavourably - in fact, they welcome it. Hence some researchers have argued that only negative deviations should be considered while measuring risk.

   Markowitz, the father of portfolio theory, himself had recognised this limitation and suggested a measure of downside risk called semi-variance. Semi-variance is calculated the way variance is calculated, except that it considers only negative deviations. Markowitz, however, chose variance because analytically it can be handled easily. Note that, as long as the returns are distributed symmetrically, variance is simply two times semi-variance and it does not make any difference whether variance is used or semi-variance is used.

2. When the probability distribution is not symmetrical around its expected value, variance alone does not suffice. In addition to variance, the skewness of the distribution should also be used. Markowitz does not consider skewness in developing portfolio theory. Proponents of the Markowitz model rely only on variance on the grounds that the historical returns of stocks have been approximately symmetrical.

Rationale for Standard Deviation Notwithstanding the above criticisms, standard deviation is commonly employed in finance as a measure of risk. Why? The principal reasons for using standard deviation appear to be as follows:

- If a variable is normally distributed, its mean and standard deviation contain all the information about its probability distribution.
- If the utility of money is represented by a quadratic function (a function commonly suggested to represent diminishing marginal utility of wealth), then the expected utility is a function of mean and standard deviation.
- Standard deviation is analytically more easily tractable.

Risk Aversion and Required Returns You are lucky to be invited by the host of a television game show. After the usual introduction, the host shows two boxes to you. He tells you that one box contains Rs.10,000 and the other box is empty. He does not tell you which one is which.

The host asks you to open any one of the two boxes and keep whatever you find in it. You are not sure which box you should open. Sensing your vacillation, he says he will offer you a certain Rs.3,000 if you forfeit the option to open a box. You don't accept his offer. He raises his offer to Rs.3,500. Now you feel indifferent between a certain return of Rs.3,500 and a risky (uncertain) expected return of Rs.5,000. This means that a certain amount of Rs.3,500 provides you with the same satisfaction as a risky expected value of Rs.5,000. Thus your certainty equivalent (Rs.3,500) is less than the risky expected value (Rs.5,000).

Empirical evidence suggests that most individuals, if placed in a similar situation, would have a certainty equivalent which is less than the risky expected value.

The relationship of a person's certainty equivalent to the expected monetary value of a risky investment defines his attitude toward risk. If the certainty equivalent is less than the expected value, the person is *risk-averse*; if the certainty equivalent is equal to the expected value, the person is *risk-neutral*; finally, if the certainty equivalent is more than the expected value, the person is *risk-loving*.

In general, investors are risk-averse. This means that risky investments must offer higher expected returns than less risky investments to induce people to invest in them. Remember, however, that we are talking about *expected* returns; the *actual* return on a risky investment may well turn out to be less than the *actual* return on a less risky investment.

Put differently, risk and return go hand in hand. This indeed is a well-established empirical fact, particularly over long periods of time. For example, the average annual rate of return and annual standard deviations for Treasury bills, bonds, and common stocks in the US over a 75 year period (1926-2000) as calculated by Ibbotson Associates have been as shown in Exhibit 4.1[3].

Exhibit 4.1 ***Return and Risk Performance of Different Categories of Financial Assets in the US Over 75 Years (1926 – 2000)***

Portfolio	*Average Annual Rate of Return (%)*	*Standard Deviation (%)*
Treasury bills	3.9	3.2
Government bonds	5.7	9.4
Corporate bonds	6.0	8.7
Common stocks (S&P 500)	13.0	20.2
Small-firm common stock	17.3	33.4

From the above it is clear that: (a) Treasury bills, the least risky of financial assets, earned the lowest average annual rate of return. (b) Common stocks, the most risky of financial assets, earned the highest average annual rate of return. (d) Bonds which occupy a middling position on the risk dimension earned a middling average annual return.

Risk Premiums Investors assume risk so that they are rewarded in the form of higher return. Hence risk premium may be defined as the additional return investors expect to get, or investors earned in the past, for assuming additional risk. Risk premium may be calculated between two classes of securities that differ in their risk level. There are three well known risk premiums:

Equity Risk Premium This is the difference between the return on equity stocks as a class and the risk-free rate represented commonly by the return on Treasury bills.

Bond Horizon Premium This is the difference between the return on long-term government bonds and the return on Treasury bills.

Bond Default Premium This is the difference between the return on long-term corporate bonds (which have some probability of default) and the return on long-term government bonds (which are free from default risk).

4.5 MEASURING EXPECTED (EX ANTE) RETURN AND RISK

So far we looked at the historical (ex post facto) return and risk. We now discuss expected (ex ante) return and risk.

Probability Distribution When you invest in a stock you know that the return from it can take various possible values. For example, it may be –5 percent, or 15 percent, or 35

[3] *Source* : Ibbotson Associates, Inc. *2001 Yearbook*

percent. Further, the likelihood of these possible returns can vary. Hence, you should think in terms of a probability distribution.

The probability of an event represents the likelihood of its occurrence. Suppose you say that there is a 4 to 1 chance that the market price of a stock A will rise during the next fortnight. This implies that there is an 80 percent chance that the price of stock A will increase and a 20 percent chance that it will not increase during the next fortnight. Your judgment can be represented in the form of a probability distribution as follows:

Outcome	*Probability*
Stock price will rise	0.80
Stock price will not rise	0.20

Another example may be given to illustrate the notion of probability distribution. Consider two equity stocks, Bharat Foods stock and Oriental Shipping stock. Bharat Foods stock may provide a return of 6 percent, 11 percent, or 16 percent with certain probabilities associated with them, based on the state of the economy. The second stock, Oriental Shipping stock, being more volatile, may earn a return of –20 percent, 10 percent, or 40 percent with the same probabilities, based on the state of the economy. The probability distributions of the returns on these two stocks are shown in Exhibit 4.2

When you define the probability distribution of rate of return (or for that matter any other variable) remember that:

- The possible outcomes must be mutually exclusive and collectively exhaustive.
- The probability assigned to an outcome can only vary between 0 and 1 (an impossible event is assigned a probability 0, a certain event a probability of 1, and an uncertain event a probability somewhere between 0 and 1).
- The sum of the probabilities assigned to various possible outcomes is 1.

Exhibit 4.2 ***Probability Distributions of the Rates of Return on Bharat Foods Stocks and Oriental Shipping Stocks***

State of the Economy	Probability of Occurrence	Rate of Return (%) Bharat Foods	Rate of Return (%) Oriental Shipping
Boom	0.30	16	40
Normal	0.50	11	10
Recession	0.20	6	– 20

Based on the probability distribution of the rate of return, you can compute two key parameters, the expected rate of return and the standard deviation of rate of return.

Expected Rate of Return The expected rate of return is the weighted average of all possible returns multiplied by their respective probabilities. In symbols,

$$E(R) = \sum_{i=1}^{n} R_i \, p_i \tag{4.7}$$

where $E(R)$ is the expected return from the stock, R_i is the return from stock under state i, p_i is the probability that state i occurs, and n is the number of possible states of the world.

From Eq. (4.7), it is clear that *E(R)* is the weighted average of possible outcomes—each outcome is weighted by the probability associated with it. The expected rate of return on Bharat Foods stock is:

$$E(R_b) = (0.30)\ (16\%) + (0.50)\ (11\%) + (0.20)\ (6\%) = 11.5\%$$

Similarly, the expected rate of return on Oriental Shipping stock is:

$$E(R_o) = (0.30)\ (40\%) + (0.50)\ (10\%) + (0.20)\ (-20\%) = 13.0\%$$

Standard Deviation of Return Risk refers to the dispersion of a variable. It is commonly measured by the variance or the standard deviation. The variance of a probability distribution is the sum of the squares of the deviations of actual returns from the expected return, weighted by the associated probabilities. In symbols,

$$\sigma^2 = \Sigma\, p_i\, (R_i - E(R))^2 \tag{4.8}$$

where σ^2 is the variance, R_i is the return for the ith possible outcome, p_i is the probability associated with the ith possible outcome, and $E(R)$ is the expected return.

Since variance is expressed as squared returns, it is somewhat difficult to grasp. So its square root, the standard deviation, is employed as an equivalent measure.

$$\sigma = (\sigma^2)^{1/2} \tag{4.9}$$

where σ is the standard deviation

As an illustration, the standard deviations of returns on Bharat Foods stock and Oriental Shipping stock are calculated in Exhibit 4.3.

Exhibit 4.3 ***Illustration of the Calculation of Standard Deviation***

Bharat Foods Stock						
i. State of the Economy	p_i	R_i	p_iR_i	$R_i - E(R)$	$(R_i - E(R))^2$	$p_i(R_i - E(R))^2$
1. Boom	0.30	16	4.8	4.5	20.25	6.075
2. Normal	0.50	11	5.5	– 0.5	0.25	0.125
3. Recession	0.20	6	1.2	– 5.5	30.25	6.050
			$E(R) = \Sigma p_iR_i = 11.5$		$\Sigma p_i(R_i - E(R))^2 = 12.25$	
			$\sigma = [\Sigma p_i(R_i - E(R))^2]^{1/2} = (12.25)^{1/2} = 3.5\%$			

Oriental Shipping Stock						
i. State of the Economy	p_i	R_i	p_iR_i	$R_i - E(R)$	$(R_i - E(R))^2$	$p_i(R_i - E(R))^2$
1. Boom	0.30	40	12.0	27.0	729.0	218.7
2. Normal	0.50	10	5.0	– 3.0	9.0	4.5
3. Recession	0.20	–20	– 4.0	– 33.0	1089.00	217.8
			$E(R) = \Sigma p_iR_i = 13.0$		$\Sigma p_i(R_i - E(R))^2 = 441.0$	
			$\sigma = [\Sigma p_i(R_i - E(R))^2]^{1/2} = (441.0)^{1/2} = 21.0\%$			

Continuous Probability Distribution The probability distribution of returns on Bharat Foods stock (or Oriental Shipping stock) is a discrete distribution because probabilities have been assigned to a finite number of specific values. In finance, however, probability distributions are commonly regarded as continuous, even though they may actually be discrete. In a continuous probability distribution, probabilities are not assigned to individual points as in the case of a discrete distribution. Instead, probabilities are assigned to intervals between two points on a continuous curve. Hence, when a continuous probability distribution is used, the following kinds of questions are answered: What is the probability that the rate of return will fall between, say, 10 percent and 20 percent? What is the probability that the rate of return will be less than 0 percent or more than 25 percent?

The Normal Distribution The normal distribution, a continuous probability distribution, is the most commonly used probability distribution in finance. As Exhibit 4.4 shows, the normal distribution resembles a bell shaped curve. It appears that stock returns, at least over short time intervals, are approximately normally distributed.

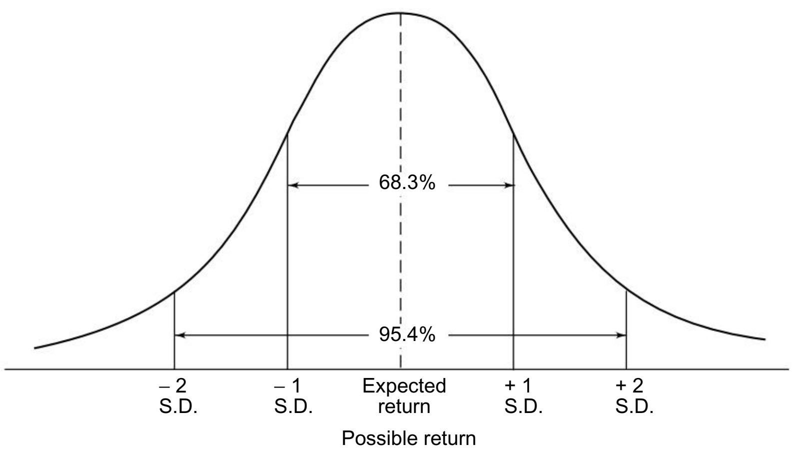
The following features of the normal distribution may be noted:

- It is completely characterised by just two parameters, viz., expected return and standard deviation of return.
- A bell-shaped distribution, it is perfectly symmetric around the expected return.
- The probabilities for values lying within certain bands around the expected return are as follows:

Band	*Probability*
± One standard deviation	68.3 per cent
± Two standard deviation	95.4 per cent
± Three standard deviation	99.7 per cent

Exhibit 4.4 displays this graphically. Detailed probability ranges are given in an appendix at the end of the book.

Exhibit 4.4 ***Normal Distribution***



Summary of Equations The equations for measuring the arithmetic mean and standard deviation of individual security returns for both historical and expected data are summarised in Exhibit 4.5.

Exhibit 4.5 ***Measuring Individual Security Returns***

	Historical (ex post facto)	*Expected (ex ante)*
Mean return	$\bar{R} = \dfrac{\sum_{i=1}^{n} R_i}{n}$	$E(R) = \sum_{i=1}^{n} R_i p_i$
Standard deviation	$\sigma = \left(\dfrac{\sum_{i=1}^{n} (R_i - \bar{R})^2}{n-1} \right)^{1/2}$	$\sigma = \left(\sum p_i [R_i - E(R_i)]^2 \right)^{1/2}$

SUMMARY

- For earning returns investors have to almost invariably bear some risk. While investors like returns they abhor risk. Investment decisions therefore involve a tradeoff between risk and return.
- The **total return** on an investment for a given period is :

$$R = \frac{C + (P_E - P_B)}{P_B}$$

- The **return relative** is defined as :

$$\text{Return relative} = \frac{C + P_E}{P_B}$$

- The **cumulative wealth index** captures the cumulative effect of total returns. It is calculated as follows :

$$CWI_n = WI_0\ (1 + R_1)\ (1 + R_2)\ \ldots\ (1 + R_n)$$

- The **arithmetic mean** of a series of returns is defined as :

$$\bar{R} = \frac{\sum_{i=1}^{n} R_i}{n}$$

- The **geometric mean** of a series of returns is defined as :

$$GM = [(1+R_1)(1+R_2)\ldots(1+R_n)]^{1/n} - 1$$

- The **real return** is defined as :

$$\frac{1+\text{Nominal return}}{1+\text{Inflation rate}} - 1$$

- The **standard deviation** of a historical series of returns is calculated as follows :

$$\sigma = \left(\frac{\sum_{i=1}^{n} (R_i - \bar{R})^2}{n-1} \right)^{1/2}$$

- There are three well known risk premiums: equity risk premium, bond horizon premium, and bond default premium.
- The expected rate of return on a stock is :

$$E(R) = \sum_{i=1}^{n} p_i R_i$$

- The standard deviation of return is :

$$\sigma = \left\{ \sum p_i \left(R_i - E(R)^2 \right) \right\}^{1/2}$$

QUESTIONS

1. Define the following : (a) return relative, (b) geometric mean return, and (c) real return.
2. Compare arithmetic mean with geometric mean.
3. What is variance? standard deviation?
4. What are the criticisms of variance as a measure of risk?
5. Why is standard deviation commonly employed as a measure of risk?
6. Describe the three well known risk premiums.

7. What are the features of normal distribution?

SOLVED PROBLEMS

1. Following are the price and other details of three stocks for the year 20X1. Calculate the total return as well as the return relative for the three stocks.

Stock	*Beginning Price*	*Dividend Paid*	*Ending Price*
A	30	3.40	34
B	72	4.70	69
C	140	4.80	146

Solution:

$$\text{Total return} = \frac{\text{Cash payment received during the period + Price change over the period}}{\text{Price of the investment at the beginning}}$$

$$\text{Return relative} = 1 + \text{Total return}$$

			Total Return	*Return Relative*
A	$\frac{3.4+(34-30)}{30}$	=	0.247 or 24.7%	1 + 0.247 = 1.247
B	$\frac{4.7+(69-72)}{72}$	=	0.024 or 2.4%	1 + .024 = 1.024
C	$\frac{4.8+(146-140)}{140}$	=	0.077 or 7.7%	1 + 0.077 = 1.077

A earned the highest return.

2. During the past five years, the returns of a stock were as follows:

Year	*Return*
1	0.07
2	0.03
3	– 0.09
4	0.06
5	0.10

Compute the following: (a) cumulative wealth index, (b) arithmetic mean, (c) geometric mean, (d) variance, and (e) standard deviation.

Solution:

(a) Cumulative wealth index

$$CWI_5 = 1(1.07)(1.03)(0.91)(1.06)(1.10) = 1.169$$

(b) Arithmetic mean

$$\bar{R} = \frac{0.07 + 0.03 - 0.09 + 0.06 + 0.10}{5} = 0.034 \text{ or } 3.4\%$$

(c) Geometric mean

$$GM = [(1.07)(1.03)(0.91)(1.06)(1.10)]^{1/5} - 1 = 0.032 \text{ or } 3.2\%$$

(d) Variance

Period	*Return in %* R_i	*Deviation* $(R_i - \bar{R})$	*Square of deviation* $(R_i - \bar{R})^2$
1	7	3.6	12.96
2	3	- 0.4	0.16
3	-9	-12.4	153.76
4	6	2.6	6.76
5	10	6.6	43.56

$$\text{Variance} = \left(\frac{\sum (R_i - \bar{R})^2}{n-1}\right) = \frac{217.2}{5-1} = 54.3$$

(e) Standard deviation = Square root of variance
= Square root of 54.3 = 7.4%

3. You are thinking of acquiring some shares of ABC Ltd. The rates of return expectations are as follows:

Possible rate of return	*Probability*
0.05	0.20
0.10	0.40
0.08	0.10
0.11	0.30

Compute the expected return $E(R)$ on the investment.

Solution:

$$\text{Expected return} = (0.20)(0.05)+(0.40)(0.10)+(0.10)(0.08)+(0.30)(0.11)$$
$$= 0.091 = 9.1\%$$

PROBLEMS

1. A stock earns the following returns over a five year period: R_1 = 0.20, R_2 = -0.10, R_3 = 0.18, R_4 = 0.12, R_5 = 0.16. Calculate the following: (a) arithmetic mean return, (b) cumulative wealth index, and (c) geometric mean return.
2. What is the standard deviation of returns for the stock described in 1
3. The probability distribution of the rate of return on Alpha stock is given below :

State of the Economy	*Probability of Occurrence*	*Rate of Return*
Boom	0.40	25%
Normal	0.3	12%
Recession	0.30	– 6%

What is the standard deviation of return?

Chapter **5**

The Time Value of Money

The Magic of Compounding

LEARNING OBJECTIVES

After studying this chapter, you should be able to:

- Demonstrate the power of compounding.
- Apply compounding and discounting formulae to a variety of situations in finance.
- Set up a loan amortisation schedule.
- Show how the effective interest rate behaves with increased frequency of compounding.

Money has time value. A rupee today is more valuable than a rupee a year hence. Why? There are several reasons:

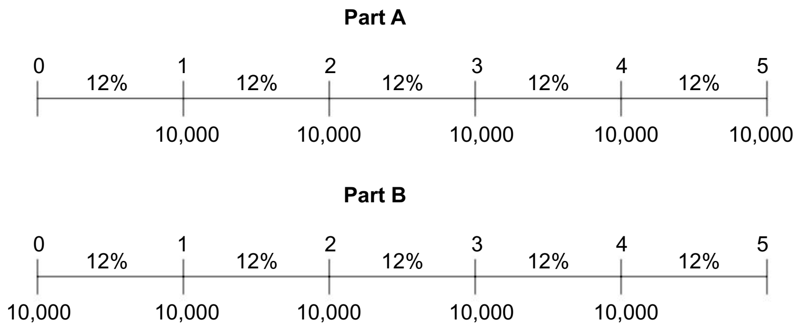
- Individuals, in general, prefer current consumption to future consumption.
- Capital can be employed productively to generate positive returns. An investment of one rupee today would grow to $(1 + r)$ a year hence (r is the rate of return earned on the investment).
- In an inflationary period a rupee today represents a greater real purchasing power than a rupee a year hence.

Most financial problems involve cash flows occuring at different points of time. These cash flows have to be brought to the same point of time for purposes of comparison and aggregation. Hence you should understand the tools of compounding and discounting which underlie most of what we do in finance - from valuing securities to analysing projects, from determining lease rentals to choosing the right financing instruments, from setting up the loan amortisation schedules to valuing companies, so on and so forth.

5.1 TIME LINES AND NOTATION

When cash flows occur at different points in time, it is easier to deal with them using a *time line*. A time line shows the timing and the amount of each cash flow in a cash flow stream. Thus, a cash flow stream of Rs. 10,000 at the end of each of the next five years can be depicted on a time line like the one shown in Part A of Exhibit 5.1.

Exhibit 5.1 ***Time Line***



In Exhibit 5.1, 0 refers to the present time. A cash flow that occurs at time 0 is already in present value terms and hence does not require any adjustment for the time value of money. You must distinguish between a *period of time* and a *point in time*. Period 1 which is the first year is the portion of time line between point 0 and point 1. The cash flow occurring at point 1 is the cash flow that occurs at the end of period 1. Finally, the discount rate, which is 12 percent in our example, is specified for each period on the time line and it may differ from period to period. If the cash flow occurs at the beginning, rather than the end, of each year, the time line would be as shown in Part B of Exhibit 5.1. Note that a cash flow occuring at the end of year 1 is equivalent to a cash flow occuring at the beginning of year 2.

Cash flows can be positive or negative. A positive cash flow is called a *cash inflow*; a negative cash flow, a *cash outflow*.

The following notation will be used in our discussion:

PV	:	Present value
FV_n	:	Future value n years hence
C_t	:	Cash flow occurring at the end of year t
A	:	A stream of constant periodic cash flows over a given time
r	:	Interest rate or discount rate
g	:	Expected growth rate in cash flows
n	:	Number of periods over which the cash flows occur.

5.2 FUTURE VALUE OF A SINGLE AMOUNT

Suppose you invest Rs. 1,000 for three years in a savings account that pays 10 percent interest per year. If you let your interest income be reinvested, your investment will grow as follows:

First year	:	Principal at the beginning	1,000
		Interest for the year (Rs. $1{,}000 \times 0.10$)	100

		Principal at the end	1,100
Second year	:	Principal at the beginning	1,100
		Interest for the year (Rs. 1,100 × 0.10)	110
		Principal at the end	1,210
Third year	:	Principal at the beginning	1,210
		Interest for the year (Rs. 1,210 × 0.10)	121
		Principal at the end	1,331

Formula The process of investing money as well as reinvesting the interest earned thereon is called compounding. The future value or compounded value of an investment after n years when the interest rate is r percent is:

$$FV_n = PV(1+r)^n \tag{5.1}$$

In this equation $(1+r)^n$ is called the future value interest factor or simply the future value factor.

To solve future value problems you have to find the future value factors. You can do it in different ways. In the example given above, you can multiply 1.10 by itself three times or more generally $(1+r)$ by itself n times. This becomes tedious when the period of investment is long.

Fortunately, you have an easy way to get the future value factor. Most calculators have a key labelled "y^x". So all that you have to do is to enter 1.10, press the key labelled y^x, enter 3, and press the "=" key to obtain the answer.

Alternatively, you can consult a future value interest factor ($FVIF_{r,n}$) table. Exhibit 5.2 presents one such table showing the future value factors for certain combinations of periods and interest rates. A more comprehensive table is given in Appendix A at the end of the book.

Suppose you deposit Rs. 1,000 today in a bank which pays 10 percent interest compounded annually, how much will the deposit grow to after 8 years and 12 years?

$$\text{Rs. } 1{,}000\,(1.10)^8 = \text{Rs. } 1{,}000\,(2.144)$$
$$= \text{Rs. } 2{,}144$$

The future value, 12 years hence, will be :

$$\text{Rs. } 1{,}000\,(1.10)^{12} = \text{Rs. } 1{,}000\,(3.138)$$
$$= \text{Rs. } 3{,}138$$

Exhibit 5.2 ***Value of FVIF$_{r,n}$ for Various Combinations of r and n***

n/r	6%	8%	10%	12%	14%
2	1.124	1.166	1.210	1.254	1.300
4	1.262	1.360	1.464	1.574	1.689
6	1.419	1.587	1.772	1.974	2.195
8	1.594	1.851	2.144	2.476	2.853
10	1.791	2.159	2.594	3.106	3.707
12	2.012	2.518	3.138	3.896	4.817

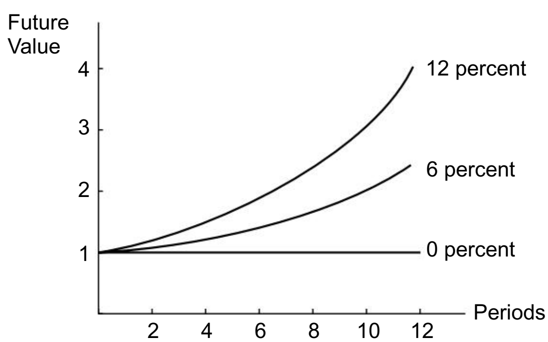
While tables are easy to use they have a limitation as they contain values only for a small number of interest rates. So often you may have to use a calculator.

Graphic View Exhibit 5.3 shows graphically how one rupee would grow over time for different interest rates. Naturally the higher the interest rate, the faster the growth rate. We have plotted the growth curves for three interest rates: 0 percent, 6 percent, and 12 percent. Growth curves can be readily plotted for other interest rates.

Compound and Simple Interest So far we assumed that money is invested at compound interest which means that each interest payment is reinvested to earn further interest in future periods. By contrast, if no interest is earned on interest the investment earns only simple interest. In such a case the investment grows as follows:

Future value = Present value [1 + Number of years x Interest rate]

Exhibit 5.3 ***Graphic View of Simple and Compound Interest***



For example, an investment of Rs. 1,000, if invested at 12 percent simple interest rate will in 5 years time become :

1,000 [1 + 5 x 0.12] = Rs. 1,600

Exhibit 5.4 shows how an investment of Rs. 1,000 grows over time under simple interest as well as compound interest when the interest rate is 12 percent. From this exhibit you can feel the power of compound interest. As Albert Einstein once remarked: "I don't know what the seven wonders of the world are, but I know the eighth - compound interest". You may be wondering why your ancestors did not display foresight. Hopefully, you will show concern for your posterity.

Exhibit 5.4 ***Value of Rs. 1000 Invested at 10 percent Simple and Compound Interest***

Year	Simple Interest					Compound Interest				
	Starting Balance	+	Interest	=	Ending Balance	Starting Balance	+	Interest	=	Ending Balance
1	1000	+	100	=	1100	1000	+	100	=	1100
5	1400	+	100	=	1500	1464	+	146	=	1610
10	1900	+	100	=	2000	2358	+	236	=	2594
20	2900	+	100	=	3000	6116	+	612	=	6728
50	5900	+	100	=	6000	106,718	+	10672	=	117,390
100	10,900	+	100	=	11,000	12,527,829	+	1,252,783	=	13,780,612

Doubling Period Investors commonly ask the question: How long would it take to double the amount at a given rate of interest? To answer this question we may look at the future value interest factor table. Looking at Exhibit 5.2 we find that when the interest rate is 12 percent it takes about 6 years to double the amount, when the interest rate is 6 percent it takes about 12 years to double the amount, so on and so forth. Is there a rule of thumb which dispenses with the use of the future value interest factor table? Yes, there is one and it is called the rule of 72. According to this rule of thumb, the doubling period is obtained by dividing 72 by the interest rate. For example, if the interest rate is 8 percent, the doubling period is about 9 years (72/8). Likewise, if the interest rate is 4 percent the doubling period is about 18 years (72/4). Though somewhat crude, it is a handy and useful rule of thumb.

If you are inclined to do a slightly more involved calculation, a more accurate rule of thumb is the rule of 69. According to this rule of thumb, the doubling period is equal to:

$$0.35 + \frac{69}{\text{Interest Rate}}$$

As an illustration of this rule of thumb, the doubling period is calculated for two interest rates, 10 percent and 15 percent.

Interest Rate	*Doubling Period*
10 percent	$0.35 + \frac{69}{10} = 7.25$ years
15 percent	$0.35 + \frac{69}{15} = 4.95$ years

Finding the Growth Rate The formula we used to calculate future value is quite general and it can be applied to answer other types of questions related to growth. Suppose your company currently has 5,000 employees and this number is expected to grow by 5 percent per year. How many employees will your company have in 10 years? The number of employees 10 years hence will be:

$$5{,}000 \times (1.05)^{10} = 5000 \times 1.629 = 8{,}145$$

Consider another example. Phoenix Limited had revenues of Rs. 100 million in 1990 which increased to Rs. 1000 million in 2000. What was the compound growth rate in revenues? The compound growth rate may be calculated as follows:

$$100\,(1+g)^{10} = 1{,}000$$

$$(1+g)^{10} = \frac{1000}{100} = 10$$

$$(1+g) = 10^{1/10}$$

$$g = 10^{1/10} - 1$$

$$= 1.26 - 1 = 0.26 \text{ or } 26 \text{ percent}$$

Future Value in Real Terms So far we calculated the future value figures in nominal terms. To convert a nominal figure into a real figure, you have to adjust for the inflation factor. For example, if you earn a nominal rate of return of 15 percent on an investment of Rs. 100 for one year when the inflation rate is 6 percent, your investment grows as follows:

In Nominal Terms	In Real Terms
100 (1.15) = Rs. 115	$100\left[\frac{1.15}{1.06}\right]$ = Rs. 108.49

In general, the future value in real terms is:

$$\text{Present value}\left[\frac{1+\text{Nominal rate}}{1+\text{Inflation rate}}\right]^{n}$$

Note the following relationship:

$$1 + \text{Real rate} = \frac{1+\text{Nominal rate}}{1+\text{Inflation rate}}$$

Put differently,

$$\text{Real rate} = \frac{\text{Nominal rate} - \text{Inflation rate}}{1+\text{Inflation rate}}$$

5.3 PRESENT VALUE OF A SINGLE AMOUNT

Suppose someone promises to give you Rs. 1,000 three years hence. What is the present value of this amount if the interest rate is 10 percent? The present value can be calculated by discounting Rs. 1,000, to the present point of time, as follows :

$$\text{Value three years hence} = \text{Rs. } 1{,}000$$

$$\text{Value two years hence} = \text{Rs. } 1{,}000\left[\frac{1}{1.10}\right]$$

$$\text{Value one year hence} = \text{Rs. } 1{,}000\left[\frac{1}{1.10}\right]\left[\frac{1}{1.10}\right]$$

$$\text{Value now} = \text{Rs. } 1{,}000\left[\frac{1}{1.10}\right]\left[\frac{1}{1.10}\right]\left[\frac{1}{1.10}\right]$$

Formula The process of discounting, used for calculating the present value, is simply the inverse of compounding. The present value formula can be readily obtained by manipulating the compounding formula:

$$FV_n = PV\,(1+r)^n \tag{5.2}$$

Dividing both the sides of Eq. (5.2) by $(1+r)^n$, we get:

$$PV = FV_n\,[1\,/\,(1+r)^n] \tag{5.3}$$

The factor $1/(1+r)^n$ in Eq. (5.3) is called the discounting factor or the present value interest factor ($PVIF_{r,n}$). Exhibit 5.5 gives the value of $PVIF_{r,n}$ for several combinations of r and n. A more detailed table of $PVIF_{r,n}$ is given in Appendix A at the end of this book.

What is the present value of Rs. 1,000 receivable 6 years hence if the rate of discount is 10 percent ?

The present value is:

$$\text{Rs. } 1{,}000 \times PVIF_{10\%,6} = \text{Rs. } 1{,}000(0.565) = \text{Rs. } 565$$

What is the present value of Rs. 1,000 receivable 20 years hence if the discount rate is 8 percent? Since Exhibit 5.5 does not have the value of $PVIF_{8\%,20}$ we obtain the answer as follows:

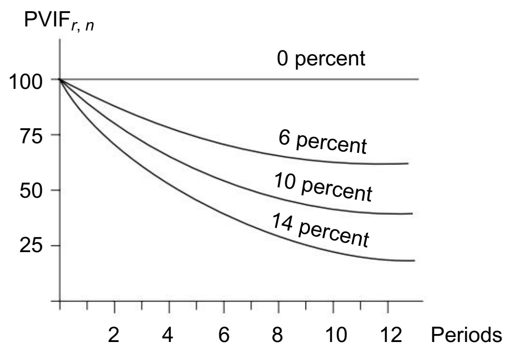
$$\begin{aligned}\text{Rs. } 1{,}000\left[\frac{1}{1.08}\right]^{20} &= \text{Rs. } 1{,}000\left[\frac{1}{1.08}\right]^{10}\left[\frac{1}{1.08}\right]^{10}\\ &= \text{Rs. } 1{,}000\,(PVIF_{8\%,10})(PVIF_{8\%,10})\\ &= \text{Rs. } 1{,}000\,(0.463)(0.463) = \text{Rs. } 214\end{aligned}$$

Exhibit 5.5 ***Value of PVIF$_{r,\,n}$ for Various Combinations of r and n***

n/r	6%	8%	10%	12%	14%
2	0.890	0.857	0.826	0.797	0.770
4	0.792	0.735	0.683	0.636	0.592
6	0.705	0.630	0.565	0.507	0.456
8	0.626	0.540	0.467	0.404	0.351
10	0.558	0.463	0.386	0.322	0.270
12	0.497	0.397	0.319	0.257	0.208

Graphic View of Discounting Exhibit 5.6 shows graphically how the present value interest factor varies in response to changes in interest rate and time. The present value interest factor declines as the interest rate rises and as the length of time increases.

Exhibit 5.6 ***Graphic View of Discounting***



Present Value of an Uneven Series In financial analysis we often come across uneven cash flow streams. For example, the cash flow stream associated with a capital investment project is typically uneven. Likewise, the dividend stream associated with an equity share is usually uneven and perhaps growing.

The present value of a cash flow stream - uneven or even - may be calculated with the help of the following formula:

$$\mathrm{PV}_n = \frac{A_1}{(1+r)} + \frac{A_2}{(1+r)^2} + \cdots + \frac{A_n}{(1+r)^n} = \sum_{t=1}^{n} \frac{A_t}{(1+r)^t} \tag{5.4}$$

where PV$_n$ is the present value of the cash flow stream, A_t is the cash flow occurring at the end of year t, r is the discount rate, and n is the duration of the cash flow stream.

Exhibit 5.7 shows the calculation of the present value of an uneven cash flow stream, using a discount rate of 12 percent.

Exhibit 5.7 ***Present Value of an Uneven Cash Flow Stream***

Year	Cash Flow Rs	$PVIF_{12\%, n}$	Present Value of Individual Cash Flow
1	1,000	0.893	893
2	2,000	0.797	1,594
3	2,000	0.712	1,424
4	3,000	0.636	1,908
5	3,000	0.567	1,701
6	4,000	0.507	2,028
7	4,000	0.452	1,808
8	5,000	0.404	2,020
Present Value of the Cash Flow Stream			13,376

Spreadsheet Application To calculate the present value of the cash flow stream given in Exhibit 5.7 you can use the Excel spreadsheet given below:

	A	B	C	D	E	F	G	H	I
1	Year	1	2	3	4	5	6	7	8
2	Cash flow	1,000	2,000	2,000	3,000	3,000	4,000	4,000	5,000
3	Discount rate	12%		= NPV(B3, B2: I2)				→	13,375

Type the cash flows for years 1 through 8 in the cells B2 to 12 and the discount rate in the cell B3. Select I3 and type =. Select the built-in function NPV which returns the present value of a series of future cash flows. In the argument box that opens, fill in the given cash flows sequence by selecting the cell reference range from B2 to I2 and click OK to get the result. Alternatively, by typing = NPV(B3,B2:I2) inside I3 and pressing enter, you get the same result. Here it should be noted that in Excel the term NPV is used to denote the net result of adding the present values of a stream of future cash flows unlike our usual practice of using the term NPV, net present value, to denote the excess of the total present value of the future receipts (payments) over the initial investment (cash inflow).

5.4 FUTURE VALUE OF AN ANNUITY

An annuity is a stream of constant cash flows (payments or receipts) occurring at regular intervals of time. The premium payments of a life insurance policy, for example, are an annuity. When the cash flows occur at the end of each period the annuity is called an ordinary annuity or a **deferred annuity**. When the cash flows occur at the beginning of each period, the annuity is called an **annuity due**. Our discussion here will focus on a deferred annuity—the formulae of course can be applied, with some modification, to an annuity due.

Suppose you deposit Rs. 1,000 annually in a bank for 5 years and your deposits earn a compound interest rate of 10 percent. What will be the value of this series of deposits (an annuity) at the end of 5 years? Assuming that each deposit occurs at the end of the year, the future value of this annuity will be:

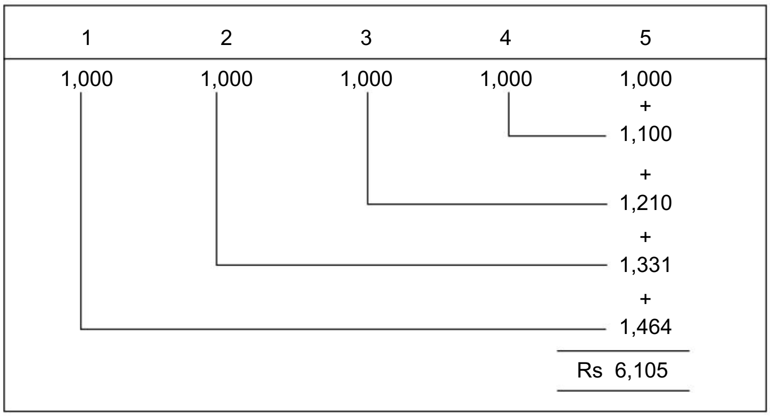
Rs. $1{,}000(1.10)^4$ + Rs. $1{,}000(1.10)^3$ + Rs. $1{,}000(1.10)^2$ + Rs. 1,000(1.10) + Rs. 1,000

= Rs. 1,000(1.464) + Rs. 1,000(1.331) + Rs. 1,000(1.21) + Rs. 1,000(1.10) + Rs. 1,000

= Rs. 6,105

The time line for this annuity is shown in Exhibit 5.8

Exhibit 5.8 ***Time Line for an Annuity***



Formula In general terms the future value of an annuity is given by the following formula:

$$\begin{aligned} \text{FVA}_n &= A\,(1+r)^{n-1} + A\,(1+r)^{n-2} + \ldots + A \\ &= A\,[(1+r)^n - 1] \,/\, r \end{aligned} \qquad (5.5)^1$$

[1] The formula for the future value of an annuity is derived as follows:
The future value of an annuity is:

$$\text{FVA}_n = A\,(1+r)^{n-1} + A\,(1+r)^{n-2} + \ldots + A\,(1+r) + A \qquad (1)$$

Multiplying both the sides of (1) by $(1+r)$ gives:

$$\text{FVA}_n(1+r) = A\,(1+r)^n + A\,(1+r)^{n-1} + \ldots + A\,(1+r)^2 + A\,(1+r) \qquad (2)$$

Subtracting (1) from (2) yields:

$$\text{FVA}_n\, r = A\,[(1+r)^n - 1] \qquad (3)$$

Dividing both the sides of (3) by r gives:

$$\text{FVA}_n = A\left[\frac{(1+r)^n - 1}{r}\right] \qquad (4)$$

where FVA_n is the future value of an annuity which has a duration of n periods, A is the constant periodic flow, r is the interest rate per period, and n is the duration of the annuity.

The term $[(1+r)^n - 1] / r$ is referred to as the future value interest factor for an annuity ($FVIFA_{r,n}$). The value of this factor for several combinations of r and n is given in Exhibit 5.9. A more detailed table is given in Appendix A at the end of this book.

Exhibit 5.9 ***Value of $FVIFA_{r,n}$ for Various Combinations of r and n***

n/r	6%	8%	10%	12%	14%
2	2.060	2.080	2.100	2.120	2.140
4	4.375	4.507	4.641	4.779	4.921
6	6.975	7.336	7.716	8.115	8.536
8	9.897	10.636	11.436	12.299	13.232
10	13.181	14.487	15.937	17.548	19.337
12	16.869	18.977	21.384	24.133	27.270

Applications

The future value annuity formula can be applied in a variety of contexts. Its important applications are illustrated below.

Knowing What Lies in Store for You Suppose you have decided to deposit Rs. 30,000 per year in your Public Provident Fund Account for 30 years. What will be the accumulated amount in your Public Provident Fund Account at the end of 30 years if the interest rate is 9 percent?

The accumulated sum will be:

Rs. 30,000 ($FVIFA_{9\%,30yrs}$)

$$= \text{Rs. } 30{,}000 \left[\frac{(1.09)^{30} - 1}{0.09}\right]$$

$$= \text{Rs. } 30{,}000\ [\ 136.308]$$

$$= \text{Rs. } 4{,}089{,}240$$

How Much Should You Save Annually You want to buy a house after 5 years when it is expected to cost Rs. 2 million. How much should you save annually if your savings earn a compound return of 12 percent?

The future value interest factor for a 5 year annuity, given an interest rate of 12 percent, is:

$$FVIFA_{\,n=5,\ r=12\%} = \frac{(1+0.12)^5 - 1}{0.12} = 6.353$$

The annual savings should be :

$$\frac{\text{Rs } 2{,}000{,}000}{6.353} = \text{Rs. } 314{,}812$$

Spreadsheet Application This problem can very easily be worked out using Microsoft Excel. Excel has built-in formulas for calculating the Present Value (PV), Future Value (FV), equal periodic receipt /payment (PMT), number of periods (NPER), interest/ discount rate (RATE). The notations inside the brackets are the ones used in Excel for the respective parameters.

The periodic payment is obtained using the function PMT. When you input an outflow (such as payment) use a minus sign before the cell number. The built-in formula for PMT reads: PMT(RATE,NPER,PV,[FV],[TYPE]). In the present problem, as no PV is involved, while typing out the formula, we leave that field blank-by just typing two commas between NPER and FV. The future value is a payment and so is an outflow. To indicate this, while typing A3 in the formula, a minus sign is prefixed. The notation 'TYPE' in the formula refers to the type of periodic savings-if the savings are made in the beginning of each year the 'TYPE' is 0 and if the savings are made at the end of each year the 'TYPE' is 1. If the TYPE is 1, you can as well leave that field blank. As this field is the last one in the formula, there is no need to type out two commas (,,) when leaving that field blank. So the formula to be entered in cell C4 to get the annual saving figure is PMT (C3,B3,,-A3)

	A	B	C
1	How much should you save annually?		
2	Future value (FV)	No. of years (NPER)	Interest rate (RATE)
3	2,000,000	5	12%
4	Annual saving (PMT)	= PMT(C3,B3,,-A3)⟶	314.819

Annual Deposit in a Sinking Fund Futura Limited has an obligation to redeem Rs. 500 million bonds 6 years hence. How much should the company deposit annually in a sinking fund account wherein it earns 14 percent interest to cumulate Rs. 500 million in 6 years time?

The future value interest factor for a 6 year annuity, given an interest rate of 14 percent, is:

$$\text{FVIFA}_{n=6,\ r=14\%} = \frac{(1+0.14)^6 - 1}{0.14} = 8.536$$

The annual sinking fund deposit should be:

$$\frac{\text{Rs 500 million}}{8.536} = \text{Rs. } 58.575 \text{ million}$$

Finding the Interest Rate A finance company advertises that it will pay a lump sum of Rs. 8,000 at the end of 6 years to investors who deposit annually Rs. 1,000 for 6 years. What interest rate is implicit in this offer?

The interest rate may be calculated in two steps:

1. Find the $FVIFA_{r,6}$ for this contract as follows :

$$\text{Rs. } 8{,}000 = \text{Rs. } 1{,}000 \times FVIFA_{r,6}$$

$$FVIFA_{r,6} = \frac{\text{Rs } 8{,}000}{\text{Rs } 1{,}000} = 8.000$$

2. Look at the $FVIFA_{r,n}$ table and read the row corresponding to 6 years until you find a value close to 8.000. Doing so, we find that

$$FVIFA_{12\%,6} \text{ is } 8.115$$

So, we conclude that the interest rate is slightly below 12 percent.

A **spreadsheet/ illustration** of the above problem is as follows. Note the minus sign before C3 and the following two commas.

	A	B	C
1		Finding the interest rate	
2	Future value (FV)	No. of years (NPER)	Annual deposit (PMT)
3	8,000	6	1,000
4	Interest rate	= RATE(B3,-C3,,A3) →	11.43%

How Long Should You Wait You want to take up a trip to the moon which costs Rs. 1,000,000–the cost is expected to remain unchanged in nominal terms. You can save annually Rs. 50,000 to fulfill your desire. How long will you have to wait if your savings earn an interest of 12 percent?

The future value of an annuity of Rs. 50,000 that earns 12 percent is equated to Rs. 1,000,000.

$$50{,}000 \times FVIFA_{n=?,12\%} = 1{,}000{,}000$$

$$50{,}000 \times \left[\frac{1.12^n - 1}{0.12}\right] = 1{,}000{,}000$$

$$1.12^n - 1 = \frac{1{,}000{,}000}{50{,}000} \times 0.12 = 2.4$$

$$1.12^n = 2.4 + 1 = 3.4$$

$$n \log 1.12 = \log 3.4$$
$$n \times 0.0492 = 0.5315$$
$$n = \frac{0.5315}{0.0492} = 10.8 \text{ years}$$

You will have to wait for about 11 years.
The **spreadsheet** illustration of this problem is as given below.

	A	B	C
1		How long should you wait	
2	Future cost (FV)	Annual saving (PMT)	Interest rate (RATE)
3	1,000,000	50,000	12%
4	Period of waiting in years	= NPER(C3,B3,,-A3) →	10.80

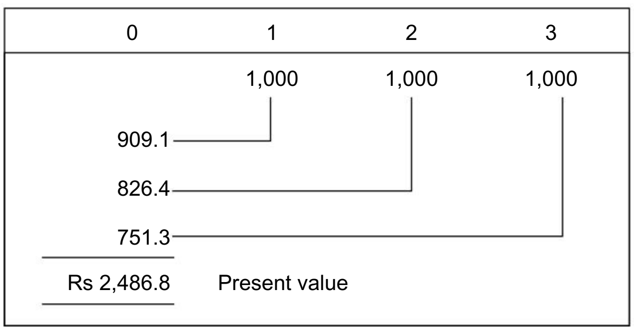
5.5 PRESENT VALUE OF AN ANNUITY

Suppose you expect to receive Rs. 1,000 annually for 3 years, each receipt occurring at the end of the year. What is the present value of this stream of benefits if the discount rate is 10 percent? The present value of this annuity is simply the sum of the present values of all the inflows of this annuity:

$$\text{Rs. } 1{,}000 \left[\frac{1}{1.10}\right] + \text{Rs. } 1{,}000 \left[\frac{1}{1.10}\right]^2 + \text{Rs. } 1{,}000 \left[\frac{1}{1.10}\right]^3$$
$$= \text{Rs. } 1{,}000 \times 0.9091 + \text{Rs. } 1{,}000 \times 0.8264 + \text{Rs. } 1{,}000 \times 0.7513$$
$$= \text{Rs. } 2{,}486.8$$

The time line for this problem is shown in Exhibit 5.10

Exhibit 5.10 ***Time Line***



Formula

In general terms the present value of an annuity may be expressed as follows:

$$\text{PVA}_n = \frac{A}{(1+r)} + \frac{A}{(1+r)^2} + \cdots + \frac{A}{(1+r)^{n-1}} + \frac{A}{(1+r)^n}$$

$$= A\left[\frac{1}{(1+r)} + \frac{1}{(1+r)^2} + \cdots + \frac{1}{(1+r)^{n-1}} + \frac{1}{(1+r)^n}\right]$$

$$= A\,[\{\,1 - (1/1{+}r)^n\}/\,r\,] \qquad (5.6)^2$$

where PVA_n is the present value of an annuity which has a duration of n periods, A is the constant periodic flow, and r is the discount rate.

$[\{1\text{-}\ (1/1 + r)^{\,n}\}/r]$ is referred to as the present value interest factor for an annuity ($\text{PVIFA}_{r,n}$). It is, as can be seen clearly, simply equal to the product of the future value interest factor for an annuity ($\text{FVIFA}_{r,n}$) and the present value interest factor ($\text{PVIF}_{r,n}$). Exhibit 5.10 shows the value of $\text{PVIFA}_{r,n}$ for several combinations of r and n. A more detailed table of $\text{PVIFA}_{r,n}$ values is given in Appendix A at the end of this book.

Exhibit 5.10 ***Value of $PVIFA_{r,n}$ for Different Combinations of r and n***

n/r	6%	8%	10%	12%	14%
2	1.833	1.783	1.737	1.690	1.647
4	3.465	3.312	3.170	3.037	2.914
6	4.917	4.623	4.355	4.111	3.889
8	6.210	5.747	5.335	4.968	4.639
10	7.360	6.710	6.145	5.650	5.216
12	8.384	7.536	6.814	6.194	5.660

---

[2] The formula for the present value of an annuity is derived as follows:

$$\text{PVA}_n = A\,(1+r)^{-1} + A\,(1+r)^{-2} + \ldots + A\,(1+r)^{-n} \qquad (1)$$

Multiplying both the sides of (1) by $(1 + r)$ gives :

$$\text{PVA}_n\,(1+r) = A + A\,(1+r)^{-1} + \ldots + A\,(1+r)^{-n+1} \qquad (2)$$

Subtracting (1) from (2) yields :

$$\text{PVA}_n\, r = A\,[1 - (1+r)^{-n}] = \text{A}\,\{\,[(1+r)^n - 1]\,/\,(1+r)^n\,\} \qquad (3)$$

Dividing both the sides of (3) by r results in :

$$\text{PVA}_n = A\,\{\,[(1+r)^n - 1]\,/\,r\,(1+r)^n\,\} = A\,[\{\,1 - (1/1+r)^n\}/\,r\,] \qquad (4)$$

Applications

The present value annuity formula can be applied in a variety of contexts. Its important applications are discussed below by way of examples.

How Much Can You Borrow for a Car After reviewing your budget, you have determined that you can afford to pay Rs. 12,000 per month for 3 years toward a new car. You call a finance company and learn that the going rate of interest on car finance is 1.5 percent per month for 36 months. How much can you borrow?

To determine how much you can borrow, you have to calculate the present value of Rs. 12,000 per month for 36 months at 1.5 percent per month.

Since the loan payments are an ordinary annuity, the present value interest factor of annuity is:

$$\text{PVIFA}_{r,\,n} = \frac{1 - 1/(1+r)^n}{r} = \frac{(1 - 1/(1.015)^{36}}{.015} = 27.66$$

Hence the present value of 36 payments of Rs. 12,000 each is:

$$\text{Present value} = \text{Rs. } 12{,}000 \times 27.66 = \text{Rs. } 331{,}920$$

You can, therefore, borrow Rs. 331,920 to buy the car.

A **spreadsheet** illustration of this problem is as given below.

	A	B	C
1	How much can you borrow for a car		
2	Payment per month (PMT)	No. of months (NPER)	Interest rate (RATE)
3	12,000	36	1.50%
4	Loan amount	= PV(C3,B3,-A3) →	331,928

Period of Loan Amortisation You want to borrow Rs. 1,080,000 to buy a flat. You approach a housing finance company which charges 12.5 percent interest. You can pay Rs. 180,000 per year toward loan amortisation. What should be the maturity period of the loan?

The present value of annuity of Rs. 180,000 is set equal to Rs. 1,080,000.

$$180{,}000 \times \text{PVIFA}_{n,r} = 1{,}080{,}000$$

$$180{,}000 \times \text{PVIFA}_{n=?,\ r=12.5\%} = 1{,}080{,}000$$

$$180{,}000\left[\frac{1 - 1/(1.125)^n}{0.125}\right] = 1{,}080{,}000$$

Given this equality the value of n is calculated as follows:

$$\frac{1 - 1/(1.125)^n}{0.125} = \frac{1{,}080{,}000}{180{,}000} = 6$$

$$\frac{1}{(1.125)^n} = 0.25$$

$$1.125^n = 4$$

$$n \log 1.125 = \log 4$$

$$n \times 0.0512 = 0.6021$$

$$n = \frac{0.6021}{0.0512} = 11.76 \text{ years}$$

You can perhaps request for a maturity of 12 years.

Determining the Loan Amortisation Schedule Most loans are repaid in equal periodic instalments (monthly, quarterly, or annually), which cover interest as well as principal repayment. Such loans are referred to as *amortised loans*.

For an amortised loan we would like to know (a) the periodic instalment payment and (b) the loan amortisation schedule showing the break up of the periodic instalment payments between the interest component and the principal repayment component. To illustrate how these are calculated, let us look at an example.

Suppose a firm borrows Rs. 1,000,000 at an interest rate of 15 percent and the loan is to be repaid in 5 equal instalments payable at the end of each of the next 5 years. The annual installment payment A is obtained by solving the following equation.

$$\text{Loan amount} = A \times \text{PVIFA}_{n = 5,\, r = 15\%}$$

$$1{,}000{,}000 = A \times 3.35215$$

$$\text{Hence } A = 298{,}316$$

The amortisation schedule is shown in Exhibit 5.11. The interest component is the largest for year 1 and progressively declines as the outstanding loan amount decreases.

Exhibit 5.11 ***Loan Amortisation Schedule***

Year	Beginning Amount (1)	Annual Installment (2)	Interest (3)	Principal Repayment (2) – (3) = (4)	Remaining Balance (1) – (4) = (5)
1	1,00,000	298,316	150,000	148,316	851,684
2	851,684	298,316	127,753	170,563	681,121
3	681,121	298,316	102,168	196,148	484,973
4	484,973	298,316	72,746	225,570	259,403
5	259,403	298,316	38,910	259,406	(3)*

* Due to rounding off error a small balance is shown.

The above schedule can be set up using a **spreadsheet**, as under.

	A	B	C	D	E	F
1		Present value	Interest rate	No. of installments (in years)	Annual installment amount	
2		1,000,000	15%	5	(298,316)	
3	Year	Beginning amount	Annual installment	Interest	Principal repayment	Remaining balance
4	1	1,000,000	298,316	150,000	148,316	851,684
5	2	851,684	298,316	127,753	170.563	681,121
6	3	681,121	298,316	102,168	196.148	484,973
7	4	484,973	298,316	72,746	225,570	259,403
8	5	259,403	298,316	38,910	259,406	(3)

Type 1,000,000, 15%, and 5 in B2, C2, and D2. Use the financial function PMT to get the installment amount in E2. This means E2 = PMT (B2, C2, D2). In B4 type = B2 to get the beginning amount. To get the installment amount in C4 type = –E2 and press F4. A $ sign will appear before E and 2(E2). This will make the value in this cell absolute, that is, constant throughout. Use the formula = B4*C2 to get interest amount in D4 (note that C2 here is made absolute by pressing F4). Fill in the principal repayment amount in E4 using the formula =C4-D4 and the remaining balance in F4 using the formula = B4-E4. Copy this value to B5 by typing =F4. Next, click on C4. Observe that there is a tiny black box at the lower right corner of the cell. This is called a fill handle. Point the cursor to the fill handle (it will turn into a black cross) and drag it down up to C8. This will autofil the value in C4 (whether an absolute value or a formula) up to C8. Autofil the remaining cells in all columns using fill handle by dragging down the formula from the cell last filled in. Once you finish this, correct values will appear in each cell.

Conceptually, the periodic loan installment is the value of A in the following equation.

$$P = A\,[1-(1/1+r)^n]\,/\,r \tag{5.6}$$

This means,

$$A = \frac{P \times r}{\left[1 - (1/1+r)^n\right]} \tag{5.6a}$$

In the housing finance industry, it is equivalently expressed as:

$$A = P \times r \times \left[\frac{(1+r)^n}{(1+r)^n - 1}\right] \tag{5.6b}$$

Note that the formula in Eq (5.6b) is equivalent to the formula in Eq (5.6a) because

$$\frac{1}{[1 - /(1+r)^n]} = \left[\frac{(1+r)^n}{(1+r)^n - 1}\right]$$

Determining the Periodic Withdrawal Your father deposits Rs. 300,000 on retirement in a bank which pays 10 percent annual interest. How much can be withdrawn annually for a period of 10 years?

$$A = \text{Rs. } 300{,}000 \times \frac{1}{\text{PVIFA}_{10\%,\,10}}$$

$$= \text{Rs. } 300{,}000 \times \frac{1}{6.145}$$

$$= \text{Rs. } 48{,}819$$

A **spreadsheet** calculation of the above is as under.

	A	B	C	D	E
1	Initial deposit	(300,000)			
2	Interest rate	10%	= PMT(B2,B3,,B1)	⟶	48,824
3	Period in years	10			

Finding the Interest Rate Suppose someone offers you the following financial contract: If you deposit Rs. 10,000 with him he promises to pay Rs. 2,500 annually for 6 years. What interest rate do you earn on this deposit? The interest rate may be calculated in two steps:

Step 1 Find the $\text{PVIFA}_{r,\,6}$ for this contract by dividing Rs. 10,000 by Rs. 2,500

$$\text{PVIFA}_{r,\,6} = \frac{\text{Rs } 10{,}000}{\text{Rs } 2{,}500} = 4.000$$

Step 2 Look at the PVIFA table and read the row corresponding to 6 years until you find a value close to 4.000. Doing so, you find that

$$PVIFA_{13\%,6} \text{ is } 3.998$$

Since 4.000 is very close to 3.998, the interest rate is 13 percent.

Valuing an Infrequent Annuity Raghavan will receive an annuity of Rs. 50,000, payable once every two years. The payments will stretch out over 30 years. The first payment will be received at the end of two years. If the annual interest rate is 8 percent, what is the present value of the annuity?

The interest rate over a two-year period is:

$$(1.08) \times (1.08) - 1 = 0.1664 \text{ percent}$$

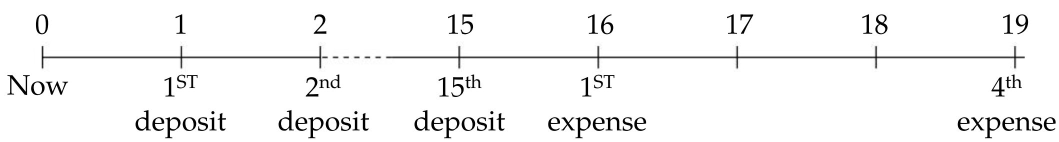
This means that Rs. 100 invested over two years will yield Rs. 116.64.

We have to calculate the present value of a Rs. 50,000 annuity over 15 periods, with an interest rate of 16.64 percent per period. This works out to:

$$\text{Rs. } 50{,}000\ [\{ 1 - (1/1.1664)^{15} \}]\ /\ 0.1664 = \text{Rs. } 270{,}620$$

Equating Present Value of Two Annuities Ravi wants to save for the college education of his son, Deepak. Ravi estimates that the college education expenses will be rupees one million per year for four years when his son reaches college after 16 years – the expenses will be payable at the beginning of the years. He expects the annual interest rate of 8 percent over the next two decades. How much money should he deposit in the bank each year for the next 15 years (assume that the deposit is made at the end of the year) to take care of his son's college education expenses?

The time line for this problem is as follows:



The present value of college education expenses as at the end of the 15th year:

$$\text{Rs. } 1{,}000{,}000 \times \text{PVIFA (4 years, 8\%)}$$

$$= \text{Rs. } 1{,}000{,}000 \times 3.312 = \text{Rs. } 3{,}312{,}000$$

The annual deposit to be made so that the future value of the deposits at the end of 15 years is Rs. 3,312,000 is:

$$A = \frac{\text{Rs. } 3{,}312{,}000}{\text{FVIFA (15 years, 8\%)}} = \frac{\text{Rs. } 3{,}312{,}000}{27.152}$$

$$= \text{Rs. } 121{,}980$$

Present Value of a Growing Annuity

A cash flow that grows at a constant rate for a specified period of time is a growing annuity. The time line of a growing annuity is shown below:

$$\begin{array}{ccccc} & A(1+g) & A(1+g)^2 & & A(1+g)^n \\ 0 & 1 & 2 & 3 & n \end{array}$$

The present value of a growing annuity can be determined using the following formula:

$$\text{PV of a Growing Annuity} = \text{A}\ (1+g)\left[\frac{1-\dfrac{(1+g)^n}{(1+r)^n}}{r-g}\right] \qquad (5.7)[3]$$

The above formula can be used when the growth rate is less than the discount rate ($g < r$) as well as when the growth rate is more than the discount rate ($g > r$). However, it does not work when the growth rate is equal to the discount rate ($g = r$) - in this case, the present value is simply equal to $n\,A$.

For example, suppose you have the right to harvest a teak plantation for the next 20 years over which you expect to get 100,000 cubic feet of teak per year. The current price per cubic feet of teak is Rs. 500, but it is expected to increase at a rate of 8 percent per year. The discount rate is 15 percent. The present value of the teak that you can harvest from the teak forest can be determined as follows:

[3] The formula for the present value of a growing annuity (PVGA) is derived as follows:

$$\text{PVGA} = \frac{A(1+g)}{(1+r)} + \frac{A(1+g)^2}{(1+r)^2} + \cdots + \frac{A(1+g)^n}{(1+r)^n} \qquad (1)$$

Multiplying both the sides of (1) by $(1+g)/(1+r)$ gives :

$$\text{PVGA} \times \frac{(1+g)}{(1+r)} = \frac{A(1+g)^2}{(1+r)^2} + \frac{A(1+g)^3}{(1+r)^3} + \cdots + \frac{A(1+g)^{n+1}}{(1+r)^{n+1}} \qquad (2)$$

Subtracting (2) from (1) yields:

$$\text{PVGA}\left[1-\frac{(1+g)}{(1+r)}\right] = \frac{A(1+g)}{(1+r)} - \frac{A(1+g)^{n+1}}{(1+r)^{n+1}} \qquad (3)$$

This simplifies to:

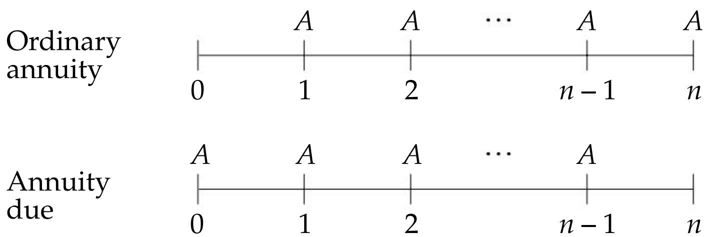
$$\text{PVGA} = A\ (1+g)\left[\frac{1-\dfrac{(1+g)^n}{(1+r)^n}}{r-g}\right] \qquad (4)$$

$$\text{PV of teak} = \text{Rs. } 500 \times 100{,}000\,(1.08)\left[\frac{1-\dfrac{1.08^{20}}{1.15^{20}}}{0.15-0.08}\right]$$

$$= \text{Rs. } 551{,}736{,}683$$

A Note on Annuities Due

So far we discussed ordinary annuities in which cash flows occur at the end of each period. There is a variation, which is fairly common, in which cash flows occur at the beginning of each period. Such an annuity is called an *annuity due*. For example, when you enter into a lease for an apartment, the lease payments are due at the beginning of the month. The first lease payment is made at the beginning; the second lease payment is due at the beginning of the second month; so on and so forth. The time lines for ordinary annuity and annuity due are shown below:



Since the cash flows of an annuity due occur one period earlier in comparison to the cash flows on an ordinary annuity, the following relationship holds:

Annuity due value = Ordinary annuity value × $(1 + r)$

This applies for both present and future values. So, two steps are involved in calculating the value of an annuity due. First, calculate the present or future value as though it were an ordinary annuity. Second, multiply your answer by $(1 + r)$.

5.6 PRESENT VALUE OF A PERPETUITY

A perpetuity is an annuity of infinite duration. For example, the British government has issued bonds called consols which pay yearly interest forever.

Present Value of a Perpetuity The present value of a perpetuity may be expressed as follows:

$$P_\infty = A \times \text{PVIFA}_{r,\infty} \qquad (5.8)$$

where P_∞ is the present value of a perpetuity and A is the constant annual payment.

What is the value of $PVIFA_{r,\infty}$? It is equal to:

$$\sum_{t=1}^{\infty} \frac{1}{(1+r)^t} = \frac{1}{r} \tag{5.9}$$ [4]

Put in words, it means that the present value interest factor of a perpetuity is simply 1 divided by the interest rate expressed in decimal form. Hence, the present value of a perpetuity is simply equal to the constant annual payment divided by the interest rate. For example, the present value of a perpetuity of Rs. 10,000 if the interest rate is 10 percent is equal to: Rs. 10,000/0.10 = Rs. 100,000. Intuitively this is quite convincing because an initial sum of Rs. 100,000 would, if invested at a rate of interest of 10 percent per annum, provide a constant annual income of Rs 10,000 for ever without any impairment of the capital value.

Growing Perpetuity

An office complex is expected to generate a net rental of Rs. 3 million next year, which is expected to increase by 5 percent every year. If we assume that the increase will continue indefinitely, the rental stream is a growing perpetuity. If the discount rate is 10 percent, the present value of the rental stream is:

$$PV = \frac{3{,}000{,}000}{(1.10)} + \frac{3{,}000{,}000(1.05)}{(1.10)^2} + \ldots + \frac{3{,}000{,}000(1.05)^{n-1}}{(1.10)^n} + \ldots$$

Algebraically, it may be expressed as follows:

$$PV = \frac{C}{(1+r)} + \frac{C(1+g)}{(1+r)^2} + \frac{C(1+g)^2}{(1+r)^3} + \ldots + \frac{C(1+g)^{n-1}}{(1+r)^n} + \ldots \tag{5.10}$$

where C is the rental to be received a year hence, g is the rate of growth per year, and r is the discount rate.

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[4] The formula for $PVIFA_{r,\infty}$ is derived as follows:

$$PVIFA_{r,\infty} = 1(1+r)^{-1} + 1(1+r)^{-2} + \ldots + 1(1+r)^{-\infty} \tag{1}$$

Multiplying both the sides of (1) by $(1+r)$ gives:

$$PVIFA_{r,\infty}(1+r) = 1 + 1(1+r)^{-1} + \ldots + 1(1+r)^{-\infty+1} \tag{2}$$

Subtracting (1) from (2) yields:

$$PVIFA_{r,\infty} \times r = 1 - 1(1+r)^{-\infty} \tag{3}$$

Since the second term on the right hand side of (3) vanishes, we get:

$$PVIFA_{r,\infty} \times r = 1 \tag{4}$$

This results in:

$$PVIFA_{r,\infty} = \frac{1}{r} \tag{5}$$

While Eq. (5.10) looks daunting, it reduces itself to the following simplification.

$$PV = \frac{C}{(r - g)} \tag{5.11}$$

5.7 INTRA-YEAR COMPOUNDING AND DISCOUNTING

So far we assumed that compounding is done annually. Now we consider the case where compounding is done more frequently. Suppose you deposit Rs 1,000 with a finance company which advertises that it pays 12 percent interest semi-annually—this means that the interest is paid every six months. Your deposit (if interest is not withdrawn) grows as follows:

First six months	:	Principal at the beginning	= Rs 1,000.0
		Interest for 6 months	= Rs 60.0
		Rs 1,000 $\times \frac{.12}{2}$	
		Principal at the end	= Rs 1,060.0
Second six months	:	Principal at the beginning	= Rs. 1,060.0
		Interest for 6 months	= Rs. 63.6
		Rs. 1,060 $\times \frac{.12}{2}$	
		Principal at the end	= Rs. 1,123.6

Note that if compounding is done annually, the principal at the end of one year would be Rs. 1,000 (1.12) = Rs. 1,120. The difference of Rs. 3.6 (between Rs. 1,123.6 under semi-annual compounding and Rs. 1,120 under annual compounding) represents interest on interest for the second half year.

The general formula for the future value of a single cash flow after n years when compounding is done m times a year is:

$$FV_n = PV \left[1 + \frac{r}{m}\right]^{m \times n} \tag{5.12}$$

Suppose you deposit Rs. 5,000 in a bank for 6 years. If the interest rate is 12 percent and the frequency of compounding is 4 times a year your deposit after 6 years will be:

$$\text{Rs. } 5{,}000 \left[1 + \frac{0.12}{4}\right]^{4 \times 6} = \text{Rs. } 5{,}000\ (1.03)^{24}$$

$$= \text{Rs. } 5{,}000 \times 2.0328 = \text{Rs. } 10{,}164$$

Effective versus Stated Rate We have seen above that Rs. 1,000 grows to Rs. 1,123.6 at the end of a year if the stated rate of interest is 12 percent and compounding is done semi-annually. This means that Rs. 1,000 grows at the rate of 12.36 percent per annum. The figure of 12.36 percent is called the effective interest rate - the rate of interest under annual compounding which produces the same result as that produced by an interest rate of 12 percent under semi-annual compounding.

The general relationship between the effective interest rate and the stated annual interest rate is as follows:

$$\text{Effective interest rate} = \left[1 + \frac{\text{Stated annual interest rate}}{m}\right]^m - 1$$

where m is the frequency of compounding per year.

Suppose a bank offers 12 percent stated annual interest rate. What will be the effective interest rate when compounding is done annually, semiannually, and quarterly?

$$\text{Effective interest rate with annual compounding} = \left[1 + \frac{0.12}{1}\right]^1 - 1 = 0.12$$

$$\text{Effective interest rate with semi-annual compounding} = \left[1 + \frac{0.12}{2}\right]^2 - 1 = 0.1236$$

$$\text{Effective interest rate with quarterly compounding} = \left[1 + \frac{0.12}{4}\right]^4 - 1 = 0.1255$$

When compounding becomes continuous, the effective interest rate is expressed as follows:

$$\text{Effective interest rate} = e^r - 1 \tag{5.13}$$

where e is the base of natural logarithm and r is the stated interest rate.

Exhibit 5.13 shows how compounding frequency impacts on the effective interest rate. From this exhibit it is clear that the effect of increasing the frequency of compounding is not as dramatic as some would believe it to be - the additional gains dwindle as the frequency of compounding increases.

Shorter Discounting Periods Sometimes cash flows have to be discounted more frequently than once a year - semi-annually, quarterly, monthly, or daily. As in the case of intra-year compounding, the shorter discounting period implies that (i) the number of periods in the analysis increases and (ii) the discount rate applicable per period decreases. The general formula for calculating the present value in the case of shorter discounting period is:

$$\text{PV} = \text{FV}_n \left[\frac{1}{1 + r/m}\right]^{mn} \tag{5.14}$$

where PV is the present value, FV_n is the cash flow after n years, m is the number of times per year discounting is done, and r is the annual discount rate.

Exhibit 5.13 ***Compounding Frequency and Effective Interest Rate***

Frequency	*Stated Interest Rate (%)*	*m*	*Formula*	*Effective Interest Rate Rate (%)*
Annual	12	1	0.12	12.00
Semi-annual	12	2	$\left[1+\frac{0.12}{2}\right]^2-1$	12.36
Quarterly	12	4	$\left[1+\frac{0.12}{4}\right]^4-1$	12.55
Monthly	12	12	$\left[1+\frac{0.12}{12}\right]^{12}-1$	12.68
Weekly	12	52	$\left[1+\frac{0.12}{52}\right]^{52}-1$	12.73
Daily	12	365	$\left[1+\frac{0.12}{365}\right]^{365}-1$	12.75
Continuous	12		$e^{0.12}-1$	12.75

To illustrate, consider a cash flow of Rs. 10,000 to be received at the end of four years. The present value of this cash flow when the discount rate is 12 percent (r=12 percent) and discounting is done quarterly (m=4) is determined as follows:

$$\begin{aligned} \text{PV} &= \text{Rs. } 10{,}000 \times \text{PVIF}_{r/m,\, m \times n} \\ &= \text{Rs. } 10{,}000 \times \text{PVIF}_{3\%,16} \\ &= \text{Rs. } 10{,}000 \times 0.623 = \text{Rs. } 6{,}230 \end{aligned}$$

SUMMARY

- Money has time value. A rupee today is more valuable than a rupee a year hence.
- When cash flows occur at different points in time, it is easier to deal with them using a time line. A **time line** shows the timing and the amount of each cash flow in a cash flow stream.
- The process of investing money as well as reinvesting the interest earned thereon is called **compounding.** The future or compounded value of an investment after n years when the interest rate is r percent is:

$$\text{Future value}_n = \text{Present value } (1+r)^n$$

- If no interest is earned on interest the investment earns only simple interest. In such a case the investment grows as follows:

$$\text{Future value} = \text{Present value } [1 + nr]$$

- According to the **rule of 72**, the doubling period under compounding is obtained by dividing 72 by the interest rate.
- The process of **discounting**, used for calculating the present value, is simply the inverse of compounding. The present value formula is:

$$PV = FV_n \, [\, 1/(1+r)^n \,]$$

- The present value of a cash flow stream is equal to:

$$PV_n = \sum_{t=1}^{n} \frac{A_t}{(1+r)^t}$$

- An **annuity** is a stream of constant cash flows (payments or receipts) ccurring at regular intervals of time. When the cash flows occur at the end of each period the annuity is called a regular annuity or a deferred annuity. When the cash flows occur at the beginning of each period, the annuity is called an annuity due.
- The future value of an annuity is given by the formula:

$$FVA_n = A\,[(1+r)^n - 1] \,/\, r$$

- The present value of an annuity is given by the formula:

$$PVA_n = A\,[\{\,1 - (1/1+r)^n\}/\; r\,]$$

- A cash flow that grows at a constant rate for a specified period of time is a growing annuity. The present value of a **growing annuity** is given by the following formula:

$$\text{PV of a Growing Annuity} = A(1+g)\ \{[1 - (1+g)^n \,/\, (1+r)^n\,] \,/\, \{r - g\}$$

- Since the cash flows of an annuity due occur one period earlier in comparison to the cash flows of an ordinary annuity, the following relationship holds:

$$\text{Annuity due value} = \text{Ordinary annuity value x } (1+r)$$

- A **perpetuity** is an annuity of infinite duration. The present value of a perpetuity is:

$$\text{Present value of a perpetuity} = A/r$$

- The general formula for the future value of a single cash flow after n years when compounding is done m times a year is:

$$FV_n = PV\,[1 + r/\,m]^{mn}$$

- The relationship between **effective interest rate** and the **stated annual interest rate** is as follows:

$$\text{Effective interest rate} = \left[\frac{\text{Stated annual interest rate}}{m}\right]^m - 1$$

- When compounding becomes continuous the effective interest rate is expressed as:

$$\text{Effective interest rate} = e^r - 1$$

- The formula for calculating the present value in the case of shorter compounding period is:

$$PV = FV_n\,[1/\,(1 + r/m)\,]^{mn}$$

QUESTIONS

1. Why does money have time value?
2. State the general formula for the future value of a single amount.
3. What is the difference between compound and simple interest?
4. Explain the rule of 72.
5. Explain the rule of 69. How does it compare with the rule of 72?
6. State the general formula for calculating the present value of a single amount.
7. What is an annuity? What is the difference between an ordinary annuity and an annuity due?
8. State the formula for the future value of an annuity.
9. State the formula for the present value of an annuity.
10. What is a growing annuity? What is the formula for finding the present value of a growing annuity?
11. What is the formula for the present value of a perpetuity?
12. State the formula for the future value of a single cash flow after *n* years when compounding is done *m* times a year.
13. What is the relationship between the effective interest rate and the stated interest rate?
14. State the formula for calculating the present value of a single cash flow when discounting is done *m* times a year.
15. A firm's earnings grew from Re.1 per share to Rs. 3 per share over a period of 10 years. The total growth was 200 percent, but the annual compound growth rate was less than 20 percent. Why?

SOLVED PROBLEMS

1 If you invest Rs. 5,000 today at a compound interest of 9 per cent, what will be its future value after 75 years ?

Solution

The future value of Rs. 5,000 after 75 years, when it earns a compound interest of 9 percent, is

$$\text{Rs. } 5{,}000\ (1.09)^{75}$$

Since the FVIF table given in Appendix A has a maximum period of 30, the future value expression may be stated as

$$\text{Rs. } 5{,}000\ (1.09)^{30}\ (1.09)^{30}\ (1.09)^{15}$$

The above product is equal to

$$\text{Rs. } 5{,}000\ (13.268)\ (13.268)\ (3.642) = \text{Rs. } 32{,}05{,}685.1$$

2 If the interest rate is 12 per cent, what are the doubling periods as per the rule of 72 and the rule of 69 respectively?

Solution

As per the rule of 72 the doubling period will be

$$72\ /\ 12 = 6 \text{ years}$$

As per the rule of 69, the doubling period will be

$$0.35 + \frac{69}{12} = 6.1 \text{ years}$$

3 A borrower offers 16 per cent nominal rate of interest with quarterly compounding. What is the effective rate of interest ?

Solution

The effective rate of interest is

$$\left[1 + \frac{0.16}{4}\right]^4 - 1 = (1.04)^4 - 1$$

$$= 1.17 - 1$$

$$= 0.17 = 17 \text{ percent}$$

4 Fifteen annual payments of Rs. 5,000 are made into a deposit account that pays 14 percent interest per year. What is the future value of this annuity at the end of 15 years?

Solution

The future value of this annuity will be:

$$\text{Rs. } 5{,}000\ (\text{FVIFA}_{14\%,15}) = \text{Rs. } 5{,}000\ (43.842)$$

$$= \text{Rs. } 2{,}19{,}210$$

5 A finance company advertises that it will pay a lumpsum of Rs. 44,650 at the end of five years to investors who deposit annually Rs. 6,000 for 5 years. What is the interest rate implicit in this offer?

Solution

The interest rate may be calculated in two steps

(a) Find the FVIFA for this contract as follows:

$$\text{Rs. } 6{,}000\ (\text{FVIFA}) = \text{Rs. } 44{,}650$$

So

$$\text{FVIFA} = \frac{\text{Rs } 44{,}650}{\text{Rs } 6{,}000} = 7.442$$

(b) Look at the FVIFA table and read the row corresponding to 5 years until 7.442 or a value close to it is reached. Doing so we find that

$$\text{FVIFA}_{20\%,5\text{yrs}} \text{ is } 7.442$$

So, we conclude that the interest rate is 20 percent.

6 What is the present value of Rs. 1,000,000 receivable 60 years from now, if the discount rate is 10 percent ?

Solution

The present value is

$$\text{Rs. } 1{,}000{,}000 \left(\frac{1}{1.10}\right)^{60}$$

This may be expressed as

$$\text{Rs. } 1{,}000{,}000 \left(\frac{1}{1.10}\right)^{30} \left(\frac{1}{1.10}\right)^{30}$$

$$= \text{Rs. } 1{,}000{,}000\ (0.057)\ (0.057) = \text{Rs. } 3249$$

7 A 12 – payment annuity of Rs. 10,000 will begin 8 years hence. (The first payment occurs at the end of 8 years). What is the present value of this annuity if the discount rate is 14 percent?

Solution

This problem may be solved in two steps.

Step 1: Determine the value of this annuity a year before the first payment begins, i.e., 7 years from now. This is equal to:

$$\text{Rs. } 10{,}000\ (\text{PVIFA}_{14\%,12\text{ years}}) = \text{Rs. } 10{,}000\ (5.660)$$
$$= \text{Rs. } 56{,}600$$

Step 2: Compute the present value of the amount obtained in Step1:

$$\text{Rs. } 56{,}600\ (\text{PVIF}_{14\%,\ 7\text{ years}}) = \text{Rs. } 56{,}600\ (0.400)$$
$$= \text{Rs. } 22{,}640$$

8 What is the present value of the following cash flow stream if the discount rate is 14 percent?

Year	*0*	*1*	*2*	*3*	*4*
Cash flow	5,000	6,000	8,000	9,000	8,000

Solution

The present value of the above cash flow stream is:

Year	*Cash Flow Rs*	*($PVIF_{14\%,\ n}$)*	*Present Value Rs*
0	5,000	1.000	5,000
1	6,000	0.877	5,262
2	8,000	0.769	6,152
3	9,000	0.675	6,075
4	8,000	0.592	4,736
			Rs 27,225

9 Mahesh deposits Rs. 200,000 in a bank account which pays 10 per cent interest. How much can he withdraw annually for a period of 15 years ?

Solution

The annual withdrawal is equal to:

$$\frac{\text{Rs } 200{,}000}{\text{PVIFA}_{10\%,\ 15\text{ yrs}}} = \frac{\text{Rs } 200{,}000}{7.606} = \text{Rs. } 26{,}295$$

10 You want to take a world tour which costs Rs. 1,000,000 – the cost is expected to remain unchanged in nominal terms. You are willing to save annually Rs. 80,000 to fulfill your desire. How long will you have to wait if your savings earn a return of 14 percent per annum ?

Solution

The future value of an annuity of Rs. 80,000 that earns 14 per cent per annum is equated to Rs 1,000,000.

$$80{,}000 \times \text{FVIFA}_{n=?,14\%} = 1{,}000{,}000$$

$$80{,}000 \left(\frac{1.14^n - 1}{0.14}\right) = 1{,}000{,}000$$

$$1.14^n - 1 = \frac{1{,}000{,}000}{80{,}000} \times 0.14 = 1.75$$

$$1.14^n = 1.75 + 1 = 2.75$$

$$n \log 1.14 = \log 2.75$$

$$n \times .0569 = 0.4393$$

$$n = 0.4393 \;/\; 0.0569 = 7.72 \text{ years}$$

You will have to wait for 7.72 years.

11 Shyam borrows Rs. 80,000 for a musical system at a monthly interest of 1.25 per cent. The loan is to be repaid in 12 equal monthly instalments, payable at the end of each month. What is the monthly installment? Prepare the loan amortisation schedule.

Solution

The monthly installment A is obtained by solving the equation:

$$80{,}000 = A \times \text{PVIFA}_{n=12,\, r=1.25\%}$$

$$80{,}000 = A \times \frac{1 - \dfrac{1}{(1+r)^n}}{r}$$

$$80{,}000 = A \times \frac{1 - \dfrac{1}{(1.0125)^{12}}}{.0125}$$

$$= A \times 11.0786$$

Hence $A = 80{,}000 \;/\; 11.0786 = \text{Rs. } 7221$

The loan amortisation schedule is shown below:

Loan Amortisation Schedule

Month	*Beginning Amount* (1)	*Monthly Installment* (2)	*Interest* (3)	*Principal Repayment* (2)-(3) = (4)	*Remaining Balance* (1)-(4) = (5)
1	80,000	7221	1000	6221	73779
2	73,779	7221	922.2	6298.8	67480.2
3	67,480.2	7221	843.5	6377.5	61102.7
4	61102.7	7221	763.8	6457.2	54645.5
5	54645.5	7221	683.1	6537.9	48107.6
6	48107.6	7221	601.3	6619.7	41487.9
7	41487.9	7221	518.6	6702.4	34785.5
8	34785.5	7221	434.8	6786.2	27999.3
9	27999.3	7221	350.0	6871.0	21128.3
10	21128.3	7221	264.1	6956.9	14171.4
11	14171.4	7221	177.1	7043.9	7127.1
12	7127.1	7221	89.1	7131.9	– 4.8[@]

[@] Rounding off error

PROBLEMS

1 Calculate the value 5 years hence of a deposit of Rs. 1,000 made today if the interest rate is (a) 8 percent, (b) 10 percent, (c) 12 percent, and (d) 15 percent.

2 If you deposit Rs. 5,000 today at 12 percent rate of interest in how many years (roughly) will this amount grow to Rs. 1,60,000 ? Work this problem using the *rule of 72*–do not use tables.

3 A finance company offers to give Rs. 8,000 after 12 years in return for Rs. 1,000 deposited today. Using the *rule of 69*, figure out the approximate interest offered.

4 You can save Rs. 2,000 a year for 5 years, and Rs. 3,000 a year for 10 years thereafter. What will these savings cumulate to at the end of 15 years, if the rate of interest is 10 percent?

5 Mr. Vinay plans to send his son for higher studies abroad after 10 years. He expects the cost of these studies to be Rs. 100,000. How much should he save annually to have a sum of Rs. 100,000 at the end of 10 years, if the interest rate is 12 percent ?

6 A finance company advertises that it will pay a lump sum of Rs. 10,000 at the end of 6 years to investors who deposit annually Rs. 1,000. What interest rate is implicit in this offer?

7 Someone promises to give you Rs. 5,000 after 10 years in exchange for Rs. 1,000 today. What interest rate is implicit in this offer?

8 Find the present value of Rs. 10,000 receivable after 8 years if the rate of discount is (i) 10 percent, (ii) 12 percent, and (iii) 15 percent.

9 What is the present value of a 5-year annuity of Rs. 2,000 at 10 percent ?

10 At the time of his retirement, Mr.Jingo is given a choice between two alternatives: (a) an annual pension of Rs. 10,000 as long as he lives, and (b) a lump sum amount of Rs. 50,000. If Mr.Jingo expects to live for 15 years and the interest rate is 15 percent, which option appears more attractive?

11 Mr.X deposits Rs. 1,00,000 in a bank which pays 10 percent interest. How much can he withdraw annually for a period of 30 years. Assume that at the end of 30 years the amount deposited will whittle down to zero.

12 What is the present value of an income stream which provides Rs. 1,000 at the end of year one, Rs. 2,500 at the end of year two, and Rs. 5,000 at the end of each of the years 3 through 10, if the discount rate is 12 percent ?

13 What is the present value of an income stream which provides Rs. 2,000 a year for the first five years and Rs. 3,000 a year forever thereafter, if the discount rate is 10 percent ? Hint: The present value for a perpetual annuity is derived by dividing the constant annual flow by the discount factor.

14 What amount must be deposited today in order to earn an annual income of Rs. 5,000 forever beginning from the end of 15 years from now ? The deposit earns 10 percent per year.

15 Suppose someone offers you the following financial contract. If you deposit Rs. 20,000 with him he promises to pay Rs. 4,000 annually for 10 years. What interest rate would you earn on this deposit?

16 What is the present value of the following cash flow streams?

End of year	*Stream A*	*Stream B*	*Stream C*
1	100	1,000	500
2	200	900	500
3	300	800	500
4	400	700	500
5	500	600	500
6	600	500	500
7	700	400	500
8	800	300	500
9	900	200	500
10	1,000	100	500

The discount rate is 12 percent.

17 Suppose you deposit Rs. 10,000 with an investment company which pays 16 percent interest with quarterly compounding. How much will this deposit grow to in 5 years?

18 How much would a deposit of Rs. 5,000 at the end of 5 years be, if the interest rate is 12 percent and if the compounding is done quarterly ?

19 What is the difference between the effective rate of interest and stated rate of interest in the following cases:

Case A: Stated rate of interest is 12 percent and the frequency of compounding is six times a year.

Case B: Stated rate of interest is 24 percent and the frequency of compounding is four times a year.

Case C: Stated rate of interest is 24 percent and the frequency of compounding is twelve times a year.

20 If the interest rate is 12 percent how much investment is required now to yield an income of Rs. 12,000 per year from the beginning of the 10^{th} year and continuing thereafter forever ?

21 You have a choice between Rs. 5,000 now and Rs. 20,000 after 10 years. Which would you choose? What does your preference indicate?

22 Mr.Raghu deposits Rs. 10,000 in a bank now. The interest rate is 10 percent and compounding is done semi-annually. What will the deposit grow to after 10 years? If the inflation rate is 8 percent per year, what will be the value of the deposit after 10 years in terms of the current rupee?

23 How much should be deposited at the beginning of each year for 10 years in order to provide a sum of Rs. 50,000 at the end of 10 years ? Assume an interest rate of 12 percent.

24 A person requires Rs. 20,000 at the beginning of each year from 2005 to 2009. How much should he deposit at the end of each year from 1995 to 2000? The interest rate is 12 percent.

25 What is the present value of Rs. 2,000 receivable annually for 30 years? The first receipt occurs after 10 years and the discount rate is 10 percent.

26 After five years Mr.Ramesh will receive a pension of Rs. 600 per month for 15 years. How much can Mr.Ramesh borrow now at 12 percent interest so that the borrowed amount can be paid with 30 percent of the pension amount? The interest will be accumulated till the first pension amount becomes receivable.

27 Mr.Prakash buys a scooter with a bank loan of Rs. 6,000. An instalment of Rs. 300 is payable to the bank for each of 24 months towards the repayment of loan with interest. What interest rate does the bank charge?

28 South India Corporation has to retire Rs. 10 million of debentures each at the end of 8, 9, and 10 years from now. How much should the firm deposit in a sinking fund account annually for 5 years, in order to meet the debenture retirement need? The net interest rate earned is 8 percent.

29 Mr.Longman receives a provident fund amount or Rs. 1,00,000. He deposits it in a bank which pays 10 percent interest. If he withdraws annually Rs. 20,000, how long can he do so ?

30 Phoenix Company borrows Rs. 500,000 at an interest rate of 14 percent. The loan is to be repaid in 4 equal annual instalments payable at the end of each of the next 4 years. Prepare the loan amortisation schedule.

31 You want to borrow Rs. 1,500,000 to buy a flat. You approach a housing company which charges 13 percent interest. You can pay Rs. 200,000 per year toward loan amortisation. What should be the maturity period of the loan?

32 You are negotiating with the government the right to mine 100,000 tons of iron ore per year for 15 years. The current price per ton of iron is Rs. 3000 and it is expected to increase at the rate of 6 percent per year. What is the present value of the iron ore that you can mine if the discount rate is 16 percent?

33 As a winner of a competition, you can choose one of the following prizes:

a. Rs. 500,000 now
b. Rs. 1,000,000 at the end of 6 years
c. Rs. 60,000 a year forever
d. Rs. 100,000 per year for 10 years
e. Rs. 35,000 next year and rising thereafter by 5 percent per year forever.

If the interest rate is 10 percent, which prize has the highest present value.

■ ■

MINICASE

As an investment advisor, you have been approached by a client called Ramesh, who wants some help in investment related matters.

Ramesh is currently 45 years old and has Rs 600,000 in the bank. He plans to work for 15 more years and retire at the age of 60. Ramesh's present salary is Rs 400,000 per year. He expects his salary to increase at the rate of 12 percent per year until his retirement.

Ramesh has decided to invest his bank balance and future savings in a portfolio in which stocks and bonds would be equally weighted. For the sake of simplicity, assume that these proportions will be maintained by him throughout. He also believes that bonds would provide a return of 7 percent and stocks a return of 13 percent. You concur with his assessment.

Once Ramesh retires at the age of 60 he would like to withdraw Rs 500,000 per year from his investments for the following 15 years as he expects to live upto the age of 75 years. He also wants to bequeath Rs 1,000,000 to his children at the end of his life. How much money would he need 15 years from now?

How much should Ramesh save each year for the next 15 years to be able to meet his investment objectives spelt out above? Assume that the savings will occur at the end of each year.

Suppose Ramesh wants to donate Rs 200,000 per year in the last three years of his life to a charitable cause. Each donation would be made at the beginning of the year. How much money would he need when he reaches the age of 60 to meet this specific need?

Ramesh recently attended a seminar on human capital where the speaker talked about a person's human capital as the present value of his life time earnings. Ramesh is curious to find out the present value of his lifetime salary. For the sake of simplicity assume that his present salary of Rs 400,000 will be paid exactly one year from now, and his salary will be paid in annual instalments. What is the present value of his life time salary, if the discount rate is 8 percent? Remember that Ramesh expects his salary to increase at the rate of 12 percent per year until his retirement.

In answering the above questions, ignore the tax factor.

Chapter **6**

Financial Statement Analysis
The Information Maze

LEARNING OBJECTIVES

After studying this chapter, you should be able to:

- Explain the discrepancy between accounting income and economic income.
- Identify the devices used in practice to manipulate the bottom line.
- Use a firm's financial statements to calculate standard financial ratios.
- Decompose the return on equity into its key determinants
- Carry out comparative analysis.
- Show how financial statement analysis is used for different purposes.

Financial statements are an important source of information for evaluating the performance and prospects of a firm. As a student of finance and investments, you should understand how these statements are prepared, what these statements contain, and how these statements may be analysed.

The preparation of financial statements is covered in a course on financial accounting which is almost invariably a prerequisite for students of finance and investments. Assuming that you have received such an exposure, this chapter focuses on the contents, analysis, and interpretation of financial statements.

If properly analysed and interpreted, financial statements can provide valuable insights into a firm's performance. Analysis of financial statements is of interest to lenders (short-term as well as long-term), investors, security analysts, managers, and others. Financial statement analysis may be done for a variety of purposes, which may range from a simple analysis of the short-term liquidity position of the firm to a comprehensive assessment of the strengths and weaknesses of the firm in various areas. It is helpful in assessing corporate excellence, judging creditworthiness, forecasting bond ratings, evaluating intrinsic value of equity shares, predicting bankruptcy, and assessing market risk.

6.1 FINANCIAL STATEMENTS

Managers, shareholders, creditors, and other interested groups seek answers to the following questions about a firm: What is the financial position of a firm at a given point of time? How has the firm performed financially over a given period of time? What have been the sources and uses of cash over a given period? To answer these questions, companies prepare three statements, the balance sheet, the profit and loss account, and the statement of cash flows. The Companies Act, 1956 requires every company to prepare a Balance Sheet and a Profit and Loss account. While the Companies Act does not require a Cash Flow Statement to be presented as part of financial statements, the Accounting Standard 3 issued by the Institute of Chartered Accountants of India (ICAI) mandates a Cash Flow Statement when the turnover of a company exceeds Rs. 50 crore or its debt or equity is listed or proposed to be listed on a stock exchange.

Balance Sheet

The balance sheet shows the financial condition of a business at a given point of time. As per the Companies Act, the balance sheet of a company shall be in either the account form or the report form. Exhibit 6.1 shows these forms; part A of this exhibit the account form

Exhibit 6.1 ***Structure of Balance Sheet as per Companies Act***

A: Account Form

Liabilities	*Assets*
■ Share capital	■ Fixed assets
■ Reserves and surplus	■ Investments
■ Secured loans	■ Current assets, loans and advances
■ Unsecured loans	■ Current assets
■ Current liabilities and provisions	■ Loans and advances
■ Current liabilities	
■ Provisions	■ Miscellaneous expenditures and losses

B: Report Form

I. Sources of Funds
- (1) Shareholders' funds
  - (a) Share capital
  - (b) Reserves & surplus
- (2) Loan funds
  - (a) Secured loans
  - (b) Unsecured loans

II. Application of Funds
- (1) Fixed assets
- (2) Investments
- (3) Current assets, loans and advances
  Less: Current liabilities and provisions
  Net current assets
- (4) Miscellaneous expenditures and losses

and Part B the report form. Exhibit 6.2 shows the balance sheet of Horizon Limited as at March 31, 20X1 cast in the account as well as the report form. While the report form is most commonly used by companies, it is more convenient to explain the contents of the balance sheet of Horizon Limited, cast in the account form, as given in Exhibit 6.3.

Exhibit 6.2 ***Balance Sheet of Horizon Limited as at March 31, 20X1***

A Account Form — *Rs. in million*

Liabilities	20X1	20X0	Assets	20X1	20X0
Share capital	150	150	Fixed assets	330	322
Equity 150					
Preference –					
Reserves and surplus	112	106	Investments***	15	15
Secured loans*	143	131	Current assets, loans and advances	234	156
Unsecured loans**	69	25	Miscellaneous expenditures and losses	–	–
Current liabilities and provisions	105	81			
	579	493		579	493

B Report Form

		20X1	20X0
I. Sources of Funds			
(1) Shareholders' funds		262	256
(a) Share capital	150		
(b) Reserves & surplus	112		
2) Loan funds		212	156
(a) Secured loans	143		
(b) Unsecured loans	69		
		474	412
II. Application of Funds			
(1) Fixed assets		330	322
(2) Investments		15	15
(3) Current assets, loans and advances		234	156
Less: Current liabilities and provisions		105	81
Net current assets		129	75
(4) Miscellaneous expenditures and losses		–	–
		474	412

* Rs 35 million of secured loans are due within 1 year, the balance being due after 1 year.
** Rs 40 million of unsecured loans are due within 1 year, the balance being due after 1 year.
*** Rs 3 million out of Rs 15 million represent current investments.

Exhibit 6.3 ***Balance Sheet of Horizon Limited as at March 31, 20X1. A Detailed Version***

(Rs in million)

Liabilities	*20X1*	*20X0*	*Assets*	*20X1*	*20X0*
Share capital	150	150	Fixed assets		
Equity	150	150	(net)	330	322
Preference	–	–	Gross block	500	462
			Acc. depn.	170	140
Reserves and surplus	112	106	Investments	15	15
Secured loans	143	131	Current assets,		
Term loans	70	58	loans and advances	234	156
Cash credit	73	73	Cash & bank	10	6
Unsecured loans	69	25	Debtors	114	68
Bank credit	25	25	Inventories	105	72
Inter-corporate deposits	44	...	Advances	5	10
Current liabilities			Miscellaneous exp		
& provisions	105	81	and losses	–	–
Trade credit	75	60			
Advances	20	13			
Provisions	10	8			
	579	493		579	493

- Note that the working capital advance provided by banks is shown under secured loans or unsecured loans (depending on whether it is secured or not) and not under current liabilities and provisions.

Liabilities Liabilities, defined very broadly, represent what the firm owes others. A liability arises when a firm receives benefits or services and, in turn, promises to pay cash or provide goods and services in future.

Most liabilities are monetary liabilities, meaning that they require payments of specific amounts of cash. If the payment is due within a year or less, the liability is shown at the amount of cash the firm is expected to pay to discharge the obligation. If the payment dates extend beyond one year, the liability is shown at the present value of the future cash outflows. The discount rate used for valuing the future cash flows is the borrower's interest rate on that liability.

Some liabilities are non-monetary, meaning that the firm expects to discharge them by delivering goods or providing services, rather than by paying cash. For example, a magazine publisher may collect cash for subscriptions and promise delivery of magazines for many months to come. While the firm receives cash currently, it discharges its obligations by delivering the magazines in future. Such non-monetary liabilities are shown at the amount of cash received, rather than the expected cost of publishing the magazines.

The format prescribed in the Companies Act classifies liabilities as follows:[1]

- Share capital
- Reserves and surplus
- Secured loans
- Unsecured loans
- Deferred tax liability
- Current liabilities and provisions

Share Capital Share capital includes equity (or ordinary) capital and preference capital. Equity capital represents the contribution of equity shareholders who are the owners of the firm. Equity capital, being the risk capital, carries no fixed rate of dividend. Preference capital represents the contribution of preference shareholders and the dividend rate payable on it is generally fixed.

While the final figure shown against share capital is the paid up capital, the balance sheet also provides information on authorised capital, issued capital, subscribed capital, and paid-up capital. The amount of capital that a company can potentially issue, as per its memorandum, represents the **authorised capital**; the amount offered by the company to the investors is called the **issued capital**; the part of issued capital which has been subscribed to by the investors is called the **subscribed capital**; the actual amount paid up is called the **paid-up capital.** Typically, the issued, subscribed, and paid up capital are the same.

Reserves and Surplus Reserves and surplus comprise retained earnings as well as non-earnings items like share premium and capital subsidy.

There are several kinds of reserves. Capital reserves include items such as share premium, revaluation reserve, and capital redemption reserve. A capital reserve cannot be distributed as dividend to shareholders. Revenue reserves represent accumulated retained earnings from the profits of the business that can be distributed as dividends. Dividend equalisation reserve, foreign exchange fluctuation reserve, and general reserve are examples of revenue reserves. Statutory reserves are reserves created to comply with statutory requirements. Debenture redemption reserve and investment allowance reserve are examples of statutory reserves. These reserves cannot be distributed as dividends during the period specified in the law.

It is a common practice for companies to effect transfers from the profit and loss account to various reserve accounts. This process is called appropriation.

Surplus is the balance in the profit and loss account which has not been appropriated to any particular reserve account. Note that reserves and surplus along with paid up capital represent owners' equity, which is also called shareholders' funds or net worth.

Secured Loans Secured loans are loans that are secured by a charge on the assets of the firm. The charge may be created in the form of pledge or hypothecation of movable assets such as inventories and debtors and / or in the form of mortgage (usually

[1] This list includes deferred tax liability, which is now required to be shown in the financial statements.

equitable mortgage[2]) of immovable assets such as land, buildings, and plant and machinery (which are embedded to earth).

The most common forms of secured loans in India are debentures, term loans, and working capital loans.

Unsecured Loans In contrast to secured loans, unsecured loans are loans which are not secured by a charge on the assets of the firm.

The most common forms of unsecured loans in India are public deposits, commercial paper, unsecured loans from promoters, inter-corporate loans, and unsecured loans from commercial banks and financial institutions.

Deferred Tax Liability Taxable income, which is determined according to income tax regulations, is generally different from accounting profit, which is measured according to generally accepted accounting principles and the accounting policies followed by the firm. The difference may be permanent or temporary.

A permanent difference is caused by an item which is included for calculating either taxable income or accounting profit, but not both. For example, if some income is tax-exempt, it is included in accounting profit but not taxable income. A temporary difference (also called a timing difference) is caused by an item which is included for calculating both taxable income and accounting period, but in different periods. For example, depreciation is charged as per the written down value for calculating the taxable income but typically as per the straight line method for calculating the accounting profit. As a result, there are differences in the year-to-year depreciation charges under the two methods, but the total depreciation charges over the life of the asset would be the same under both the methods.

Deferred tax liability (or asset) arises because of the temporary differences between taxable income and accounting profit. A deferred tax liability (asset) is recognised when the charge in the financial statements is less (more) than the amount allowed for tax purposes.

Current Liabilities and Provisions Broadly speaking, current liabilities and provisions represent obligations that are expected to mature within a year.

As per the format prescribed under the Company's Act, current liabilities and provisions are divided into two sub-categories viz., current liabilities and provisions. **Current liabilities** include items such as bills payable, sundry creditors, advance payments, and interest accrued but not due on loans. **Provisions** include items such as provision for taxes, provision for dividend, and provision for provident fund, gratuity, superannuation, and leave encashment.

Note that installments of loans which are repayable within a year from the date of the balance sheet should also be part of current liabilities and provisions. However, in the format prescribed under the Companies Act, loans are shown separately under two categories viz., secured loans and unsecured loans. For analytical purposes, it makes sense to identify portions of loans, whether secured or unsecured, which are repayable within a year from the date of the balance sheet and include them under current liabilities and provisions.

[2] In an equitable mortgage, the title deeds of the property is deposited with the lender.

Assets Assets are resources which are expected to provide a firm with future economic benefits, by way of higher cash inflows or lower cash outflows. Resources are recognised as assets in accounting when (a) the firm acquires rights over them as a result of a past transaction and (b) the firm can quantify future economic benefits with a fair degree of accuracy.

Assets are classified as follows under the Companies Act:

- Fixed assets
- Investments
- Currents assets, loans, and advances
- Miscellaneous expenditures and losses

Fixed Assets Fixed assets, also called noncurrent assets, are assets that are expected to produce benefits for more than one year. These assets may be tangible or intangible. Tangible fixed assets include items such as land, buildings, plant, machinery, furniture, and computers. Intangible fixed assets include items such as patents, copyrights, trademarks, and goodwill.

Tangible fixed assets are reported in the balance sheet at their net book value, which is simply the gross value (the cost of acquiring the asset) less accumulated depreciation—depreciation represents the allocation of the cost of a tangible fixed asset to various accounting periods that benefit from its use. Likewise, intangible fixed assets are reported at their net book value, which is simply the gross value less accumulated amortisation. Amortisation represents the allocation of the cost of an intangible fixed asset to various accounting periods that benefit from its use.

Investments Investments represent financial securities owned by the firm. They are divided into two categories viz., long-term investments and current investments.

Long-term investments generally comprise of financial securities like equity shares, preference shares, and debentures of other companies, most of which are likely to be associate companies and subsidiary companies. These investments are made for income and control purposes. Long-term investments are stated at cost less any diminution of value which is regarded as permanent in the opinion of management.

Current investments generally represent short-term holdings of units or shares of mutual fund schemes. These investments are made primarily to generate income from short-term cash surpluses of the firm. Current investments are carried at cost or market (fair) value, whichever is lower.

For analytical purposes current investments, being short-term in nature, may be classified under the asset category current assets, loans, and advances. Under the format prescribed in the Companies Act, however, current investments also have to be shown under the asset category investments.

Current Assets, Loans and Advances This category consists of cash and other assets which get converted into cash, or which result in cash savings, during the operating cycle of the firm. The major components of current assets, loans and advances are: inventories, sundry debtors, cash and bank balances, other current assets, and loans and advances.

- **Inventories** (also called stocks) comprise of raw materials, work-in-process, finished goods, packing materials, and stores and spares. Inventories are generally valued at cost or net realisable value, whichever is lower. The cost of inventories comprises of purchase cost, conversion cost, and other cost incurred to bring them to their respective present location and condition. The cost of raw materials, stores and spares, packing materials, trading and other products is generally determined on weighted average basis. The cost of work-in-process and finished goods is generally determined on absorption costing basis—this means that the cost figure includes allocation of manufacturing overheads.
- **Sundry debtors** (also called accounts receivable) represent the amounts owed to the firm by its customers (who have bought goods and services on credit) and others. Sundry debtors are classified into two categories viz., debts outstanding for a period exceeding six months and other debts. Further, sundry debtors are classified as debts considered good and debts considered doubtful. Generally, firms make a provision for doubtful debts which is equal to debts considered doubtful. The net figure of sundry debtors is arrived at after deducting the provision for doubtful debts.
- **Cash and bank balances** comprise of cash on hand and balances with scheduled banks and non-scheduled banks.
- **Other current assets** comprise of items such as interest accrued on investments, dividends receivable, and fixed assets held for sale (the last item is valued at net book value or estimated net realisable value, whichever is lower).
- **Loans and advances** comprise of items such as advances and loans to subsidiaries, advances recoverable in cash or in kind for value to be received, and deposits with governmental authorities. The net figure of loans and advances is arrived at after deducting a provision for doubtful advances, if any.

Miscellaneous Expenditures and Losses This category consists of two items (i) miscellaneous expenditure and (ii) loss or debit balance of profit and loss account.

- **Miscellaneous expenditures** comprise of items such as preliminary expenses, discount allowed on the issue of securities, and development expenditure to the extent not written off or adjusted.
- **Losses** If there is a debit balance of profit and loss account carried forward after deduction of the uncommitted reserves, if any, it is shown on the asset side.

Accounting Values versus Economic Values Accounting values and economic values ought to be similar, at least in theory. In reality, however, the two diverge very often. There are three main reasons for such a discrepancy.

Use of the Historical Cost Principle For purposes of valuation, accountants use the historical cost as the basis. The value of an asset is shown at its historical cost less accumulated depreciation. Likewise, the value of a liability reflects a historical number. Hence accounting values differ significantly from current economic values.

Exclusion of Intangible Assets Intangible assets like technical know-how, brand equity, managerial capability, and goodwill with suppliers often have substantial economic value. Yet they are ignored in financial accounting because it is difficult to objectively value them.

Understatement or Omission of Certain Liabilities Firms may understate or even wholly omit certain liabilities that are of a contingent nature. They may be mentioned by way of a footnote to the balance sheet but they are not recorded on the main balance sheet.

Profit and Loss Account

The Companies Act has prescribed a standard form for the balance sheet, but none for the profit and loss account. However, the Companies Act does require that the information provided should be adequate to reflect a true and fair picture of the operations of the company for the accounting period. The Companies Act has also specified that the profit and loss account must show specific information as required by Schedule IV.

The profit and loss account, like the balance sheet, may be presented in the account form or the report form. Typically, companies employ the report form. The report form statement may be a single-step statement or a multi-step statement. In a single-step statement, all revenue items are recorded first, then the expense items are shown, and finally the net profit is given. Exhibit 6.4 presents a single-step profit and loss account for Horizon Limited for the year ending on March 31, 20X1.

Exhibit 6.4 ***Profit and Loss Account of Horizon Limited for the Year Ended on March 31, 20X1***

	(Rs. in million)
Income	
Sales	701
Other income	–
Expenditure	
Material and other expenditure	582
Interest	21
Depreciation	30
Provision for tax	34
Profit after tax	34

While a single-step profit and loss account aggregates all revenues and expenses, a multi-step profit and loss account provides disaggregated information. Further, instead of showing only the final profit measure, viz., the profit after tax figure, it presents profit measures at intermediate stages as well. Exhibit 6.5 gives a multi-step profit and loss account for Horizon Limited for the year ending March 31, 20X1. The form given in this exhibit highlights the following:

- Net sales
- Cost of goods sold
- Gross profit
- Operating expenses
- Operating profit
- Other income
- Profit before interest and tax
- Interest
- Profit before tax
- Tax
- Profit after tax
- Prior period adjustments
- Amount available for appropriations
- Appropriations
- Balance carried forward

Exhibit 6.5 ***Profit and Loss Account of Horizon Limited for the Year Ended on March 31, 20X1***

(Rs in million)

		20X1	*20X0*
Net sales		701	623
Cost of goods sold		552	475
Stocks	421		
Wages and salaries	68		
Other manufacturing expenses	63		
Gross profit		149	148
Operating expenses		60	49
Depreciation	30		
General administration	12		
Selling	18		
Operating profit		89	99
Other income (expense)		–	6
Profit before interest and tax		89	105
Interest		21	22
Profit before tax		68	83
Provision for tax		34	41
Profit after tax		34	42

Net Sales Net sales are generally defined as: Sales–Sales returns–Excise duty

Sales are the sum of the invoice price of goods and services rendered during the period. Sales returns represent the invoice value of goods returned by the customers. Excise duty refers to the amount paid to the excise department.

Cost of Goods Sold The cost of goods sold (COGS), also called the cost of sales, represents the cost of goods sold during the accounting period. For a distribution firm, the COGS is the acquisition cost of inventories sold during the accounting period. For a manufacturing firm, the COGS consists of direct material costs, direct labour costs, and manufacturing overhead costs incurred for producing the goods sold during the accounting period. The COGS should be distinguished from the cost of production which represents the cost of goods produced during the accounting period.

Gross Profit Gross profit is the difference between net sales and the cost of goods sold. It is the first and the broadest measure of profit.

Operating Expenses Operating expenses are the expenses incurred by a firm for running its operations during the accounting period. General administration expenses, selling and distribution expenses, research and development expenses, and depreciation and amortisation are the major items of operating expenses (Many accountants include depreciation under manufacturing overhead and treat it as part of the cost of goods sold, rather than as an operating expense. This treatment is also quite acceptable).

Operating Profit Operating profit represents profit from operations after considering the cost of goods sold and operating expenses. If reflects the profit generated by the normal and recurring business activities of the firm and does not take into account non-operating gains (or losses), interest expenses, and taxes.

Other Income Operating profit (income) is generated by the core business of the firm whereas other income reflects extra-ordinary income and non-operating income. While extra-ordinary income is sporadic, non-operating income is regular. Profit or loss from the sale of strategic investments and expenses on voluntary retirement scheme are examples of extra-ordinary income (or loss). Interest on mutual fund units and duty drawbacks are examples of non-operating income.

Profit Before Interest and Taxes Profit before interest and taxes (PBIT), referred to also as earnings before interest and taxes (EBIT), is the operating profit of the firm plus any non-operating surplus less any non-operating loss. It is a measure of profit before considering interest expense and tax burden. It abstracts away the effect of debt policy (which determines the interest expense) as well as the tax code (which determines the tax burden). Hence, it is pre-eminently suitable for comparing profitability of firms with different debt policies and tax obligations.

Interest Interest is the periodic expense incurred for borrowings like term loans, debentures, working capital loans, commercial paper, fixed deposits, and unsecured loans provided by promoters. Remember that the interest income received on financial assets owned by the firm was included under non-operating surplus. Some firms, however, deduct the interest income on financial assets from the interest expense to arrive at the net interest expense which is shown here.

Profit Before Tax Profit before tax is the difference between the firm's profit before interest and tax and its interest expense. It is a measure of profit before taking taxes into account.

Income Tax Provision Thanks to the deferred tax accounting rule being followed now, the income tax provision consists of two items viz., current tax and deferred tax liability. The current tax is the income tax payable on the basis of taxable income as computed under the Income Tax Act. The deferred tax liability arises on account of temporary differences (also known as timing differences) caused by items which are considered for calculating the taxable income (for income tax purposes) and accounting profit (for financial reporting purposes)[3] . For the sake of simplicity we will assume that the income tax provision represents current tax.

Profit After Tax Profit after tax is obtained by subtracting the income tax provision from profit before tax. It is also called the net profit or the net income or the bottom line. When the profit after tax is positive the firm is said to be in the black; when it is negative, the firm is said to be in the red. Profit after tax is a measure of the change in the owners' equity arising from the revenues and expenses of the accounting period.

Prior Period Adjustments After the profit after tax is calculated some adjustments are made to arrive at the profit available for appropriation. The common adjustments involve adding the profit brought forward, adding the reserves written back, and subtracting extra burdens for previous years on items such as taxation.

Amount Available for Appropriations Profit available for appropriation is equal to profit after tax plus prior period adjustments.

Appropriations From the amount available for appropriations, transfers are made to various reserve accounts and provision is made for the proposed dividend.

Balance Carried Forward What is left after various appropriations represents the balance (or surplus) in the profit and loss account which is carried forward.

Accounting Income versus Economic Income

The economic income of a period is defined as the change in wealth during the period. Suppose you buy a share for Rs.50 at the beginning of a year. If you receive a dividend of Rs.2 and the price of the share moves up to Rs.60 at the end of the year then the economic income from the share is Rs.12, the increase in your wealth.

While it is easy to measure the change in the wealth of an investor, it is somewhat difficult to measure the change in the value of a firm. The profit and loss account represents the accountant's attempt to measure the change in the wealth of

[3] A firm can have a deferred tax asset as well on account of timing differences.

shareholders. Accounting income, however, diverges from economic income due to the following reasons:

Use of the Accrual Principle The accountant uses the accrual principle and not the cash principle. Hence the computation of accounting income is not based on cash flows, even though it is cash that really matters in the determination of economic income.

Omission of Changes in Value The accountant records only those changes in value which arise from definite transactions. He does not bother about things like development of new products, emergence of competition, and changes in regulation that significantly alter the future revenues and costs of the firm and, hence, its value.

Depreciation Economic depreciation represents the decline in the value of asset during the year. Since it is difficult to measure economic depreciation, the accountant often follows a fairly straight forward method for allocating the historical cost of the assets over its useful life. For example, under the straight line method—a commonly adopted method—the historical cost of the asset is allocated evenly over its life. Understandably, there is often a discrepancy between economic depreciation (loss of economic value) and accounting depreciation (allocation of historical cost using some arbitrary rule).

Treatment of R&D and Advertising Expenditures R&D expenditures increase a firm's technical know-how which enhances revenues and lowers costs in the future; likewise, advertising expenditures that build brand equity benefit the firm over a period of time. Hence these expenditures are akin to capital expenditures. Yet, for purposes of accounting, these expenditures are typically written off in the year in which they are incurred. This naturally causes a discrepancy between accounting income and economic income.

Inflation Inflation raises the market value of a firm's assets. However, under historical cost accounting this is not acknowledged. Hence, the depreciation charge is based on the historical cost, and not the replacement cost, of assets. This leads to a divergence between accounting income and economic income.

Creative Accounting Firms may manage their accounting income by resorting to various creative accounting techniques like change in the method of stock valuation, change in the method and rate of depreciation, and sale and leaseback arrangement. Generally, the motive for creative accounting is to artificially boost the reported profit. Obviously, such tactics cause a discrepancy between accounting income and economic income.

Unaudited Quarterly Financial Results

A listed company is required to furnish unaudited financial results on a quarterly basis within a month of expiry of the period to the stock exchange where the company is listed. Further, the company is required to advertise the details within 48 hours of the disclosure. The advertisement must appear in at least one national English daily and one regional newspaper published from where the registered office of the company is located.

The pro forma specified for such disclosure is a multi-step profit and loss account where the following stages of profit are given:

- Profit from operations before other income, interest and exceptional items
- Profit before interest and exceptional items
- Profit after interest but before exceptional items
- Profit from ordinary activities before tax
- Net profit from ordinary activities after tax

In addition, information has to be provided about the following: paid-up equity share capital, reserves excluding revaluation reserves, basic and diluted earnings per share, and non-promoter shareholding.

The pro forma requires a company to give financial results for the quarter ended, for the corresponding quarter of the previous year, and for the previous accounting year.

Statement of Cash Flow

From a financial point of view, a firm basically generates cash and spends cash. It generates cash when it issues securities, raises a bank loan, sells a product, disposes an asset, so on and so forth. It spends cash when it redeems securities, pays interest and dividends, purchases materials, acquires an asset, so on and so forth. The activities that generate cash are called sources of cash and the activities that absorb cash are called uses of cash.

To understand how a firm has obtained cash and how it has spent cash during a given period, we need to look at the changes in each of the items in the balance sheet over that period. As an illustration, Exhibit 6.6 shows the balance sheets of Horizon Limited as on 31.3.20X0 and 31.3.20X1. The changes in various items of the balance sheet are noted in the last two columns of that exhibit.

Looking at the exhibit we find that values of a number of things have changed over the year. For example, term loans increased by Rs 12 million and fixed assets (net) increased by Rs 8 million. Which of these changes represents a source of cash and which a use of cash? Our common sense tells us that a firm generates cash when it increases its liabilities (as well as owners' equity) and disposes assets; on the other hand it uses cash when it reduces its liabilities (as well owners' equity) and acquires assets. Thus, the following picture emerges.

Sources of Cash	Uses of Cash
■ Increase in liabilities and owners' equity	Decrease in liabilities and owners' equity
■ Decrease in assets (other than cash)	Increase in assets (other than cash)

Exhibit 6.6 ***Changes in Balance Sheet Items***

	Mar.31 20X1	*Mar.31 20X0*	*Increase*	*Decreases*
Owners' equity and liabilities				
Share capital				
Equity capital	150	150	–	–
Preference capital	–	–	–	–
Reserves & surplus	112	106	6	–
Secured loans				
Term loans	70	58	12	–
Cash credit	73	73	–	–
Bank credit	25	25	–	–
Inter corporate deposits	44	–	44	–
Current liabilities & provisions				
Trade credit	75	60	15	–
Advance (taken)	20	13	7	–
Provisions	10	8	2	–
Total	579	493		
Assets				
Fixed assets (net)	330	322	8	–
Investments	15	15	–	–
Current assets, loans & advances				
Cash & bank	10	6	4	–
Debtors	114	68	46	–
Inventories	105	72	33	–
Advances given	5	10	–	5
Miscellaneous expenditures & losses	–	–	–	–
Total	579	493		

Using the above framework we can summarise the sources and uses of cash from the balance sheet data as follows:

Sources		*Uses*	
Increase in reserves and surplus	6	Increase in fixed assets (net)	8
Increase in term loans	12	Increase in debtors	46
Increase in inter-corporate deposits	44	Increase in inventories	33
Increase in trade credit	15		
Increase in advances (taken)	7		
Increase in provisions	2		
Decrease in advances (given)	5		
Total sources	91	Total uses	87
		Net addition to cash	4

Note that the net addition to cash is Rs 4 million and it tallies with the Rs 4 million change shown on the balance sheet.

This simple statement tells us a lot about what happened during the year, but it does not convey the full story. For example, the increase in reserves and surplus is equal to: profit after tax–dividends. If these are reported separately it would be more informative. Likewise, it would be more illuminating to know the break-up of net fixed assets acquisition in terms of gross assets acquisition and depreciation charge.

To get these details, we have to draw on the profit and loss account of Horizon Limited shown in Exhibit 6.5. The amplified sources and uses of cash statement is given below:

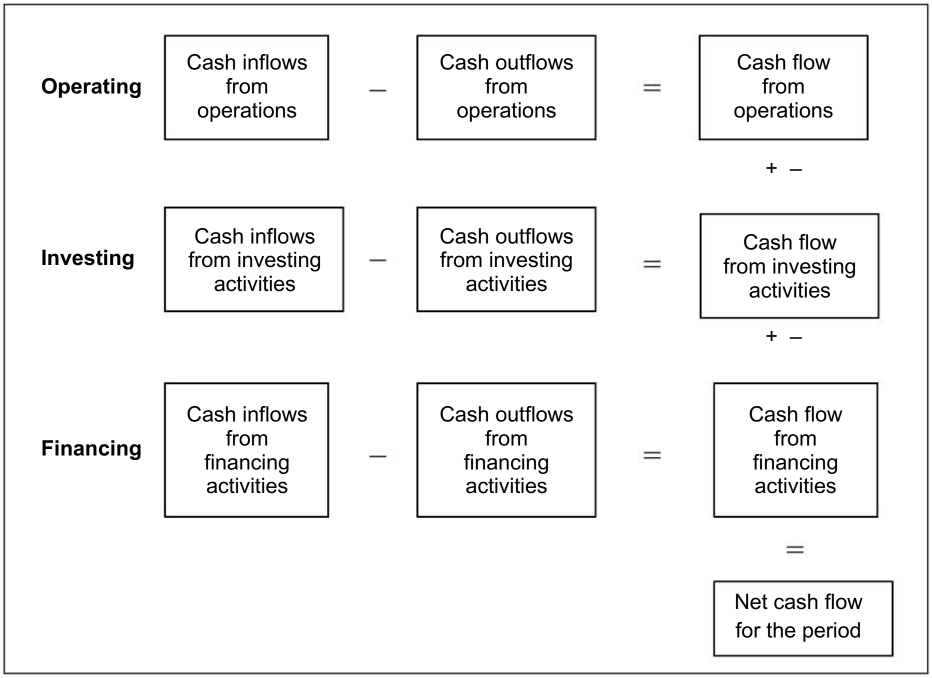
Sources		*Uses*	
Net profit	34	Dividend payment	28
Depreciation	30	Purchase of fixed assets	38
Increase in term loans	12	Increase in debtors	46
Increase in inter-corporate deposits	44	Increase in inventories	33
Increase in trade credit	15		
Increase in advances (taken)	7		
Increase in provisions	2		
Decrease in advances (given)	5		
Total sources	149	Total uses	145
		Net addition to cash	4

Classified Cash Flow Statement The statement presented above lumped together all sources of cash and uses of cash. To understand better how cash flows have been influenced by various decisions, it is helpful to classify cash flows into three classes viz., cash flows from operating activities, cash flows from investing activities, and cash flows from financing activities as shown in Exhibit 6.7

Operating activities involve producing and selling goods and services. Cash inflows from operating activities include monies received from customers for sales of goods and services. Cash outflows from operating activities include payments to suppliers for materials, to employees for services, and to the government for taxes.

Investing activities involve acquiring and disposing fixed assets, buying and selling financial securities, and disbursing and collecting loans. Cash inflows from investing activities include receipts from the sale of assets (real as well financial), recovery of loans, and collection of dividends and interest. Cash outflows from investing activities include payments for the purchase of assets (real and financial) and disbursement of loans.

Exhibit 6.7 ***Components of Cash Flows***



Financing activities involve raising money from lenders and shareholders, paying interest and dividend, and redeeming loans and share capital. Cash inflows from financing activities include receipts from issue of securities and from loans and deposits. Cash outflows from financing activities include payment of interest on various forms of borrowings, payment of dividend, retirement of borrowings, and redemption of capital.

Exhibit 6.8 shows the cash flow statement of Horizon Limited for the period 1.4.20X0 to 31.3.20X1 prepared in conformity with the format prescribed by the Accounting Principles Board of the Institute of Chartered Accountants of India.

• Alternative Measures of Cash Flow

As an analyst, you can use the following measures of cash flow to determine the financial health of the company: cash flow from operations and free cash flow.

Cash Flow from Operations When we looked at the profit and loss account, the emphasis was on profit after tax (also called the bottom line). In finance, however, the focus is on cash flow.

A firm's cash flow generally differs from its profit after tax because some of the revenues/expenses shown on its profit and loss account may not have been received/

paid in cash during the year. The relationship between net cash flow and profit after tax is as follows:

Net cash flow = Profit after tax – Non cash revenues + Non cash expenses

An example of non cash revenue is accrued interest income that has not yet been received. It increases the bottom line but is not matched by a cash inflow during the accounting period – the cash inflow would occur in a subsequent period. An example of a noncash expense is depreciation.

In practice, analysts define the net cash flow as:

Net cash flow = Profit after tax + Depreciation + Amortisation

However, note that the above expression will not reflect net cash flow accurately if there are significant noncash items other than depreciation and amortisation.

Exhibit 6.8 ***Cash Flow Statement for Horizon Limited for the Period 1.4.20X0 to 31.3.20X1***

	(Rs. in million)
(A) *Cash Flow from Operating Activities*	
Net profit before tax and extraordinary items	68
Adjustments for	
Interest paid	21
Depreciation	30
Operating profit before working capital changes	119
Adjustments	
Debtors	(46)
Inventories	(33)
Advances	5
Trade credit	15
Advances	7
Provisions	2
Cash generated from operations	69
Income tax paid	34
Cash flow before extraordinary items	35
Extraordinary item	–
Net cash flow from operating activities	35
(B) *Cash Flow from Investing Activities*	
Purchase of fixed assets	(38)
Net cash flow from investing activities	(38)
(C) *Cash Flow from Financing Activities*	
Proceeds from term loans	12
Proceeds from inter-corporate deposits	44
Interest paid	(21)
Dividend paid	(28)
Net cash flow from financing activities	7
(D) *Net Increase in Cash and Cash Equivalents: (A) + (B) + (C)*	4
Cash and cash equivalents as on 31.03.20X0	6
Cash and cash equivalents as on 31.03.20X1	10

Free Cash Flow The cash flow from operations does not recognise that the firm has to make investments in fixed capital and net working capital for sustaining operations. So, a measure called free cash flow is considered.

The **free cash flow** is the post-tax cash flow generated from the operations of the firm after providing for investments in fixed capital and net working capital required for the operations of firm. It is the cash flow available for distribution to shareholders (by way of dividend and share buyback) and lenders (by way of interest and debt repayment.)

Management of the Bottom Line

Financial statements reflect revenues, expenses, assets, liabilities, and owners' equity. Corporate managements have some discretion in influencing the occurrence, measurement, and reporting of these items. They may use this latitude to manipulate the reported profits referred to as the 'bottom line'. The devices commonly employed for this purpose are:

- Inflate the sales for the current year by advancing the sales from the following year.
- Alter the 'other income' figure by playing with non-operational items like sale of fixed assets.
- Fiddle with the method and rate of depreciation. (A switch may be effected from the written down value method to the straight line method or vice versa).
- Change the method of stock valuation.
- Capitalise certain expenses like research and development costs and product promotion costs that are ordinarily written off in the profit and loss account.
- Defer discretionary expenditures (like repairs, advertising, research and development) to the following year.
- Make inadequate provision for certain known liabilities (gratuity, etc.) and treat certain liabilities as 'contingent liabilities 'after getting suitable 'legal opinion'.
- Make extra provision during prosperous years and write them back in lean years.
- Revalue assets to create the impression of substantial reserves.
- Lengthen the accounting year in an attempt to cover poor performance.

Why Do Companies Manage or Smoothen Earnings A variety of motives prompt firms to manage or smoothen earnings. The more common ones are:

- To project an image that the company is a low risk company (It is assumed that financial analysts regard earnings variability as a key factor in risk evaluation).
- To enhance managerial compensation if the same is linked in some way to reported earnings.
- To promote a perception that the management of the firm is competent.
- To communicate more meaningfully about the long-term prospects of the firm.

What Can You Do What can you do to read between the lines when corporate managements tend to manage the 'bottom line' by employing a variety of ingenious devices? Our suggestions are as follows:

- Acquire greater knowledge of how accountants prepare financial statements and what are the current financial reporting practices.
- Carefully peruse the notes to accounts in order to: (a) discover changes in accounting policies; and (b) learn about the nature and magnitude of contingent liabilities.
- Read the auditor's report and understand the implications of the qualifications in that report.
- Look at the performance of the company over a period of time and do not attach much importance to the figures for one year. Remember that while manipulation may pay for a year or two, it tends to be a self-defeating exercise in the long run. This indeed is your best safeguard against corporate accounting gimmickry.

General Electric: Master in Earnings Management

Barring occasional declines, General Electric (GE) has reported rising earnings for a long time. How has GE managed to do it? One indisputable explanation has been the robustness of its business portfolio and the fundamental growth in its industrial businesses and financial service units.

Another explanation is its aggressive earnings management. To smooth out fluctuations in earnings, GE generally offsets one-time gains from asset sales with restructuring charges. For example, when GE booked a pre-tax gain of $1.43 billion on the sale of its aerospace business, it took a restructuring charge of $1.01 billion for closing, downsizing, and streamlining some of its facilities. GE has been adept in timing the sales of its equity stakes and acquisitions in producing profit gains when needed.

As a Wall Street Journal article put it: "Few companies have maneuvered so successfully for so long on so large a scale. GE's size and diversity give it an unusual array of opportunities of course."

The emphasis put by GE on consistent earnings growth and its ability to achieve the same through its robust and diverse portfolio of business and aggressive management seems to be valued by investment analysts who can't easily track its different businesses. Indeed, GE seems to have a low 'conglomerate discount'. (This is the discount suffered by a conglomerate because analysts cannot track easily all its businesses or analysts do not have faith in the ability of the company to manage effectively a diversified portfolio).

6.2 GENERALLY ACCEPTED ACCOUNTING PRINCIPLES

It is important that the information in financial statements is reliable and comparable over time and across firms. To ensure this, companies are required to conform to a set of conventions and rules, broadly referred to as the generally accepted accounting principles (GAAP).

Indian GAAP

The Indian GAAP is influenced and shaped by the following institutions or organisations.

- The **Ministry of Company Affairs (MCA),** Government of India, which is responsible for administering the Companies Act, a comprehensive piece of legislation governing companies. This Act has prescribed the form and content of financial reports to be prepared by companies.
- The **Institute of Chartered Accountants of India (ICAI),** which is the professional body of chartered accountants. It recommends accounting standards to the government.
- The **Securities and Exchange Board of India (SEBI),** the regulatory authority for the capital market, seeks to enhance the standards of corporate accounting and disclosure by listed companies. SEBI's initiatives have led to improvements such as quarterly financial statements, cash flow statement, and consolidated financial statements.
- The **Reserve Bank of India (RBI),** the regulatory authority for the financial sector, specifies the accounting and reporting standards to be followed by banks and financial institutions. RBI prescribes detailed rules for income recognition and provision for bad debts.
- The **Comptroller and Auditor General of India (CAG)** is responsible for auditing the accounts of government organisations. The advice of CAG on accounting matters is generally accepted by the government organisations.
- The **International Accounting Standards Board (IASB)** is an independent, privately funded body having members from nine countries with varied functional backgrounds. It is based in London. Committed to developing a single set of high-quality, global accounting standards, the IASB publishes its standards in the form of pronouncements called "International Financial Reporting Standards" (IFRS). IASB has also adopted the standards issued by the Board of the International Accounting Committee, which continue to be called "International Accounting Standards". The ICAI has decided to adopt IASB standards by April 2011.

Indian GAAP and the US GAAP

In the US there is no federal company law that defines statutory provisions for corporate accounting. The Financial Accounting Standards Board (FASB), a non-governmental body, issues standards that form the US GAAP. The FASB standards are supported by the Securities Exchange Commission.

Until recently, there were many differences between the Indian GAAP and the US GAAP. The differences, however, have narrowed with the issuance of accounting standards on the following topics by ICAI:

(i) Consolidated Financial Statements
(ii) Cash Flow Statement

(iii) Segment Reporting
(iv) Accounting for Taxes on Income
(v) Leases
(vi) Earnings Per Share
(vii) Investment in Associated Companies.

Although the contents and presentation of financial statements as per the Indian GAAP and the US GAAP have become quite similar, there are a number of differences in the treatment of various accounting matters. Some of the important differences are as follows:

- The US GAAP permits inventory valuation using the 'Last In First Out' (LIFO) method whereas the Indian GAAP does not.
- Research cost is treated as revenue expense under both the GAAPs. However, the US GAAP generally requires development cost to be written off whereas the Indian GAAP allows the same to be capitalised, subject to certain conditions.
- The US GAAP prohibits asset revaluation, whereas the Indian GAAP permits the same.
- Foreign exchange differences arising from borrowings to finance fixed assets are capitalised under the Indian GAAP, whereas the same is not allowed under the US GAAP.
- For segment reporting, the US GAAP defines segments from the management standpoint, whereas the Indian GAAP defines segments in terms of products or services.
- Under the US GAAP, for merger accounting the larger entity is deemed to have acquired the smaller one. Under, the Indian GAAP, merger accounting follows the legal form. This means that if a smaller entity acquires a larger entity, which is rather common for tax considerations, for accounting purpose also the smaller entity is deemed to have acquired the larger entity.
- Under the Indian GAAP, goodwill arising out of amalgamation has to be written off within five years, whereas under the US GAAP goodwill is not regarded as a wasting asset.
- Under the US GAAP, accounting for amalgamation is done from the date of actual implementation (when all legal and other formalities are completed). In India, however, the scheme of amalgamation provides for an effective date. After completion of legal and other formalities, the accounting is done retrospectively from the effective date.

IFRS and the US GAAP

The key differences between IFRS (formulated by the International Accounting Standards Board or IASB) and the US GAAP (formulated by the Financial Accounting Standards Board or FASB) are as follows:

- IFRS is a more principle-based accounting system whereas the US GAAP is a more rule-based accounting system.

- IFRS permits a company to revalue its fixed assets like land and buildings whereas the US GAAP does not.
- IFRS allows a company to amortise certain expenses like R & D expenses over several years, whereas the US GAAP does not.
- IFRS has a less elaborate format for the accounting of derivatives, whereas the US GAAP requires a detailed mention of various kinds of exposures and liabilities arising from derivative contracts.
- IFRS permits separate accounting in unusual circumstances such as a hyperinflationary situation whereas the US GAAP does not.

Key Trends in Accounting Standards

While presently there are substantial differences between accounting standards in different countries, accounting bodies have been working to evolve common standards. Here are some pointers:

- On January 1, 2005, Europe's 7000 listed companies adopted International Financial Reporting Standards (IFRS), replacing 25 different local accounting regimes with one set of rules.
- IFRS formulated by the International Accounting Standards Board (IASB) has been gaining in popularity. It has been adopted or will be adopted by nearly 100 countries. The Institute of Chartered Accountant of India (ICAI) too decided to adopt IFRS by 2011.
- In June 2007, SEC has decided to allow foreign companies listed in the US to issue their financial reports using the English version of International Financial Reporting Standards (IFRS) in place of US Generally Accepted Accounting Standards or GAAP. This has been a monumental development.
- The US and the European Union are working on converging their accounting rules.

The ultimate goal is to evolve a uniform set of global standards. This will give fillip to cross-border investment, international capital markets, and save multinationals a lot of effort and money.

6.3 FINANCIAL RATIOS

The financial statements of Horizon Limited are given in Exhibits 6.3 and 6.5. If you want to compare the financial statements of Horizon Limited with those of other companies, you would have a problem because of differences in size. One way of avoiding this problem is to calculate and compare financial ratios – remember a ratio eliminates the size problem as the size effectively divides out.

A ratio is an arithmetical relationship between two figures. Financial ratio analysis is a study of ratios between various items or groups of items in financial statements. Financial ratios have been classified in several ways. For our purposes, we divide them into five broad categories as follows:

- Liquidity ratios
- Leverage ratios
- Turnover ratios
- Profitability ratios
- Valuation ratios

To facilitate the discussion of various ratios, the financial statements of Horizon Limited, shown in Exhibits 6.3 and 6.5, will be used.

Liquidity Ratios

Liquidity refers to the ability of a firm to meet its obligations in the short run, usually one year. Liquidity ratios are generally based on the relationship between current assets (the sources for meeting short-term obligations) and current liabilities. The important liquidity ratios are: current ratio, acid-test ratio, and cash ratio.

Current Ratio A very popular ratio, the current ratio is defined as:

$$\frac{\text{Current assets}}{\text{Current liabilities}}$$

Current assets include cash, current investments, debtors, inventories (stocks), loans and advances, and pre-paid expenses. Current liabilities represent liabilities that are expected to mature in the next twelve months. These comprise (i) installments of loans, secured or unsecured, that are due in the next twelve months and (ii) current liabilities and provisions.

Horizon Limited's current ratio for 20X1 is 237/180 = 1.32

The current ratio measures the ability of the firm to meet its current liabilities—current assets get converted into cash during the operating cycle of the firm and provide the funds needed to pay current liabilities. Apparently, the higher the current ratio, the greater the short-term solvency. However, in interpreting the current ratio the composition of current assets must not be overlooked. A firm with a high proportion of current assets in the form of cash and debtors is more liquid than one with a high proportion of current assets in the form of inventories even though both the firms have the same current ratio.

The general norm for current ratio in India is 1.33. Internationally it is 2.

Acid-test Ratio Also called the quick ratio, the acid-test ratio is defined as:

$$\frac{\text{Quick assets}}{\text{Current liabilities}}$$

Quick assets are defined as current assets excluding inventories.

Horizon's acid-test ratio for 20X1 is:

(237–105)/180 = 0.73

The acid-test ratio is a fairly stringent measure of liquidity. It is based on those current assets which are highly liquid—inventories are excluded from the numerator of this ratio because inventories are deemed to be the least liquid of current assets.

Cash Ratio Because cash and bank balances and short term marketable securities are the most liquid assets of a firm, financial analysts look at cash ratio, which is defined as:

$$\text{Cash ratio} = \frac{\text{Cash and bank balances + Current investments}}{\text{Current liabilities}}$$

Horizon Limited's cash ratio for 20X1 is:

(10+3)/180 = 0.07

Clearly, the cash ratio is perhaps the most stringent measure of liquidity. Indeed, one can argue that it is overly stringent. Lack of immediate cash may not matter if the firm can stretch its payments or borrow money at short notice. Aren't financial managers quite skillful at these things?

Leverage Ratios

Financial leverage refers to the use of debt finance. While debt capital is a cheaper source of finance, it is also a riskier source of finance. Leverage ratios help in assessing the risk arising from the use of debt capital.

Two types of ratios are commonly used to analyse financial leverage: structural ratios and coverage ratios. *Structural ratios* are based on the proportions of debt and equity in the financial structure of the firm. The important structural ratios are: debt-equity ratio and debt-assets ratio. *Coverage ratios* show the relationship between debt servicing commitments and the sources for meeting these burdens. The important coverage ratios are: interest coverage ratio, fixed charges coverage ratio, and debt service coverage ratio.

Debt-equity Ratio The debt-equity ratio shows the relative contributions of creditors and owners. It is defined as:

$$\frac{\text{Debt}}{\text{Equity}}$$

The numerator of this ratio consists of all debt, short-term as well as long-term, and the denominator consists of net worth plus preference capital[4,5] plus deferred tax liability. (Deferred tax liability may be treated as quasi-equity).

Horizon's debt-equity ratio for the 20X1 year-end is:

212/262 = 0.809

In general, the lower the debt-equity ratio, the higher the degree of protection enjoyed by the creditors. In using this ratio, however, the following points should be borne in mind:

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[4] Alternatively, the ratio of long-term debt to equity may be calculated. What is important is that the same ratio is used consistently when comparisons are made.

[5] For the sake of simplicity, preference capital is subsumed under equity. Since preference capital is usually a very minor source of finance, its inclusion or exclusion hardly makes any difference.

- The book value of equity often understates its market value. This happens because tangible assets are carried at their historical values less depreciation and many highly valuable intangible assets are not recorded on the balance sheet.
- Some forms of debt (like term loans, secured debentures, and secured short-term bank borrowing) are usually protected by charges on specific assets and hence enjoy superior protection.

Debt-asset Ratio The debt-asset ratio measures the extent to which borrowed funds support the firm's assets. It is defined as:

$$\frac{\text{Debt}}{\text{Assets}}$$

The numerator of this ratio includes all debt, short-term as well as long-term, and the denominator of this ratio is the total of all assets (the balance sheet total).

Horizon's debt-asset ratio for 20X1 is:

$$212/474 = 0.45$$

This ratio is related to the debt-equity ratio as follows:

$$\frac{\text{Debt}}{\text{Assets}} = \frac{\text{Debt/Equity}}{1+\text{Debt/Equity}} \tag{6.1}$$ [6]

Interest Coverage Ratio Also called the times interest earned, the interest coverage ratio is defined as:

$$\frac{\text{Profit before interest and taxes}}{\text{Interest}}$$

Horizon's interest coverage ratio for 20X1 is:

$$89/21 = 4.23$$

Note that profit before interest and taxes is used in the numerator of this ratio because the ability of a firm to pay interest is not affected by tax payment, as interest on debt funds is a tax-deductible expense. A high interest coverage ratio means that the firm can easily meet its interest burden even if earnings before interest and taxes suffer a

[6] Equation (6.1) is derived as follows:

$$\frac{\text{Debt}}{\text{Assets}} = \frac{\text{Debt}}{\text{Equity+Debt}}$$

Dividing both the numerator and the denominator of the right-hand side of this equation by equity, we get

$$\frac{\text{Debt}}{\text{Assets}} = \frac{\dfrac{\text{Debt}}{\text{Equity}}}{\dfrac{\text{Equity}}{\text{Equity}}+\dfrac{\text{Debt}}{\text{Equity}}} = \frac{\dfrac{\text{Debt}}{\text{Equity}}}{1+\dfrac{\text{Debt}}{\text{Equity}}}$$

In view of the above relationship, the interpretation of the debt ratio is similar to that of the debt-equity ratio.

considerable decline. A low interest coverage ratio may result in financial embarrassment when earnings before interest and taxes decline. This ratio is widely used by lenders to assess a firm's debt capacity. Further, it is a major determinant of bond rating.

Though widely used, this ratio is not a very appropriate measure of interest coverage because the source of interest payment is cash flow before interest and taxes, not profit before interest and taxes. In view of this, we may use a modified interest coverage ratio:

$$\frac{\text{Profit before interest and taxes + Depreciation}}{\text{Debt interest}}$$

For Horizon Limited, this ratio for 20X1 is: 119/21 = 5.67.

Fixed Charges Coverage Ratio This ratio shows how many times the cash flow before interest and taxes covers all fixed financing charges. It is defined as:

$$\frac{\text{Profit before interest and taxes + Depreciation}}{\text{Interest} + \dfrac{\text{Repayment of loan}}{\text{1-Tax rate}}}$$

In the denominator of this ratio the repayment of loan alone is adjusted upwards for the tax factor because the loan repayment amount, unlike interest, is not tax deductible. Horizon's tax rate has been assumed to be 50 percent.

Horizon's fixed charges coverage ratio[7] for 20X1 is:

$$\frac{119}{21 + \dfrac{75}{0.50}} = 0.70$$

This ratio measures debt servicing ability comprehensively because it considers both the interest and the principal repayment obligations. The ratio may be amplified to include other fixed charges like lease payment and preference dividends[8].

Debt Service Coverage Ratio Used by financial institutions in India, the debt service coverage ratio is defined as:

$$\frac{\text{Profit after tax} + \text{Depreciation} + \text{Other non} - \text{cash charges} + \text{Interest on term loan} + \text{Lease rentals}}{\text{Interest on term loan} + \text{Lease rentals} + \text{Repayment of term loan}}$$

Financial institutions calculate the average debt service coverage ratio for the period during which the term loan for the project is repayable. Normally, financial institutions regard a debt service coverage ratio of 1.5 to 2.0 as satisfactory.

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[7] From the balance sheet we find that Rs.75 million loans are repayable within one year.

[8] A ratio along these lines is:

$$\frac{\text{Profit before depreciation, interest and lease payments}}{\text{Debt interest} + \text{Lease payments} + \dfrac{\text{Loan repayment instalment}}{\text{(1-Tax rate)}} + \dfrac{\text{Preference dividends}}{\text{(1-Tax rate)}}}$$

Turnover Ratios

Turnover ratios, also referred to as activity ratios or asset management ratios, measure how efficiently the assets are employed by a firm. These ratios are based on the relationship between the level of activity, represented by sales or cost of goods sold, and the levels of various assets. The important turnover ratios are: inventory turnover, debtors turnover, average collection period, fixed assets turnover, and total assets turnover.

Inventory Turnover The inventory turnover, or stock turnover, measures how fast the inventory is moving through the firm and generating sales. It is defined as:

$$\frac{\text{Cost of goods sold}}{\text{Average inventory}}$$

Horizon's inventory turnover for 20X1 is:

$$\frac{552}{(105+72)/2} = 6.24$$

The inventory turnover reflects the efficiency of inventory management. The higher the ratio, the more efficient the management of inventories and vice versa. However, this may not always be true. A high inventory turnover may be caused by a low level of inventory which may result in frequent stockouts and loss of sales and customer goodwill.

Notice that as inventories tend to change over the year, we use the average of the inventories at the beginning and the end of the year. *In general, averages may be used when a flow figure (cost of goods sold) is related to a stock figure (inventories).*

Debtors Turnover This ratio shows how many times sundry debtors (accounts receivable) turn over during the year. It is defined as:

$$\frac{\text{Net credit sales}}{\text{Average sundry debtors}}$$

If the figure for net credit sales is not available, one may have to make do with the net sales figure.

Horizon's debtors turnover for 20X1 is:

$$701 \div [(114 + 68) / 2] = 7.70$$

Obviously, the higher the debtors turnover the greater the efficiency of credit management.

Average Collection Period The average collection period represents the number of days' worth of credit sales that is locked in sundry debtors. It is defined as:

$$\frac{\text{Average sundry debtors}}{\text{Average daily credit sales}}$$

If the figure for credit sales is not available, one may have to make do with the net sales figure.

Horizon's average collection period for 20X1 is:

[(114 + 68) / 2] ÷ (701 / 365) = 47.4 days

Note that the average collection period and the debtors turnover are related as follows:

$$\text{Average collection period} = \frac{365}{\text{Debtors turnover}}$$

The average collection period may be compared with the firm's credit terms to judge the efficiency of credit management. For example, if the credit terms are 2/10, net 45, an average collection period of 85 days means that the collection is slow and an average collection period of 40 days means that the collection is prompt. An average collection period which is shorter than the credit period allowed by the firm needs to be interpreted carefully. It may mean efficiency of credit management or excessive conservatism in credit granting that may result in the loss of some desirable sales.

Fixed Assets Turnover This ratio measures sales per rupee of investment in fixed assets. It is defined as:

$$\frac{\text{Net sales}}{\text{Average net fixed assets}}$$

Horizon's fixed assets turnover ratio for 20X1 is:

701 ÷ [(330 + 322) / 2] = 2.15

This ratio is supposed to measure the efficiency with which fixed assets are employed—a high ratio indicates a high degree of efficiency in asset utilisation and a low ratio reflects inefficient use of assets. However, in interpreting this ratio, one caution should be borne in mind. When the fixed assets of the firm are old and substantially depreciated, the fixed assets turnover ratio tends to be high because the denominator of the ratio is very low.

Total Assets Turnover Akin to the output-capital ratio in economic analysis, the total assets turnover is defined as:

$$\frac{\text{Net sales}}{\text{Average total assets}}$$

Horizon's total assets turnover ratio for 20X1 is:

701 ÷ [(474 + 412) / 2] = 1.58

This ratio measures how efficiently assets are employed, overall.

• Profitability Ratios

Profitability reflects the final result of business operations. There are two types of profitability ratios: profit margin ratios and rate of return ratios. *Profit margin ratios* show the relationship between profit and sales. Since profit can be measured at different stages, there are several measures of profit margin. The most popular profit margin ratios are: gross profit margin ratio and net profit margin ratio.

Rate of return ratios reflect the relationship between profit and investment. The important rate of return measures are: return on assets, earning power, return on capital employed, and return on equity.

Gross Profit Margin Ratio The gross profit margin ratio is defined as:

$$\frac{\text{Gross profit}}{\text{Net sales}}$$

Gross profit is defined as the difference between net sales and cost of goods sold. Horizon's gross profit margin ratio for 20X1 is:

$$149 \ / \ 701 = 0.21 \text{ or } 21 \text{ percent}$$

This ratio shows the margin left after meeting manufacturing costs. It measures the efficiency of production as well as pricing. To analyse the factors underlying the variation in gross profit margin the proportion of various elements of cost (labour, materials, and manufacturing overheads) to sales may be studied in detail.

Net Profit Margin Ratio The net profit margin ratio is defined as:

$$\frac{\text{Net profit}}{\text{Net sales}}$$

Horizon's net profit margin ratio for 20X1 is:

$$34 \ / \ 701 = 0.049 \text{ or } 4.9 \text{ percent}$$

This ratio shows the earnings left for shareholders (both equity and preference) as a percentage of net sales. It measures the overall efficiency of production, administration, selling, financing, pricing, and tax management. Jointly considered, the gross and net profit margin ratios provide a valuable understanding of the cost and profit structure of the firm and enable the analyst to identify the sources of business efficiency/inefficiency.

Return on Assets The return on assets (ROA) is defined as:

$$\text{ROA} = \frac{\text{Profit after tax}}{\text{Average total assets}}$$

Horizon's ROA for the year 20X1 is:

$34 \div [(412 + 474) / 2] = 7.7$ percent

Though widely used, ROA is an odd measure because its numerator measures the return to shareholders (equity and preference) whereas its denominator represents the contribution of all investors (shareholders as well as lenders).

Earning Power The earning power is defined as:

$$\text{Earning power} = \frac{\text{Profit before interest and tax}}{\text{Average total assets}}$$

Horizon's earning power for the year 20X1 is:

$89 \div [(412 + 474) / 2] = 0.201$ or 20.1 percent

Earning power is a measure of business performance which is not affected by interest charges and tax burden. It abstracts away the effect of capital structure and tax factor and focuses on operating performance. Hence it is eminently suited for inter–firm comparison. Further, it is internally consistent. The numerator represents a measure of pre-tax earnings belonging to all sources of finance and the denominator represents total financing.

Return on Capital Employed The return on capital employed is defined as:

$$\text{ROCE} = \frac{\text{Profit before interest and tax (1 – Tax rate)}}{\text{Average total assets}}$$

The numerator of this ratio viz., profit before interest and tax (1-tax rate) is also called net operating profit after tax (NOPAT).

Horizon's ROCE for the year 20X1 is:

$89 (1 - 0.5) \div [(412 + 474) / 2] = 0.101$ or 10.1 percent

ROCE is the post-tax version of earning power. It considers the effect of taxation, but not the capital structure. It is internally consistent. Its merit is that it is defined in such a way that it can be compared directly with the post-tax weighted average cost of capital of the firm.

Return on Equity A measure of great interest to equity shareholders, the return on equity is defined as:

$$\frac{\text{Equity earnings}}{\text{Average equity}}$$

The numerator of this ratio is equal to profit after tax less preference dividends. The denominator includes all contributions made by equity shareholders (paid-up capital + reserves and surplus). This ratio is also called the return on net worth.

Horizon's return on equity for 20X1 is:

$$34 \div [(262 + 256) / 2] = 0.131 \text{ or } 13.1 \text{ per cent}$$

The return on equity measures the profitability of equity funds invested in the firm. It is regarded as a very important measure because it reflects the productivity of the ownership (or risk) capital employed in the firm. It is influenced by several factors: earning power, debt-equity ratio, average cost of debt funds, and tax rate.

In judging all the profitability measures it should be borne in mind that the historical valuation of assets imparts an upward bias to profitability measures during an inflationary period. This happens because the numerator of these measures represents current values, whereas the denominator represents historical values.

Valuation Ratios

Valuation ratios indicate how the equity stock of the company is assessed in the capital market. Since the market value of equity reflects the combined influence of risk and return, valuation ratios are the most comprehensive measures of a firm's performance. The important valuation ratios are: price-earnings ratio, yield, and market value to book value ratio.

Price-earnings Ratio Perhaps the most popular financial statistic in stock market discussion, the price-earnings ratio is defined as:

$$\frac{\text{Market price per share}}{\text{Earnings per share}}$$

The market price per share may be the price prevailing on a certain day or the average price over a period of time. The earnings per share is simply: profit after tax less preference dividend divided by the number of outstanding equity shares.

Horizon' price-earnings ratio at the end of 20X1, assuming a market price of Rs. 21, is:

$$21.0 / 2.27 = 9.25$$

The price-earnings ratio (or the price-earnings multiple as it is commonly referred to) is a summary measure which primarily reflects the following factors: growth prospects, risk characteristics, shareholder orientation, corporate image, and degree of liquidity.

EV-EBITDA Ratio A widely used multiple in company valuation, the EV-EBITDA ratio is defined as:

$$\frac{\text{Enterprise value (EV)}}{\text{Earnings before interest, taxes, depreciation, and amortisation (EBITDA)}}$$

EV is the sum of the market value of equity and the market value of debt. The market value of equity is simply the number of outstanding equity shares times the price per share. As far as debt is concerned, if it is in the form of loans, its market value has to be imputed. Generally, a rupee of loan is deemed to have a rupee of market value.

Horizon's EV-EBITDA ratio for 20X1 is:

$$\frac{15 \times 21 + 212}{119} = 4.43$$

EV-EBITDA is supposed to reflect profitability, growth, risk, liquidity, and corporate image.

Market Price to Book Value Ratio Another popular stock market statistic, the market price to book value is defined as:

$$\frac{\text{Market price per share}}{\text{Book value per share}}$$

Horizon's market price to book value ratio at the end of 20X1 was:

$$21.00 \;/\; 17.47 = 1.20$$

In a way, this ratio reflects the contribution of a firm to the wealth of society. When this ratio exceeds 1 it means that the firm has contributed to the creation of wealth in the society—if this ratio is, say, 2, the firm has created a wealth of one rupee for every rupee invested in it. When this ratio is equal to 1, it implies that the firm has neither contributed to nor detracted from the wealth of society.

It may be emphasised here that if the market value to book value ratio is equal to 1, all the three ratios, namely, return on equity, earnings-price ratio (which is the inverse of the price-earnings ratio), and total yield, are equal[9].

Q Ratio Proposed by James Tobin, the *q* ratio is defined as:

$$\frac{\text{Market value of equity and liabilities}}{\text{Estimated replacement cost of assets}}$$

The *q* ratio resembles the market value to book value ratio. However, there are two key differences:

[9] The following analysis proves this point:

Let B_0 = book value per share at the beginning of the year
E_1 = earnings per share for the year
D_1 = dividends per share for the year
R_1 = retained earnings per share for the year = $E_1 - D_1$
B_1 = book value per share at the end of the year = $B_0 + E_1 - D_1$
M_0 = market price per share at the beginning of the year = B_0
M_1 = market price per share at the end of the year = B_1

Return on equity = E_1/B_0

Earnings-price ratio = $E_1/M_0 = E_1/B_0$

$$\text{Market yield} = \frac{D_1 + (M_1 - M_0)}{M_0} = \frac{D_1 + B_1 - B_0}{B_0}$$

$$= \frac{D_1 + (B_0 + E_1 - D_1) - B_0}{B_0} = \frac{E_1}{B_0}$$

(i) The numerator of the q ratio represents the market value of equity as well as debt, not just equity.
(ii) The denominator of the q ratio represents all assets.

Further these assets are reckoned at their replacement cost, not book value.

Comparison with Industry Averages

We have discussed a long list of financial ratios. For judging whether the ratios are high or low, one has to make a comparative analysis such as a cross-section analysis (in which the industry averages may be used as benchmarks) or time series analysis (in which the ratios of the firm are compared over time.

Exhibit 6.9 shows the ratios of Horizon Limited along with industry averages. The industry averages often provide useful benchmarks for comparisons. Sometimes the ratios of a few competitor firms may be used as benchmarks.

Comparing the ratios of Horizon Limited with industry averages we find that:

- Horizon Limited has a favourable liquidity position. All the liquidity ratios of Horizon Limited are higher than the industry average.
- Leverage ratios of Horizon Limited are a shade lower than the industry average.
- Turnover ratios of Horizon Limited are more or less comparable with the industry average.
- Profit margin ratios of Horizon Limited are somewhat higher than the industry average. The rate of return measures of Horizon Limited are also higher than the industry average.
- The valuation ratios of Horizon Limited are a shade better than the industry average.

Time Series of Financial Ratios

Besides looking at the ratios for one year, one would like to look at the ratios for several years. This will help in the detection of secular changes and avoidance of the bias introduced by transitory forces. Exhibit 6.10 presents certain selected ratios for Horizon Limited for a period of five years (year 5 corresponds to 20X1). Looking at this exhibit we find that:

- The debt-equity ratio improved for three years in succession but deteriorated in the last year.
- The total assets turnover ratio remained more or less the same.
- The net profit margin ratio improved impressively in the second year but subsequently declined somewhat steeply over the remaining three years.
- The return on equity followed the pattern of the net profit margin ratio.

- The price-earnings ratio deteriorated steadily over time except in the last year.

Exhibit 6.9 ***Comparison of Ratios of Horizon Limited with Industry Average***

Ratio	*Formula*	*Horizon Limited*	*Industry Average*
Liquidity			
■ Current ratio	$\frac{\text{Current assets}}{\text{Current liabilities}}$	1.32	1.26
■ Acid-test ratio	$\frac{\text{Quick assets}}{\text{Current liabilities}}$	0.73	0.69
Leverage			
■ Debt-equity ratio	$\frac{\text{Debt}}{\text{Equity}}$	0.81	1.25
■ Debt-asset ratio	$\frac{\text{Debt}}{\text{Assets}}$	0.45	0.56
■ Interest coverage ratio	$\frac{\text{PBIT}}{\text{Interest}}$	4.23	4.14
Turnover			
■ Inventory turnover	$\frac{\text{Net sales}}{\text{Average inventory}}$	6.24	6.43
■ Debtors' turnover	$\frac{\text{Net sales}}{\text{Average accounts receivable}}$	7.70	7.50
■ Fixed assets turnover	$\frac{\text{Net sales}}{\text{Average net fixed assets}}$	2.15	2.23
■ Total assets turnover	$\frac{\text{Net sales}}{\text{Average total assets}}$	1.58	1.26
Profitability			
■ Gross profit margin ratio	$\frac{\text{Gross profit}}{\text{Net sales}}$	21.0%	18.0%
■ Net profit margin ratio	$\frac{\text{Net profit}}{\text{Net sales}}$	4.9%	4.0%
■ Return on assets	$\frac{\text{Net profit}}{\text{Average total assets}}$	7.7%	6.9%
■ Earning power	$\frac{\text{PBIT}}{\text{Average total assets}}$	20.1%	17.7%
■ Return on capital employed	$\frac{\text{PBIT}(1-\text{T})}{\text{Average total assets}}$	10.1%	8.8%

■ Return on equity	$\dfrac{\text{Equity earnings}}{\text{Average net worth}}$	13.1%	11.9%

Exhibit 6.9 **(Contd.)**

Ratio	*Formula*	*Horizon Limited*	*Industry Average*
Valuation			
■ Price-earnings ratio	$\dfrac{\text{Market price per share}}{\text{Earnings per share}}$	9.25	9.26
■ Yield	$\dfrac{\text{Dividend} + \text{Price change}}{\text{Initial price}}$	14.0%	14.1%
■ Market price to book value ratio	$\dfrac{\text{Market price per share}}{\text{Book value per share}}$	1.20	1.16

Exhibit 6.10 ***Time Series of Certain Financial Ratios***

	1	*2*	*3*	*4*	*5*
Debt-equity ratio	0.91	0.98	0.65	0.61	0.81
Total asset turnover ratio	1.5	1.59	1.58	1.53	1.58
Net profit margin (%)	8.8	11.6	9.8	6.6	4.9
Return on equity (%)	25.4	30.7	24.5	16.7	13.1
Price-earnings ratio	18.6	15.3	10.3	7.1	9.3

6.4 DU PONT ANALYSIS

The Du Pont Company of the US pioneered a system of financial analysis which has received widespread recognition and acceptance. A useful system of analysis, which considers important interrelationships based on information found in financial statements, it has been adopted by many firms in some form or the other. Exhibit 6.11 shows the Du Pont chart as applied to Horizon Limited.

At the apex of the Du Pont chart is the return on assets (ROA), defined as the product of the net profit margin (NPM) and the total assets turnover ratio (TATR):

$$\underbrace{\frac{\text{Net profit}}{\text{Average total assets}}}_{\text{ROA}} = \underbrace{\frac{\text{Net profit}}{\text{Net sales}}}_{\text{NPM}} \times \underbrace{\frac{\text{Net sales}}{\text{Average total assets}}}_{\text{TATR}} \tag{6.2}$$

Such decomposition helps in understanding how the return on assets is influenced by the net profit margin and the total assets turnover ratio.

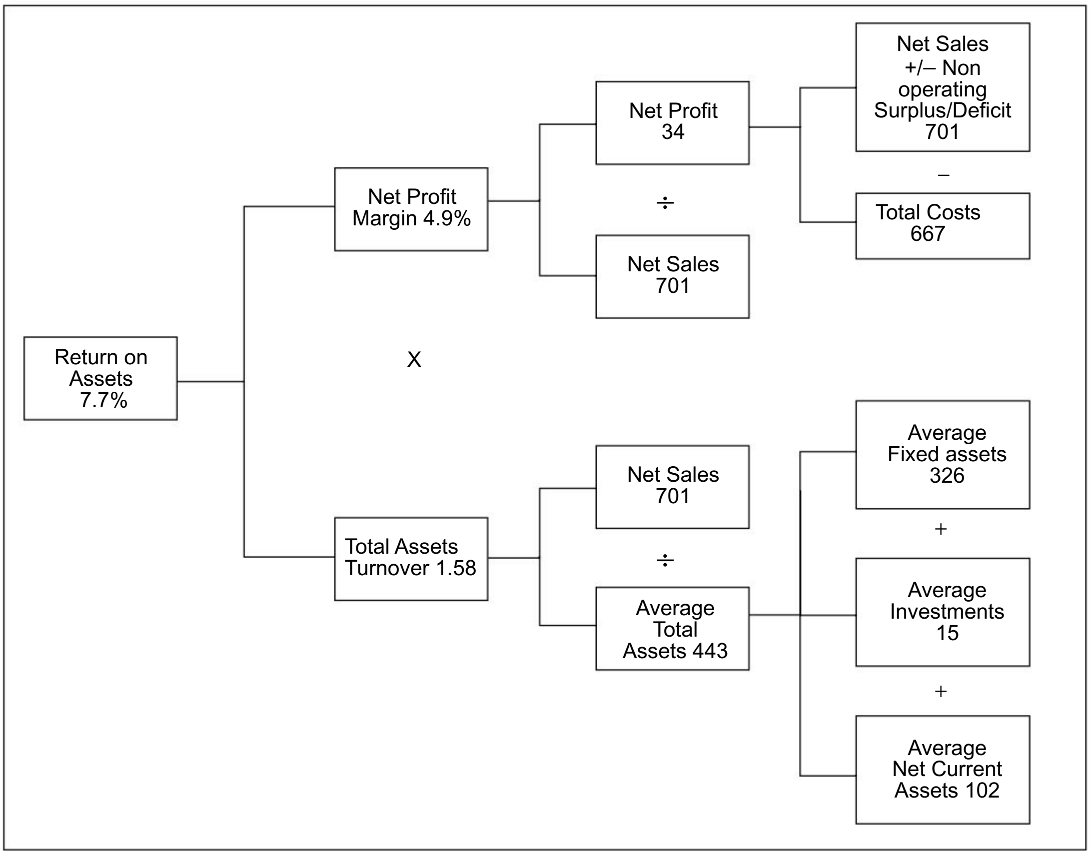
The upper side of the Du Pont chart shows the details underlying the net profit margin ratio. An examination of this side may indicate areas where cost reductions may be effected to improve the net profit margin. If this is supplemented by comparative common size analysis, it becomes relatively easier to understand where cost control efforts should be directed.

The lower side of the Du Pont chart throws light on the determinants of the total assets turnover ratio. If this is supplemented by a study of component turnover ratios (inventory turnover, debtors turnover, and fixed assets turnover), a deeper insight can be gained into efficiencies/inefficiencies of asset utilisation.

The basic Du Pont analysis may be extended to explore the determinants of the return on equity (ROE).

$$\underbrace{\frac{\text{Net profit}}{\text{Equity}}}_{\text{ROE}} = \underbrace{\frac{\text{Net profit}}{\text{Sales}}}_{\text{NPM}} \times \underbrace{\frac{\text{Sales}}{\text{Average total assets}}}_{\text{TATR}} \times \underbrace{\frac{\text{Average total assets}}{\text{Equity}}}_{(1+\text{Debt/Equity})} \tag{6.3}$$

Exhibit 6.11 ***Du Pont Chart Applied to Horizon Limited***

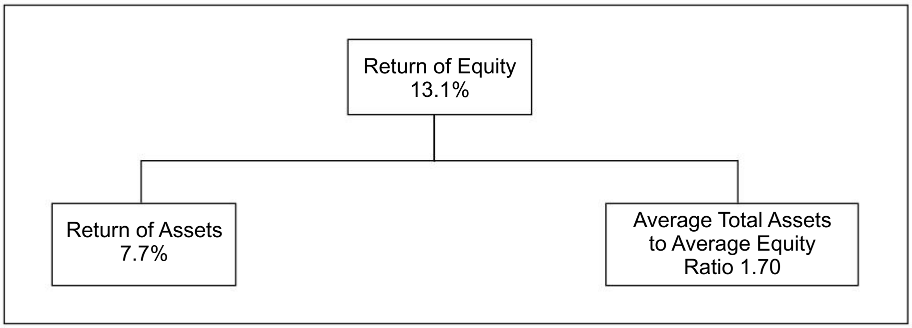


The third component on the right side of Eq. (6.3), called the equity multiplier, is equal to: 1 + Debt/Equity. This is clear from the following:

$$\frac{\text{Total assets}}{\text{Equity}} = \frac{A}{E} = \frac{E+D}{E} = 1 + \frac{D}{E}$$

The extension of Du Pont chart as applied to Horizon Limited is shown in Exhibit 6.12.

Exhibit 6.12 ***Extension of Du Pont Chart***



6.5 STANDARDISED FINANCIAL STATEMENTS

As an analyst, you would like to compare the financial statements of Horizon Limited to those of other companies. You would have a problem, however, because companies often differ considerably in size. For example, Hindustan Unilever and Nirma are very different in size, so it is difficult to compare their financial statements directly. Even for the same company, if its size changes over time, it is difficult to compare financial statements at different times.

For meaningful comparison, you can standardise the financial statements. A simple way to do this is to work with percentages, rather than rupees. We discuss below some ways of doing this.

Common Size Statements A useful and convenient way of standardising financial statements is to express each item on the profit and loss account as a percentage of sales and each item on the balance sheet as a percentage of total assets. The resulting financial statements are called common size statements.

The common size profit and loss account and the common size balance sheet of Horizon Limited are shown in Part A and Part B of Exhibit 6.13.

Exhibit 6.13 ***Common Size Statements***

Part A: Profit and Loss Account				
	Regular (in million)		Common Size (%)	
	20X0	20X1	20X0	20X1
■ Net sales	Rs. 623	Rs. 701	100	100
■ Cost of goods sold	475	552	76	79
■ Gross profit	148	149	24	21
■ PBIT	105	89	17	13
■ Interest	22	21	4	3
■ PBT	83	68	13	10
■ Tax	41	34	7	5
■ PAT	42	34	7	5
Part B: Balance Sheet				
	Regular (in million)		Common Size (%)	
	20X0	20X1	20X0	20X1
■ Shareholders' fund	256	262	62	55
■ Loan funds	156	212	38	45
Total	412	414	100	100
■ Fixed assets	322	330	78	70
■ Investments	15	15	4	3
■ Net current assets	75	129	18	27
Total	412	474	100	100

Common Base Year Financial Statements Suppose you are looking at the financial statements of a company over a period of time and trying to figure out trends in revenues, profits, net worth, debt, and so on. A useful way of doing this is to select a base year and then express each item relative to the amount in the base year. The resulting statements are called common base year statements.

Exhibit 6.14 presents the common base year profit and loss account and balance sheet of Horizon Limited. For example, the common base year value for net sales for year 20X1 is 113. This means that net sales have increased 13 percent over their base-year (20X0) value. Other numbers can be similarly interpreted.

Exhibit 6.14 ***Common Base Year Financial Statements***

Part A: Profit and Loss Account

	Regular (in million) 20X0	Regular (in million) 20X1	Common Base Year (%) 20X0	Common Base Year (%) 20X1
■ Net sales	Rs 623	Rs 701	100	113
■ Cost of goods sold	475	552	100	116
■ Gross profit	148	149	100	101
■ PBIT	105	89	100	85
■ Interest	22	21	100	95
■ PBT	83	68	100	82
■ Tax	41	34	100	83
■ PAT	42	34	100	81

Part B: Balance Sheet

	Regular (in million) 20X0	Regular (in million) 20X1	Common Base Year (%) 20X0	Common Base Year (%) 20X1
■ Shareholders' funds	Rs 256	Rs 262	100	102
■ Loan funds	156	212	100	136
Total	412	474	100	115
■ Fixed assets	322	330	100	102
■ Investments	15	15	100	100
■ Net current assets	75	129	100	172
Total	412	474	100	115

6.6 APPLICATIONS OF FINANCIAL STATEMENT ANALYSIS

Having learnt how to compute and interpret a number of financial ratios, let us now examine how a set of financial ratios may be combined to answer some questions that are commonly raised by financial managers and others.

Assessing Corporate Excellence Every year, the *Economic Times* gives corporate excellence award for the Company of the Year and the Emerging Company of the Year. The *Economic Times* considers the following financial indicators in its quantitative evaluation for judging corporate excellence:

- Increase in market capitalisation over the 12-month period as on the date of calculation.

- Increase in revenues over one accounting year.
- Increase in profit after tax over one accounting year.
- Return on net worth.
- Compound annual growth in EPS over the past three years.
- Price-earnings ratio.
- Market capitalisation as on July 15.
- Sales for the latest financial year.
- Profit after tax for the latest financial year.

The determination of the top 20 companies in each category is based on a combined ranking over the nine indicators which are equally weighted.

To judge corporate excellence, other studies have employed different sets of financial indicators.

Judging Creditworthiness For judging credit worthiness of a potential customer or client a number of *ad hoc* scoring models employing several financial variables have been used. One such model is shown in Exhibit 6.15.

In this model you assess a client on various factors by assigning points in the range 0-15. By looking at the total points you judge the creditworthiness of the client.

Exhibit 6.15 ***A Credit Scoring Model***

				Points
Character				
■ Average past payment	Up to 60 days late	Up to 30 days late	On time	——
Capacity				
■ Profit margin	0–5%	6–10%	>10%	——
■ Quick ratio	< 0.75	0.75 – 1.25	> 1.25	——
■ Cash flow	Low	Average	High	——
Capital				
■ Current ratio	< 1	1 – 1.5	> 1.5	——
■ Debt-equity ratio	> 2	1 – 2	< 1	——
■ Interest earned	< 2*X*	2*X* – 3*X*	> 3*X*	——
Collateral				
■ Net worth	Low	Average	High	——
■ Per cent assets free	Low	Average	High	——
■ Market value to net worth	Low	Average	High	——
Conditions	Recession	Average	Prosperity	——
			Total	——

Forecasting Bankruptcy A multivariate model of the kind displayed in Exhibit 6.15 represents a distinct improvement over a single ratio analysis. It seems to comprehensively consider almost all the key factors relevant for credit evaluation. A critical look at this model, however, raises several issues: Why should the model have eleven factors? What is the sanctity of the scale of rating? Why should the factors be regarded equally important? Is there any conceptual framework or theory that supports such scoring? In sum, the approach seems to be *ad hoc*.

To overcome some of these limitations, the modern approach to financial analysis employs multivariate statistical techniques. What is the key difference between scientific multivariate analysis and *ad hoc* multivariate analysis? In scientific multivariate analysis, the selection of variables, the form of the model, the scheme of weighting, and the determination of cut off levels (wherever it is done) are guided largely by objective statistical methodology, not subjective managerial judgment.

A widely cited example of scientific multivariate analysis is the classic study by Altman[10] on prediction of corporate bankruptcy. In this study Altman compared a sample of 33 bankrupt firms with a pair of 33 non-bankrupt firms. He considered 22 accounting and non-accounting variables in various combinations as predictors of failure. He found that the following function discriminated best between the bankrupt and non-bankrupt firms:

$$Z = 1.2X_1 + 1.4X_2 + 3.3X_3 + 0.6X_4 + 1.0X_5 \tag{6.5}$$

where X_1 is working capital/total assets (a liquidity measure), X_2 is retained earnings/ total assets (a measure for reinvestment of earnings), X_3 is earnings before interest and taxes/total assets (a profitability measure), X_4 is market value of equity/book value of total debt (a leverage measure), and X_5 is sales/total assets (a turnover measure).

Altman found that firms which had a Z score below 1.81 almost went bankrupt, firms which had a Z score value above 2.99 remained healthy, and firms which had a Z score between 1.81 and 2.99 fell in a grey area.

Valuing Equity Shares Prasanna Chandra[11] tried to study the manner in which the stock market in India weights and combines certain fundamental factors in determining share prices. One of the equations estimated by him is given below

$$Y = \alpha_0 D^{\alpha_1} G^{\alpha_2} O^{\alpha_3} F^{\alpha_4} S^{\alpha_5} \varepsilon \tag{6.6}$$

On logarithmic transformation this becomes:

$$\ln Y = \ln\alpha_0 + \alpha_1 \ln D + \alpha_2 \ln G + \alpha_3 \ln O + \alpha_4 \ln F + \alpha_5 \ln S + \ln \varepsilon \tag{6.7}$$

where Y is the share price, D is the dividend per share, G is the growth rate, O is the operating risk, F is the financial risk, S is the company size, and ε the error term.

The estimated relationship for one of the samples in 1970 was as follows:

$$\ln Y = 10.65 + 0.926 \ln D + 3.85 \ln G - 0.044 \ln O - 0.063 \ln F + 0.093 \ln S \tag{6.8}$$

[10] Edward I. Altman, "Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy", *Journal of Finance* (September 1968)

[11] Prasanna Chandra, *Valuation of Equity Shares in India*, New Delhi, Sultan Chand & Sons, 1978.

Predicting Bonds Ratings In the US, Moody's bond ratings and Standard and Poor's bond ratings are most widely used. Naturally, financial managers are interested in guessing the ratings the bonds of their firms would get from these agencies. Hence, a question that concerns them is: Can financial ratios be used for predicting bond ratings? Empirical research suggests that the answer to this question is a 'yes'. We will look at one illustrative study.

In a path breaking study Kaplan and Urwitz[12] found that, in general, a lower debt ratio, a higher interest coverage ratio, a higher return on assets ratio, a larger size, a lower market risk, and a lower unique risk had a favourable influence on bond ratings. They combined these variables into a single measure of bond quality and examined how well it could predict Moody's ratings. They found a very close correspondence between predicted ratings and actual ratings for a sample of newly issued bonds.

Estimating Market Risk The market risk of a company's stock, as measured by beta[13], is an important determinant of the return required by investors. To estimate a stock's beta you need sufficient history of stock price data. Since this may not always be available, financial economists examined whether accounting data can be used to get a handle over equity beta. For example, economic logic tells us that if the debt-equity ratio is high, other things being equal, equity beta is also high. No wonder, empirical evidence supports such a relationship.

You can also calculate the "accounting beta" of a firm. It reflects the sensitivity of the firm's earnings changes to changes in the aggregate earnings of all firms.

Instead of looking at one measure at a time, you can look at a combination of several of them. For example, Hochman[14] found that the debt ratio, dividend yield, and accounting beta when combined provide an estimate of a stock's equity beta which is as good as that obtained from stock's price history.

[12] R.S. Kaplan and G. Urwitz, "Statistical Models of Bond Ratings: A Methodological Inquiry," *Journal of Business*, Vol. 52, (April 1979).

[13] Beta is discussed in Chapter 8.

[14] S. Hochman, "The Beta Coefficient: An Instrumental Variable Approach," In *Research in Finance*, Vol. 4. Greenwich, Conn.: JAI Press, 1983.

6.7 USING FINANCIAL STATEMENT ANALYSIS

Financial statement analysis can be a very useful tool for understanding a firm's performance and condition. However, there are certain problems and issues encountered in such analysis which call for care, circumspection, and judgment.

Problems in Financial Statement Analysis You have to cope with the following problems while analysing financial statements.

Lack of an Underlying Theory The basic problem in financial statement analysis is that there is no theory that tells us which numbers to look at and how to interpret them. In the absence of an underlying theory, financial statement analysis appears to be *ad hoc*, informal, and subjective. In the absence of an explicit theoretical structure, the subject of ratio analysis abounds with untested assertions about which ratios should be used and what their appropriate levels should be.

Conglomerate Firms Many firms, particularly the large ones, have operations spanning a wide range of industries. Given the diversity of their product lines, it is difficult to find suitable benchmarks for evaluating their financial performance and condition. Hence, it appears that meaningful benchmarks may be available only for firms which have a well defined industry classification.

Window Dressing Firms may resort to window dressing to project a favourable financial picture. For example, a firm may prepare its balance sheet at a point when its inventory level is very low. As a result, it may appear that the firm has a very comfortable liquidity position and a high turnover of inventories. When window dressing of this kind is suspected, the financial analyst should look at the average level of inventory over a period of time and the not the level of inventory at just one point of time.

Price Level Changes Financial accounting, as it is currently practised in India and most other countries, does not take into account price level changes. As a result, balance sheet figures are distorted and profits misreported. Hence, financial statement analysis can be vitiated.

Variations in Accounting Policies Business firms have some latitude in the accounting treatment of items like depreciation, valuation of stocks, research and development expenses, foreign exchange transactions, installment sales, preliminary and pre-operative expenses, provision of reserves, and revaluation of assets. Due to diversity of accounting policies found in practice, comparative financial statement analysis may be vitiated.

Interpretation of Results Though industry averages and other yardsticks are commonly used in financial ratios, it is somewhat difficult to judge whether a certain ratio is 'good' or 'bad'. A high current ratio, for example, may indicate a strong liquidity position (something good) or excessive inventories (something bad). Likewise, a high turnover of fixed assets may mean efficient utilisation of plant and machinery or continued flogging of more or less fully depreciated, worn out, and inefficient plant and machinery.

Another problem in interpretation arises when a firm has some favourable ratios and some unfavourable ratios – and this is rather common. In such a situation, it may be somewhat difficult to form an overall judgement about its financial strength or weakness. Multiple discriminant analysis, a statistical tool, may be employed to sort out the net effect of several ratios pointing in different directions.

Correlation among Ratios Notwithstanding the previous observation, financial ratios of a firm often show a high degree of correlation. Why? This is because several ratios have some common element (sales, for example, is used in various turnover ratios) and several items tend to move in harmony because of some common underlying factor. In view of ratio correlations, it is redundant and often confusing to employ a large number of ratios in financial statement analysis. Hence it is necessary to choose a small group of ratios from a large set of ratios. Such a selection requires a good understanding of the meaning and limitations of various ratios and an insight into the economics of the business.

Guidelines for Financial Statement Analysis From the foregoing discussion, it is clear that financial statement analysis cannot be treated as a simple, structured exercise. When you analyse financial statements bear in mind the following guidelines.

1. **Use ratios to get clues to ask the right questions** By themselves ratios rarely provide answers, but they definitely help you to raise the right questions.
2. **Be selective in the choice of ratios** You can compute scores of different ratios and easily drown yourself into confusion. For most purposes a small set of ratios—three to seven—would suffice. Few ratios, aptly chosen, would capture most of the information that you can derive from financial statements.
3. **Employ proper benchmarks** It is a common practice to compare the ratios (calculated from a set of financial statements) against some benchmarks. These benchmarks may be the average ratios of the industry or the ratios of the industry leaders or the historic ratios of the firm itself.

4. **Know the tricks used by accountants** Since firms tend to manipulate the reported income, you should learn about the devices employed by them.
5. **Read the footnotes** Footnotes sometimes contain valuable information. They may reveal things that management may try to hide. The more difficult it is to read a footnote, the more information—laden it may be.
6. **Remember that financial statement analysis is an odd mixture of art and science** Financial statement analysis cannot be regarded as a simple, structured exercise. It is a process requiring care, thought, common sense, and business judgment—a process for which there are no mechanical substitutes.

6.8 GOING BEYOND THE NUMBERS

The tools of analysis discussed in this chapter are helpful in making investment decisions, evaluating performance, and forecasting future developments.

Comprehensive business analysis, however, calls for going beyond the conventional financial measures to consider qualitative factors relevant for evaluating the performance and prospects of a company. The American Association of Individual Investors (AAII) has summarised these factors as follows:

1. *Are the company's revenues tied to one key customer?* If so, the company's performance may decline dramatically if the customer goes elsewhere. On the other hand, if the relationship is firmly entrenched, this might actually stabilise sales.
2. *To what extent are the company's revenues tied to one key product?* Companies that rely on a single product may be more efficient and focused, but a lack of diversification increases risk. If revenues come from several different products, the overall bottom line will be less affected by a drop in the demand for any one product.
3. *To what extent does the company rely on a single supplier?* Depending on a single supplier may lead to unanticipated shortages, which investors and potential creditors should consider.
4. *What percentage of the company's business is generated overseas?* Companies with a large percentage of overseas business are often able to realise higher growth and larger profit margins. However, firms with large overseas operations find that the value of their operations depends in large part on the value of the local currency. Thus, fluctuations in currency markets create additional risks for firms with large overseas operations. Also, the potential stability of the region is important.
5. *Competition.* Generally, increased competition lowers prices and profit margins. In forecasting future performance, it is important to assess both the likely actions of the current competition and the likelihood of new competitors in the future.
6. *Future prospects.* Does the company invest heavily in research and development? If so, its future prospects may depend critically on the success of new products in the pipeline. For example, the market's assessment of a computer company depends on how next year's products are shaping up. Likewise, investors in pharmaceutical companies are interested in knowing whether the company has developed any

potential blockbuster drugs that are doing well in the required tests.

7. *Legal and regulatory environment*. Changes in laws and regulations have important implications for many industries. For example, when forecasting the future of tobacco companies, it is crucial to factor in the effects of proposed regulations and pending or likely lawsuits. Likewise, when assessing banks, telecommunications firms, and electric utilities, analysts need to forecast both the extent to which these industries will be regulated in the years ahead, and the ability of individual firms to respond to changes in regulation.

SUMMARY

- The **balance sheet** shows the financial position (or condition) of a firm at a given point of time. It provides a snapshot and may be regarded as a static picture. The income statement (referred to in India as **the profit and loss account**) reflects the performance of a firm over a period of time. The **cash flow statement** portrays the flow of cash through the business during a given accounting period.
- To understand how cash flows have been influenced by various decisions, it is helpful to classify cash flows into three categories: cash flows from operating activities, cash flows from investing activities, and cash flows from financing activities.
- Corporate managements have discretion in influencing the occurrence, measurement, and reporting of revenues, expenses, assets and liabilities. They may use this latitude to manage the bottom line.
- **Financial ratio analysis,** the principal tool of financial statement analysis, is a study of ratios between items or groups of items in financial statements.
- Financial ratios may be divided into five broad types: liquidity ratios, leverage ratios, turnover ratios, profitability ratios, and valuation ratios.
- **Liquidity** refers to the ability of the firm to meet its obligations in the short run, usually one year. **Current ratio** and **acid-test ratio** are the important liquidity ratios.
- **Leverage** refers to the use of debt finance. **Debt-equity ratio, interest coverage ratio,** and **fixed charges coverage ratio** are the important leverage ratios.
- **Turnover** refers to the efficiency of asset use. **Inventory turnover ratio, debtors turnover ratio, fixed assets turnover ratio,** and **total assets turnover ratio** are the important turnover ratios.
- **Profitability** reflects the final result of business operations. **Gross profit margin ratio, net profit margin ratio, return on assets, earning power, return on capital employed,** and **return on equity** are the most important profitability ratios.
- **Valuation** refers to the assessment of the firm by the capital market. **Price-earnings ratio** and **market value—book value** ratio are the most important valuation ratios.
- For judging whether the ratios are high or low, **cross-section analysis** and **time-series analysis** are used.
- In **common size analysis,** the items in the balance sheet are stated as percentages of total assets and the items in the profit and loss account are stated as percentages of sales.
- According to **Du Pont** analysis, return on equity is expressed as a product of net profit

margin, total asset turnover, and asset-equity ratio.

- Properly combined, financial ratios may be used to assess corporate excellence, judge creditworthiness, predict bankruptcy, value equity shares, predict bond ratings, and measure market risk.
- While financial statement analysis can be a very useful tool, there are certain problems and issues encountered in such analysis that call for care, circumspection, and judgment.
- Comprehensive business analysis calls for going beyond conventional financial measures to consider qualitative factors relevant for evaluating the performance and prospects of a company.

QUESTIONS

1. Present the account form as well as the report form of the balance sheet.
2. Describe the various asset accounts and liability accounts found on a company's balance sheet.
3. "Accounting and economic values tend to differ". Why?
4. Discuss the important items found on the profit and loss account.
5. Explain the sources of divergence between accounting income and economic income.
6. What are the sources of cash and what are the uses of cash?
7. Give the format for the classified cash flow statement.
8. What devices are commonly employed to manage the bottom line?
9. Why do companies manipulate earnings?
10. What are the different types of financial ratios?
11. Discuss the important liquidity ratios.
12. Define and evaluate various leverage ratios.
13. Discuss the important turnover ratios.
14. Explain the important profit margin ratios.
15. Compare the following rate of return ratios: return on total assets ratio, earning power, and return on equity.
16. Discuss the key valuation ratios.
17. "If the market price per share is equal to the book value per share, the following are equal: return on equity, earnings–price ratio, and total yield." Prove.
18. What are common size statements and common base year financial statements?
19. Why is it important to do time-series analysis and common size analysis?
20. Discuss the Du Pont analysis.
21. Carry out the Du Pont analysis for a company of your choice.
22. List the financial indicators used by the *Economic Times* in quantitative evaluation for judging corporate excellence.
23. Describe the Altman model for predicting corporate bankruptcy.
24. Discuss the problems and issues faced in financial statement analysis.
25. What guidelines would you follow in financial statement analysis?

■ ■

SOLVED PROBLEMS

1. The financial statements of Matrix Limited are shown below:

Matrix Limited: Profit and Loss Account for the year ending 31st March 20X1

Rs in Million

	20X1	*20X0*
Net sales	1065	950
Cost of good sold	805	720
Stocks	600	520
Wages and salaries	120	110
Other manufacturing expenses	85	90
Gross profit	260	230
Operating expenses	90	75
Depreciation	50	40
Selling and general administration	40	35
Profit before interest and tax	170	155
Interest	35	30
Profit before tax	135	125
Tax	50	45
Profit after tax	85	80
Dividends	35	30
Retained earnings	50	50

Matrix Limited: Balance Sheet as at 31st March 20X1

Rs in Million

	20X1	*20X0*
I Sources of Funds		
1. Shareholders' funds	505	455
(a) Share capital	125	125
(b) Reserve and surplus	380	330
2. Loan funds	280	260
(a) Secured loans	180	160
(i) Due after 1 year	130	135
(ii) Due within 1 year	50	25
(b) Unsecured loans	100	100
(i) Due after 1 year	60	70
(ii) Due within 1 year	40	30
Total	785	715
II Application of Funds		
1. Net fixed assets	550	495
2. Investments	30	25
(a) Long term investments	20	20
(b) Current investments	10	5
3. Current assets, loans and advances	355	333
(a) Inventories	160	138
(b) Sundry debtors	120	115

(c) Cash and bank balances	25	20
(d) Loans and advances	50	60
Less: Current liabilities and provisions	150	138
Net current assets	205	195
Total	785	715

(i) Prepare a sources and uses of cash statement
(ii) Prepare the classified cash flow statement

Solution

(i) Sources and Uses of Cash Statement
The sources and uses of cash statement for Matrix Limited for the year ending 31st March 20X1 is given below:

Sources		*Uses*	
Net profit	85	Dividend payment	35
Depreciation	50	Purchase of fixed assets	105
Increase in secured loans	20	Increase in current investments	5
Increase in current liabilities and provisions	12	Increase in inventories	22
Decrease in loans and advances (given)	10	Increase in debtors	5
Total sources	177	Total uses	172
		Net addition to cash	5
			177

(ii) Classified Cash Flow Statement
Classified Cash Flow Statement for Matrix Limited for Period 1.4.20X0 to 31.3.20X1

	Rs. in million
A. Cash Flow from Operating Activities	
Net profit before tax and extraordinary items	135
Adjustments for	
Interest paid	35
Depreciation	50
Operating profit before working capital changes	220
Adjustments for	
Debtors	(5)
Inventories	(22)
Loans and advances	10
Current liabilities and provisions	12
Cash generated from operations	215
Tax paid	(50)
Net cash flow from operating activities	165
B. Cash Flow from Investing Activities	
Purchases of fixed assets	(105)
Net investment in marketable securities	(5)
Net cash flow from investing activities	(110)
C. Cash Flow from Financing Activities	
Proceeds from loans	20

Interest paid	(35)
Dividend paid	(35)
Net cash flow from financing activities	(50)
D. Net Increase in Cash and Cash Equivalents	5
Cash and cash equivalents as on 31.3.20X1	25
Cash and cash equivalents as on 31.3.20X0	20

2. A firm's current assets and current liabilities are 1,600 and 1,000 respectively. How much can it borrow on a short-term basis without reducing the current ratio below 1.25.

Solution

Let the maximum short-term borrowing be *B*. The current ratio with this borrowing should be 1.25.

$$\frac{1{,}600 + B}{1{,}000 + B} = 1.25$$

Solving this equation, we get B = 1,400. Hence the maximum permissible short-term borrowing is 1,400.

3. Determine the sales of a firm given the following information:

$$\begin{aligned} \text{Current ratio} &= 1.4 \\ \text{Acid-test ratio} &= 1.2 \\ \text{Current liabilities} &= 1{,}600 \\ \text{Inventory turnover ratio} &= 8 \end{aligned}$$

Solution

The sales figure may be derived as follows :

$$\begin{aligned} \text{Current assets} &= \text{Current liabilities} \times \text{Current ratio} \\ &= 1{,}600 \times 1.4 = 2{,}240 \\ \text{Current assets} - \text{Inventories} &= \text{Current liabilities} \times \text{Acid-test ratio} \\ &= 1{,}600 \times 1.2 = 1{,}920 \\ \text{Inventories} &= 2{,}240 - 1{,}920 = 320 \\ \text{Sales} &= \text{Inventories x Inventories turnover ratio} \\ &= 320 \times 8 = 2{,}560 \end{aligned}$$

4. The following ratios are given for Mintex Company

Net profit margin ratio	4 per cent
Current ratio	1.25
Return on net worth	15.23 per cent
Total debt to total assets ratio	0.40
Inventory turnover ratio	25

Complete the following statements

Income Statement

	Rs.
Sales	....
Cost of goods sold	....
Operating expenses	700
EBIT	....
Interest	45

Profit before tax	....
Tax provision (50 per cent)	....
Profit after tax	....

Balance Sheet

Net worth	....	Fixed assets	....
Long-term debt (10 per cent interest)	....	Current assets	180
		Cash	....
Short-term debt (10.42 per cent interest)	....	Receivables	60
		Inventory	....

Solution

The blanks in the above statements may be filled as follows :

(a) *Accounts payable* The value of accounts payable—the only current liabilities—is derived as follows.

$$\text{Current ratio} = \frac{\text{Current assets}}{\text{Current liabilities}} = 1.25$$

$$\text{Current liabilities} = \frac{\text{Current assets}}{1.25} = \frac{180}{1.25} = 144$$

So short-term debt is 144

(b) *Long-term debt* The long-term debt carries 10 per cent interest rate. Hence the long-term debt is equal to

$$\frac{\text{Interest} - .1042\,(144)}{0.10} = \frac{45 - 15}{0.10} = 300$$

(c) *Total assets* As the ratio of total debt to total assets is 0.4, total assets (the total of the balance sheet) is simply :

$$\frac{\text{Total debt}}{0.4} = \frac{144 + 300}{0.4} = 1110$$

(d) *Net worth* The difference between total assets and total debt represents the net worth. Hence, it is equal to :

$$1110 - 444 = 666$$

(e) *Fixed assets* The difference between total assets and current assets represents fixed assets. So,

$$\text{Fixed assets} = 1110 - 180 = 930$$

(f) *Profit after tax* This is equal to :

$$\text{(Net worth) (Return on net worth)} = (666)\ (0.1523) = 101.4$$

(g) *Tax* As the tax rate is 50 per cent, the tax provision is simply equal to the profit after tax, i.e., 101.4

(h) *Profit before tax* The sum of the profit after tax and the tax provision is equal to the profit before tax. So, it is equal to :

$$101.4 + 101.4 = 202.8$$

(i) *EBIT* This is equal to the profit before tax plus the interest payment. Hence, it is equal to:

202.8 + 45 = 247.8

(j) *Sales* The figure of sales may be derived as follows :

$$\frac{\text{Profit after tax}}{\text{Net profit margin ratio}} = \frac{101.4}{.04} = 2535$$

(k) *Cost of goods sold* This figure of cost of goods sold may be derived from the following accounting identity :

Sales – cost of goods sold – operating expenses = EBIT
2535 – cost of goods sold – 700 = 247.8

Hence the cost of goods sold figure is 1587.2

(l) *Inventory* This is equal to :

$$\frac{\text{Sales}}{\text{Inventory turnover ratio}} = \frac{2535}{25} = 101.4$$

(m) *Cash* This may be obtained as follows :

Current assets – receivables – inventory = 180 – 60 – 101.4 = 18.6

5. The financial statements of Matrix Limited are given below:
Matrix Limited: Profit and Loss Account for the Year Ending 31st March 20X1

Rs in Million

	20X1	*20X0*
Net sales	1065	950
Cost of goods sold	805	720
Stocks	600	520
Wages and salaries	120	110
Other manufacturing expenses	85	90
Gross profit	260	230
Operating expenses	90	75
Depreciation	50	40
Selling and general administration	40	35
Profit before interest and tax	170	155
Interest	35	30
Profit before tax	135	125
Tax	50	45
Profit after tax	85	80
Dividends	35	30
Retained earnings	50	50

Matrix Limited: Balance Sheet as at 31st March 20X1

Rs. in Million

	20X1	*20X0*
I Sources of Funds		
1. Shareholders' funds	505	455
(a) Share capital	125	125
(b) Reserves and surplus	380	330
2. Loan funds	280	260
(a) Secured loans	180	160

(i) Due after 1 year	130	135
(ii) Due within 1 year	50	25
(b) Unsecured loans	100	100
(i) Due after 1 year	60	70
(ii) Due within 1 year	40	30
Total	785	715
II Application of Funds		
1. Net fixed assets	550	495
2. Investments	30	25
(a) Long term investments	20	20
(b) Current investments	10	5
3. Current assets, loans and advances	355	333
(a) Inventories	160	138
(b) Sundry debtors	120	115
(c) Cash and bank balances	25	20
(d) Loans and advances	50	60
4. Less: Current liabilities and provisions	150	138
5. Net current assets	205	195
Total	785	715

a. Calculate the following ratios: Current ratio; Acid-test ratio; Cash ratio; Debt-equity ratio; Interest coverage ratio; Fixed charges coverage ratio; Inventory turnover ratio; Debtors turnover ratio; Average collection period; Fixed assets turnover; Total assets turnover; Gross profit margin; Net profit margin; Return on assets; Earning power; Return on equity

b. Set up the Dupont equation

Solution

a. Current ratio $= \dfrac{\text{Current assets, loans and advances + Current investments}}{\text{Current liabilities and provisions + Short term debt}}$

$$= \frac{355+10}{150+90} = 1.52$$

$$\text{Acid-test ratio} = \frac{\text{Quick assets}}{\text{Current liabilities}} = \frac{365-160}{240} = 0.85$$

$$\text{Cash ratio} = \frac{\text{Cash and bank balances+Current investments}}{\text{Current liabilities}} = \frac{25+10}{240} = 0.15$$

$$\text{Debt-equity ratio} = \frac{\text{Debt}}{\text{Equity}} = \frac{280}{505} = 0.55$$

$$\text{Interest coverage ratio} = \frac{\text{PBIT}}{\text{Interest}} = \frac{170}{35} = 4.9$$

$$\text{Fixed charges coverage ratio} = \frac{\text{PBIT+Depreciation}}{\text{Interest+}\dfrac{\text{Repayment of loan}}{\text{1-Tax rate}}} = \frac{170+50}{35+\dfrac{90}{1-.37}} = 1.24$$

$$\text{Inventory turnover} = \frac{\text{Cost of good sold}}{\text{Average inventory}} = \frac{805}{(160+138)/2} = 5.40$$

$$\text{Debtors turnover} = \frac{\text{Net credit sales}}{\text{Average debtors}} = \frac{1065}{(120+115)/2} = 9.06$$

$$\text{Average collection period} = \frac{365}{\text{Debtors turnover}} = \frac{365}{9.06} = 40.3 \text{ days}$$

$$\text{Fixed assets turnover} = \frac{\text{Net sales}}{\text{Average net fixed assets}} = \frac{1065}{(550+495)/2} = 2.04$$

$$\text{Total assets turnover} = \frac{\text{Net sales}}{\text{Average total assets}} = \frac{1065}{(785+715)/2} = 1.42$$

$$\text{Gross profit margin} = \frac{\text{Gross profit}}{\text{Net sales}} = \frac{260}{1065} = 24.4\%$$

$$\text{Net profit margin} = \frac{\text{Net profit}}{\text{Net sales}} = \frac{85}{1065} = 7.98\%$$

$$\text{Return on assets} = \frac{\text{Net profit}}{\text{Average total assets}} = \frac{85}{(785+715)/2} = 11.33\%$$

$$\text{Earning power} = \frac{\text{PBIT}}{\text{Average total assets}} = \frac{170}{(785+715)/2} = 22.7\%$$

$$\text{Return on equity} = \frac{\text{Equity earnings}}{\text{Average equity}} = \frac{85}{(505+455)/2} = 17.7\%$$

b. Dupont equation

Return on equity = Net profit margin × Total assets turnover ratio × Leverage multiplier

$$= \frac{\text{Net profit}}{\text{Net sales}} \times \frac{\text{Net sales}}{\text{Average total assets}} \times \frac{\text{Average total assets}}{\text{Average equity}}$$

$$= \frac{85}{1065} \times \frac{1065}{(785+715)/2} \times \frac{(785+715)/2}{(505+455)/2}$$

$$= 7.98\% \times 1.42 \times 1.5625$$

$$= 17.7\%$$

PROBLEMS

1 At the end of 20X1 the balances in the various accounts of Mahaveer Limited are as follows:

Rs in million

Accounts	*Balance*
Equity capital	90
Preference capital	20
Fixed assets (net)	150
Reserves and surplus	50
Cash and bank	20
Debentures (secured)	60
Marketable securities	10
Term loans (secured)	70
Receivables	70
Short-term bank borrowing (unsecured)	40
Inventories	110
Trade creditors	30
Provisions	10
Pre-paid expenses	10

Required: Classify the accounts into assets and liabilities. Prepare the balance sheet of Mahaveer Limited as per the format specified by the Companies Act.

2. The comparative balance sheets of Saraswati Company are given below :

Rs in million

Owners' Equity and Liabilities	*As on 31.3.20X0*	*As on 31.3.20X1*
Share capital	50	50
Reserves and surplus	60	70
Long-term debt	95	80
Short-term bank borrowings	70	80

Trade creditors	50	60
Provisions	20	15
Total	345	355
Assets		
Fixed assets (net)	180	190
Inventories	70	60
Debtors	60	70
Cash	20	15
Other assets	15	20
Total	345	355

The income statement of Saraswati Company for the year 20X1 is given below:

Rs. in million

Income Statement for the Period 1.4.20X0 to 31.3.20X1

Net sales		800
Cost of goods sold		520
Stocks	300	
Wages and salaries	105	
Other manufacturing expenses	115	
		280
Gross profit		
Operating expenses		150
Selling, administration and general	130	
Depreciation	20	
Operating profit		130
Non-operating surplus or deficit		(50)
EBIT		80
Interest		30
Profit before tax		50
Tax		20
Profit after tax		30
Dividends		20
Retained earnings		10

Required: (a) Prepare the sources and uses of cash statement for the period 1.4.20X0 to 31.3.20X1

(b) Prepare the classified cash flow statement for the period 1.4.20X0 to 31.3.20X1

3. Premier Company's net profit margin is 5 percent, total assets turnover ratio is 1.5 times, debt to total assets ratio is 0.7. What is the return on equity for Premier?
4. McGill Inc. has profit before tax of Rs. 40 million. If the company's times interest covered ratio is 6, what is the total interest charge?
5. The following data applies to a firm :

   Interest charges Rs.150,000

Sales	Rs.7,000,000
Tax rate	60 percent
Net profit margin	6 percent

What is the firm's times interest covered ratio?

6. A firm's current assets and current liabilities are 600 and 1,500 respectively. How much additional short-term funds can it borrow from bank without reducing the current ratio below 1.5?
7. A firm has total annual sales (all credit) of 1,000,000 and accounts receivable of 160,000. How rapidly (in how many days) must accounts receivable be collected if management wants to reduce the accounts receivable to 120,000?
8. Determine the sales of a firm with the following financial data :

Current ratio	= 1.5
Acid-test ratio	= 1.2
Current liabilities	= 800,000
Inventory turnover ratio	= 5 times

9. Complete the balance sheet and sales data (fill in the blanks) using the following financial data :

Debt/equity ratio	= 0.60
Acid-test ratio	= 1.2
Total assets turnover ratio	= 1.5
Days' sales outstanding in Accounts receivable	= 40 days
Gross profit margin	= 20 percent
Inventory turnover ratio	= 5

Balance sheet

Equity capital	50,000	Plant and equipment	....
Retained earnings	60,000	Inventories	....
Debt	....	Accounts receivable	....
		Cash	....
	....		....
Sales	....		
Cost of goods sold	....		

10. The 20X0 balance sheet and income statement for Omex Limited are given below. Compute the financial ratios for Omex. Evaluate Omex's performance with reference to the standards.

Omex Limited Balance Sheet, December 31, 20X0

Liabilities and Equity	
Equity capital	Rs.10,000,000
Reserves and surplus	22,500,000

Long-term debt	12,500,000
Short-term bank borrowing	15,000,000
Trade creditors	10,000,000
Provisions	5,000,000
Total	75,000,000
Assets	
Fixed assets (net)	Rs.30,000,000
Current assets	
Cash and bank	5,000,000
Receivables	15,000,000
Inventories	20,000,000
Pre-paid expenses	2,500,000
Others	2,500,000
Total	75,000,000

Omex Limited Income Statement for the Year Ended December 31, 20X0

Net sales	Rs.95,000,000
Cost of goods sold	72,000,000
Gross profit	23,000,000
Operating expenses	10,500,000
Operating profit	12,500,000
Non-operating surplus	2,600,000
Profit before interest and tax	15,100,000
Interest	5,000,000
Profit before tax	10,100,000
Tax	5,000,000
Profit after tax	5,100,000
Dividends	1,800,000
Retained earnings	3,300,000

	Omex	*Standard*
Current ratio		1.5
Acid-test ratio		0.80
Debt-equity ratio		1.5
Times interest covered ratio		3.5
Inventory turnover ratio		4.0
Average collection period		60 days
Total assets turnover ratio		1.0
Net profit margin ratio		6%
Earning power		10%
Return on equity		12%

■ ■

MINICASE

The balance sheet and profit and loss account of GNL Limited for the years 20X4 and 20X5 are given below:

Balance Sheet, GNL Limited

(Rs. in million)

	20X4	20X5
Liabilities and Equity		
Share capital	6.5	6.5
Reserves and surplus	7.4	9.3
Long-term debt	5.2	3.8
Short-term bank borrowing	8.3	11.7
Current liabilities	6.6	6.7
	34.0	38.0
Assets		
Net Fixed assets	19.6	23.2
Current assets		
Cash and bank	0.6	1.1
Receivables	2.9	2.0
Inventories	8.2	9.3
Other assets	2.7	2.4
	34.0	38.0

Profit and Loss Account, GNL Limited

(Rs in million)

	20X4	20X5
Net sales	39.0	57.4
Cost of goods sold	30.5	45.8
Gross profit	8.5	11.6
Operating expenses	4.9	7.0
Operating profit	3.6	4.6
Non-operating surplus/deficit	0.5	0.4
Profit before interest and tax	4.1	5.0
Interest	1.5	2.0
Profit before tax	2.6	3.0
Tax	-	-
Profit after tax	2.6	3.0
Dividends	0.9	1.1
Retained earnings	1.7	1.9

Required

a. Compute the key ratios for GNL Limited for the year 20X5
b. Prepare the Du Pont Chart for the year 20X5
c. Prepare the common size and common base financial statements for GNL
d. Identify the financial strengths and weaknesses of GNL Limited
e. What are the problems in analysing financial statements?
f. Discus the qualitative factors relevant for evaluating the performance and prospects of a company.

PART

3

Modern Portfolio Theory

Chapter 7

Portfolio Theory

The Benefits of Diversification

LEARNING OBJECTIVES

After studying this chapter, you should be able to:

- Measure the return and risk of a portfolio.
- Explain why the covariance terms dominate portfolio risk.
- Discuss the concept of an efficient portfolio.
- Explain how the optimal portfolio of risky securities is selected.
- Clarify the import of the separation theorem.
- Show how the single index model helps in obtaining the inputs required for applying the Markowitz model.

Very broadly, the investment process consists of two tasks. The first task is security analysis which focuses on assessing the risk and return characteristics of the available investment alternatives. The second task is portfolio selection which involves choosing the best possible portfolio from the set of feasible portfolios.

We begin our discussion with the second task with the help of portfolio theory. Security analysis will be taken up in later chapters.

Portfolio theory, originally proposed by Harry Markowitz in the 1950s, was the first formal attempt to quantify the risk of a portfolio and develop a methodology for determining the optimal portfolio. Prior to the development of portfolio theory, investors dealt with the concepts of return and risk somewhat loosely. Intuitively smart investors knew the benefit of diversification which is reflected in the traditional adage "Do not put all your eggs in one basket". Harry Markowitz was the first person to show quantitatively why and how diversification reduces risk. In recognition of his seminal contributions in this field he was awarded the Nobel Prize in Economics in 1990.

This chapter discusses how investors can construct the best possible risky portfolio with the help of efficient diversification. It is based largely on the pioneering work of Harry Markowitz and further insights that evolved from his work.

7.1 DIVERSIFICATION AND PORTFOLIO RISK

Diversification and Portfolio Risk Before we look at the formula for portfolio risk, let us understand somewhat intuitively how diversification influences risk. Suppose you have Rs.100,000 to invest and you want to invest it equally in two stocks, A and B. The return on these stocks depends on the state of the economy. Your assessment suggests that the probability distributions of the returns on stocks A and B are as shown in Exhibit 7.1. For the sake of simplicity, all the five states of the economy are assumed to be equiprobable. The last column of Exhibit 7.1 shows the return on a portfolio consisting of stocks A and B in equal proportions. Graphically, the returns are shown in Exhibit 7.2. The expected return and standard deviation of return on stocks A and B and the portfolio consisting of A and B in equal proportions are calculated in Exhibit 7.3.

Exhibit 7.1 ***Probability Distribution of Returns***

State of the Economy	*Probability*	*Return on Stock A*	*Return on Stock B*	*Return on Portfolio*
1	0.20	15%	–5%	5%
2	0.20	–5%	15	5%
3	0.20	5	25	15%
4	0.20	35	5	20%
5	0.20	25	35	30%

Exhibit 7.2 ***Returns on Individual Stocks and the Portfolio***

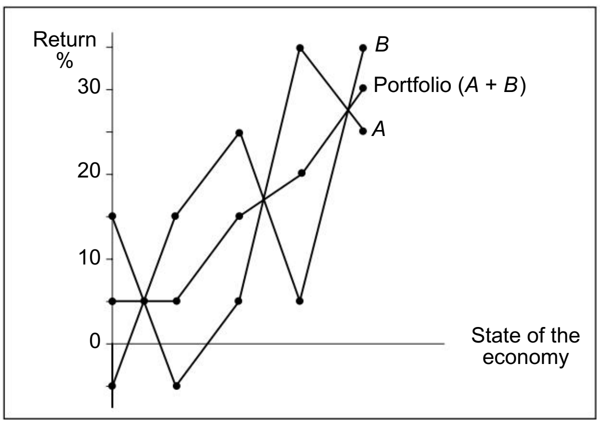


Exhibit 7.3 ***Expected Return and Standard Deviation***

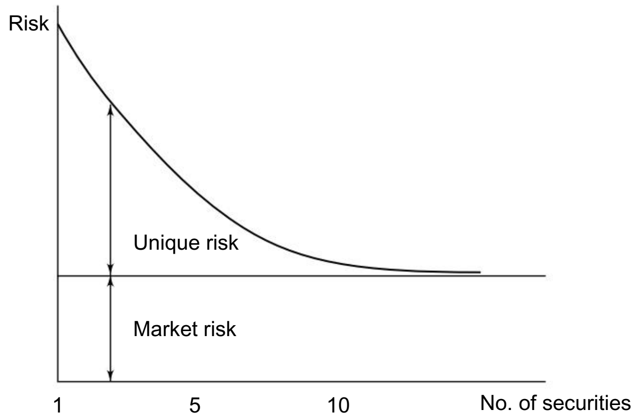
	Expected Return	
Stock A	:	0.2(15%) + 0.2(–5%) + 0.2(5%) + 0.2(35%) + 0.2(25%) = 15%
Stock B	:	0.2(–5%) + 0.2(15%) + 0.2(25%) + 0.2(5%) + 0.2(35%) = 15%
Portfolio of A and B	:	0.2(5%) + 0.2(5%) + 0.2(15%) + 0.2(20%) + 0.2(30%) = 15%
	Standard Deviation	
Stock A :	σ^2_A	$= 0.2(15–15)^2 + 0.2(–5–15)^2 + 0.2(5–15)^2 + 0.2(35–15)^2 + 0.20\ (25–15)^2$
		= 200
	σ_A	$= (200)^{1/2} = 14.14\%$
Stock B :	σ^2_B	$= 0.2(–5–15)^2 + 0.2(15–15)^2 + 0.2(25–15)^2 + 0.2(5–15)^2 + 0.2\ (35–15)^2$
		= 200
	σ_B	$= (200)^{1/2} = 14.14\%$
Portfolio :	$\sigma^2_{(A+B)}$	$= 0.2(5–15)^2 + 0.2(5–15)^2 + 0.2(15–15)^2 + 0.2(20–15)^2 + 0.2(30–15)^2$
		= 90
	σ_{A+B}	$= (90)^{1/2} = 9.49\%$

Exhibit 7.3 shows that if you invest only in stock A, the expected return is 15 percent and the standard deviation is 14.14 percent. Likewise, if you invest only in stock B, the expected return is 15 percent and the standard deviation is 14.14 percent. What happens if you invest in a portfolio consisting of stocks A and B in equal proportions? While the expected return remains at 15 percent, the same as that of either stock individually, the standard deviation of the portfolio return, 9.49 percent, is lower than that of each stock individually. Thus, in this case, diversification reduces risk.

In general, if returns on securities do not move in perfect lockstep, diversification reduces risk. In technical terms, diversification reduces risk if returns are not perfectly positively correlated.

The relationship between diversification and risk is shown graphically in Exhibit 7.4. When the portfolio has just one security, say stock 1, the risk of the portfolio, σ_p, is equal to the risk of single stock included in it, σ_1. As a second security-say stock 2- is added, the portfolio risk decreases. As more and more securities are added, the portfolio risk decreases, but at a decreasing rate, and reaches a limit. Empirical studies suggest that the bulk of the benefit of diversification, in the form of risk reduction, is achieved by forming a portfolio of about ten securities. Thereafter, the gain from diversification tends to be negligible.

Exhibit 7.4 ***Relationship Between Diversification and Risk***



Market Risk Versus Unique Risk Notice that the portfolio risk does not fall below a certain level, irrespective of how wide the diversification is. Why? The answer lies in the following relationship which represents a basic insight of modern portfolio theory.

$$\text{Total risk} = \text{Unique risk} + \text{Market risk}$$

The **unique risk** of a security represents that portion of its total risk which stems from firm-specific factors like the development of a new product, a labour strike, or the emergence of a new competitor. Events of this nature primarily affect the specific firm and not all firms in general. Hence, the unique risk of a stock can be washed away by combining it with other stocks. In a diversified portfolio, unique risks of different stocks tend to cancel each other–a favourable development in one firm may offset an adverse happening in another and vice versa. Hence, unique risk is also referred to as diversifiable risk or unsystematic risk.

The **market risk** of a stock represents that portion of its risk which is attributable to economy-wide factors like the growth rate of GNP, the level of government spending, money supply, interest rate structure, and inflation rate. Since these factors affect all firms to a greater or lesser degree, investors cannot avoid the risk arising from them, however diversified their portfolios may be. Hence, it is also referred to as systematic risk (as it affects all securities) or non-diversifiable risk.

7.2 PORTFOLIO RETURN AND RISK

Investors generally hold a portfolio of securities. So, while individual returns and risks are important, what matters finally is the return and risk of the portfolio. We will now look at portfolio return and risk in more formal terms.

Portfolio Expected Return The expected return on a portfolio is simply the weighted average of the expected returns on the individual securities in the portfolio:

$$E(R_p) = \sum_{i=1}^{n} w_i E(R_i) \tag{7.1}$$

where $E(R_p)$ is the expected return on the portfolio, w_i is the weight of security i in the portfolio, $E(R_i)$ is the expected return on security i, and n is the number of securities in the portfolio.

Note that the weight of a security represents the proportion of portfolio value invested in that security and the combined portfolio weights equal 1. $\left(\sum_{i=1}^{n} w_i = 1\right)$.

Example A portfolio consists of four securities A, B, C, and D with expected returns of 12 percent, 15 percent, 18 percent, and 20 percent respectively. The proportions of portfolio value invested in these securities are 0.20, 0.30, 0.30, and 0.20 respectively. The expected return on the portfolio is:

$$E(R_p) = 0.20\ (12\%) + 0.30\ (15\%) + 0.30\ (18\%) + 0.20\ (20\%) = 16.3\%$$

Portfolio Risk Just as the risk of an individual security is measured by the variance (or standard deviation) of its return, the risk of a portfolio too is measured by the variance (or standard deviation) of its return.

Although the expected return on a portfolio is the weighted average of the expected returns on the individual securities in the portfolio, portfolio risk (measured by the variance or standard deviation) is not the weighted average of the risks of the individual securities in the portfolio (except when the returns from the securities are uncorrelated). In symbols,

$$E(R_p) = \sum_{i=1}^{n} w_i\ E(R_i) \tag{7.2}$$

But

$$\sigma_p^{\ 2} \neq \sum w_i^{\ 2} \sigma_i^{\ 2} \tag{7.3}$$

Thanks to the inequality shown in Eq. (7.3), investors can achieve the benefit of risk reduction through diversification. Before we discuss how this can be accomplished let us first understand how comovements in security returns are measured.

7.3 MEASUREMENT OF COMOVEMENTS IN SECURITY RETURNS

To develop the equation for calculating portfolio risk we need information on weighted individual security risks and weighted comovements between the returns of securities included in the portfolio.

Comovements between the returns of securities are measured by covariance (an absolute measure) and coefficient of correlation (a relative measure).

Covariance Covariance reflects the degree to which the returns of the two securities vary or change together. A positive covariance means that the returns of the two securities move in the same direction whereas a negative covariance implies that the returns of the two securities move in opposite direction. The covariance between any two securities i and j is calculated as follows:

$$\begin{aligned}\text{Cov}(R_i, R_j) = {} & p_1 [R_{i1} - E(R_i)]\,[R_{j1} - E(R_j)] \\ & + p_2 [R_{i2} - E(R_i)]\,[R_{j2} - E(R_j)] \\ & + . \\ & \;\; . \\ & + p_n [R_{in} - E(R_i)]\,[R_{jn} - E(R_j)] \end{aligned} \tag{7.4}$$

where $p_1, p_2 \ldots p_n$ are the probabilities associated with states 1, … n, $R_{i1}, \ldots R_{in}$ are the returns on security i in states 1, … n, $R_{j1}, \ldots R_{jn}$ are the returns on security j in states 1, … n and $E(R_i)$, $E(R_j)$ are the expected returns on securities i and j.

Example The returns on securities 1 and 2 under five possible states of nature are given below:

State of nature	*Probability*	*Return on security 1*	*Return on security 2*
1	0.10	– 10%	5%
2	0.30	15	12
3	0.30	18	19
4	0.20	22	15
5	0.10	27	12

The expected return on security 1 is:

$$E(R_1) = 0.10\,(-10\%) + 0.30\,(15\%) + 0.30\,(18\%) + 0.20\,(22\%) + 0.10\,(27\%) = 16\%$$

The expected return on security 2 is:

$$E(R_2) = 0.10\,(5\%) + 0.30\,(12\%) + 0.30\,(19\%) + 0.20\,(15\%) + 0.10\,(12\%) = 14\%$$

The covariance between the returns on securities 1 and 2 is calculated below:

State of nature (1)	*Probability* (2)	*Return on security 1* (3)	*Deviation of the return on security 1 from its mean* (4)	*Return on security 2* (5)	*Deviation of the return on security 2 from its mean* (6)	*Product of the deviations times probability* (2) × (4) × (6)
1	0.10	– 10 %	– 26 %	5 %	– 9 %	23.4
2	0.30	15 %	–1 %	12 %	– 2 %	0.6
3	0.30	18 %	2 %	19 %	5 %	3.0
4	0.20	22 %	6 %	15 %	1 %	1.2
5	0.10	27 %	11 %	12 %	– 2 %	– 2.2
						Sum = 26.0

Thus the covariance between the returns on the two securities is 26.0.

Coefficient of Correlation Covariance and correlation are conceptually analogous in the sense that both of them reflect the degree of comovement between two variables. Mathematically, they are related as follows:

$$\text{Cor}\,(R_i, R_j) \text{ or } \rho_{ij} = \frac{\text{Cov}\left(R_i, R_j\right)}{\sigma_i . \sigma_j} \text{ or } \frac{\sigma_{ij}}{\sigma_i . \sigma_j} \tag{8.5}$$

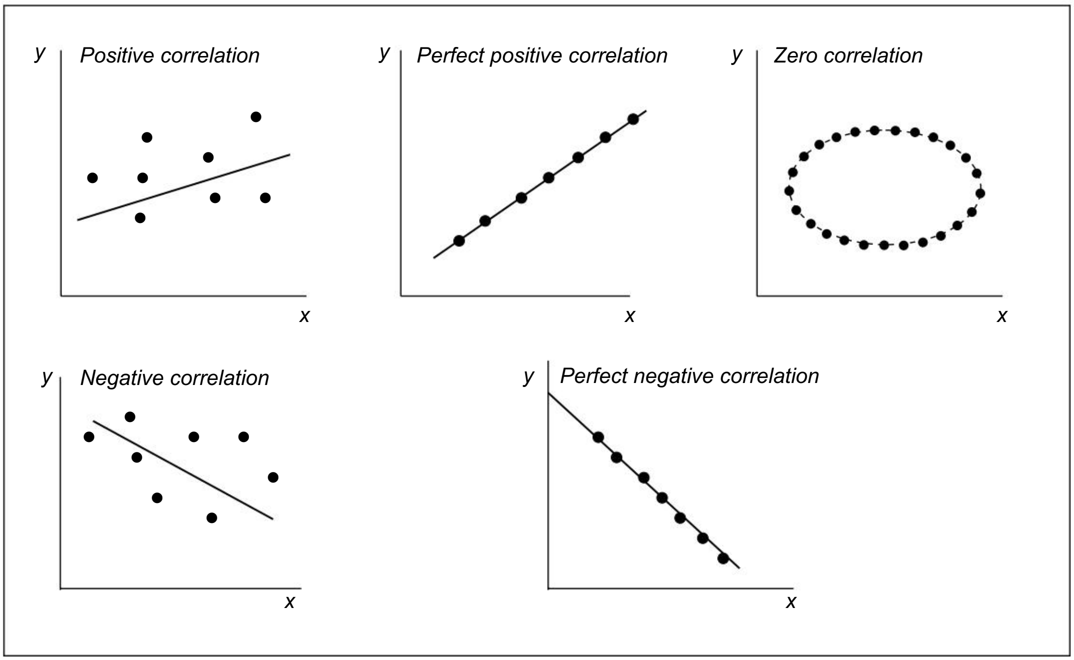
$$\sigma_{ij} = \rho_{ij} . \sigma_i . \sigma_j \tag{8.6}$$

where Cor $(R_i, R_j) = \rho_{ij}$ is the correlation coefficient between the returns on securities i and j, Cov $(R_i, R_j) = \sigma_{ij}$ is the covariance between the returns on securities i and j, and $\sigma(R_i),\sigma(R_j) = \sigma_i$, σ_j are the standard deviations of the returns on securities i and j.

Thus the correlation coefficient is simply covariance divided by the product of standard deviations.

The correlation coefficient can vary between –1.0 and +1.0. A value of –1.0 means perfect negative correlation or perfect comovement in the opposite direction; a value of 0 means no correlation or comovement whatsoever; a value of +1.0 means perfect correlation or perfect comovement in the same direction. Exhibit 7.5 portrays graphically various types of correlation relationships.

Exhibit 7.5 ***Graphical Portrayal of Various Types of Correlation Relationships***



7.4 CALCULATION OF PORTFOLIO RISK

Now that we understand how to measure covariance and correlation, we will learn how to calculate portfolio risk. We will first look at a 2-security case and then generalise it to an *n*-security case.

Portfolio Risk: 2-Security Case The risk of a portfolio consisting of two securities is given by the following formula:

$$\sigma_p^2 = w_1^2\,\sigma_1^2 + w_2^2\,\sigma_2^2 + 2\,w_1 w_2\,\rho_{12}\,\sigma_1\,\sigma_2 \qquad (7.6)^1$$

where σ_p^2 is the variance of the portfolio return, w_1, w_2 are the weights of securities 1 and 2 in the portfolio, σ_1^2, σ_2^2 are the variances of the returns on securities 1 and 2 and $\rho_{12}\,\sigma_1\,\sigma_2$ is the covariance of the returns on securities 1 and 2

In words, Eq. (7.6) says that the variance of the return on a 2-security portfolio is the sum of the weighted variance of the two securities plus twice the weighted covariance between the two securities.

Example A portfolio consists of two securities, 1 and 2, in the proportions 0.6 and 0.4. The standard deviations of the returns on securities 1 and 2 are $\sigma_1 = 10$ and $\sigma_2 = 16$. The coefficient of correlation between the returns on securities 1 and 2 is 0.5. What is the standard deviation of the portfolio return?

$$\sigma_p = [0.6^2 \times 10^2 + 0.4^2 \times 16^2 + 2 \times 0.6 \times 0.4 \times 0.5 \times 10 \times 16]^{1/2}$$
$$= 10.7 \text{ percent}$$

[1] Eq. (7.6) is derived as follows:

$$R_p = w_1\,R_1 + w_2\,R_2 \qquad (1)$$

$$E(R_p) = w_1\,E(R_1) + w_2\,E(R_2) \qquad (2)$$

$$\begin{aligned}
\sigma_p^2 &= E\,[R_p - E(R_p)]^2 \\
&= E\,[w_1\,R_1 + w_2\,R_2 - E\,(w_1 R_1 + w_2 R_2)]^2 \\
&= E\,[w_1\,R_1 + w_2\,R_2 - w_1\,E(R_1) - w_2\,E(R_2)]^2 \\
&= E\,[w_1\,R_1 - w_1\,E(R_1) + w_2\,R_2 - w_2\,E(R_2)]^2 \\
&= E\,[w_1\,\{R_1 - E(R_1)\} + w_2\,\{R_2 - E(R_2)\}]^2 \\
&= E\,[w_1^2\,\{R_1 - E(R_1)\}^2 + w_2^2\,\{R_2 - E(R_2)\}^2 + 2\,w_1\,w_2\,\{R_1 - E(R_1)\}\,\{R_2 - E(R_2)\}] \\
&= w_1^2\,E\{R_1 - E(R_1)\}^2 + w_2^2\,E\{R_2 - E(R_2)\}^2 + 2\,w_1\,w_2\,E\{R_1 - E(R_1)\}\{R_2 - E(R_2)\} \\
&= w_1^2\,\sigma_1^2 + w_2^2\,\sigma_2^2 + 2\,w_1\,w_2\,\rho_{12}\,\sigma_1\sigma_2 \qquad (3)
\end{aligned}$$

The portfolio variance may be viewed as the sum of the four cells in a 2 × 2 matrix:

	Security 1	Security 2
Security 1	$w_1^2\ \sigma_1^2$	$w_1 w_2 \rho_{12} \sigma_1 \sigma_2$
Security 2	$w_2 w_2 \rho_{21} \sigma_2 \sigma_1$	$w_2^2\ \sigma_2^2$

The entry in the top left box, $w_1^2\ \sigma_1^2$, is the product of the square of the proportion invested in security 1 (w_1^2) and the variance of the returns on security 1 (σ_1^2); likewise, the entry in the bottom right box, $w_2^2\sigma_2^2$, is the product of the square of the proportion invested in security 2 (w_2^2) and the variance of the returns on security 2 (σ_2^2).

The entries in the other two boxes are the same. They are the product of the proportion invested in security 1 (w_1), the proportion invested in security 2 (w_2), and the covariance of the returns on the two securities (which may be expressed as $\rho_{12}\sigma_1\sigma_2$ or $\rho_{21}\sigma_2\sigma_1$).

Once you have filled in the four cells of the 2 × 2 matrix, you have to simply add the entries in these boxes to get the portfolio variance.

Portfolio Risk: *n*-Security Case The variance and standard deviation of the return of an n-security portfolio are:

$$\sigma_p^2 = \Sigma\,\Sigma\, w_i\, w_j\, \rho_{ij}\, \sigma_i\, \sigma_j \tag{7.7}$$

$$\sigma_p = [\Sigma\,\Sigma\, w_i\, w_j\, \rho_{ij}\, \sigma_i \sigma_j\,]^{1/2} \tag{7.8}$$

where σ_p^2 is the variance of portfolio return, σ_p is the standard deviation of portfolio return, w_i is the proportion of portfolio value invested in security i, w_j is the proportion of portfolio value invested in security j, ρ_{ij} is the coefficient of correlation between the returns on securities i and j, σ_i is the standard deviation of the return on security i, and σ_j is the standard deviation of the return on security j.

Example A portfolio consists of 3 securities, 1, 2, and 3. The proportions of these securities are: $w_1 = 0.5$, $w_2 = 0.3$, and $w_3 = 0.2$. The standard deviations of returns on these securities (in percentage terms) are: $\sigma_1 = 10$, $\sigma_2 = 15$, and $\sigma_3 = 20$. The correlation coefficients among security returns are: $\rho_{12} = 0.3$, $\rho_{13} = 0.5$, and $\rho_{23} = 0.6$. What is the standard deviation of portfolio return?

$$\begin{aligned}\sigma_p &= [w_1^2\sigma_1^2 + w_2^2\sigma_2^2 + w_3^2\sigma_3^2 + 2\,w_1 w_2\,\rho_{12}\,\sigma_1\sigma_2 + 2\,w_1 w_3 \rho_{13}\sigma_1\sigma_3 + 2\,w_2 w_3 \rho_{23}\sigma_2\sigma_3]^{1/2}\\ &= [0.5^2 \times 10^2 + 0.3^2 \times 15^2 + 0.2^2 \times 20^2 + 2 \times 0.5 \times 0.3 \times 0.3 \times 10 \times 15 + 2 \times 0.5 \times 0.2\\ &\quad \times 0.5 \times 10 \times 20 + 2 \times 0.3 \times 0.2 \times 0.6 \times 15 \times 20]^{1/2}\\ &= 10.79 \text{ percent}\end{aligned}$$

The relationship embodied in Eq.(7.7) is not as complicated as it appears. It is the sum of n^2 terms found in the $n \times n$ matrix shown in Exhibit 7.6.

Exhibit 7.6 ***n × n Matrix***

	1	2	3	⋯	n
1	$w_1^2\sigma_1^2$	$w_1w_2\rho_{12}\sigma_1\sigma_2$	$w_1w_3\rho_{13}\sigma_1\sigma_3$	⋯	$w_1w_n\rho_{1n}\sigma_1\sigma_n$
2	$w_2w_1\rho_{21}\sigma_2\sigma_1$	$w_2^2\sigma_2^2$	$w_2w_3\rho_{23}\sigma_2\sigma_3$	⋯	$w_2w_n\rho_{2n}\sigma_2\sigma_n$
3	$w_3w_1\rho_{31}\sigma_3\sigma_1$	$w_3w_2\rho_{32}\sigma_3\sigma_2$	$w_3^2\sigma_3^2$	⋯	
⋮	⋮				⋮
n	$w_nw_1\rho_{n1}\sigma_n\sigma_1$				$w_n^2\sigma_n^2$

Notice that in Exhibit 7.6 there are n variance terms (the diagonal terms) and $n(n - 1)$ covariance terms (the non-diagonal terms). If n is just two, there are two variance terms and two covariance terms. However, as n increases, the number of covariance terms is much larger than the number of variance terms. For example, when n is 10, there are 10 (that is n) variance terms and 90 (that is $n(n - 1)$) covariance terms. Hence the variance of a well-diversified portfolio is largely determined by the covariance terms. If covariance terms are likely to be negative, it may be possible to get rid of risk almost wholly by resorting to diversification. Unfortunately, security prices tend to move together. This means that most covariance terms are positive. Hence, irrespective of how widely diversified a portfolio is, its risk does not fall below a certain level.

Dominance of Covariance As the number of securities included in a portfolio increases, the importance of the risk of each individual security decreases whereas the significance of the covariance relationship increases. To understand this, let us look at the equation for the variance of portfolio return:

$$\text{Var}(R_p) = \sum_{i=1}^{n} w_1^2 \,\text{Var}(R_i) + \sum_{i=1}^{n} \sum_{\substack{j=1 \\ i \neq j}}^{n} w_i\, w_j \,\text{Cov}\,(R_i, R_j) \qquad (7.9)$$

If a naïve diversification strategy is followed, $w_i = 1/n$. Under such a strategy

$$\text{Var}\,(R_p) = 1/n \sum_{i=1}^{n} 1/n\ \text{Var}\,(R_i) + \sum_{i=1}^{n} \sum_{\substack{j=1 \\ j \neq i}}^{n} 1/n^2\ \text{Cov}\,(R_i, R_j) \qquad (7.10)$$

The average variance term and the average covariance term may be expressed as follows:

$$\overline{\text{Var}} = 1/n \sum_{i=1}^{n} \text{Var}\,(R_i) \qquad (7.11)$$

$$\overline{\text{Cov}} = \frac{1}{n(n-1)} \sum_{i=1}^{n} \sum_{\substack{j=1 \\ i \neq j}}^{n} \text{Cov}\,(R_i, R_j) \qquad (7.12)$$

Hence

$$\text{Var}\,(R_p) = \frac{1}{n}\,\overline{\text{Var}} + \frac{n-1}{n}\,\overline{\text{Cov}} \qquad (7.13)$$

As n increases, the first term tends to become zero and the second term looms large. Put differently, the importance of the variance term diminishes whereas the importance of the covariance term increases.

7.5 EFFICIENT FRONTIER

Now that we know how to calculate the risk and return of a portfolio, let us understand how the efficient frontier is delineated. We will first look at the 2-security case and then consider the n-security case.

Efficient Frontier for a Two Security Case

Suppose an investor is evaluating two securities, A and B.

	Security A	*Security B*
Expected return	12%	20%
Standard deviation of return	20%	40%
Coefficient of correlation	– 0.20	

The investor can combine securities A and B in a portfolio in a number of ways by simply changing the proportions of funds allocated to them. Some of the options available to him are shown below:

Portfolio	*Proportion of A* w_A	*Proportion of B* w_B	*Expected return* $E(R_p)$	*Standard deviation* σ_p
1 (A)	1.00	0.00	12.00%	20.00%
2	0.90	0.10	12.80%	17.64%
3	0.759	0.241	13.93%	16.27%
4	0.50	0.50	16.00%	20.49%
5	0.25	0.75	18.00%	29.41%
6 (B)	0.00	1.00	20.00%	40.00%

Spreadsheet Application A spreadsheet application of the above illustration is given below:

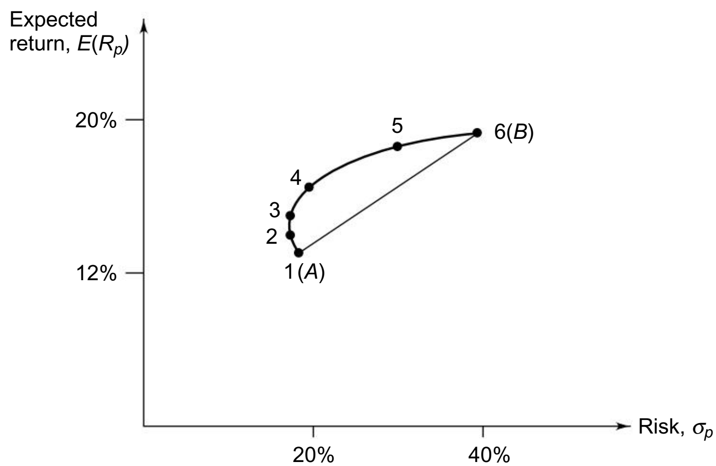
	A	B	C	D	E
1		Expected Return	Standard Deviation	Coefficient of Correlation	
2	Security A	12%	20%	–0.2	
3	Security B	20%	40%		
4	Portfolio	Proportion of A	Proportion of B	Expected Return	Standard Deviation
5	1(A)	1	0	12.00%	20.00%
6	2	0.9	0.1	12.80%	17.64%
7	3	0.759	0.241	13.93%	16.27%
8	4	0.5	0.5	16.00%	20.49%
9	5	0.25	0.75	18.00%	29.41%
10	6(B)	0	1	20.00%	40.00%
11	Formula used for getting Expected Return in cell D5 =		B5*B2+C5*B3		
12	Formula for getting Standard Deviation in cell E5=		((B5^2)*C2^2+(C5^2)*C3^2+2*B5*C5*D2*C2*C3)^0.5		

The six options described above are plotted graphically in Exhibit 7.7. A few important points about this graph may be noted:

1. The benefit of diversification arises when the correlation between the two securities is less than 1. Because the correlation between securities A and B is – 0.20 (which is less than 1), the effect of diversification can be seen by comparing the curved line between points A and B with the straight line between A and B. The straight line represents the risk–return possibilities by combining A and B, if the correlation coefficient between the two stocks had been 1. Since the curved line is always to the left of the straight line, the diversification effect is illustrated in the figure.
2. Portfolio 3 represents the minimum variance portfolio (MVP) or more accurately the minimum standard deviation portfolio. Though the term MVP is commonly used in the literature, it is actually the minimum standard deviation portfolio because the x-axis represents standard deviation.
3. The investor considering a portfolio of A and B faces an *opportunity set* or *feasible set* represented by the curved line AB. By choosing an appropriate mix between the two securities, the investor can achieve any point on the curved line.

4. The curve bends backward between points A and 3 (the minimum variance portfolio). This means that for a portion of the feasible set, standard deviation decreases although expected return increases. You may ask: How can an increase in the proportion of the riskier security B, result in a reduction of portfolio risk? This happens because of the diversification effect. Since the returns on A and B are negatively correlated, they tend to move in different directions. Thus, an addition of a small amount of B provides a hedge to a portfolio composed only of A. Of course, the curve bends backward only for some length. As the proportion of B increases in the portfolio, the standard deviation of the portfolio increases. Technically, a backward bend occurs when $\rho \leq 0$; it may or may not occur when $\rho > 0$.

Exhibit 7.7 ***Portfolio Options***



5. No investor would like to invest in a portfolio whose expected return is less than that of the MVP. For example, no investor would choose portfolio 2. This portfolio has lower expected return and higher standard deviation than the MVP. Clearly, it is dominated by the MVP. Although the entire curve from A to B is feasible, investors would consider only the segment from 3 to B. This is called the efficient set or the efficient frontier. Points lying along the efficient frontier are called efficient portfolios.

Feasible Frontier for Different Degrees of Correlation In our discussion so far we looked at a case where the coefficient of correlation between the two securities was slightly negative (– 0.20). Since the coefficient of correlation can vary between –1.00 and +1.00, it is instructive to examine the shape of the feasible frontier under the following conditions:

Coefficient of correlation : – 1.00
Coefficient of correlation : 0
Coefficient of correlation : 1.00

The feasible frontier under various degrees of coefficient of correlation is delineated in Exhibit 7.8. Note that when the securities are perfectly positively correlated ($\rho = 1.0$), diversification does not reduce risk. By the same logic when the securities are perfectly negatively correlated ($\rho = -1.0$), diversification results in maximal risk reduction. In fact, in this case, risk can be reduced to zero, by choosing the weights (w_A and w_B) suitably. This point can be demonstrated by examining the equation for portfolio risk.

$$\text{Var}(R_p) = w_A^2\sigma_A^2 + w_B^2\sigma_B^2 + 2\, w_A w_B\, \rho_{AB}\, \sigma_A\, \sigma_B \tag{7.14}$$

If $\rho_{AB} = -1$, the above equation becomes:

$$\begin{aligned}\text{Var}(R_p) &= w_A^2\sigma_A^2 + w_B^2\sigma_B^2 - 2\, w_A w_B \sigma_A \sigma_B \\ &= (w_A\sigma_A - w_B\sigma_B)^2\end{aligned} \tag{7.15}$$

So,
$$\sigma_p = w_A\sigma_A - w_b\sigma_B \tag{7.16}$$

Since $w_B = (1 - w_A)$, Eq. (7.16) may be expressed as:

$$\begin{aligned}\sigma_p &= w_A\sigma_A - (1 - w_A)\,\sigma_B \\ &= w_A(\sigma_A + \sigma_B) - \sigma_B\end{aligned} \tag{7.17}$$

σ_p can be driven down to zero by setting

$$w_A = \frac{\sigma_B}{\sigma_A + \sigma_B}$$

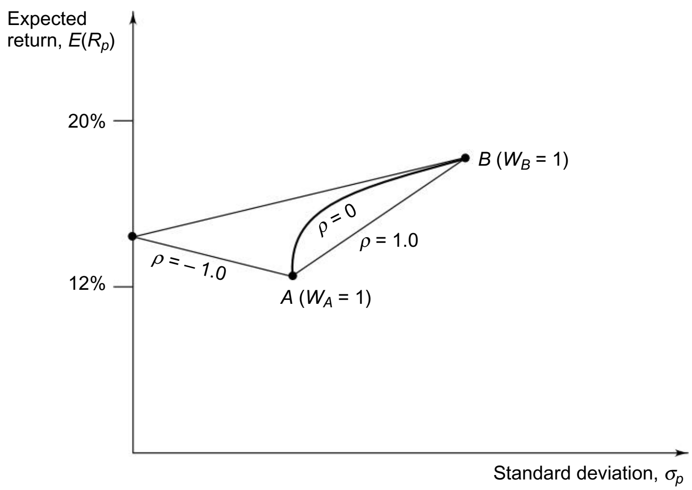
For example, when $E(r_A) = 12\%$, $E(r_B) = 20\%$, $\sigma_A = 20\%$, $\sigma_B = 40\%$, and $\rho_{AB} = -1$,

$$w_A = \frac{40\%}{20\% + 40\%} = 2/3$$

and
$$w_B = (1 - w_A) = 1/3$$

You can verify that these weights drive down the portfolio risk to 0.

Exhibit 7.8 ***Feasible Frontier under Various Degrees of Coefficient of Correlation***



Minimum Variance Portfolio Most investors (and portfolio managers) invest in two broad categories of financial assets viz., bonds and stocks. So, an important practical issue is: what is the proportion of bonds (and, by derivation, stocks) that minimises portfolio variance? To answer this question, let us look at the risk of a portfolio consisting of two assets, viz., bonds and stocks:

$$\text{Var}\,(R_p) = w^2{}_b\sigma^2{}_b + w^2{}_s\sigma^2{}_s + 2w_b w_s\,\rho_{bs}\sigma_b\sigma_s \quad (7.18)$$

where Var (R_p) is the variance of the portfolio consisting of bonds and stocks, w_b is the proportion invested in bonds, w_s is the proportion invested in stocks (w_s =1-w_b), σ_b is the standard deviation of returns from bonds, σ_s is the standard deviation of returns from stocks, and ρ_{bs} is the coefficient of correlation between the returns from bonds and stocks.

The value of w_b that minimises portfolio variance is:

$$w_B\,(\text{min}) = \frac{\sigma_s^2 - \sigma_b\sigma_s\rho_{bs}}{\sigma_b^2 + \sigma_s^2 - 2\sigma_b\sigma_s\rho_{bs}} \quad (7.19)^2$$

To illustrate the above formula, let us consider the following data: $E(r_B)$ = 8%, $E(r_s)$ = 15%, σ_b = 0%, and σ_s = 20%.

Given the above data the expected return and standard deviation of a portfolio consisting of bonds and stocks is:

$$E(r_p) = w_b\,.\,8 + w_s\,.\,15$$

$$\sigma_p = [\,w^2{}_b\,.\,100 + w^2{}_s\,.\,400 + 2w_b.w_s.\rho_{bs}\,.\,200\,]^{1/2}$$

where $E(r_p)$ is the expected portfolio return, σ_p is the portfolio standard deviation, w_b and w_s are the proportions invested in bonds and stocks, and ρ_{bs} is the coefficient of correlation between the returns on bonds and stocks.

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[2] This formula is derived as follows:

$$\sigma^2 p = w^2{}_b\sigma^2{}_b + w^2{}_s\sigma^2{}_s + 2w_b w_s\,\rho_{bs}\sigma_b\sigma_s \quad (1)$$

Since $w_S = (1 - w_b)$, Eq. (1) may be restated as:

$$\sigma^2{}_p = w^2{}_b\sigma^2{}_b + (1 - w_b)^2\sigma^2{}_s + 2w_b\,(1 - w_b)\,\rho_{bs}\sigma_b\sigma_s \quad (2)$$

The first derivative of $\sigma^2{}_p$ with respect to w_b is:

$$\frac{d\sigma_p^2}{dw_b} = 2w_b\,\sigma^2{}_B + 2(1 - w_b) \times -1 \times \sigma^2{}_s + 2(1 - w_b)\,\rho_{bs}\sigma_b\sigma_s - 2w_b\rho_{bs}\sigma_b\sigma_s \quad (3)$$

Setting the first derivative of $\sigma^2{}_p$ with respect to w_b equal to zero and solving it for w_b, we get:

$$w_B\,(\text{min}) = \frac{\sigma_s^2 - \sigma_b\sigma_s\rho_{bs}}{\sigma_b^2 + \sigma_s^2 - 2\sigma_b\sigma_s\rho_{bs}} \quad (4)$$

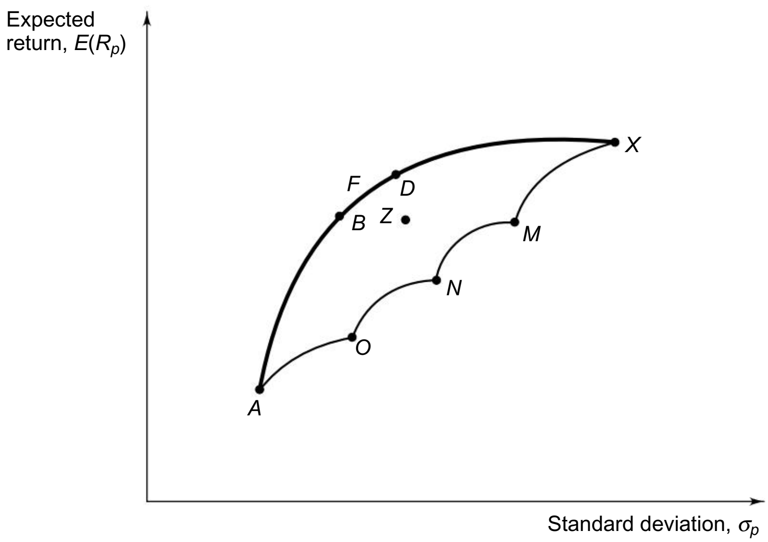
The minimum variance portfolio for various correlations is shown below

	Correlation		
	$\rho = -1.0$	$\rho = 0$	$\rho = 0.5$
	Minimum Variance Portfolio		
w_b (min)	0.6667	0.8000	1.000
$E(r_p)$	10.33%	9.400	8.000
σ_p	0	12.00%	10.00%

Efficient Frontier for the *n*-Security Case

In a 2-security case, a curved line delineates all possible portfolios. In a multi-security case, the collection of all the possible portfolios is represented by the broken-egg shape region, referred to as the feasible region, shown in Exhibit 7.9. Obviously, the number of possible portfolios in that region is virtually endless. However, the investor need not feel unduly overwhelmed by the bewildering range of possibilities shown in Exhibit 7.9 because what really matters to him is the northwest boundary of the feasible region which is defined by the thick dark line. Referred to as the efficient frontier, this boundary contains all the efficient portfolios. It may be useful to clarify here what exactly an efficient portfolio is. A portfolio is efficient if (and only if) there is no alternative with (i) the same $E(R_p)$ and a lower σ_p, (ii) the same σ_p and a higher $E(R_p)$, or (iii) a higher $E(R_p)$ and a lower σ_p. Thus, in Exhibit 7.9 while all the feasible portfolios are contained in the region AFXMNO, only the portfolios which lie along the boundary

Exhibit 7.9 ***Feasible Region***



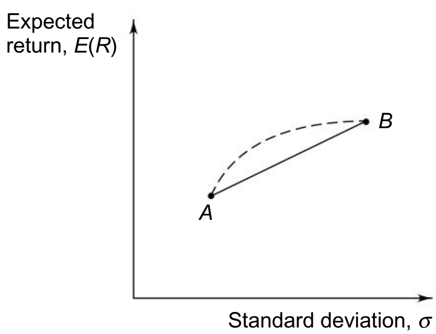
AFX are efficient. AFX represents the efficient frontier. All other portfolios are inefficient. A portfolio like Z is inefficient because portfolios like B and D, among others, dominate it. The efficient frontier is the same for all investors because portfolio theory is based on the assumption that investors have homogeneous expectations.

We have merely defined what is meant by a set of efficient portfolios. How can this set be actually obtained from the innumerable portfolio possibilities that lie before the investor? The set of efficient portfolios may be determined with the help of graphical analysis, or calculus analysis, or quadratic programming analysis[3]. The major advantage of graphical analysis is that it is easier to grasp. Its disadvantage is that it cannot handle portfolios containing more than three securities[4]. The calculus analysis can grapple with the *n*-dimensional space. However, the calculus method is not capable of handling constraints in the form of inequalities. Quadratic programming analysis is the most versatile of all the three approaches. It can handle any number of securities and cope with inequalities as well. For all practical purposes, the quadratic programming approach is the most useful approach.

Technically, the quadratic programming approach manipulates the portfolio weights to determine efficient portfolios. The procedure followed is as follows. A desired expected return, say 9 percent, is specified. Then all portfolios (combinations of securities) that produce 9 percent expected return are considered and the portfolio that has the smallest variance (standard deviation) of return is chosen as the efficient portfolio. This is continued for other levels of portfolio return, 10 percent, 11 percent, 12 percent, and so on, until all the possible expected returns are considered. Alternatively, the problem can be solved by specifying various levels of portfolio variance (standard deviation) and choosing the portfolios that offer the highest expected return for various levels of portfolio variance (standard deviation).

Why Is the Feasible Region Broken-egg Shaped To see why the feasible region has a broken-egg shape (or umbrella shape), let us look at two securities shown in Exhibit 7.10.

Exhibit 7.10 ***Two Securities Portfolio***



[3] Readers may refer to Jack Clark and Stephen H. Archer, *Portfolio Analysis*, Englewood Cliffs, Prentice- Hall Inc., N.J.

[4] At the most portfolios of four securities may be handled if three-dimensional analysis is used.

The expected return of a portfolio comprising of A and B ($w_A + w_B = 1$) is:

$$E(R_p) = w_a\, E(R_a) + w_b\, E(R_b) \tag{7.20}$$

The standard deviation of the portfolio return is:

$$\sigma_p = [w_a^2\, \sigma_a^2 + w_b^2\, \sigma_b^2 + 2\, w_a\, w_b\, \rho_{ab}\, \sigma_a\, \sigma_b\,]^{1/2} \tag{7.21}$$

Note that while the expected portfolio return is not affected by ρ_{ab}, the coefficient of correlation between the returns on A and B, the standard deviation of portfolio return is affected by ρ_{ab}.

Now consider two cases:

Case 1: The returns of securities A and B are perfectly positively correlated.

Case 2: The returns of securities A and B are less than perfectly positively correlated.

In case 1, $\rho_{ab} = 1$.

So

$$\sigma_p = [w_a^2\, \sigma_a^2 + w_b^2\, \sigma_b^2 + 2\, w_a\, w_b\, \sigma_a\, \sigma_b\,]^{1/2}$$

$$= [w_a\, \sigma_a + w_b\, \sigma_b] \tag{7.22}$$

Graphically, this means that the portfolio risk-return profile plots as the straight line joining A and B in Exhibit 7.10.

In case 2, $\rho_{ab} < 1$.

So

$$\sigma_p = [w_a^2\, \sigma_a^2 + w_b^2\, \sigma_b^2 + 2\, w_a\, w_b\, \rho_{ab}\, \sigma_a\, \sigma_b\,]^{1/2} \tag{7.23}$$

Since $\rho_{ab} < 1$, σ_p will be less than $[w_a\, \sigma_a + w_b\, \sigma_b]$

Graphically, this means that the portfolio risk-return profile plots as the broken curved line joining A and B in Exhibit 7.10.

Since ρ_{ab} is typically less than 1, most of the portfolio risk-return profiles are like the curved line. This implies that the feasible region would have an umbrella like shape.

7.6 OPTIMAL PORTFOLIO

Once the efficient frontier is delineated, the next question is: What is the optimal portfolio for the investor? To determine the optimal portfolio on the efficient frontier, the investor's risk-return tradeoff must be known. Exhibit 7.11 presents two illustrative indifference curves which reflect risk- return tradeoff functions – note that all points lying on an indifference curve provide the same level of satisfaction. The indifference curves I_p and I_q represent the risk-return tradeoffs of two hypothetical investors, *P* and *Q*. Both *P* and *Q*, like most investors, are risk-averse. They want higher returns to bear more risk. *Q* is however more risk-averse than *P*. *Q* wants a higher expected return for bearing a given amount of risk as compared to *P*. In general, the steeper the slope of the indifference curve, the greater the degree of risk aversion.

Exhibit 7.11 ***Risk-Return Indifference Curves***

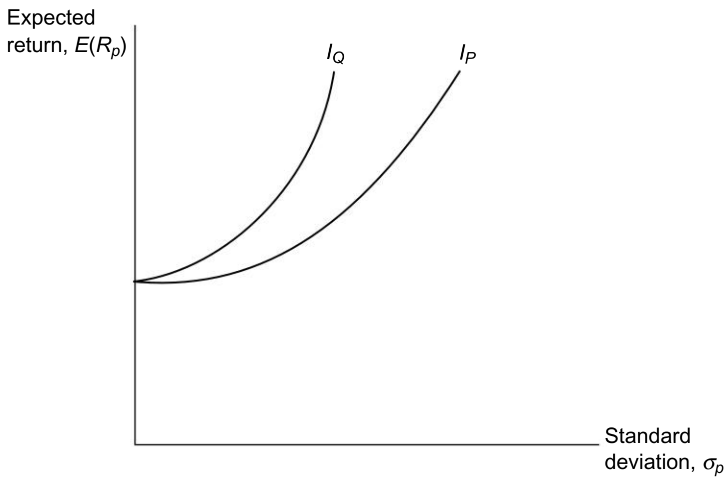
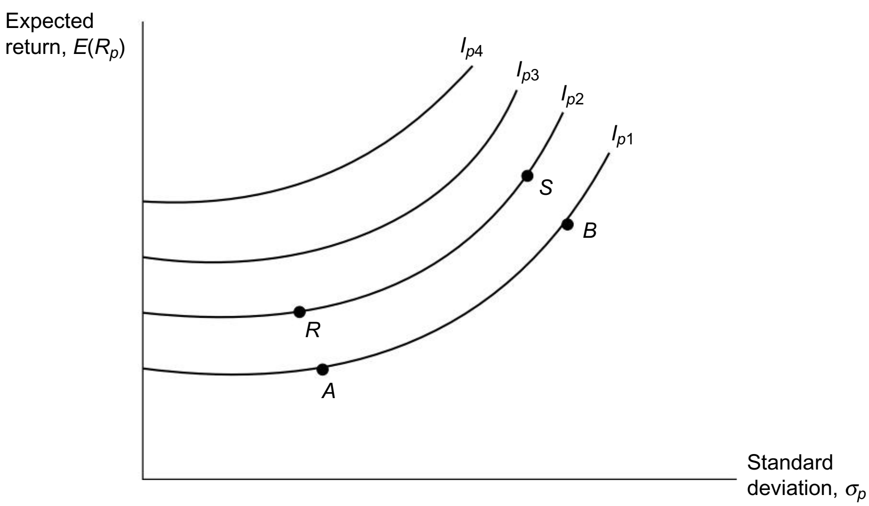


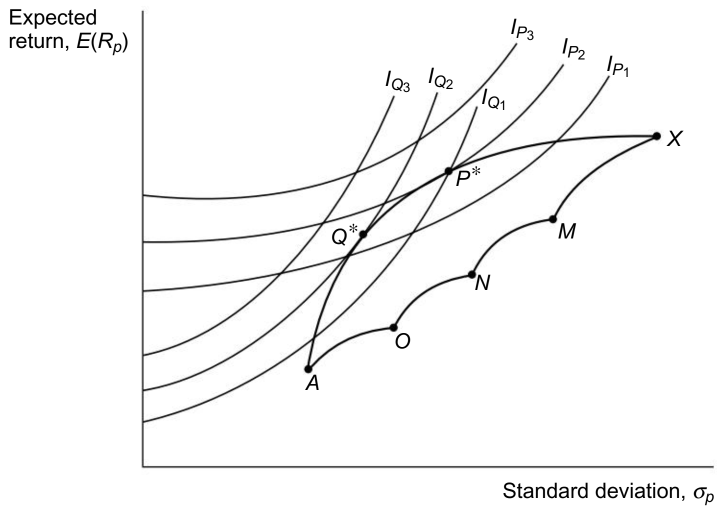
Exhibit 7.12 ***Utility Indifferences Curves***



Each person has a map of indifference curves. Exhibit 7.12 shows the indifference map for P. In this figure, four risk-return indifference curves, I_{p1}, I_{p2}, I_{p3}, and I_{p4} are shown. All the points lying on a given indifference curve offer the same level of satisfaction. For example, points A and B, which lie on the indifference curve I_{p1} offer the same level of satisfaction; likewise, points R and S, which lie on the indifference curve I_{p2}, offer the same level of satisfaction. The level of satisfaction increases as one moves leftward. The indifference curve I_{p2} represents a higher level of satisfaction as compared to the indifference curve I_{p1}; the indifference curve I_{p3} represents a higher level of satisfaction when compared to the indifference curve I_{p4}; and so on.

Given the efficient frontier and the risk-return indifference curves, the **optimal portfolio** is found at the point of tangency between the efficient frontier and a utility indifference curve. This point represents the highest level of utility the investor can reach. In Exhibit 7.13, two investors P and Q, confronted with the same efficient frontier, but having different utility indifferences curves (I_{p1}, I_{p2} and I_{p3} for P and I_{q1}, I_{q2} and I_{q3} for Q) are shown to achieve their highest utilities at points P^* and Q^* respectively.

Exhibit 7.13 ***Optimal Portfolio***

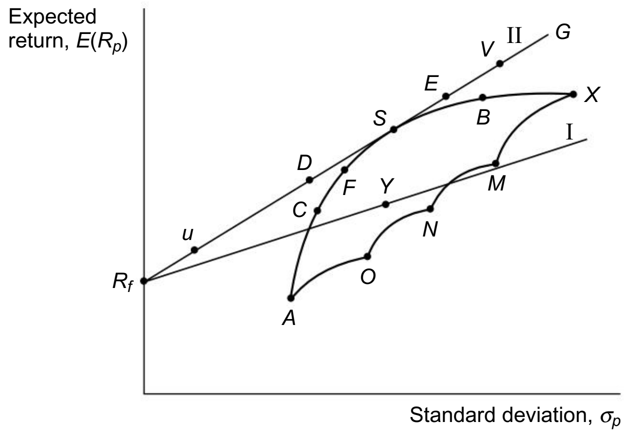


7.7 RISKLESS LENDING AND BORROWING

Exhibit 7.13 assumes that all the securities on the efficient set are risky. Let us introduce yet another opportunity. Suppose that investors can also lend and borrow money at a risk-free rate of R_f as shown in Exhibit 7.14. Since R_f is a risk-free asset it has a zero correlation with all the points in the feasible region of risky portfolios. So a combination of R_f and any point in the feasible region of risky securities will be represented by a straight line. Consider point Y, a portfolio of risky securities. Investors can combine R_f and Y and reach any point along the straight line from R_f to Y and even beyond—to go beyond they have to leverage. We refer to this as line I.

Although the investor can reach any point on line I, no point on this line is optimal. To see this, consider line II which runs from R_f to S and beyond. Line II is tangent to the efficient set of risky securities, so it provides the investor the best possible opportunities. You can see that line II dominates line I - for that matter, it dominates any other line between R_f and any point in the feasible region of risky securities.

Exhibit 7.14 ***Lending and Borrowing Opportunity***



Thus, with the opportunity of lending and borrowing, the efficient frontier changes. It is no longer AFX. Rather, it is R_fSG because R_fSG dominates AFX. For every point on AFX (excepting *S*) there is at least one point on R_f *SG* which is superior to the point on AFX. For example, compared to *C* on AFX, *D* on R_f *SG* offers a higher expected return for the same standard deviation; likewise, compared to *B* on AFX, *E* on R_f *SG* offers the same expected return with a lower standard deviation; and so on.

Since R_f*SG* dominates AFX, every investor would do well to choose some combination of R_f and *S*. A conservative investor may choose a point like U, whereas an aggressive investor may choose a point like *V*. However, note that both investors choose some combination of R_f and *S*. While the conservative investor weighs R_f more in his portfolio, the aggressive investor weighs *S* more in his portfolio (in fact, in his portfolio, the weight assigned to R_f is negative and that assigned to *S* is more than 1).

Thus, the task of portfolio selection can be separated into two steps: (a) Identification of *S*, the optimal portfolio of risky securities. (b) Choice of a combination of R_f and *S* depending on one's risk attitude. This is the import of the celebrated **separation theorem**, first enunciated by James Tobin, a Nobel Laureate in Economics.

7.8 THE SINGLE INDEX MODEL

The Markowitz model is highly information-intensive. If there are *n* securities, the Markowitz model requires *n* expected returns, *n* variance terms, and $n\ (n - 1)/2$ covariance terms. For example, if an analyst is considering 100 securities, the Markowitz model requires 100 expected return terms, 100 variance terms, and 4950 covariance terms.

Clearly, the problem of estimating a large number of covariance terms becomes intractable, particularly for institutional investors who may have 50 to 100 or even more securities in their portfolio. Hence, until the Markowitz model is simplified in terms of covariance inputs, it can scarcely become an operational tool.

In his seminal contribution, Markowitz had suggested that an index, to which securities are related, may be used for the purpose of generating the covariance terms. Taking a cue from Markowitz, William Sharpe[5] developed the single index model, which expresses the returns on each security as a function of the return on a broad market index as follows:

$$R_i = a_i + b_i R_M + e_i \tag{7.24}$$

where R_i is the return on security *i*, R_M is the return on the market index, a_i is the constant return, b_i is the measure of the sensitivity of the security *i*'s return to the return on the market index, and e_i is the error term

The estimates of a_i (the constant term) and b_i (the slope term of the single index model) may be obtained by regressing the return on security *i* on the corresponding return on the market index.

The single-index model is based on the following assumptions:

- The error term (e_i) has an expected value of zero and a finite variance.
- The error term is not correlated with the return on the market portfolio:

$$\text{Cov}(e_i, R_M) = 0 \tag{7.25}$$

- Securities are related only through their common response to the return on the market index. This implies that the error term for security *i* is not correlated with the error term for any other security,say *j*:

$$\text{Cov}(e_i, e_j) = 0 \tag{7.26}$$

Because a_i (a constant) and $b_i R_M$ are uncorrelated, the variance of the return of the stock can be expressed as follows:

$$\begin{aligned} \text{Variance}(R_i) &= \text{Variance}(a_i + b_i R_M + e_i) \\ &= \text{Variance}(b_i R_M) + \text{Variance}(e_i) \\ &= b_i^2 \sigma_M^2 + \sigma^2(e_i) \end{aligned} \tag{7.27}$$

where $b_i^2 \sigma_M^2$ represents the market risk or systematic risk and $\sigma^2(e_i)$ represents the unique risk or firm-specific risk.

Generating the Inputs to the Markowitz Model The single-index model immensely helps in obtaining the following inputs required for applying the Markowitz model: (i) the expected return on each security, (ii) the variance of return on each security, and (iii) the covariances of returns between each pair of securities. The following equations may be used for the purpose:

$$E(R_i) = a_i + b_i E(R_M) \tag{7.28}$$

$$\text{Var}(R_i) = b_i^2 [\text{Var}(R_M)] + \text{Var}(e_i) \tag{7.29}$$

$$\text{Cov}(R_i, R_j) = b_i b_j \text{Var}(R_M) \tag{7.30}$$

To apply these equations, you need to know a_i, b_i, Var(e_i), $E(R_M)$, and Var(R_M). All these may be estimated on the basis of historical analysis and/or judgemental evaluation.

[5] W. Sharpe, "A Simplified Model for Portfolio Analysis," *Management Science* (January 1963).

Calculation of the Single Index Model Clearly the single index model is a very helpful simplification over the Marktowitz model. If you are looking at n securities, the single index model requires $3n + 2$ estimates (a_i, b_i, Var(e_i) for each security and $E(R_M)$, and Var(R_M)).

By contrast the Markowitz model requires $n(n+3)/2$ estimates ($E(R_i)$ and Var(R_i) for each security and $n(n–1)/2$ covariance terms). For example, if you are considering 100 securities, the single index model requires 302 inputs, whereas the Markowitz model requires 5150 inputs.

How does the single index model perform compared to the Markowitz model? In his pioneering study, William Sharpe found considerable similarity between the efficient portfolios generated by the single index model and the Markowitz model. Subsequent studies have also found that the single index model performs well. Since the single index model simplifies considerably the input requirements and performs fairly well, it represents a major practical advance in portfolio analysis.

SUMMARY

- Portfolio theory, originally proposed by Harry Markowitz in the 1950s, was the first formal attempt to quantify the risk of a portfolio and develop a methodology for determining the optimal portfolio.
- The **expected return** on a portfolio of assets is:

$$E(R_p) = w_1\, E(R_1) + w_2\, E(R_2) + \dots\dots\dots + w_n\, E(R_n)$$

- The **variance** of a two-asset portfolio is:

$$\text{Var}(R_p) = w_1^2\, \text{Var}(R_1) + w_2^2\, \text{Var}(R_2) + 2\, w_1\, w_2\, \text{Cov}\,(R_1, R_2)$$

- **Covariance** and **correlation** are conceptually analogous in the sense that both of them reflect the degree of comovement between two variables. Mathematically, they are related as follows:

$$\text{Cor}\,(R_i, R_j) = \frac{\text{Cov}\left(R_i, R_j\right)}{\sigma\left(R_i\right) \cdot \sigma\left(R_j\right)}$$

- The correlation coefficient can vary between – 1.0 and + 1.0.
- The variance and standard deviation of the return on an n-security portfolio are:

$$\sigma^2_p = \Sigma\, \Sigma\, \omega_i\, \omega_j\, \rho_{ij}\, \sigma_i\, \sigma_j$$

$$\sigma_p = [\Sigma\, \Sigma\, \omega_i\, \omega_j\, \rho_{ij}\, \sigma_i \sigma_j\,]^{1/2}$$

- As the number of securities in a portfolio increases, the importance of the risk of each security decreases whereas the significance of the covariance relationship increases.
- Because the risk of a portfolio is determined largely by the degree of covariance (correlation) between the returns of assets in the portfolio, the key to reducing

portfolio risk is to combine assets in a portfolio that are less than perfectly positively correlated.

- The procedure developed by Markowitz for choosing the optimal portfolio of risky assets consists of three steps: (i) Delineate the set of efficient portfolios. (ii) Specify the risk-return indifference curves. (iii) Choose the optimal portfolio.
- A portfolio is **efficient** if (and only if) there is no alternative with (i) the same $E(R_p)$ and a lower σ_p or (ii) the same σ_p and a higher $E(R_p)$ or (iii) a higher $E(R_p)$ and a lower σ_p.
- Each person has a map of **indifference curves**. All the points lying on a given indifference curve offer the same level of satisfaction.
- Given the **efficient frontier** and the risk-return indifference curves, the optimal portfolio is found at the tangency between the efficient frontier and a utility indifference curve.
- If we introduce the opportunity for lending and borrowing at the risk-free rate, the efficient frontier changes dramatically. It is simply the straight line from the risk-free rate which is tangential to the broken-egg shaped feasible region representing all possible combinations of risky assets.
- The **Markowitz model** is highly information-intensive. If there are n securities, the Markowitz model requires n expected returns, n variance terms, and $n(n-1)/2$ covariance terms.
- To generate the covariance terms, William Sharpe developed the **single index model**, which expresses the returns on each security as a function of the return on a broad market index as follows:

$$R_i = a_i + b_i R_M + e_i$$

- Based on the single index model, the following equations are used for generating the inputs required for applying the Markowitz model:

$$E(R_i) = a_i + b_i E(R_M)$$

$$\text{Var}(R_i) = b_i^2 [\text{Var}(R_M)] + \text{Var}(e_i)$$

$$\text{Cov}(R_i, R_j) = b_i b_j \text{Var}(R_M)$$

- The single index model is a very helpful simplification over the Markowitz model. If you are looking at n securities, the single index model requires $3n+2$ estimates. By contrast the Markowitz model requires $n(n+3)/2$ estimates.

QUESTIONS

1. What is the expected return on a portfolio of risky assets?
2. What is the risk of a 2-security portfolio?
3. What is the risk of an *n*-security portfolio?
4. What is covariance?
5. State the relationship between covariance and correlation.
6. Show why the covariance term dominates the risk of a portfolio as the number of securities increases.
7. Describe the procedure developed by Markowitz for choosing the optimal portfolio of risky assets.
8. What is an efficient portfolio?
9. Explain the nature of a risk-return indifference curve.
10. How does the efficient frontier change, when the possibility of lending and borrowing at a risk-free rate is introduced?
11. Explain the single index model proposed by William Sharpe.

■ ■

SOLVED PROBLEMS

1. The stock of Box Limited performs well relative to other stocks during recessionary periods. The stock of Cox Limited, on the other hand, does well during growth periods. Both the stocks are currently selling for Rs 100 per share. You assess the rupee return (dividend plus price) of these stocks for the next year as follows:

	Economic Condition			
	High growth	*Low growth*	*Stagnation*	*Recession*
Probability	0.3	0.4	0.2	0.1
Return on Box's stock	100	110	120	140
Return on Cox's stock	150	130	90	60

Calculate the expected return and standard deviation of investing:
(a) Rs 1,000 in the equity stock of Box Limited
(b) Rs 1,000 in the equity stock of Cox Limited
(c) Rs 500 each in the equity stock of Box Limited and Cox Limited.

Solution

(a) 10 equity shares of Box Limited can be bought for Rs 1,000. The probability distribution of overall return, when 10 equity shares of Box Limited are purchased will be as follows:

Economic condition	*Overall return*	*Probability*
High growth	10(100) = Rs 1,000	0.3
Low growth	10(110) = Rs 1,100	0.4
Stagnation	10(120) = Rs 1,200	0.2
Recession	10(140) = Rs 1,400	0.1

The expected return is:

$$0.3(1{,}000) + 0.4(1{,}100) + 0.2(1{,}200) + 0.1(1{,}400) = 300 + 440 + 240 + 140$$
$$= \text{Rs } 1{,}120$$

The standard deviation of return is:

$$[0.3(1{,}000 - 1{,}120)^2 + 0.4\,(1{,}100 - 1{,}120)^2 + 0.2(1{,}200 - 1{,}120)^2 + 0.1\,(1{,}400 - 1{,}120)^2]^{/2}$$
$$= [0.3\,(14{,}400) + 0.4\,(400) + 0.2\,(6{,}400) + 0.1\,(78{,}400)]^{1/2}$$
$$= [4{,}320 + 160 + 1{,}280 + 7{,}840]^{1/2}$$
$$= [13{,}600]^{1/2} = \text{Rs } 116.6$$

(b) 10 equity shares of Cox Limited can be bought for Rs 1,000. The probability distribution of overall return, when 10 equity shares of Cox Limited are purchased will be as follows:

Economic condition	*Overall return*	*Probability*
High growth	10(150) = Rs 1,500	0.3
Low growth	10(130) = Rs 1,300	0.4
Stagnation	10(90) = Rs 900	0.2
Recession	10(60) = Rs 600	0.1

The expected return is:

$$0.3\,(1{,}500) + 0.4\,(1{,}300) + 0.2\,(900) + 0.1(600) = 450 + 520 + 180 + 60$$
$$= \text{Rs } 1{,}210$$

The standard deviation of return is:

$$[0.3(1{,}500 - 1{,}210)^2 + 0.4\,(1{,}300 - 1{,}210)^2 + 0.2(900 - 1{,}210)^2 + 0.1\,(600 - 1{,}210)^2]^{1/2}$$
$$= [0.3\,(84{,}100) + 0.4\,(8{,}100) + 0.2\,(96{,}100) + 0.1\,(372{,}100)]^{1/2}$$
$$= [25{,}230 + 3{,}240 + 19{,}220 + 37{,}210]^{1/2}$$
$$= [84{,}900]^{1/2} = \text{Rs } 291.4$$

(c) If Rs. 500 each are invested in the equity stocks of Box Limited and Cox Limited, 5 shares will be bought of each company. The probability distribution of overall return on this portfolio will be as follows:

Economic condition	*Overall return*	*Probability*
High growth	5(100) + 5(150) = Rs 1,250	0.3
Low growth	5(110) + 5(130) = Rs 1,200	0.4
Stagnation	5(120) + 5(90) = Rs 1,050	0.2
Recession	5(140) + 5(60) = Rs 1,000	0.1

The expected return is:

$$0.3\ (1{,}250) + 0.4\ (1{,}200) + 0.2(1{,}050) + 0.1(1{,}000)$$
$$= 375 + 480 + 210 + 100$$
$$= \text{Rs } 1{,}165$$

The standard deviation of return is:

$$[0.3(1{,}250 - 1{,}165)^2 + 0.4\ (1{,}200 - 1{,}165)^2 + 0.2(1{,}050 - 1{,}165)^2 + 0.1\ (1{,}000 - 1{,}165)^2]^{1/2}$$
$$= [0.3(7{,}225) + 0.4\ (1{,}225) + 0.2\ (13{,}225) + 0.1\ (27{,}225)]^{1/2}$$
$$= [2167.5 + 490 + 2{,}645 + 2{,}722.5]^{1/2}$$
$$= [8{,}025]^{1/2} = \text{Rs } 89.6$$

2. The returns of two assets under four possible states of nature are given below:

State of nature	*Probability*	*Return on asset 1*	*Return on asset 2*
1	0.10	5%	0%
2	0.30	10%	8%
3	0.50	15%	18%
4	0.10	20%	26%

a. What is the standard deviation of the return on asset 1? asset 2?
b. What is the covariance between the returns on assets 1 and 2?
c. What is the coefficient of correlation between the returns on assets 1 and 2?

Solution

(a) The expected return on assets 1 and 2 are:

$$E(R_1) = 0.1\ (5\%) + 0.3\ (10\%) + 0.5\ (15\%) + 0.1\ (20\%)$$
$$= 13\%$$
$$E(R_2) = 0.1\ (0\%) + 0.3\ (8\%) + 0.5\ (18\%) + 0.1\ (26\%)$$
$$= 14\%$$

The standard deviation of the returns on assets 1 and 2 are:

$$\sigma_1 = [0.1\ (5 - 13)^2 + 0.3\ (10 - 13)^2 + 0.5\ (15 - 13)^2 + 0.1\ (20 - 13)^2]^{1/2} = 4\%$$
$$\sigma_2 = [0.1\ (0 - 14)^2 + 0.3\ (8 - 14)^2 + 0.5\ (18 - 14)^2 + 0.1\ (26 - 14)^2]^{1/2}$$
$$= [19.6 + 10.8 + 8 + 14.4]^{1/2} = 7.27\%$$

(b) The covariance between the returns on assets 1 and 2 is calculated below:

State of nature (1)	Probability (2)	Return on asset 1 (3)	Deviation of the return on asset 1 from its mean (4)	Return on asset 2 (5)	Deviation of the return on asset 2 from its mean (6)	Product of deviations times Probability (7)
1	0.10	5%	– 8%	0%	– 14%	11.2
2	0.30	10%	– 3%	8%	– 6%	5.4
3	0.50	15%	2%	18%	4%	4
4	0.10	20%	7%	26%	12%	8.4

Sum = 29.0

Thus the covariance between the returns of the two assets is 29.0.

(c) The coefficient of correlation between the returns on assets 1 and 2 is:

$$\frac{\text{Covariance}_{12}}{\sigma_1 \times \sigma_2} = \frac{29}{4 \times 7.27} = 0.997$$

3. A portfolio consists of 3 securities, 1, 2, and 3. The proportions of these securities are: $w_1 = 0.3$, $w_2 = 0.5$, and $w_3 = 0.2$. The standard deviations of returns on these securities (in percentage terms) are: $\sigma_1 = 6$, $\sigma_2 = 9$, and $\sigma_3 = 10$. The correlation coefficients among security returns are $\rho_{12} = 0.4$, $\rho_{13} = 0.6$, $\rho_{23} = 0.7$. What is the standard deviation of portfolio return?

Solution

$$\sigma_p = [w^2_1\,\sigma^2_1 + w^2_2\,\sigma^2_2 + w^2_3\,\sigma^2_3 + 2\,w_1\,w_2\,\rho_{12}\,\sigma_1\,\sigma_2 + 2\,w_1\,w_3\,\rho_{13}\,\sigma_1\,\sigma_3 + 2\,w_2\,w_3\,\rho_{23}\,\sigma_2\,\sigma_3]^{1/2}$$

$$= [0.3^2 \times 6^2 + 0.5^2 \times 9^2 + 0.2^2 \times 10^2 + 2 \times 0.3 \times 0.5 \times 0.4 \times 6 \times 9 + 2 \times 0.3 \times 0.2 \times 0.6 \times 6 \times 10 + 2 \times 0.5 \times 0.2 \times 0.7 \times 9 \times 10]^{1/2}$$

$$= [\,3.24 + 22.75 + 4 + 6.48 + 4.32 + 12.6\,]^{1/2} = 7.31\%$$

4. Assume that a group of securities has the following characteristics: (a) the standard deviation of each security is equal to σ_A and (b) covariance of returns σ_{AB} is equal for each pair of securities in the group. What is the portfolio variance for a portfolio containing four securities which are equally weighted?

Solution

$$\sigma_p^2 = [w_A{}^2\,\sigma_A{}^2 + w_B{}^2\,\sigma_B{}^2 + w_C{}^2\,\sigma_C{}^2 + w_D{}^2\,\sigma_D{}^2 + 2\,w_A\,w_B\,\sigma_{AB} + 2\,w_A\,w_C\,\sigma_{AC} + 2\,w_A\,w_D\,\sigma_{AD} + 2\,w_B\,w_C\,\sigma_{BC} + 2\,w_B\,w_D\,\sigma_{BD} + 2\,w_C\,w_D\,\sigma_{CD}]$$

Since $\sigma_A = \sigma_B = \sigma_C = \sigma_D$

and $\sigma_{AB} = \sigma_{AC} = \sigma_{AD} = \sigma_{BC} = \sigma_{BD} = \sigma_{CD}$

and $w_A = w_B = w_C = w_D$

we get

$$\sigma^2_P = [w_A{}^2\,\sigma_A{}^2 + w_A{}^2\,\sigma_A{}^2 + w_A{}^2\,\sigma_A{}^2 + w_A{}^2\,\sigma_A{}^2 + 2\,w_A{}^2\,\sigma_{AB} + 2\,w_A{}^2\,\sigma_{AB} + 2\,w_A{}^2\,\sigma_{AB} + 2\,w_A{}^2\,\sigma_{AB} + 2\,w_A{}^2\,\sigma_{AB} + 2\,w_A{}^2\,\sigma_{AB}]$$

$$= 4\,w_A{}^2\,\sigma_A{}^2 + 12\,w_A{}^2\,\sigma_{AB}.$$

5. Consider two stocks, P and Q

	Expected return (%)	*Standard deviation (%)*
Stock P	16%	25%
Stock Q	18%	30%

The returns on the two stocks are perfectly negatively correlated.
What is the expected return of a portfolio constructed to drive the standard deviation of portfolio return to zero?

Solution

The weights that drive the standard deviation of portfolio to zero, when the returns are perfectly negatively correlated, are

$$w_p = \frac{\sigma_Q}{\sigma_P + \sigma_Q} = \frac{30}{25 + 30} = 0.545$$

The expected return of the portfolio is:

$$0.545 \times 16\% + 0.455 \times 18\% = 16.91\%$$

6. The following information is available.

	Stock A		*Stock B*
Expected return	16%		12%
Standard deviation	15%		8%
Coefficient of correlation		0.60	

(a) What is the covariance between stocks A and B?

(b) What is the expected return and risk of a portfolio in which A and B have weights of 0.6 and 0.4.

Solution

(a) Covariance (A, B) $= \rho_{AB} \times \sigma_A \times \sigma_B$

$= 0.60 \times 15 \times 8 = 72$

(b) Expected return $= 0.6 \times 16 + 0.4 \times 12 = 14.4\%$

Risk (standard deviation) $= [w_A{}^2 \sigma_A{}^2 + w_B{}^2 \sigma_B{}^2 + 2\, w_A w_B \,\text{Cov}\,(A, B)]^{1/2}$

$= [\,0.6^2 \times 225 + 0.4^2 \times 64 + 2 \times 0.6 \times 0.4 \times 72]^{1/2}$

$= 11.22\%$

PROBLEMS

1. The returns of two assets under four possible states of nature are given below:

State of nature	*Probability*	*Return on asset 1*	*Return on asset 2*
1	0.20	– 5%	10%
2	0.30	15%	12%
3	0.40	18%	14%
4	0.10	22%	18%

   a. What is the standard deviation of the return on asset 1 and on asset 2?
   b. What is the covariance between the returns on assets 1 and 2?
   c. What is the coefficient of correlation between the returns on assets 1 and 2?

2. The stock of Alpha Company performs well relative to other stocks during recessionary periods. The stock of Beta Company, on the other hand, does well during growth periods. Both the stocks are currently selling for Rs 50 per share. The rupee return (dividend plus price change) of these stocks for the next year would be as follows:

	Economic condition			
	High growth	Low growth	Stagnation	Recession
Probability	0.3	0.3	0.2	0.2
Return on Alpha stock	55	50	60	70
Return on Beta stock	75	65	50	40

   Calculate the expected return and standard deviation of:
   a. Rs 1,000 invested in the equity stock of Alpha;
   b. Rs 1,000 invested in the equity stock of Beta;
   c. Rs 500 invested in the equity stock of Alpha and Rs 500 in the equity stock of Beta;
   d. Rs 700 invested in the equity stock of Alpha and Rs 300 in the equity of Beta.
   Which of the above four options would you choose? Why?

3. The returns of four stocks, *A, B, C,* and *D* over a period of six years have been as follows:

	1	2	3	4	5	6
A	10 %	12 %	– 8 %	15 %	– 2 %	20 %
B	8 %	4 %	15 %	12 %	10 %	6 %
C	7 %	8 %	12 %	9 %	6 %	12 %
D	9 %	9 %	11 %	4 %	8 %	16 %

   Calculate the return on:
   a. a portfolio of one stock at a time
   b. portfolios of two stocks at a time
   c. portfolios of three stocks at a time.
   d. a portfolio of all the four stocks.
   Assume equiproportional investment.

4. A portfolio consists of four securities, 1, 2, 3, and 4. The proportions of these securities are : w_1=0.2, w_2=0.3, w_3=0.4, and w_4=0.1. The standard deviations of returns on these securities (in percentage terms) are : σ_1=4, σ_2=8, σ_3=20, and σ_4=10. The correlation

coefficients among security returns are : ρ_{12}=0.3, ρ_{13}=0.5, ρ_{14}=0.2, ρ_{23}=0.6, ρ_{24}=0.8, and ρ_{34}=0.4. What is the standard deviation of portfolio return ?

5. Assume that a group of securities has the following characteristics: (a) the standard deviation of each security is equal to σ_A; (b) covariance of returns σ_{AB} is equal for each security pair in the group. Calculate the portfolio variance for two portfolios: (i) A portfolio containing three securities which are equally weighted. (ii) A portfolio containing nine securities which are equally weighted.
6. Which of the following portfolios constitute the efficient set:

Portfolio	*Expected return (%)*	*Standard deviation (%)*
1	11	21
2	14	24
3	9	15
4	8	14
5	10	20
6	16	32
7	12	21
8	14	28

7. Consider two stocks, *A* and *B*

	Expected return (%)	*Standard deviation (%)*
Stock *A*	14 %	22 %
Stock *B*	20 %	35 %

The returns on the stocks are perfectly negatively correlated.
What is the expected return of a portfolio comprising of stocks *A* and *B* when the portfolio is constructed to drive the standard deviation of portfolio return to zero?

8. The following information is available.

	Stock P	*Stock Q*
Expected return	14%	20%
Standard deviation	25%	40%
Coefficient of correlation	0.40	

a. What is the covariance between stocks *P* and *Q*?
b. What is the expected return and risk of a portfolio in which *P* and *Q* are equally weighted?

Chapter **8**

Capital Asset Pricing Model and Arbitrage Pricing Theory

The Risk Reward Relationship

LEARNING OBJECTIVES

After studying this chapter, you should be able to:

- Explain the capital market relationship and the security market line relationship.
- Develop the inputs required for applying the capital asset pricing model.
- Calculate the beta of a security.
- Describe the procedure used by researchers to test the capital asset pricing model.
- Discuss the return generating process and the equilibrium risk-return relationship according to the arbitrage pricing theory.

Harry Markowitz developed an approach that helps an investor to achieve his optimal portfolio position. Hence, portfolio theory, in essence, has a normative character as it prescribes what a rational investor should do.

William Sharpe[1] and others asked the follow-up question: If rational investors follow the Markowitzian prescription, what kind of relationship exists between risk and return? Essentially, the capital asset pricing model (CAPM) developed by them is an exercise in positive economics. It is concerned with two key questions:

- What is the relationship between risk and return for an efficient portfolio?
- What is the relationship between risk and return for an individual security?

The CAPM, in essence, predicts the relationship between the risk of an asset and its expected return. This relationship is very useful in two important ways. First, it produces a benchmark for evaluating various investments. For example, when we are analysing a security we are interested in knowing whether the expected return from it is in line with its fair return as per the CAPM. Second, it helps us to make an informed guess about the return that can be expected from an asset that has not yet been traded in the market. For example, how should a firm price its initial public offering of stock?

Although the empirical evidence on the CAPM is mixed, it is widely used because of the valuable insight it offers and its accuracy is deemed satisfactory for most practical

[1] W. Sharpe, "Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk," *The Journal of Finance*, (September 1964).

applications. No wonder, the CAPM is a centrepiece of modern financial economics and William Sharpe, its principal originator, was awarded the Nobel Prize in Economics.

This chapter discusses various aspects of the CAPM, explains the basics of arbitrage pricing theory (APT) and multifactor models which have been proposed as an alternative to the CAPM, and finally describes the stock market as a complex adaptive system.

8.1 CAPITAL ASSET PRICING MODEL (CAPM)

Basic Assumptions

The CAPM is based on the following assumptions:

- Individuals are risk averse.
- Individuals seek to maximise the expected utility of their portfolio over a single period planning horizon.
- Individuals have homogeneous expectations—they have identical subjective estimates of the means, variances, and covariances among returns.
- Individuals can borrow and lend freely at a riskless rate of interest.
- The market is perfect: there are no taxes; there are no transactions costs; securities are completely divisible; the market is competitive.
- The quantity of risky securities in the market is given.

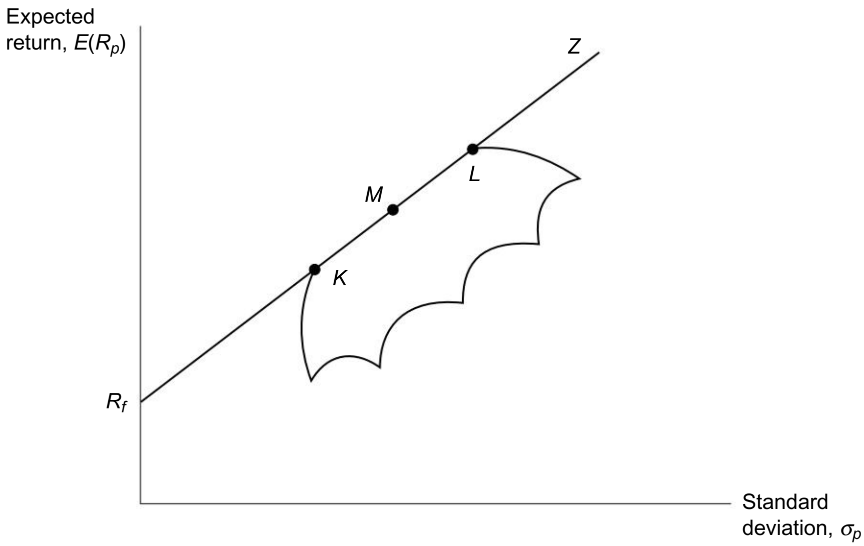
Looking at these assumptions, one may feel that the CAPM is unrealistic. However, the value of a model depends not on the realism of its assumption, but on the validity of its conclusions. Extensive empirical analysis suggests that there is some merit in the CAPM.

Capital Market Line

In our discussion of portfolio theory, we learnt that rational investors would choose a combination of R_f and S (S represents the point on the efficient frontier of risky portfolios where the straight line emanating from R_f is tangential to the efficient frontier). If all investors attempt to purchase the securities in S and ignore securities not included in S, prices of securities would be revised. On the one hand, prices of securities included in S would rise and hence their expected returns will fall. This would shift S, along with other points which share securities with S, downward: On the other hand, prices of securities not included in S will fall, leading to an increase in their expected return. Consequently, points representing portfolios in which these securities are included will shift upward. As this process continues, the efficient frontier of risky securities will flatten as shown in Exhibit 8.1. Finally, the set of prices reached would be such that every security will enter at least one portfolio on the linear segment KML. Of course, the market portfolio would itself be a point on that linear segment.

Portfolios which have returns that are perfectly positively correlated with the market portfolio are referred to as efficient portfolios. Obviously, these are portfolios that lie on the linear segment.

Exhibit 8.1 ***Adjustment of the Efficient Frontier***



For efficient portfolios (which includes the market portfolio) the relationship between risk and return is depicted by the straight line $R_f\,MZ$. The equation for this line, called the capital market line (CML), is:

$$E(R_j) = R_f + \lambda\sigma_j \tag{8.1}$$

where $E(R_j)$ is the expected return on portfolio j, R_f is the risk-free rate, λ is the slope of the capital market line, and σ_j is the standard deviation of portfolio j.

Given that the market portfolio has an expected return of $E(R_M)$ and standard deviation of σ_M, the slope of the CML can be obtained as follows :

$$\lambda = \frac{E(R_M) - R_f}{\sigma_M} \tag{8.2}$$

where λ, the slope of the CML, may be regarded as the "price of risk" in the market.

Security Market Line

As discussed above, as far as efficient portfolios are concerned, there is a simple linear relationship between the expected return and standard deviation. What about individual securities and inefficient portfolios? Typically, the expected return and standard deviation for individual securities will be below the CML, reflecting the inefficiency of undiversified holdings. Further, such points would be found throughout the feasible region with no well-defined relationship between their expected return and standard deviation. However, there is a linear relationship between their expected return and their covariance with the market portfolio. This relationship, called the *security market line* (SML), is as follows:

$$E(R_i) = R_f + \left(\frac{E(R_M) - R_f}{\sigma_M^2}\right)\sigma_{iM} \tag{8.3}$$

where $E(R_i)$ is the expected return on security i, R_f is the risk-free return, $E(R_M)$ is the expected return on market portfolio, σ^2_M is the variance of return on market portfolio, and σ_{iM} is the covariance of returns between security i and market portfolio.

In words, the SML relationship says:

Expected return on security i = Risk-free return + (Price per unit of risk) Risk

The price per unit of risk is : $\dfrac{E(R_M) - R_f}{\sigma_M^2}$

The measure of risk is: σ_{iM}

In Equation (8.3), the risk of a security is expressed in terms of its covariance with the market portfolio, σ_{iM}.

Can we find a standardised measure of risk? Fortunately, we can find a standardised measure of systematic risk, popularly called beta (β), by taking advantage of the relationship

$$\beta_i = \frac{\sigma_{iM}}{\sigma_M^2} \tag{8.4}$$

β_i reflects the slope of a linear regression relationship in which the return on security i is regressed on the return on the market portfolio.

Thus, the SML is popularly expressed as

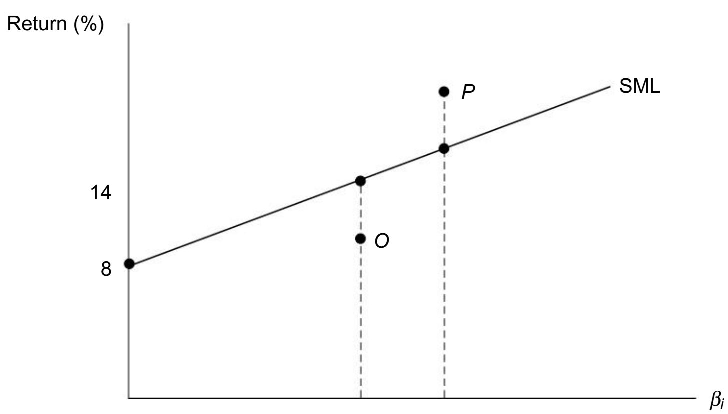
$$E(R_i) = R_f + [E(R_M) - R_f]\beta_i \tag{8.5}$$

In words, the SML relationship says:

Expected return on security i	=	Risk-free return	+	Market risk premium	×	Beta of security i

The SML which reflects the expected return-beta relationship is shown in Exhibit 8.2. Note that the slope of the SML is the market risk premium.

Exhibit 8.2 ***The Security Market Line***



Assets which are fairly priced plot exactly on the SML. Underpriced securities (such as *P*) plot above the SML, whereas overpriced securities (such as *O*) plot below the SML. The difference between the actual expected return on a security and its fair return as per the SML is called the security's *alpha*, denoted by α.

Example The risk-free rate is 8 percent and the expected return on the market portfolio is 14 percent. The beta of stock *Q* is 1.25. Investors believe that the stock will provide an expected return of 17 percent.

The fair return[2] as per the SML is:

$$R_Q = 8 + 1.25\ (14 - 8) = 15.5\%$$

The alpha of the stock is

$$17 - 15.5 = 1.5\%$$

Relationship between SML and CML

Note that the CML relationship is a special case of the SML relationship. This point may be demonstrated as follows:

As per the SML

$$E(R_i) = R_f + \left(\frac{E(R_M) - R_f}{\sigma_M^2}\right)\sigma_{iM} \tag{8.3}$$

Since $\sigma_{iM} = \rho_{iM}\,\sigma_i\sigma_M$, Eq. (8.3) can be re-written as:

$$E(R_i) = R_f + \left(\frac{E(R_M) - R_f}{\sigma_M}\right)\rho_{iM}\,\sigma_i \tag{8.6}$$

If the returns on *i* and *M* are perfectly correlated (this is true for efficient portfolios), Eq. (8.6) becomes:

$$E(R_i) = R_f + \left(\frac{E(R_M) - R_f}{\sigma_M}\right)\sigma_i \tag{8.7}$$

This is nothing but the CML. Hence the CML is a special case of the SML.

8.2 INPUTS REQUIRED FOR APPLYING CAPM

To apply the CAPM, you need estimates of the following factors that determine the CAPM line:

[2] This is the return stipulated by the SML.

- Risk-free rate
- Market risk premium
- Beta

Risk-free Rate

The risk-free rate is the return on a security (or a portfolio of securities) that is free from default risk and is uncorrelated with returns from anything else in the economy. Theoretically, the return on a zero-beta portfolio is the best estimate of the risk-free rate. Constructing zero-beta portfolios, however, is costly and complex. Hence, they are often unavailable for estimating the risk-free rate.

In practice, two alternatives are commonly used:

- The rate on a short-term government security like the 364-days Treasury bill.
- The rate on a long-term government bond that has a maturity of 15 to 20 years.

Both the alternatives have their advantages and limitations. The choice may depend largely on the judgment of the analyst.

Market Risk Premium

The risk premium used in the CAPM is typically based on historical data. It is calculated as the difference between the average return on stocks and the average risk-free rate. Two measurement issues have to be addressed in this context: How long should the measurement period be? Should arithmetic mean or geometric mean be used?

The answer to the first question is: Use the longest possible historical period, absent any trends in risk premium over time.

Practitioners seem to disagree over the choice of arithmetic mean versus geometric mean. The arithmetic mean is the average of the annual rates of return over the measurement period whereas the geometric mean is the compounded annual return over the measurement period. The difference between the two may be illustrated with a simple example where we have two years of returns:

Year	*Price*	*Return*
0	100	
1	180	80%
2	135	−25%

The arithmetic mean over the two years is 27.5% [(80 – 25)/2], whereas the geometric mean is only 16.2% ($1.35^{0.5} - 1 = 0.162$). The advocates of arithmetic mean argue that it is more consistent with the mean-variance framework and can better predict the premium in the next period. The votaries of geometric mean argue that it takes into account compounding and can better predict the average premium in the long term. It appears that the arithmetic mean is more appropriate.

What Drives the Market Risk Premium? Three factors seem to influence the market risk premium, in the main:

Variance in the Underlying Economy If the underlying economy is more volatile, the market risk premium is likely to be large. For example, the market risk premiums for emerging markets, given their high-growth and high-risk economies, are larger than the market risk premiums for developed markets.

Political Risk Market risk premiums are larger in markets subject to higher political instability. Remember that political instability causes economic uncertainty.

Market Structure If the companies listed on the market are mostly large, stable, and diversified, the market risk premium is smaller. On the other hand, if the companies listed on the market are generally small and risky, the market risk premium is larger.

According to Aswath Damodaran,[3] in developed markets with limited listings and stable economies (Examples: Germany and Switzerland) the market risk premium over the government bond rate may be 3.5 to 4.5 percent; on the other hand in emerging markets with political risk (Examples: China and Russia) the market risk premium may be 7.5 to 9.5 percent.

The above figures are fairly reflective of the general view of finance academics and practitioners, which is perhaps derived largely from the experience in the US. A different view has been expressed by Elroy Dimson, Paul March, and Michael Stanton in a book titled *Triumph of the Optimists* published in 2001. They looked at equity returns for 16 rich countries using newly gathered data going back to 1900. They estimated that the global historical equity premium for the 20th century was 4.6 percent and they have argued that the best estimate of equity premium worldwide in future is 4 to 5 percent.

Beta

The beta of an investment *i* is the slope of the following regression relationship:

[3] Aswath Damodaran, *Corporate Finance: Theory and Practice*, New York: John Wiley & Sons Inc., 1997.

$$R_{it} = \alpha_i + \beta_i R_{Mt} + e_{it} \qquad (8.8)[4]$$

where R_{it} is the return on investment i (a project or a security) in period t, R_{Mt} is the return on the market portfolio in period t, α_i is the intercept of the linear regression relationship between R_{it} and R_{Mt} (α is pronounced as alpha), β_i is the slope of the linear regression relationship between R_{it} and R_{Mt} (β is pronounced as beta)

The variance of R_{it} as per Eq. (8.8) is:

$$\text{Var}(R_{it}) = \beta_i^2 \sigma_M^2 + \text{Var}(e_{it}) \qquad (8.9)[5]$$

Examining Eq. (8.9), we find that the total risk associated with investment i, as measured by its variance, is the sum of two components: (i) The risk associated with the responsiveness of the return of the investment to market index: $\beta_i^2\sigma_M^2$ and (ii) The risk associated with the error term: Var(e_{it}). The first component represents the systematic risk and the second, unsystematic risk. Systematic risk stems from economy-wide factors which have a bearing on the fortunes of all firms whereas unsystematic risk emanates from firm-specific factors. While systematic risk cannot be diversified away, unsystematic risk can be. Hence, the relevant risk, as per the CAPM, is the systematic risk. It is also referred to as non-diversifiable risk or market risk.

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[4] In this regression model, the following properties are usually assigned to the error term e_{it}. It has an expected value of zero and a finite variance:

$$E(e_{it}) = 0$$

$$\text{Var}(e_{it}) = Q^2 \text{ (a finite term)}$$

It is not correlated with the return on the market portfolio:

$$\text{Cov}(e_{it}, R_{Mt}) = 0$$

It is not serially correlated over time:

$$\text{Cov}(e_{it}, e_{i,t+n}) = 0 \text{ for all values of } n$$

In addition to these assumptions, commonly made in regression models, the capital asset pricing model is based on the assumption that the error term for i is not correlated with the error term for any other. This means:

$$\text{Cov}(e_{it}, e_{jt}) = 0$$

[5] Eq. (8.9) is derived as follows:

$$\begin{aligned}
\text{Var}(R_{it}) &= \text{Var}(\alpha_i + \beta_i R_{Mt} + e_{it}) = E[\alpha_i + \beta_i R_{Mt} + e_{it} - E(\alpha_i + \beta_i R_{Mt} + e_{it})]^2 \\
&= E[\alpha_i + \beta_i R_{Mt} + e_{it} - \alpha_i - \beta_i E(R_{Mt})]^2 = E[(\beta_i (R_{Mt} - E(R_{Mt})) + e_{it}]^2 \\
&= E[\beta^2_i (R_{Mt} - E(R_{Mt}))^2 + e^2_{it} + 2\beta_i (R_{Mt} - E(R_{Mt}))\, e_{it}] \\
&= E(\beta_i)^2 E(R_{Mt} - E(R_{Mt}))^2 + E(e_{it}^2) + 2E(\beta_i) E(R_{Mt} - E(R_{Mt})) E(e_{it}) \\
&= \beta_i^2 \sigma_M^2 + \text{Var}(e_{it}) + 0 = \beta_i^2 \sigma_M^2 + \text{Var}(e_{it})
\end{aligned}$$

To measure the systematic risk of a stock, we have to calculate the slope of the regression Eq. (8.8). The estimate of the slope of the regression model is:

$$\beta_i = \frac{\sigma_{iM}}{\sigma_M^2} \tag{8.10}$$

where β_i is the estimate of the slope in the regression model, σ_{iM} is the covariance between the return on stock i and the return on the market portfolio, and σ^2_M is the variance of the return on market portfolio.

The calculation of beta may be illustrated with an example. The rates of return on stock A and the market portfolio for 15 periods are given below:

Period	*Return on stock A (%)*	*Return on market portfolio (%)*	*Period*	*Return on stock A (%)*	*Return on market portfolio M (%)*
1	10	12	9	– 9	1
2	15	14	10	14	12
3	18	13	11	15	– 11
4	14	10	12	14	16
5	16	9	13	6	8
6	16	13	14	7	7
7	18	14	15	– 8	10
8	4	7			

What is the beta for stock A? The beta of stock A is equal to:

$$\frac{\text{Cov}\left(R_A, R_M\right)}{\sigma_M^2}$$

The inputs required for calculating beta are drawn from Exhibit 8.3

$$\text{Cov }(R_A , R_M) = \frac{\sum \left(R_A - \bar{R}_A\right)\left(R_M - \bar{R}_M\right)}{n-1} = \frac{221}{14} = 15.79$$

$$\sigma_M{}^2 = \frac{\sum \left(R_M - \bar{R}_M\right)^2}{n-1} = \frac{624}{14} = 44.57$$

So, the beta for stock A is 15.79 / 44.57 = 0.354.

Note that when covariance and variance are calculated on the basis of a sample of observed returns, the divisor is $n - 1$ not n. The reason for subtracting 1 is to correct for what is technically called the loss of 1 degree of freedom.

Exhibit 8.3 ***Calculation of Beta***

Period	Return on stock A, R_A	Return on market portfolio, R_M	Deviation of return on stock A from its mean, $(R_A - \bar{R}_A)$	Deviation of return on market portfolio from its mean, $(R_M - \bar{R}_M)$	Product of the deviations, $(R_A - \bar{R}_A)(R_M - \bar{R}_M)$	Square of the deviation of return on market portfolio from its mean, $(R_M - \bar{R}_M)^2$
1	10	12	0	3	0	9
2	15	14	5	5	25	25
3	18	13	8	4	32	16
4	14	10	4	1	4	1
5	16	9	6	0	0	0
6	16	13	6	4	24	16
7	18	14	8	5	40	25
8	4	7	–6	–2	12	4
9	– 9	1	–19	–8	152	64
10	14	12	4	3	12	9
11	15	–11	5	–20	–100	400
12	14	16	4	7	28	49
13	6	8	–4	–1	4	1
14	7	7	–3	–2	6	4
15	– 8	10	–18	1	–18	1
	$\Sigma R_A = 150$ $\bar{R}_A = 10$	$\Sigma R_M = 135$ $\bar{R}_M = 9$			$\Sigma(R_A - \bar{R}_A)(R_M - \bar{R}_M) = 221$	$\Sigma(R_M - \bar{R}_M)^2 = 624$

Estimation Issues In setting up the regression relation described above, the analyst has to decide on the length of the estimation period, the return interval, and the choice of the market index.

Estimation Period A longer estimation period provides more data but the risk profile of the firm may change over that period. Given this tradeoff most analysts regard a 5-year period to be reasonable.

Return Interval Returns may be calculated on an annual, monthly, weekly, or daily basis. Using daily returns increases the number of observations, but introduces a bias due to nontrading. Hence analysts prefer weekly or monthly returns to reduce nontrading bias.

Market Index The standard practice is to estimate the beta of a stock in relation to the index of the market to which it belongs. Thus, the betas of Indian stocks are estimated relative to Nifty index (or any other Indian stock market index) and the betas of US stocks are estimated relative to S & P 500 index (or any other US market index). While this practice provides an acceptable measure of risk for a parochial investor, it may not be appropriate for an international investor.

Adjusting Historical Beta The beta calculated above reflects a measure of historical alignment of the price of a stock with that of the market. Hence many regard it as a "measurement" of past relationship that cannot be naively used as an "estimate" of future risk. Why? Two reasons are commonly given:

- The historical alignment may have been significantly influenced by chance factors.
- A company's beta may change over time.

To overcome these limitations, some adjustment may be required. A procedure that is sometimes recommended is to take a weighted average of the historical beta, on the one hand, and 1.0 (the value of market beta) on the other. The weighting scheme should take into account the degree of historical estimation error and the dispersion of individual firms around the average. If the historical estimation error is large, the weight assigned to the historical beta should be small. If the dispersion of individual firms around the average is large, the weight assigned to 1.00 (the market beta) should be small. By balancing these factors, a suitable weighting scheme can be developed. Note that Merill Lynch, in its beta prediction, assigns a weight of 0.66 to historical beta and a weight of 0.34 to average value (see Merill Lynch's booklet *Security Risk Evaluation Service*).

Other Approaches to Beta Estimation

As described above, the standard approach for estimating betas requires information on market prices. Hence this approach cannot be applied easily to assets which are not traded, or to assets which have been traded only for a short period, or to assets subject to a lot of manipulative trading that casts doubt over the quality of market price information. To cope with these situations, analysts try to get a handle over beta by looking at fundamental factors, or accounting earnings, or cross-sectional regression relationship for traded companies.

Betas Based on Fundamental Information Can fundamental information be used for predicting betas? Based on the research done by Rosenberg and others, the answer seems to be "yes". Applying complex econometric analysis, Rosenberg and others have devised methods for predicting betas largely on the basis of the fundamental operating and financial characteristics of the company. The key fundamental factors employed by them for predicting betas are given below:

Industry Affiliation Betas vary significantly across industries. These differences are primarily attributable to variations in business risks across industries.

Corporate Growth Corporate growth and beta are correlated. The stronger the growth orientation, the higher the beta is likely to be.

Earnings Variability The greater the variability of earnings over time, the higher the beta is likely to be.

Financial Leverage The greater the financial leverage, the higher the beta is likely to be.

Size The larger the size of a company, the smaller the beta is likely to be.

It appears that fundamental betas have several advantages over historical (market-generated) betas:

- Fundamental betas have a stronger intuitive appeal as the rules for predicting them are consistent with our general understanding of what makes a company risky.
- Fundamental betas are ideal for the analysis of non-trading assets like individual projects, strategic business units, and corporate divisions as the price behaviour for such assets is not available.
- Fundamental betas, in general, seem to outperform historical betas.
- Fundamental betas can be based on future descriptors, whereas historical betas necessarily require past data (for example, a firm's growth orientation can be estimated using revenue projections).

Betas Based on Accounting Earnings One can estimate the beta of a company (or a division or a project) by using accounting earnings rather than traded prices. This involves regressing the changes in company earnings (on a quarterly or annual basis) against changes in the earnings for the market (the aggregate earnings of all the companies included in a market index which is used as the proxy for the market).

Although this approach is intuitively appealing, it suffers from three possible limitations:

- Accounting earnings are generally smoothed out, relative to the value of the company. This results in betas which have an upward bias (for risky firms) or downward bias (for safer firms).
- Accounting earnings are influenced by non-operating factors like extraordinary gains or losses and changes in accounting policy with respect to depreciation, inventory valuation, and so on.
- Compared to stock prices which are observed on a daily basis, accounting earnings are measured at less frequent intervals (yearly or at most quarterly). This means that regression analysis using accounting data will have fewer observations and have lesser power.

Betas from Cross-sectional Regressions Yet another approach to estimate beta for unlisted companies or divisions or projects calls for cross-sectional regression analysis. It involves two steps:

Step 1: Estimate a cross-sectional regression relationship for publicly traded firms in which the dependent variable is beta and the independent variables are fundamental firm factors like growth rate, earnings variability, financial leverage, size, and dividend payout ratios, which seem to drive betas.

Step 2: Plug the specific characteristics of the project, division, or unlisted company in the regression relationship to arrive at an estimate of beta.

For example, the following is a regression relating the betas of *NYSE* and *AMEX* stocks in 1994 to four variables: coefficient of variation in operating income, debt-equity ratio, earnings growth, and total assets.

Beta = 0.6507 + 0.27 Coefficient of variation in operating income
+ 0.09 Debt/equity ratio + 0.54 Earnings growth
– 0.00009 Total assets (millions of dollars)

Suppose an unlisted firm has the following characteristics:

Coefficient of variation in operating income	=	1.85
Debt equity ratio	=	0.90
Earnings growth rate	=	12 percent
Total assets	=	$ 150 million

Plugging these values into the regression relation yields the following beta:

Beta = 0.6507 + 0.27 (1.85) + 0.09 (0.90) + 0.54 (0.12) – 0.00009 (150) = 1.2825

8.3 EMPIRICAL EVIDENCE ON CAPITAL ASSET PRICING MODEL

According to the CAPM, the expected return on a security is:

$$E(R_i) = R_f + \beta_i\,[\,E\,(R_M) - R_f\,] \tag{8.11}$$

The ideal way to test the CAPM would be to observe investors' expectations of betas and expected returns on individual securities and the market portfolio and then compare the expected return on each security with its return as predicted by CAPM. Unfortunately, this procedure is not very practical since information on investor expectations is very sketchy.

In practice, researchers have tested the CAPM using *ex post facto* data, rather than *ex ante* data. The commonly followed procedure involves three basic steps:

1. Set up the sample data
2. Estimate the security characteristic lines (SCLs)
3. Estimate the security market line (SML)

Set up the Sample Data Suppose you are looking at a sample of 75 securities over a period of 60 monthly holding periods (five years). For each of the 60 holding periods, you have to collect the rates of returns on 75 securities, a market portfolio proxy, and one-month (risk-free) Treasury bill. Your data set will thus consist of:

R_{it} : returns on 75 securities over the 60 month period (i = 1, 2 … 75 and t = 1, 2 … 60)
R_{Mt} : returns on a market portfolio proxy over the 60 month period
R_{ft} : risk-free rates over the 60 month period.

This constitutes a total of 77 × 60 = 4620 rates of return

Estimate the Security Characteristic Line You have to estimate the beta for each security in the sample. The beta for each security is simply the slope of its security characteristic line. There are two ways in which security beta is estimated:

$$R_{it} = a_i + b_i R_{Mt} + e_{it} \tag{8.12}$$

$$R_{it} - R_{ft} = a_i + b_i (R_{Mt} - R_{ft}) + e_{it} \tag{8.13}$$

Note that in Eq. (8.12) the return on security *i* is regressed on the return on the market portfolio, whereas in Eq. (8.13) the excess return on security *i* is regressed on the excess return on market portfolio. It appears that Eq. (8.13) is used more commonly.

Estimate the Security Market Line Once you have the beta estimates of various securities, you can estimate the security market line:

$$\bar{R}_i = \gamma_0 + \gamma_1 b_i + e_i \quad i = 1, \ldots 75 \tag{8.14}$$

Comparing Eqs (8.13) and (8.14) you can infer that if the CAPM holds:

- The relationship should be linear. This means that terms like b_i^2, if substituted for b_i, should not yield better explanatory power.
- γ_0, the intercept, should not be significantly different from the risk-free rate, $\bar{R}_f$.
- γ_1, the slope coefficient, should not be significantly different from $\overline{R_M - R_f}$.
- No other factors, such as company size or total variance, should affect $\bar{R}_i$.
- The model should explain a significant portion of variation in returns among securities.

Numerous empirical studies have been conducted to test the CAPM. Without going into the details of the individual studies, let us note the following general conclusions that emerge from these studies.

- The relation appears to be linear.
- In general γ_0 is greater than the risk-free rate and γ_1 is less than $\overline{R_M - R_f}$. This means that the actual relationship between risk (as measured by beta) and return is flatter than what the CAPM says.
- In addition to beta, some other factors, such as standard deviation of returns and company size, too have a bearing on return.
- Beta does not explain a very high percentage of the variance in return among securities.

While reviewing the empirical evidence, bear in mind two important problems. First, the studies use historical returns as proxies for expectations. This assumes that the expected returns will be the same as the realised returns. Second, the studies use a market index as a proxy for the market portfolio. Richard Roll[6] has argued persuasively that since the 'true' market portfolio (which in principle must include all assets—

[6] Richard Roll, "A Critique of Asset Pricing Theory's Tests," *Journal Financial Economics* (March 1977).

financial, real, as well as human—and not just equity stocks), cannot be measured, the CAPM cannot be tested.

Notwithstanding the problems mentioned above, the CAPM is the most widely used risk return model. As Nancy Nichols wrote in a 1993 *Harvard Business Review* article: "Yet even as the academic world debated whether beta was the appropriate measure of risk, the corporate world embraced it. CAPM is now taught in business schools and accepted in boardrooms across the country. Its assumptions, prescriptions, and calculations are embedded in countless computers nationwide". Its popularity may be attributed to the following factors:

- Some objective estimate of risk premium is better than a completely subjective estimate or no estimate.
- CAPM is a simple and intuitively appealing risk-return model. Its basic message that diversifiable risk does not matter is accepted by nearly every one.
- While there are plausible alternative risk measures, no consensus has emerged on what course to plot if beta is abandoned. It appears that the CAPM remains popular not because there is no competition, but because there is excess of it.

The situation perhaps may change as additional evidence is gathered in favour of arbitrage pricing theory and operational guidelines for applying that theory are developed further. As of now, however, the CAPM appears to be the model of choice in practice.

8.4 ARBITRAGE PRICING THEORY AND MULTIFACTOR MODELS

Arbitrage Pricing Theory

While the CAPM represents a seminal contribution to the field of finance, many empirical studies have pointed towards its deficiencies in explaining the relationship between risk and return.

A key challenge to the CAPM came from a set of studies that have suggested that it is possible to rely on certain firm or security characteristics and earn superior returns even after adjustment for risk as measured by beta. Examples: Banz[7] found that small cap stocks outperformed large cap stocks on a risk-adjusted basis; Basu[8] found that low P/E stocks outperformed high P/E stocks, after adjustment for risk; more recently, Fama and French[9] documented that "value stocks" (stocks with high book-to-market

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[7] R.W. Banz, "The Relationship between Return and Market Value of Common Stocks," *Journal of Financial Economics* (March 1981).

[8] S. Basu,"Investment Performance of Common Stocks in Relation to Their Price-Earnings Ratios: A Test of Efficient Market Hypothesis," *Journal of Finance* (June 1977).

[9] Eugene F. Fama and Kenneth French, "The Cross Section of Expected Stock Returns," *Journal of Finance* (June 1992).

price ratios) generated larger returns than "growth stocks" (stocks with low book-to-market ratios), on a risk-adjusted basis.

In an efficient market such return differentials should not exist. Does it mean that the markets are not particularly efficient for long periods of time? Or, does it mean that the markets are efficient but a single-factor model such as the CAPM does not capture risk adequately?

Since it is unlikely that markets are inefficient for extended periods of time, financial economists began looking for alternative risk-return models, beyond the CAPM. In the mid-1970s, Stephen Ross[10] developed an alternative model called the Arbitrage Pricing Theory (APT) which is reasonably intuitive, requires only limited assumptions, and allows for multiple risk factors.

The APT does not require the following assumptions (which undergird the CAPM): the utility functions of investors are quadratic; security returns are normally distributed; the market portfolio that contains all risky assets is mean-variance efficient.

The APT only assumes that the capital markets are perfectly competitive and that investors always prefer more wealth to less wealth with certainty.

Return Generating Process The APT assumes that the return on an asset is linearly related to a set of risk factors as shown below:

$$R_i = E(R_i) + b_{i1}I_1 + b_{i2}I_2 \ldots . b_{iK}I_K + e_i \tag{8.15}$$

where R_i is the actual return on asset i during a specified time period ($i = 1, 2, \ldots n$), $E(R_i)$ is the expected return on asset i if all the risk factors have zero changes, b_{ij} is the sensitivity of asset i's return to the common risk factor j, Ij ($j = 1, 2, \ldots k$) is the deviation of a systematic risk factor j from its expected value, and e_i is the random error term, unique to asset i.

Note that the expected value of each risk factor, I, is zero. Hence, the Ij's in Eq.(8.15) measure the deviation of each risk factor from its expected value.

What are the risk factors, $I_1 \ldots . I_K$, that have a bearing on asset returns? The APT does not specify these factors. It merely says asset returns are related in a linear manner to a limited number of systematic risk factors.

Equilibrium Risk-Return Relationship Given the return—generating process reflected in Eq. (8.15), the APT establishes an equilibrium risk-return relationship. The key idea that guides the development of the equilibrium relationship is the law of one price which says that two identical things cannot sell at different prices. Applied to portfolios, it means that two portfolios that have the same risk cannot offer different expected returns. If it were so, arbitrageurs will step in and their actions will ensure that the law of one price is satisfied.

The equilibrium relationship according to the APT is as follows:

$$E(R_i) = \lambda_0 + b_{i1}\lambda_1 + b_{i2}\lambda_2 + \ldots b_{ij}\lambda_j \tag{8.16}$$

[10] Stephen Ross, "The Arbitrage Theory of Capital Asset Pricing," *Journal of Economic Theory* (December 1976).

where $E(R_i)$ is the expected return on asset i, λ_0 is the expected return on an asset with zero systematic risk, b_{ij} is the sensitivity of asset i's return to the common risk factor j, and λ_j is the risk premium related to the jth risk factor.

Comparison of CAPM and APT

	CAPM	*APT*
Nature of relation	Linear	Linear
Number of risk factors	1	k
Factor risk premium	$[E(R_M) - R_f]$	λ_j
Factor risk sensitivity	β_i	b_{ij}
Zero-beta return	R_f	λ_0

Empirical Evidence Unlike the CAPM, the APT does not specify *a priori* what the underlying risk factors are. So, a test of APT calls for first discovering the basic risk factors by employing multivariate techniques like factor analysis and then examining whether these basic risk factors correspond to some economic or behavioral variables.

Empirical studies of this kind so far suggest that there is hardly any consistency in terms of (i) the number of basic factors, (ii) the interpretation that may be put on these factors (typically, the factors identified are artificial constructs representing several economic variables), and (iii) the stability of these factors from test to test.

• Multifactor Models

Given the practical difficulties in using the above approach, researchers have followed a different approach that captures the essence of the APT. In this approach, the researcher chooses *a priori* the exact number and identity of risk factors and specifies the **multifactor model** of the following kind.

$$R_{it} = a_i + [\, b_{it} F_{1t} + b_{i2} F_{2t} + \ldots.. + b_{ik} F_{kt} \,] + e_{it} \tag{8.17}$$

where R_{it} is the return on security i in period t and F_{1t} is the return associated with the j th risk factor in period t.

The advantage of a factor model like this is that the researcher can specify the risk factors; the disadvantage of such a model is that there is very little theory to guide it. Hence, developing a useful factor model is as much an art as science.

The variety of multifactor models employed in practice may be divided into two broad categories: macro-economic based risk factor models and micro-economic based risk factor models.

Macroeconomic Based Risk Factor Models These models consider risk factors that are macroeconomic in nature. Typical of this approach is the following model proposed by Chen, Roll, and Ross in their classic paper, "Economic Forces and the Stock Market," published in the April 1986 issue of *Journal of Business.*

$$R_{it} = a_i + b_{i1} R_{mt} + b_{i2} MP_t + b_{i3} DEI_t + b_{i4} UI_t + b_5 UPR_t + b_{i6} UTS_t + e_{it} \tag{8.18}$$

where R_m is the return on a value weighted index of NYSE–listed stocks, *MP* is the monthly growth rate in the US industrial production, *DEI* is the change in inflation, measured by the US consumer price index, *UI* is the difference between actual and expected levels of inflation, *UPR* is the unanticipated change in the bond credit spread (Baa yield—RFR), and *UTS* is the unanticipated term structure shift (long term RFR—short term RFR).

Microeconomic Based Risk Factor Models Instead of specifying risk in macroeconomic terms, you can delineate risk in microeconomic terms. Typical of this approach is the following model proposed by Fama and French in their celebrated paper "Common Risk Factors in the Returns on Stocks and Bonds," published in the January 1993 issue of the *Journal of Financial Economics:*

$$(R_{it} - RFR_t) = \alpha_i + b_{i1}\,(R_{mt} - RFR_t) + b_{i2}SMB_t + b_{i3}HML_t + e_{it} \tag{8.19}$$

In this model, in addition to $(R_{mt} - RFR_t)$, the excess return on a stock market portfolio, there are two other microeconomic risk factors: SMB_t and HML_t. SMB_t (i.e., small minus big) is the return to a portfolio of small capitalisation stocks less the return to a portfolio of large capitalisation stocks and HML_t (i.e., high minus low) is the return to a portfolio of stocks with high ratios of book-to-market values less the return to a portfolio of low book-to-market value stocks.

In this model, *SMB* is intended to capture the risk associated with firm size while *HML* is meant to reflect risk differentials associated with "growth" (i.e., low book-to-market ratio) and "value" (i.e., high book-to-market ratio).

Choice of Model Compared to the CAPM, multifactor models explain past returns better. However, when it comes to predicting expected returns, the evidence is ambiguous. It appears that the gains from having multiple factors are offset by the errors committed in estimating the factor loadings and the factor betas. The widespread use of the CAPM stems from its intuitive appeal and its simplicity.

8.5 STOCK MARKET AS A COMPLEX ADAPTIVE SYSTEM[11]

The classical capital market theory, like the bulk of economics, is based on the equilibrium system articulated so well by Alfred Marshall, the father of modern economics, in 1890s. This view is based on the idea that economics is like Newtonian physics, with well defined cause-effect relationships.

The irony is that while economists still subscribe to the deterministic model of Newtonian physics, quantum theory and other advances in physics emphasise "indeterminancy." It appears that most systems, in nature as well as in business, are in constant flux and not in equilibrium.

The classical capital market theory assumes that investors are rational and the market is efficient. Based on these assumptions, it derives the following results:

[11] Adapted from Michael J. Mauboussin, "Revisiting Market Efficiency: The Stock Market as an Adaptive System," *Journal of Applied Corporate Finance*, Winter 2002.

- Stock market returns are normal
- Prices behave like a random walk
- Risk and return are linearly related

Empirical evidence suggests that the classical theory falls short in the following ways:

1. The distribution of stock market returns exhibits a high degree of kurtosis. This means that the "tails" of the distribution are "fatter" and the "mean" of the distribution is higher than what is predicted by a normal distribution. In simple words, this means that periods of relatively modest changes are interspersed with periods of booms and busts.
2. Financial returns are predictable to some extent.
3. Risk and reward are not related in a linear manner.
4. Investors are prone to make systematic errors in their judgment and trade excessively.

Capital Market as a Complex Adaptive System Despite these limitations, the classical capital market theory has substantially advanced our understanding of capital markets. However, since it is approaching the limit of its usefulness, a new model that has higher explanatory power is required. Michael J. Mauboussin has suggested that the capital market may be regarded as a complex adaptive system. This model appears to be more consistent with what is known in disciplines like physics and biology.

To understand what a complex adaptive system is, let us begin with a simple situation where two people are put in a room and asked to trade a commodity. What happens? Hardly anything. If a few more people are added, the activity picks up, but the interactions remain somewhat subdued. The system remains static and lifeless compared to what we see in the capital markets. As more and more people are added to the system, something remarkable happens: it acquires lifelike characteristics. As Mauboussin put it: "In a tangible way, the system becomes more complex than the pieces that it comprises. Importantly, the transition—often called 'self-organised criticality'—occurs without design or help from outside agent. Rather, it is a direct function of the dynamic interactions among the agents in the system."

The central characteristics and properties of a complex adaptive system are as follows:

Aggregation The collective interactions of many less-complex agents produces complex, large-scale behaviour.

Adaptive Decision Rules Agents in the system take information from the environment and develop decision rules. The competition between various decision rules ensures that eventually the most effective decision rules survive.

Non-Linearity Unlike a linear system, wherein the value of the whole is equal to the sum of its parts, a non-linear system is one wherein the aggregate behaviour is very complex because of interaction effects.

Feedback Loops In a system that has feedback loops the output of one interaction becomes the input of the next. A positive feedback can magnify an effect, whereas a negative feedback can dampen an effect.

How Does the New Model Compare with the Classical Capital Market Theory The complex adaptive expectations model seems to conform to reality better than the classical capital market theory. The following evidence bear this out:

1. The high kurtosis ("fat tails") in return distribution suggests that periods of stability are interspersed by rapid change.
2. The price behaviour in a complex adaptive system would not be very different from a classic random walk. However, the new model explains better the observed persistence in returns, to the extent that the same exists.
3. Under most circumstances, the aggregation of the heterogeneous expectations of investors would yield prices that are similar to intrinsic values. However, if certain decision rules become pervasive, the resulting homogeneity of views may lead to self-reinforcing trends, leading to booms and crashes.
4. The poor performance of active portfolio managers is consistent with the classical market theory as well as the complex adaptive model. Still, it is possible that some investors would do well. As Mauboussin put it: "That point made, it remains possible under theory that certain investors—Warren Buffett and Bill Miller, e.g.—may be 'hard-wired' to be successful investors. In this sense, 'hard-wired' suggest innate mental processes, fortified with practice, that allow for systematically superior security selection."

Implications of the New Model The important implications of the new model for investors and corporate practitioners are as follows:

1. While the CAPM is still probably the best available estimate of risk for most corporate investment decision, managers must recognise that their stock prices may fluctuate more than what the standard theory suggests.
2. The market is usually smarter than the individual. Hence managers should weight the evidence of the market over the evidence of experts.
3. Markets function well when participants pursue diverse decision rules and their errors are independent. Markets, however, can become very fragile when participants display herd-like behaviour, imitating one another.
4. It may be futile to identify the cause of a crash or boom because in a non-linear system small things can cause large-scale changes.
5. The discounted cash flow model provides an excellent framework for valuation. Indeed, it is the best model for figuring out the expectations embedded in stock prices.

Mauboussin summed up the implications of the new model as follows: "From a practical standpoint, managers who subscribe to standard capital market theory and operate on the premise of stock market efficiency will probably not go too far astray. However, complex adaptive systems may provide a useful perspective in areas like risk management and investor communication."

SUMMARY

- The relationship between risk and expected return for efficient portfolios, as given by the **capital market line,** is:

$$E\,(R_i) = R_f + \lambda\sigma_i$$

- The relationship between risk and expected return for an inefficient portfolio or a single security is expressed by the **security market line**:

$$E\,(R_j) = R_f + [E(R_M) - R_f]\,\frac{\sigma_{iM}}{\sigma_M^2}$$

- The **risk-free rate** is represented by the rate on a 364-day Treasury bill or the rate on a long-term government bond.
- The **market risk premium** is the difference between the expected return on the market portfolio and the risk-free return.
- The **beta** of an investment is the slope of the following regression relationship:

$$R_{it} = \alpha_i + \beta_i R_{Mt} + e_{it}$$

- The standard approach to estimating betas requires information on market prices. Where market prices are not available, analysts try to get a handle over beta by looking at fundamental factors, or accounting earnings, or cross-sectional regression relationship for traded companies.
- The commonly followed procedure for testing the CAPM involves two steps. In the first step, security betas are estimated. In the second step, the relationship between security beta and return is examined.
- Empirical evidence in support of the CAPM is mixed. Yet, the CAPM is the most widely used risk return model because of its simplicity and its basic message that diversifiable risk does not matter is accepted by nearly every one.
- Compared to the CAPM, the APT is much more general. It assumes that the return on any stock is linearly related to a set of systematic factors.

$$R_i = a_i + b_{i1}\,I_1 + b_{i2}\,I_2 + \ldots. + b_{ij}\,I_j + e_i$$

- The equilibrium relationship according to the APT is:

$$E(R_i) = \lambda_0 + \beta_{i1}\,\lambda_1 + b_{i2}\,\lambda_2 + \ldots. + b_{ij}\lambda_j$$

- Some studies suggest that, in comparison to the CAPM, the APT explains stock returns better; other studies hardly find any difference between the two.

QUESTIONS

1. Mention the assumptions underlying the standard capital asset pricing model.
2. What is the relationship between risk and return for efficient portfolios?

3. What is the measure of risk for an individual security?
4. Discuss the relationship embodied in the security market line.
5. What is the risk-free rate? How would you measure it?
6. Suggest an appropriate measure for the market risk premium and justify it.
7. What factors influence market risk premium?
8. What is beta and how is it measured?
9. What adjustment is done to historical betas?
10. What fundamental factors drive beta? How are fundamental betas superior to historical betas?
11. Discuss the limitations of betas based on accounting earnings.
12. How is beta estimated from cross-sectional regressions?
13. Discuss the procedure commonly used in practice to test the CAPM.
14. What is the empirical evidence on the CAPM?
15. Despite its limitations, why is the CAPM widely used?
16. Show how the capital market line is a special case of the security market line.
17. Define the return-generating process according to the APT.
18. What is the equilibrium risk return relationship according to the APT?
19. What is a multifactor model? Describe the types of multifactor models used in practice.
20 Explain the theory of stock market as a complex adaptive system.

SOLVED PRBOLEMS

1. The following table gives an analyst's expected return on two stocks for particular market returns:

Market Return	*Aggressive Stock*	*Defensive Stock*
6%	2%	8%
20	30	16

(a) What are the betas of the two stocks?
(b) What is the expected return on each stock if the market return is equally likely to be 6% or 20%?
(c) If the risk-free rate is 7% and the market return is equally likely to be 6% or 20% what is the SML?
(d) What are the alphas of the two stocks?

Solution:

(a) The betas of the two stocks are:

$$\text{Aggressive stock} = \frac{30\% - 2\%}{20\% - 6\%} = 2$$

$$\text{Defensive stock} = \frac{16\% - 8\%}{20\% - 6\%} = 0.571$$

(b) The expected return of the two stocks are:

$$\text{Aggressive stock: } 0.5 \times 2\% + 0.5 \times 30\% = 16\%$$

$$\text{Defensive stock: } 0.5 \times 8\% + 0.5 \times 16\% = 12\%$$

(c) The expected return on the market portfolio is:

$$0.5 \times 6\% + 0.5 \times 20\% = 13\%$$

Since the risk-free rate is 7%, the market risk premium is : 13%–7% = 6%
So, the SML is:

$$\text{Required return}_i = 7\% + ß_i \times 6\%$$

(d) The alphas of the two stocks are calculated below

Stock A

Expected return = 16%

Beta = 2

Required return = 7% + 2 × 6% = 19%

Alpha = 16% – 19% = – 3%

Stock B

Expected return = 12%

Beta = 0.571

Required return = 7% + 0.571 × 6% = 10.426%

Alpha = 12% – 10.426% = 1.574%

2. The rates of return on stock *A* and market portfolio for 15 periods are given below.

Period	*Return on stock A(%)*	*Return on market portfolio (%)*	*Period*	*Return on stock A(%)*	*Return on market portfolio (%)*
1	12	12	9	–8	1
2	13	14	10	13	12
3	17	13	11	14	–11
4	15	10	12	–15	16
5	14	9	13	25	8
6	18	13	14	9	7
7	16	14	15	–9	10
8	6	7			

What is the beta for stock *A*?
What is the characteristic line for stock *A*?

Solution

Period	R_A(%)	R_M(%)	$R_A - \bar{R}_A$	$R_M - \bar{R}_M$	$(R_A - \bar{R}_A)(R_M - \bar{R}_M)$	$(R_M - \bar{R}_M)^2$
1	12	12	2	3	6	9
2	13	14	3	5	15	25
3	17	13	7	4	28	16
4	15	10	5	1	5	1
5	14	9	4	0	0	0
6	18	13	8	4	32	16

(*Contd.*)

7	16	14	6	5	30	25
8	6	7	–4	–2	8	4
9	–8	1	–18	–8	144	64
10	13	12	3	3	9	9
11	14	–11	4	–20	–80	400
12	–15	16	–25	7	–175	49
13	25	8	15	–1	–15	1
14	9	7	–1	–2	2	4
15	–9	10	–19	1	–19	1
	$\Sigma R_A=150$ $\bar{R}_A=10$	$\Sigma R_M=135$ $\bar{R}_M=9$		$\Sigma(R_A-\bar{R}_A)(R_M-\bar{R}_M) = -10$		$\Sigma(R_M-\bar{R}_M)^2 = 575$

$$\sigma_M^2 = \frac{\Sigma(R_M-\bar{R}_M)^2}{n-1} = \frac{575}{14} = 41.07 \qquad \text{Cov}_{A,M} = \frac{\Sigma(R_A-\bar{R}_A)(R_M-\bar{R}_M)}{n-1} = \frac{-10}{14} = -0.71$$

$$\text{Beta: } \beta_A = \frac{\text{Cov}_{A,M}}{\sigma_M^2} = \frac{-0.71}{41.07} = -0.017$$

$$\text{Alpha: } \alpha_A = \bar{R}_A - \beta_A \bar{R}_M = 10 + 0.017 \times 9 = 10.153$$

The characteristic line for stock A is : $R_A = 10.153 - 0.017\, R_M$

PROBLEMS

1. The returns on the equity stock of Auto Electricals Limited and the market portfolio over an 11 year period are given below :

Year	*Return on Auto Electricals Ltd. (%)*	*Return on Market Portfolio (%)*
1	15	12
2	- 6	1
3	18	14
4	30	24
5	12	16
6	25	30
7	2	- 3
8	20	24
9	18	15
10	24	22
11	8	12

   (a) Calculate the beta for the stock of Auto Electricals Limited.
   (b) Establish the characteristic line for the stock of Auto Electricals Limited.

2. The one period rates of return on stock B and the market portfolio for a 20 year period are given below :

Period	*Return on stock B (%)*	*Return on market portfolio (%)*	*Period*	*Return on stock B (%)*	*Return on market portfolio (%)*
1	15	9	11	–2	12
2	16	12	12	12	14
3	10	6	13	15	–6
4	–15	4	14	12	2
5	– 5	16	15	10	8
6	14	11	16	9	7
7	10	10	17	12	9
8	15	12	18	9	10
9	12	9	19	22	37
10	– 4	8	20	13	10

What is the beta for stock *B*?

3. The expected return for the market is 15 percent, with a standard deviation of 25 percent. The risk free rate is 8 percent. The following information is available for four mutual funds, all assumed to be efficient.

Mutual fund	Standard Deviation (%)
Omega	16
Pioneer	20
Monarch	24
Zenith	30

   (a) Calculate the slope of the capital market line.
   (b) Calculate the expected return for each mutual fund.

4. The following information is available:
   Expected return for the market = 14%.
   Standard deviation of market return = 20%.
   Risk-free return = 6%.
   Correlation coefficient between stock *A* and the market = 0.7.
   Correlation coefficient between stock *B* and the market = 0.8.
   Standard deviation for stock *A* = 24%.
   Standard deviation for stock *B* = 32%.

   (a) Calculate the beta for stock *A* and stock *B*.
   (b) Calculate the required return for each stock.

5. Assume that the following hold:

Risk free rate	:	7 percent
Expected return on the market	:	13 percent
Standard deviation of the market	:	20 percent

   Calculate the expected return and risk (standard deviation) for the following portfolios:

   (a) 60 percent of investable wealth in the market portfolio, 40 percent in the riskless assets.
   (b) 125 percent of investable wealth in the market portfolio.

6. The following table gives an analyst's expected return on two stocks for particular market returns:

Market return	Aggressive stock	Defensive stock
5%	– 5%	8%
25%	40%	18%

(a) What are the betas of the two stocks?
(b) What is the expected return on each stock if the market return is equally likely to be 5% and 25%?
(c) If the risk free rate is 8% what is the SML?
(d) What are the alphas of the two stocks?

■ ■

MINICASE

You have recently graduated as a major in finance and have been hired as a financial planner by Radiant Securities, a financial services company. Your boss has assigned you the task of investing Rs 1,000,000 for a client who has a 1-year investment horizon. You have been asked to consider only the following investment alternatives: T-bills, stock A, stock B, stock C, and market index.

The economics cell of Radiant Securities has developed the probability distribution for the state of the economy and the equity researchers of Radiant Securities have estimated the rates of return under each state of the economy. You have gathered the following information from them:

		Returns on Alternative Investments				
State of the Economy	Probability	T-Bills	Stock A	Stock B	Stock C	Market Portfolio
• Recession	0.2	6.0%	(15.0%)	30.0%	(5.0%)	(10.0%)
• Normal	0.5	6.0	20.0	5.0	15.0	16.0
• Boom	0.3	6.0	40.0	(15.0)	25.0	30.0

Your client is a very curious investor who has heard a lot relating to portfolio theory and asset pricing theory. He requests you to answer the following questions:

a. What is the expected return and the standard deviation of return for stocks A,B,C, and the market portfolio?
b. What is the covariance between the returns on A and B? Returns on A and C?
c. What is the coefficient of correlation between the returns on A and B? Returns on A and C?
d. What is the expected return and standard deviation on a portfolio in which stocks A and B are equally weighted? In which the weights assigned to stocks A, B, and C are 0.4, 0.4, and 0.2 respectively?
e. The beta coefficients for the various alternatives, based on historical analysis, are as follows:

Security	*Beta*
T-bills	0.00
A	1.20
B	(0.70)
C	0.90

   i. What is the SML relationship?
   ii. What is the alpha for stocks A, B, and C?

f. Suppose the following historical returns have been earned for the stock market and the stock of company D.

Period	Market	D
1	(5%)	(12%)
2	4	6
3	8	12
4	15	20
5	9	6

What is the beta for stock D? How would you interpret it ?

g. What is Capital Market Line (CML)? Security Market Line (SML) ? How is CML related to SML?
h. What is systematic risk ? Unsystematic risk ? Present the formulae for them
i. What is the basic difference between the CAPM and the APT ?

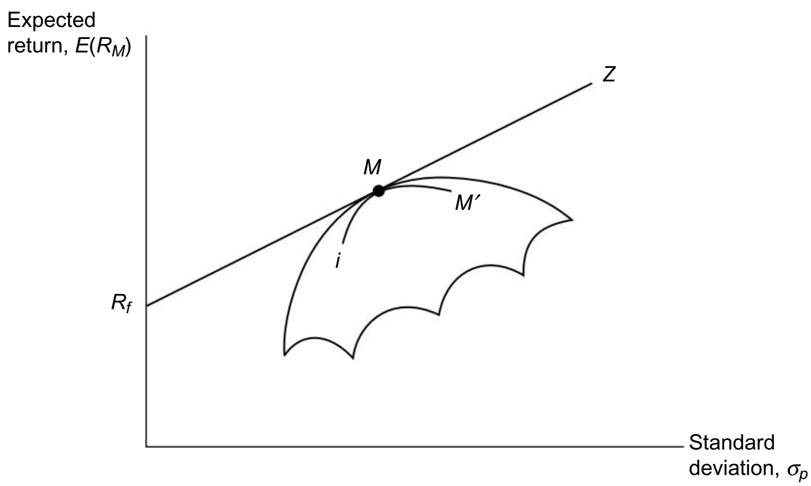
APPENDIX 8A
DERIVATION OF THE SECURITY MARKET LINE RELATIONSHIP (SML)

To understand how the SML is derived, consider Exhibit 8A.1 which shows the typical relationship between a single security (point i) and the market portfolio (M). The curve iMM' indicates all possible R_p, σ_p values obtainable by various feasible combinations of i and M. The proportion of i is denoted by w_i and the proportion of M by w_M. $w_i = 1$ reflects 100 percent investment in i and $w_M = 1$ reflects 100 percent investment in M.

Note that $w_M = 1$ implies that some funds are invested in i, since i is included in portfolio M. This means that a combination in which i is not found at all must have some negative value of w_i. Point M' represents such a combination.

The curve iMM' in Exhibit 8A.1 is tangential to the capital market line $R_f\, MZ$ at M.

Exhibit 8A.1 ***Relationship between a Single Security and the Market Portfolio***



All such curves are tangential to the capital market line in equilibrium. Such curves cannot intersect $R_f\, MZ$ (i.e. fail to be tangential to $R_f\, MZ$) because this would mean that some feasible combination of assets lies to the left of the capital market line, an impossibility since the CML represents the efficient frontier. This means that the slope of iMM' at point M is equal to the slope of the CML. The slope of iMM' at point M is equal to:

$$S_M = \frac{\left[E(R_i) - E(R_M)\right]\sigma_M}{\sigma_{iM} - \sigma_M^2} \tag{8A.1}$$ [1]

where S_M is the slope of *iMM* at point *M*, $E(R_i)$ is the expected return on security *i*, $E(R_M)$ is the expected return on market portfolio, σ_M is the standard deviation of the return on market portfolio, σ_{iM} is the covariance of return between security *i* and market portfolio

Since the slope of *iMM′* at *M* is equal to the slope of the capital market line, we get:

$$\frac{\left[E(R_i) - E(R_M)\right]\sigma_M}{\sigma_{iM} - \sigma_M^2} = \frac{E(R_M) - R_f}{\sigma_M} \tag{8A.2}$$

Simplifying and re-arranging we get:

$$E(R_i) = R_f + \left[\frac{E(R_M) - R_f}{\sigma_M^2}\right]\sigma_{iM} \tag{8A.3}$$

Since σ_{iM}/σ^2_M is the slope of a simple regression of R_i over R_M, the above relationship may be put as:

$$E(R_i) = R_f + (E(R_M) - R_f)\,\beta_i \tag{8A.4}$$

In words, this relationship, referred to popularly as the CAPM, says:

$$\text{Expected return on security } i = \text{Risk-free rate} + \left[\text{Expected return on market portfolio} - \text{Risk-free rate}\right] \text{Beta of security } i$$

[1] The slope of *iMM′* is the derivative of $E(R_p)$ with respect to σ_p, $d\,E(R_p)/d\sigma_p$. Applying the chain rule of differentiation

$$d\,E(R_p)/\,d\sigma_p = \frac{dE(R_p)/dw_i}{d\sigma_p/dw_i} \tag{1}$$

Now $$E(R_p) = w_i\,E(R_i) + (1 - w_i)\,E(R_M) \tag{2}$$

So $$dE(R_p)\,/d\,w_i = E(R_i) - E(R_M) \tag{3}$$

Further $$\sigma_p = [\,w_i^{\,2}\,\sigma_i^{\,2} + (1 - w_i)^2\,\sigma_M^{\,2} + 2\,w_i\,(1 - w_i)\,\sigma_{iM}\,]^{1/2} \tag{4}$$

So $$\frac{d\sigma_p}{dw_i} = \frac{w_i(\sigma_i^2 + \sigma_M^2 - 2\sigma_{iM}) + \sigma_{iM} - \sigma_M^2}{\sigma_p} \tag{5}$$

Substituting the results of (3) and (5) in (1), we get

$$\frac{dE(R_p)}{d\sigma_p} = \frac{(E(R_i) - E(R_M))\sigma_p}{w_i(\sigma_i^2 + \sigma_M^2 - 2\sigma_{iM}) + \sigma_{iM} - \sigma_M^2} \tag{6}$$

Evaluating $d\,E(R_p)\,/\,d\,\sigma_p$ at point *M* where $w_i = 0$, we get

$$\left[\frac{dE(R_p)}{d\sigma_p}\right]_{w_i=0} = \frac{(E(R_i) - E(R_M))\sigma_M}{\sigma_{iM} - \sigma_M^2} \tag{7}$$

This is the slope at *M*, S_M, referred to above.

Chapter 9

Efficient Market Hypothesis
The Collective Wisdom

Learning Objectives

After studying this chapter, you should be able to:

- Demonstrate why stock prices should essentially be non-forecastable.
- Dispel common misconceptions about the efficient market hypothesis.
- Cite evidence that supports and refutes the efficient market hypothesis in various versions.
- Describe the key steps involved in an event study and a portfolio study.
- Present the general view of financial economists on market efficiency.
- Discuss the implications of the efficient market hypothesis for investment analysis.

In the mid-1960s, Eugene Fama introduced the idea of an "efficient" capital market to the literature of financial economics. Put simply, the idea is that the intense competition in the capital market leads to fair pricing of debt and equity securities.

This is indeed a sweeping statement. No wonder it continues to stimulate insight and controversy even today. Benjamin Friedman refers to efficient market hypothesis as a "credo", a statement of faith and not a scientific proposition. Warren Buffett, perhaps the most successful investor of our times, has characterised the market as "a slough of fear and greed untethered to corporate realities". For most financial economists, however, the efficient market hypothesis is a central idea of modern finance that has profound implications.

An understanding of the efficient market hypothesis will help you to ask the right questions and save you from a lot of confusion that dominates popular thinking in finance. Given the importance of efficient market hypothesis we will devote this entire chapter to discuss it and explore its consequences for investment decisions.

9.1 RANDOM WALK AND EFFICIENT MARKET HYPOTHESIS

Surprise Discovery In 1953, Maurice Kendall[1], a distinguished statistician, presented a somewhat unusual paper before the Royal Statistical Society in London. Kendall

[1] M.G. Kendall, "The Analysis of Economic Time – Series, Part I. Prices," *Journal of the Royal Statistical Society* 96 (1953)

examined the behaviour of stock and commodity prices in search of regular cycles. Instead of discovering any regular price cycle, he found each series to be "a wandering one, almost as if once a week the Demon of Chance drew a random number… and added it to the current price to determine the next week's price." Put differently, prices appeared to follow a random walk, implying that successive price changes are independent of one another.

In 1959, two highly original and interesting papers supporting the random walk hypothesis were published. In one paper, Harry Roberts[2] showed that a series obtained by cumulating random numbers bore resemblance to a time series of stock prices. In the second paper, Osborne, an eminent physicist, found that stock price behaviour was similar to the movement of very small particles suspended in a liquid medium—such movement is referred to as the Brownian motion.

A random walk means that successive stock prices are independent and identically distributed. Therefore, strictly speaking, the stock price behaviour should be characterised as a submartingale, implying that the expected change in price can be positive because investors expect to be compensated for time and risk. Further, the expected return may change over time in response to change in risk.

Inspired by the works of Kendall, Roberts, and Osborne, a number of researchers employed ingenious methods to test the randomness of stock price behaviour. By and large, these tests have vindicated the random walk hypothesis. Indeed, in terms of empirical evidence, very few ideas in economics can rival the random walk hypothesis.

Search for Theory When the empirical evidence in favour of the random walk hypothesis seemed overwhelming, the academic researchers asked the question: what is the economic process that produces a random walk? They concluded that the randomness of stock prices was the result of an efficient market. Broadly, the key links in the argument are as follows:

- Information is freely and instantaneously available to all the market participants.
- Keen competition among market participants more or less ensures that market prices will reflect intrinsic values. This means that they will fully impound all available information.
- Prices change only in response to new information that, by definition, is unrelated to previous information (otherwise it will not be new information).
- Since new information cannot be predicted in advance, price changes too cannot be forecast. Hence, prices behave like a random walk.

What is an Efficient Market An efficient market is one in which the market price of a security is an unbiased estimate of its intrinsic value. Note that market efficiency does not imply that the market price equals intrinsic value at every point in time. All that it says is that the errors in the market prices are unbiased. This means that the price can deviate from the intrinsic value but the deviations are random and uncorrelated with any observable variable. If the deviations of market price from intrinsic value are random, it is not possible to consistently identify over or under-valued securities.

[2] H.V. Roberts, "Stock Market 'Patterns' and Financial Analysis: Methodological Suggestions," *Journal of Finance* 14 (March 1959).

Market efficiency is defined in relation to information that is reflected in security prices. Eugene Fama suggested that it is useful to distinguish three levels of market efficiency:

Weak-form efficiency Prices reflect all information found in the record of past prices and volumes.

Semi-strong form efficiency Prices reflect not only all information found in the record of past prices and volumes but also all other publicly available information.

Strong-form efficiency Prices reflect all available information, public as well as private.

Richard Roll adds his own nuance. According to him market efficiency doesn't mean that prices reflect all information or even publicly available information. Rather, it implies that the link between unreflected information and prices is so subtle and tenuous that it cannot be easily or costlessly detected.

In a very provocative article, titled "Noise," which appeared in the July 1986 issue of *Journal of Finance,* Fischer Black defines an efficient market as one in which the price is within a factor of 2 of value, implying that the price is more than half of value and less than two times the value. According to him, by this definition almost all markets are efficient at least 90 percent of the time.

Misconceptions about the Efficient Market Hypothesis The efficient market hypothesis has often been misunderstood. The common misconceptions about the efficient market hypothesis are stated below along with the answers meant to dispel them.

Misconception : The efficient market hypothesis implies that the market has perfect forecasting abilities.

Answer : The efficient market hypothesis merely implies that prices impound all available information. This does not mean that the market possesses perfect forecasting abilities.

Misconception : As prices tend to fluctuate, they would not reflect fair value.

Answer : Unless prices fluctuate, they would not reflect fair value. Since the future is uncertain, the market is continually surprised. As prices reflect these surprises they fluctuate.

Misconception : Inability of institutional portfolio managers to achieve superior investment performance implies that they lack competence.

Answer : In an efficient market, it is ordinarily not possible to achieve superior investment performance. Market efficiency exists because portfolio managers are doing their job well in a competitive setting.

Misconception : The random movement of stock prices suggests that the stock market is irrational.

Answer : Randomness and irrationality are two different matters. If investors are rational and competitive, price changes are bound to be random.

Profound Impact of a Simple Idea

Eugene Fama introduced the notion of efficient capital market in 1964. This simple idea has had a profound impact in several ways.

1. The evidence on market efficiency helped in establishing a receptive climate for three seminal developments in financial theory: (a) Modigliani-Miller theories of corporate financial policy, (b) the Capital Asset Pricing Model, and (c) the Black-Scholes Option Pricing Model. Each of them influenced the practice of finance in significant ways.
2. Important practical developments like indexing, asset securitisation, performance measurement, and disclosure of different earnings numbers are based on the notion of well-functioning security markets.
3. Empirical evidence on market efficiency coincided with the growing respect for free markets that began in the 1970s, initially among economists and then among politicians. Indeed, the literature on market efficiency facilitated the 'liberalisation' of financial and other markets worldwide.

9.2 EMPIRICAL EVIDENCE

Empirical Evidence on Weak-form Efficient Market Hypothesis

The weak-form efficient market hypothesis says that the current price of a stock reflects all information found in the record of past prices and volumes. This means that there is no relationship between the past and future price movements.

Returns over Short Horizons The earlier test of weak-form efficient market hypothesis looked at randomness in the short run. Three types of tests have been commonly employed for this purpose: (a) serial correlation tests; (b) runs tests; and (c) filter rules tests.

Serial Correlation Tests One way to test for randomness in stock price changes is to look at their serial correlations (also called auto-correlations). Is the price change in one period correlated with the price change in some other period? If such auto-correlations are negligible, the price changes are considered to be serially independent. Numerous serial correlation studies, employing different stocks, different time-lags, and different time-periods, have been conducted to detect serial correlations. Initial subsequent studies have failed to discover any significant serial correlations. Subsequent studies discovered minor positive correlations.

Runs Tests Given a series of stock price changes, each price change is designated as a plus (+) if it represents an increase or a minus (–) if it represents a decrease. The resulting series, for example, may look as follows:

$$+ + - + + - - +$$

A run occurs when there is no difference between the sign of two changes. When the sign of change differs, the run ends and a new run begins. For example, in the above series of pluses and minuses, there are five runs as follows:

$$\underbrace{+\ +}_{1}\quad \underbrace{-}_{2}\quad \underbrace{+\ +}_{3}\quad \underbrace{-\ -}_{4}\quad \underbrace{+}_{5}$$

To test a series of price changes for independence, the number of runs in that series is compared to see whether it is statistically different from the number of runs in a purely random series of the same size. Many studies have been carried out, employing the 'runs test' of independence. By and large, the results of these studies seem to strongly support the random walk model.

Filter Rules Test An *n* percent filter rule may be defined as follows: "If the price of a stock increases by at least *n* percent, buy and hold it until its price decreases by at least *n* percent from a subsequent high. When the price decreases by at least *n* percent or more, sell it." If the behaviour of stock price changes is random, filter rules should not outperform a simple buy-and-hold strategy. Many studies have been conducted employing different stocks and different filter rules. By and large, they suggest that filter rules do not outperform a simple buy-and-hold strategy, particularly after considering the commissions on transactions.

Returns over Long Horizons While returns over short horizons are characterised by minor positive serial correlation, returns over long horizons seem to be characterised by pronounced negative serial correlation. To explain the latter result, a "fads hypothesis" has been proposed, which says that stock prices tend to overreact to news. Such overreaction results in positive correlation over short horizons and negative correlation over long horizons. Put differently, prices overshoot in the short run but correct in the long run. Thus, market prices display excessive volatility in comparison with intrinsic value.

Robert J. Shiller and others argue that the presence of mean reversion and excessive volatility in prices imply market inefficiency. Fama and others dispute it. They contend that changing market risk premiums over time, and not market inefficiency, result in mean reversion and excessive volatility.

• Empirical Evidence on Semi-strong Form Efficient Market

The semi-strong form efficient market hypothesis holds that stock prices adjust rapidly to all publicly available information. This implies that using publicly available information investors will not be able to earn superior risk-adjusted returns.

To test market efficiency specific investment strategies are examined to see whether they earn excess return. Since excess return represents the difference between the actual return and the expected return, implicit in a test of market efficiency is some model of the expected return. The expected return may be based on the capital asset pricing model or the arbitrage pricing model or some other model. Hence, a test of market efficiency is really a **joint test** of market efficiency and the model used for expected returns. If there is evidence of excess return, it may mean that the market is inefficient or that the model used to calculate the expected return is wrong or both. This seems to be an insoluble problem. However, if the results of a study do not vary with different models of expected return one can argue that the results can be attributed to market inefficiency and not model misspecification.

To test market efficiency, empirical studies have been conducted that have examined the following questions:

- Is it possible to earn superior risk-adjusted returns by trading on information events like earnings announcements, stock splits, bonus issues, or acquisition announcements? A scheme based upon trading on an information event is usually tested with an **event study**.
- Is it possible to earn superior risk-adjusted returns by trading on an observable characteristic of a firm like price-earnings ratio, price-book value ratio, or dividend yield? A scheme based upon trading on an observable characteristic is tested using a **portfolio** study.

Event study An event study examines the market reactions to and the excess market returns around a specific information event like acquisition announcement or stock split. The key steps involved in an event study are as follows:

1. **Identify the event to be studied and pinpoint the date on which the event was announced** Event studies presume that the timing of the event can be specified with a fair degree of precision. Because financial markets react to the announcement of an event, rather than the event itself, event studies focus on the announcement date of the event.

   Announcement date

2. **Collect returns data around the announcement date** In this context two issues have to be resolved: What should be the period for calculating returns—weekly, daily, or some other interval? For how many periods should returns be calculated before and after the announcement date?

   $R_{j,-n}$ -------------- $R_{j,0}$ -------------- $R_{j,+n}$

   Return window: $-n$ to $+n$

   $R_{j,t}$ = return for firm j for period t ($t = -n, \ldots 0 \ldots +n$)

3. **Calculate the excess returns, by period, around the announcement date for each firm in the sample** The excess return is calculated by making adjustment for market performance and risk. For example, if the capital asset pricing model is employed to control for risk the excess return is calculated as:

$$E\,R_{jt} = R_{jt} - \text{Beta}_j \times R_{mt} \tag{9.1}$$

where ER_{jt} is the excess return on firm j for period t, Beta $_j$ is the beta for firm j R_{mt} is the excess returns on market for period t.

4. **Compute the average and the standard error of excess returns across all firms** The average excess return is

$$\overline{E\,R_t} = \sum_{j=1}^{j=m} \frac{E\,R_{jt}}{m} \tag{9.2}$$

where $\overline{E\,R_t}$ is the average excess return for period t, $E\,R_{jt}$ is the excess return for jth firm for period t, m is the number of firms in the event study.

The standard error of the excess return is the standard deviation of the sample average.

5. **Assess whether the excess returns around the announcement date are different from zero** To determine whether the excess returns around the announcement date are different from zero, estimate the T statistic for each day:

$$T \text{ statistic for excess return on day } t = \frac{\text{Average excess return}}{\text{Standard error}}$$

Statistically significant T statistics imply that the event has a bearing on returns; the sign of the excess return indicates whether the effect is positive or negative.

Results of Event Studies The results of event studies are mixed. Most event studies support the semi-strong form efficient market hypothesis. Two examples may be cited:

- Fama, Fisher, Jensen, and Roll[3] examined the effect of stock splits on returns for 940 stock splits on the New York Stock Exchange for the period 1927–1959. They found that prior to the split, the stocks earned higher returns than predicted by the market model. After the split, however, stocks earned returns which were more or less in conformity with the market model.
- Ball and Brown[4] studied the effect of annual earnings announcements. They divided firms into two groups. The first group consisted of firms whose earnings increased in relation to the average corporate earnings and the second group consisted of firms whose earnings decreased in relation to the average corporate earnings. They found that before the announcement of earnings, stocks in the first group earned positive abnormal returns whereas stocks in the second group earned negative abnormal returns. After the announcement of earnings, however, stocks in both groups earned normal returns.

Several event studies, however, have cast their shadow over the validity of the semi-strong form efficient markets theory. One example may be cited:

[3] Eugene F. Fama, L.Fisher, M.Jensen and R.Roll, "The Adjustment of Stock Prices to New Information", *International Economic Review*, vol.10 (February 1969).

[4] R. Ball and P. Brown, "An Empirical Evaluation of Accounting Income Numbers", *Journal of Acounting Research* (Autumn 1968).

- A study conducted by V.L. Bernard and J.K. Thomas[5] found that stock prices adjust gradually, not rapidly, to announcements of unanticipated changes in quarterly earnings.

Portfolio Study In a portfolio study, a portfolio of stocks having the observable characteristic (low price-earnings ratio or whatever) is created and tracked over time to see whether it earns superior risk-adjusted returns. The basic steps involved in a portfolio study are as follows:

1. **Define the variable (characteristic) on which firms will be classified** The proposed investment strategy spells out the relevant variable. Note that the variable must be observable, but not necessarily numerical. Examples: price-earnings ratio, company size, price-book value ratio, bond ratings, and so on.
2. **Classify firms into portfolios based upon the magnitude of the variable** Collect data on the variable for every firm in the defined universe at the beginning of the period and use that information for classifying firms into different portfolios. For example, if the price-earnings ratio is the screening variable, classify firms on the basis of the price-earnings ratio into portfolios from the lowest price-earnings class to the highest price-earnings class. The size of the universe will determine the number of classes.
3. **Compute the returns for each portfolio** Collect information on the returns for each firm in each portfolio for the testing period and calculate the return for each portfolio, assuming that the stocks included in the portfolio are equally weighted.
4. **Calculate the excess returns for each portfolio** The risk-return model commonly employed for calculating the excess returns is the capital asset pricing model. So the calculation of excess returns earned by a portfolio calls for estimating the portfolio beta and determining the excess returns:
$$E\,R_{jt} = R_{jt} - \text{Beta}_{\,j} \times R_{Mt} \tag{9.3}$$
where ER_{jt} is the excess returns earned by portfolio j in period t, R_{jt} is the returns earned by portfolio j in period t, Beta $_j$ is the beta of portfolio j, R_{Mt} is the returns earned by the market portfolio in period t.
Note that the beta of a portfolio is estimated by taking the average of the betas of the individual stocks in the portfolio or by regressing the returns on the portfolio against market returns over some prior time period (for example, the year before the testing period).
5. **Assess whether the average excess returns are different across the portfolios** Several statistical tests are available to test whether the average excess returns differ across these portfolios. Some of these tests are parametric[6] and some nonparametric.

[5] V.L. Bernard and J.K. Thomas, "Post-Earnings Announcement Drift: Delayed Price Response or Risk Premium?" *Journal of Accounting Research* vol.27 (Supplement 1989).

[6] A parametric test makes a certain assumption about the distribution of excess returns

Results of Portfolio Studies The results of portfolio studies, too, are mixed. Many portfolio studies suggest that it is not possible to earn superior risk-adjusted returns by trading on some observable characteristics. However, several portfolio studies have documented inefficiencies and anomalies. Two of them are worth mentioning:

- S.Basu[7] studied the investment performance of common stocks in relation to their P/E ratios. He found that low P/E stocks outperformed the high P/E stocks, even after adjustments for risk.
- Roly Banz[8] found that stocks of small NYSE firms, on average, outperformed the stocks of large NYSE firms in terms of risk-adjusted returns.

Empirical Evidence on the Strong-form Efficient Market

The strong-form efficient market hypothesis holds that all available information, public or private, is reflected in the stock prices. Obviously, this represents an extreme hypothesis and we would be surprised if it were true.

To test the strong-form efficient market hypothesis, researchers analysed the returns earned by certain groups (like corporate insiders, specialists on stock exchanges, and mutual fund managers) who have access to information which is not publicly available and/or ostensibly possess greater resources and abilities to intensively analyse information which is in the public domain. Empirical evidence broadly suggests the following:

- Corporate insiders (who may benefit from access to inside information) and stock exchange specialists (who have monopolistic access to buy and sell order position) earn superior rates of return, after adjustment for risk.
- Mutual fund managers do not, on an average, earn a superior rate of return. There is no scientific evidence to suggest that professionally managed portfolios as a group perform better than randomly selected portfolios.

Other Evidence

Apart from the standard tests for various forms of efficiency, many other studies have been done to explore the behaviour of security prices and interest rates. Further, economists have reflected on certain financial episodes like the crash of 1987. A brief discussion of these studies and reflections follows.

Price Overreactions It appears that prices of individual stocks overreact to information and then correct themselves as shown in Exhibit 9.1. The negative correlations in prices on account of such behaviour seem to provide profit opportunities from "contrarian" trading strategies.

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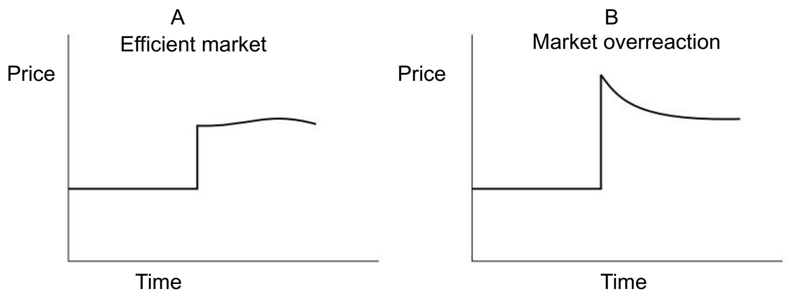
[7] S.Basu, "Investment Performance of Common Stocks in Relation to their Price-Earnings Ratios: A Test of the Efficient Market Hypothesis," *The Journal of Finance* (June 1977).

[8] R. Banz,"The Relationship Between Returns and Market Value of Common Stocks," *Journal of Financial Economics* (March 1981).

Exhibit 9.1 ***Price Overreaction***



Calendar Anomalies Researchers have found some seasonal patterns. One well documented anomaly is the "week-end effect". Stock returns tend to be negative over the period from Friday's close to Monday's opening.

Another puzzling calendar anomaly is the January effect. Stock prices seem to rise more in January than in any other month of the year.

Several explanations have been offered to explain the January effect. First, investors sell the stocks on which they have lost money in December to get the tax benefit from capital loss and buy them back in January. Second, in the first few weeks of January a lot of information is revealed about the firms. Third, there are substantial inflows to portfolios around the turn of the year. These explanations, at best, seem to be partial explanations and the January effect remains, in an important sense, an anomaly.

Excess Volatility Robert Shiller[9] and others have argued that investors pursue fads and behave like a herd. As a result stock market overreacts to events. To prove his point, he has marshalled evidence suggesting that the volatility of stock prices is too large to be justified by the volatility of dividends.

Normal Range of Interest Rates Market interest rates move within a normal range. Hence when interest rates are close to the high end of the range they are likely to decrease. By the same token, when interest rates are toward the low end of the range, they are likely to increase. This hypothesis is supported by the evidence on yield curve, which is a plot of spot interest rates against different maturities, ranging from short term to long term. The yield curve which reflects future expectations about interest rates is typically downward sloping when the interest rates are high and upward sloping when the interest rates are low.

The Crash of 1987 On October 19, 1987, the Dow Jones Industrial Average, the most widely followed stock market index of the US or the whole world, crashed by 23 percent in one day. There was obviously no new fundamental information to justify such a dramatic decline in stock prices. Hence the idea that the market price reflects intrinsic value appears less appealing. Were the prices irrationally high before the Black Monday or irrationally low afterward?

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[9] R.J.Shiller, "Do Stock Prices Move Too Much to Be Justified by Subsequent Changes in Dividends?" *American Economic Review*, vol71 (1981 a).

The events of 1987 suggest how difficult it is to value equity stocks. To illustrate the problem, suppose that an equity stock is expected to pay a dividend of Rs. 3 a year hence and the dividend would grow at a constant rate every year. Investors require a return of 16 percent on this stock and the market price of the stock is Rs. 100. Applying the constant growth dividend discount model (see Chapter 13) we can figure out the expected growth in dividends:

$$P_0 = D_1 / (r - g)$$

$$\text{Rs. } 100 = \text{Rs. } 3 / (0.16 - g) \rightarrow g = 0.13 \text{ or } 13 \text{ percent}$$

Now suppose that investors revise their growth expectation downward by 1 percent (from 13 percent to 12 percent). As a result the stock price falls to Rs. 75.

$$P_0 = \text{Rs. } 3 / (0.16 - 0.12) = \text{Rs. } 75$$

An identical fall would occur, if the investors revise their required return upward by 1 percent to 17 percent, holding their growth expectation constant.

Thus we find that 1 percent decline in the expected growth rate or 1 percent increase in the investors' required return leads to a fall of 25 percent in the stock price.

The difficulty in valuing equity stocks has two implications. First, investors typically price an equity stock in relative terms - relative to its price yesterday or relative to the price of comparable securities. They assume yesterday's price as correct and adjust it upward or downward based on today's information. Thus, when investors lose faith in the benchmark of yesterday's price, there may be a substantial revision in prices before a new benchmark is determined.

Second, it is almost impossible to test the hypothesis that the stock price is equal to the intrinsic value, as it is very difficult to establish the intrinsic value without any reference to price. Though the crash has not conclusively disproved the efficient market hypothesis, it has undermined the faith of many people in efficient market hypothesis.

Even though the crash may cast some shadow over market efficiency with respect to absolute prices, it does not weaken the case for market efficiency with respect to relative prices. Put differently, while we may not be sure whether prices of two stocks, viz. *A* and *B* are fairly established in any absolute sense, we can be reasonably confident the prices of *A* and *B* are fairly established relative to each other.

Semi-efficient Market Hypothesis

The efficient market hypothesis (EMH) has a cousin, the semi-efficient market hypothesis (SEMH). SEMH holds that some stocks are priced more efficiently than others. Consider two companies, Infosys and a hypothetical start-up firm called Nuvo Software. Infosys is followed by many investors and actively traded. Thousands of portfolios would contain Infosys shares and innumerable security analysts follow it. Hence it is likely to be fairly priced.

What about Nuvo Software? Very few people follow it; so according to SEMH there is a greater likelihood that it will be mispriced. Extending this idea, one may argue that the market perhaps has several tiers. Put differently, there is a pecking order of efficiency. Most observers of the market are generally sympathetic of the logic of SEMH.

9.3 WHAT IS THE VERDICT

Despite the anomalies and puzzles and the challenge of behaviouralists and their sympathisers, the substantial evidence in favour of the efficient market hypothesis cannot be gainsaid.

The advocates of efficient market hypothesis argue that it is not surprising that several anomalies and puzzles have been discovered. When data is mined extensively, one is bound to find a number of patterns. As Bradford Cornell put it: "Even a set of random numbers generated by a computer will appear to have some pattern after the fact. Those patterns, however, are spurious and will not be replicated in another generation of random numbers. Many scholars feel that the same is true of stock prices.[10] "As William Sharpe said if data is tortured long enough it will confess to any crime. As an extreme example of data mining, Leinweber, who sifted through United Nations CD-Rom, found that historically the best predictor of the S&P 500 was butter production in Bangladesh!

Why the Debate Persists

Most academic researchers consider efficient market hypothesis as a seminal breakthrough supported by considerable empirical evidence. However, investment practitioners, in general, have been lukewarm toward it and have questioned the empirical evidence. It is unlikely that the debate over efficient market hypothesis will be settled because of the selection bias and the role of chance.

Selection Bias Suppose you discover an investment scheme that produces superior returns. If you publicise it widely, you earn fame, but invite competition that will eventually destroy your superior returns; if you keep it to yourself you will continue to earn millions of rupees. You are likely to prefer the second option. This presents a conundrum: investment schemes that fail to produce superior returns will be reported, whereas investment schemes that produce superior returns will not be reported. This problem is called selection bias: we observe only those outcomes that are biased in favour of failed techniques. Hence, we cannot fairly assess the true ability of portfolio managers to generate superior returns.

Role of Chance Since large numbers of people participate in the field of investment, some investors are bound to perform well due to the chance factor. The successful investors will attribute their performance to skill, whereas skeptics will impute it to luck. The debate cannot be resolved.

Even if inefficiencies exist, it is difficult to take advantage of them. As Richard Roll says: "Over the past decade, I have attempted to exploit many of the seemingly most

[10] Bradford Cornell, *Corporate Valuation*, Chicago Irwin Professional Publishing, 1993.

promising 'inefficiencies' by actually trading significant amounts of money according to a trading rule suggested by the 'inefficiencies' … I have never yet found one that worked in practice, in the sense that it returned more after cost than a buy-and-hold strategy."[11]

True, the efficient market hypothesis, like all theories, is an imperfect and limited description of the stock market. However, there does not, at least for the present, seem to be a better alternative. According to Merton Miller, the efficient market hypothesis is more like a paradigm that provides a coherent explanation for a wide range of seemingly unrelated phenomena. Hence, like all scientific paradigms, it will survive till it is dislodged by a better one.

Impossibility of Informationally Efficient Markets

In a classic paper published in 1980, Grossman and Stiglitz pointed toward the "impossibility of informationally efficient markets." Their argument is fairly straightforward and goes as follows: If market prices reflect all information about stocks, no one would do equity research (as it involves cost) and everyone will simply accept market prices as the best estimates of intrinsic values. And if no one does equity research to obtain and analyse information about companies, how can market prices reflect all information about stocks?

So, as long as obtaining and analysing information is costly (as one would expect it to be), equity research will have its rewards and analysts a useful role to perform. Hence, the general view is that equity research produces benefits. However, competition will drive down those benefits to the "opportunity costs" of doing research, which is what equity researchers would have earned in their "next best" alternative employment. While this sounds logical, the hefty compensation packages of equity researchers makes one wonder as to what is the "next best" use of their time.

9.4 IMPLICATIONS FOR INVESTMENT ANALYSIS

We have examined the development of the efficient market hypothesis, the empirical evidence, and the challenge posed by the critics of the efficient market hypothesis. It is time now to hammer out the investment implications of what we have learnt so far. Before doing that let us briefly recapitulate the main points:

1. The logical development of the efficient market hypothesis, given certain assumptions, is virtually unassailable. However, the hypothesis rests on assumptions that are somewhat fragile.
2. The empirical evidence regarding the randomness of stock price behaviour seems to be overwhelming.
3. The market often adjusts rapidly to public information. Yet on many occasions it assimilates information rather slowly. (This appears to be more true of relatively less developed markets.)

[11] R. Roll, "What Every CFO Should Know About Scientific Progress in Financial Economics: What is Known and What Remains to be Resolved", *Financial Management,* vol. 23 (Summer 1994).

4. The market is rational and orderly in many ways. However, it has its own quirks and flaws: it displays certain anomalies which have not been properly understood and behaves waywardly when psychological influences are strong.

Let us now look at the investment implications of the observations—which are indeed of a mixed nature—made above.

1. The substantial evidence in favour of the randomness of stock price behaviour suggests that technical analysis (which is based on the premise that stock prices follow certain patterns) represents useless market folklore. Burton Malkiel says:

   > "Being somewhat incautious, I will climb out on a limb and argue that no technical scheme whatever would work for any length of time."[12]

   Technical analysts, of course, vehemently dispute such an assertion and argue that the tests employed by the advocates of random walk theory are too naïve to reveal the kinds of patterns and dependencies technical analysts perceive. Though there may be some merit in this rebuttal, the overwhelming evidence on randomness certainly suggests that technical analysis is of dubious value.
2. Routine and conventional fundamental analysis is not of much help in identifying profitable courses of action, more so when you are looking at actively traded securities. We have a curious paradox here. The efficiency of the market place depends on the presence of numerous investors who make competent efforts to analyse information and take appropriate actions based on their analysis. If they abandon their work, the efficiency of the market would decline. Yet, the efficiency of the marketplace renders their efforts worthless. Though striking, this paradox is not different from the paradox of all efficient, competitive markets.
3. The key levers for earning superior rates of return are:
   - Early action on any new development.
   - Sensitivity to market imperfections and anomalies.
   - Use of original, unconventional, and innovative modes of analysis.
   - Access to inside information and its sensible interpretation.
   - An independent judgment that is not affected by market psychology.
4. Only incisive analysis and uncommon techniques are likely to provide an edge in fundamental analysis. Such techniques may be economically viable when large funds are involved. So, most small investors are better off by investing through mutual funds.
5. Often active portfolio management may not be a worthwhile activity as it may not be possible to justify the expenses associated with it. So a passive investment strategy makes sense. One common passive strategy is indexing which involves constructing a portfolio that mimics a broad-based index.

[12] Burton G. Malkiel, *A Random Walk Down Wall Street*, W.W. Norton, 1999.

6. It is tempting to believe that in an efficient market you can choose a portfolio by simply throwing darts at the quotations page of *Economic Times*. This is, however, a simplistic view. Even in a perfectly efficient market, you have to diversify adequately (to wash away unsystematic risk), choose a risk-return profile that is appropriate to your situation, and tax-shelter your returns. The objective of rational portfolio management in an efficient market is not to beat the market, but to tailor the portfolio to the specific circumstances and needs of the investor.

SUMMARY

- In the mid-1960s Eugene Fama introduced the idea of an "efficient" capital market. The **efficient market hypothesis** says that the intense competition in the capital market leads to fair pricing of securities. A sweeping statement, it continues to stimulate insight and controversy even today.
- Eugene Fama suggested that it is useful to distinguish three levels of efficiency: weak-form semi-strong form, and strong-form.
- The **weak-form** efficient market hypothesis says that the current price of a stock reflects all information found in the record of past prices and volumes. By and large the empirical evidence, relying on tests like the serial correlation test, runs test, and filter rules test, supports the weak-form efficiency.
- The **semi-strong form** efficient market hypothesis holds that stock prices rapidly adjust to all publicly available information. Two kinds of studies have been conducted to test the semi-strong form efficient market hypothesis: event studies and portfolio studies.
- An **event study** examines the market reactions to and excess returns around a specific information event like an earnings announcement or a stock split. A **portfolio study** examine the returns earned by a portfolio of stocks having some observable characteristic like low price-earnings multiple. The results of event studies as well as portfolio studies are mixed.
- The **strong-form** efficient market hypothesis holds that all available information, public or private, is reflected in stock prices. Obviously, this represents an extreme hypothesis and we would be surprised if it were true. Empirical evidence too does not support it.
- The advocates of efficient market hypothesis argue that it is not surprising that several anomalies and puzzles have been found. When data is mined extensively, one is bound to find a number of patterns. Even if inefficiencies exist, it is difficult to take advantage of them.
- The efficient market hypothesis, like all theories, is an imperfect and limited description of the stock market. However, at least for the present, there does not seem to be a better alternative.
- It appears that technical analysis is of dubious value and routine fundamental analysis does not help.

QUESTIONS

1. What is the economic process that produces a random walk?
2. What is an efficient market?
3. Distinguish the three levels of market efficiency.
4. Discuss the common misconceptions surrounding the efficient market hypothesis.
5. Describe the types of tests that have been commonly employed to verify the weak-form efficient market hypothesis.
6. Discuss the evidence of event studies.
7. Discuss the evidence of portfolio studies.
8. Evaluate the empirical evidence on strong-form efficient market hypothesis.
9. What calendar anomalies have been found?
10. What is the evidence on the interest rate behaviour?
11. Comment on the crash of 1987.
12. What is the verdict on efficient market hypothesis?
13. Discuss the lessons that can be drawn from what we have learnt about market efficiency or the lack of it.
14. Why does the debate of market efficiency persist?
15. Why do Crossman and Stiglitz believe in the impossibility of informationally efficient markets.

Chapter **10**

Behavioural Finance

The Irrational Influences

LEARNING OBJECTIVES

After studying this chapter, you should be able to:

- Identify the heuristic-driven biases and cognitive errors that impair judgment.
- Discuss how frame dependence influences investment decisions.
- Describe the features of a behavioural portfolio.
- Explain why prices may deviate from fundamental values.
- Develop strategies for overcoming psychological biases.

From the mid-1950s, the field of finance has been dominated by the traditional finance model (also referred to as the standard finance model) developed primarily by the economists of the University of Chicago. The central assumption of the traditional finance model is that people are rational. However, psychologists challenged this assumption. They argued that people often suffer from cognitive and emotional biases and act in a seemingly irrational manner.

The finance field was reluctant to accept the view of psychologists who proposed the behavioral finance model. Indeed, the early proponents of behavioral finance were regarded as heretics. As the evidence of the influence of psychology and emotions on decisions became more convincing, behavioural finance has received greater acceptance. Although there is disagreement about when, how, and why psychology influences investment decisions, the award of 2002 Nobel Prize in Economics to psychologist Daniel Kahneman and experimental economist Vernon Smith is seen by many as a vindication of the field of behavioural finance.

The key differences between "traditional finance" and "behavioural finance" are as follows:

- Traditional finance assumes that people process data appropriately and correctly. In contrast, behavioural finance recognises that people employ imperfect rules of thumb (heuristics) to process data which induces biases in their beliefs and predisposes them to commit errors.
- Traditional finance presupposes that people view all decisions through the transparent and objective lens of risk and return. Put differently, the form (or

frame) used to describe a problem is inconsequential. In contrast, behavioural finance postulates that perceptions of risk and return are significantly influenced by how decision problems are framed. In other words, behavioural finance assumes frame dependence.

- Traditional finance assumes that people are guided by reason and logic and independent judgment. Behavioural finance, on the other hand, recognises that emotions and herd instincts play an important role in influencing decisions.
- Traditional finance argues that markets are efficient, implying that the price of each security is an unbiased estimate of its intrinsic value. In contrast, behavioural finance contends that heuristic-driven biases and errors, frame dependence, and effects of emotions and social influence often lead to discrepancy between market price and fundamental value.

This chapter discusses heuristic-driven biases, frame dependence, emotional and social influences, and market inefficiencies. Note that while these things are discussed separately for pedagogic convenience they are interrelated in subtle ways.

10.1 HEURISTIC-DRIVEN BIASES

The important heuristic-driven biases and cognitive errors that impair judgment are:

- Representativeness
- Overconfidence
- Anchoring
- Aversion to ambiguity
- Innumeracy

Representativeness Representativeness refers to the tendency to form judgments based on stereotypes. For example, you may form an opinion about how a student would perform academically in college on the basis of how he has performed academically in school. While representativeness may be a good rule of thumb, it can also lead people astray. For example:

- Investors may be too quick to detect patterns in data that are in fact random.
- Investors may believe that a healthy growth of earnings in the past may be representative of high growth rate in future. They may not realise that there is a lot of randomness in earnings growth rates.
- Investors may be drawn to mutual funds with a good track record because such funds are believed to be representative of well-performing funds. They may forget that even unskilled managers can earn high returns by chance.
- Investors may become overly optimistic about past winners and overly pessimistic about past losers.
- Investors generally assume that good companies are good stocks, although the opposite holds true most of the time.

Overconfidence People tend to be overconfident and hence overestimate the accuracy of their forecasts. Overconfidence stems partly from the illusion of knowledge. The human mind is perhaps designed to extract as much information as possible from what is available, but may not be aware that the available information is not adequate to develop an accurate forecast in uncertain situations. Overconfidence is particularly seductive when people have special information or experience—no matter how insignificant - that persuades them to think that they have an investment edge. In reality, however, most of the so-called sophisticated and knowledgeable investors do not outperform the market consistently.

Another factor contributing to overconfidence is the illusion of control. People tend to believe that they have influence over future outcomes in an uncertain environment. Such an illusion may be fostered by factors like active involvement and positive early outcomes. Active involvement in a task like online investing gives investors a sense of control. Positive early outcomes, although they may be purely fortuitous, create an illusion of control.

Is overconfidence not likely to get corrected in the wake of failures? It does not happen as much as it should. Why? People perhaps remain overconfident, despite failures, because they remember their successes and forget their failures. Harvard psychologist Langer describes this phenomenon as "head I win, tail it's chance". Referred to as **self-attribution bias**, it means that people tend to ascribe their success to their skill and their failure to bad luck. Another reason for persistent overconfidence and optimism is the human tendency to focus on future plans rather than on past experience.

Overconfidence manifests itself in excessive trading in financial markets. It also explains the dominance of active portfolio management, despite the disappointing performance of many actively managed funds.

Anchoring After forming an opinion, people are often unwilling to change it, even though they receive new information that is relevant. Suppose that investors have formed an opinion that company A has above-average long-term earnings prospect. Suddenly, A reports much lower earnings than expected. Thanks to anchoring (also referred to as conservatism), investors will persist in the belief that the company is above-average and will not react sufficiently to the bad news. So, on the day of earnings announcement the stock price would move very little. Gradually, however, the stock price would drift downwards over a period of time as investors shed their initial conservatism.

Anchoring manifests itself in a phenomenon called the "post-earnings announcement drift," which is well-documented empirically. Companies that report unexpectedly bad (good) earnings news generally produce unusually low (high) returns over a period of time after the announcement.

Familiarity People are comfortable with things that are familiar to them. The human brain often uses the familiarity shortcut in choosing investments. Indeed, familiarity breeds investment. That is why people tend to invest more in the stocks of their employer company, local companies, and domestic companies.

Aversion to Ambiguity People are fearful of ambiguous situations where they feel that they have little information about the possible outcomes. In experiments, people are more inclined to bet when they know the probabilities of various outcomes than when they are ignorant of the same.

In the world of investments, aversion to ambiguity means that investors are wary of stocks that they feel they don't understand. On the flip side it means that investors have a preference for the familiar. This is manifested in home country bias (investors prefer stocks of their country), local company bias (investors prefer stocks of their local area), and own company bias (employees of a company have a preference for their own company's stock).

Innumeracy People have difficulty with numbers. In his book *Innumeracy: Mathematical Illiteracy and Its Consequences*,[1] John Paulos notes that "some of the blocks to dealing comfortably with numbers and probabilities are due to quite natural psychological responses to uncertainty, to coincidence, or to how a problem is framed. Others can be attributed to anxiety, or to romantic misconceptions about the nature and importance of mathematics". Trouble with numbers is reflected in the following:

- People confuse between "nominal" changes (greater or lesser numbers of actual rupees) and "real" changes (greater or lesser purchasing power). Economists call this **money illusion**.
- People have difficulty in figuring out the "true" probabilities. Put differently, the odds are that they don't know what the odds are. To illustrate this point consider an example. In a lottery in which six numbers are selected out of fifty, what are the chances that the six numbers will be 1, 2, 3, 4, 5, and 6? Most people think that such an outcome is virtually impossible. The reality, of course, is that the probability of selecting 1 through 6 is the same as the probability of selecting *any* six numbers. As Martin Gardner says: "In no other branch of Mathematics is it easy for experts to blunder as in probability."
- People tend to pay more attention to big numbers and give less weight to small figures.
- People estimate the likelihood of an event on the basis of how vivid the past examples are and not on the basis of how frequently the event has actually occurred.
- People tend to ignore the 'base rate' which represents the normal experience and go more by the 'case' rate, which reflects the most recent experience.

10.2 FRAME DEPENDENCE

Proponents of traditional finance argue that framing is transparent, implying that investors can see through all the different ways cash flows might be described. Indeed, frame independence lies at the core of the Modigliani-Miller approach to corporate finance. The essence of frame independence was put vividly by Miller as follows: "If you transfer a dollar from your right pocket to your left pocket, you are no wealthier. Franco and I put that rigorously." Frame-independent investors pay attention to

[1] Published by Hill and Wang in 2001.

changes in their total wealth because it is this that eventually determines how much they can spend on goods and services.

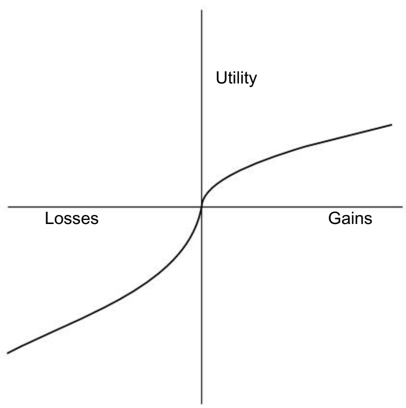
In reality, behaviour is frame-dependent. This means that the form used to describe a problem has a bearing on decision making. Frame dependence stems from a mix of cognitive and emotional factors. The cognitive aspects relate to how people organise information mentally, in particular how they code outcomes into gains and losses. The emotional aspects pertain to how people feel as they register information.

Prospect Theory The prospect theory proposed by Kahneman and Tversky[2] describes how people frame and value a decision involving uncertainty. According to the prospect theory, people look at choices in terms of potential gains or losses in relation to a specific reference point, which is often the purchase price.

And how do people value gains/losses? They value gains/losses according to a S-shaped utility function as shown in Exhibit 10.1 Notice the following features of this utility function.

1. The utility function is concave for gains. This means that people feel good when they gain, but twice the gain does not make them feel twice as good.
2. The utility function is convex for losses. This means that people experience pain when they lose, but twice the loss does not mean twice the pain.
3. The utility function is steeper for losses than for gains. This means that people feel more strongly about the pain from a loss than the pleasure from an equal gain—about two and half times as strongly, according to Kahneman and Tversky. This phenomenon is referred to as **loss aversion**.

Exhibit 10.1 ***Prospect Theory Value Function***



Because of loss aversion, the manner in which an outcome is described—either in the vocabulary of gains or in the vocabulary of losses—has an important bearing on decision making. To illustrate this idea, let us look at two cases:

[2] Daniel Kahneman and Amos Tversky, "Prospect Theory: An Analysis of Decisions under Risk," *Econometrica* 47 (1979).

Case I

A person has been given Rs. 100,000 and *asked* to choose between two options:

A: A certain gain of Rs. 50,000.

B: A chance to flip a balanced coin. If the coin shows head up he will get Rs. 100,000; on the other hand, if the coin shows tail up he will get nothing.

Case II

A person has been given Rs 200,000 and *required* to choose between two options:

A: A certain loss of Rs. 50,000.

B: A chance to flip a balanced coin. If the coin shows head up, he loses nothing; on the other hand, if the coin shows tail up, he loses Rs 100,000.

The outcome of option A in both the cases is Rs 150,000.

Case I: Rs 100,000 + Rs 50,000 = Rs 150,000

Case II: Rs 200,000 – Rs 50,000 = Rs 150,000

The outcomes of option B in both the cases are Rs 200,000 or Rs 100,000 with equal probability.

Case I: Rs 100,000 + Rs 100,000 or Rs 0 with equal probability

Case II: Rs 200,000 – Rs 0 or – Rs 100,000 with equal probability

Most people presented with such cases tend to choose option A in case I but option B in case II. By choosing option A in case I and option B in case II, they show that they are more conservative when they have an opportunity to lock in sure profits, but are willing to take more risk if it offers the possibility of avoiding losses.

According to prospect theory, people feel more strongly about the pain from loss than the pleasure from an equal gain. That is why they are likely to choose the certain gain of Rs 50,000 in the first case but reject a certain loss of Rs 50,000 in the second case, even though both produce the same outcome of Rs. 150,000.

Mental Accounting Traditional finance holds that wealth in general and money in particular must be regarded as "fungible" and every financial decision should be based on a rational calculation of its effects on overall wealth position. In reality, however, people do not have the computational skills and will power to evaluate decisions in terms of their impact on overall wealth. It is intellectually difficult and emotionally burdensome to figure out how every short-term decision (like buying a new camera or throwing a party) will bear on what will happen to wealth position in the long run.

So, as a practical expedient, people separate their money into various mental accounts and treat a rupee in one account differently from a rupee in another because each account has a different significance to them. The concept of *mental accounting* was proposed by Richard Thaler, one of the brightest stars of behavioural finance.

Mental accounting manifests itself in various ways:

- Investors have a tendency to ride the losers as they are reluctant to realise losses. Mentally, they treat unrealised "paper loss" and realised "loss" differently, although from a rational economic point of view they are the same.
- Investors often integrate the sale of losers so that the feeling of regret is confined to one time period.

- Investors tend to stagger the sale of winners over time to prolong the favourable experience.
- People are more venturesome with money received as bonus but very conservative with money set aside for children's education.
- Investors often have an irrational preference for stocks paying high dividends, because they don't mind spending the dividend income, but are not inclined to sell a few shares and "dip into the capital".

Narrow Framing Ideally, investors should pay attention to changes in their total wealth (comprising of real estate, stocks, bonds, capitalised future income, and other assets) over their investment horizon because it is this that determines how much they can spend on goods and services, which is what ultimately matters to them. In reality, however, investors engage in "narrow framing"—they focus on changes in wealth that are narrowly defined, both in a cross-sectional as well as a temporal sense.

Narrow framing in a cross-sectional sense means that investors tend to look at each investment separately rather than the portfolio in its totality. Hence they are more focused on price changes in individual stocks and less concerned about the behaviour of the overall portfolio. Narrow framing in a temporal sense means that investors pay undue attention to short-term gains and losses, even when their investment horizon is long (such as saving for son's college education which may be ten years away and saving for retirement which may be many years away).

Narrow framing can lead people to overestimate risk. This happens because the more narrowly an investor frames the more often the investor sees losses. While several individual securities in a portfolio may have negative returns, the portfolio as a whole is likely to have a positive return. Similarly, although the stock market often produces negative returns in the short run, it rarely delivers negative returns in the long run. Since people are loss-averse, narrow framing leads to **myopic risk aversion**.

Narrow framing manifests itself in the following ways:

- Investors allocate too little of their money to stocks due to myopic risk aversion.
- When investors sell stocks, they typically sell stocks that have appreciated, rather than stocks that have depreciated.

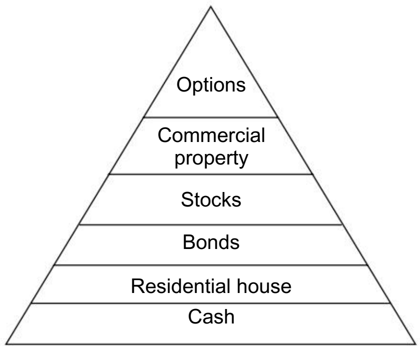
Behavioural Portfolios While investors understand the principle of diversification, they don't form portfolios in the manner suggested by portfolio theory developed by Harry Markowitz. How, then, do they build a diversified portfolio?

According to Hersh Shefrin and Meir Statman, the psychological tendencies of investors prod them to build their portfolios as a pyramid of assets as shown in Exhibit 10.2. The salient features of the pyramid of behavioural portfolio are as follows:

- Investors have several goals such as safety, income, and growth, often in that sequence.
- Each layer in the pyramid represents assets meant to meet a particular goal.
- Investors have separate mental accounts for each investment goal and they are willing to assume different levels of risk for each goal.

- The asset allocation of an investor's portfolio is determined by the amount of money assigned to each asset class by the mental accounts.
- Investors end up with a variety of mini-portfolios as they overlook interactions among mental accounts and among investment assets.
- Diversification stems from investor goal diversification, not from purposeful asset diversification as recommended by Markowitz's portfolio theory. This means that most investors do not have efficient portfolios. They may be taking too much risk for the returns expected from their portfolio. Put differently, they can earn higher expected returns for the level of risk they are taking.

Exhibit 10.2 ***Behavioural Portfolio***



The Shadow of the Past Consider this bet on a coin toss: If it shows head, you win Rs 100; if it shows tail you lose Rs 100. Would you accept this bet? Suppose you had won Rs 500 earlier. Now would you accept this bet? What if you had lost Rs 500 earlier? Would this make the bet look any different to you?

While the odds of winning the Rs100 do not change in the different scenarios, many people will take the bet in one situation, but not in the other. Put differently, people seem to consider a past outcome as a factor in evaluating a current risky decision. In general, people are willing to take more risk after earning gains and less risk after incurring losses. Experimental studies suggest a house-money effect, a snake-bite effect, and a trying-to-break-even effect.

After experiencing a gain, people are willing to take more risk. After winning money in a gamble, amateur gamblers somehow don't fully consider the winning as their own and are hence are tempted to risk it in further gambles. Gamblers refer to this as the **house-money effect.**

After incurring a loss, people are less inclined to take risk. This is sometimes referred to as the **snake-bite (or risk aversion) effect**. A loss is akin to a snake-bite that makes a person more cautious.

Losers, however, do not always shun risk. People often jump at the chance to recover their losses. This is referred to as **trying-to-break-even effect**. In fact this effect may be stronger than the snake bite effect. As Kahneman and Tversky put it, "A person who has not made peace with his losses is likely to accept gambles that would be unacceptable to him otherwise".

There are other ways in which what has happened in the past has a bearing on present decisions, actions, and beliefs. Some of the well known effects are the endowment effect, the status quo bias, and the avoidance of cognitive dissonance. The **endowment effect** says that people tend to place greater value on what belongs to them relative to the value they would place on the same thing if it belonged to someone else. A concomitant tendency is to put too much emphasis on out-of-pocket expenses and too little on opportunity costs. **Status quo bias** implies that people are comfortable with the familiar and would like to keep things the way they have been. **Cognitive dissonance** arises when the brain is struggling with two opposite ideas—I'm smart, but I'm not smart. Since cognitive dissonance is psychologically painful, people tend to reject information that conflicts with their positive image.

10.3 EMOTIONAL AND SOCIAL INFLUENCES

Emotions and herd instincts are an important part of the decision-making process, particularly when decisions involve a high degree of uncertainty. This section looks at how emotional and social influences bear on decision making.

Emotional Time Line Emotions have a bearing on risk tolerance, and risk tolerance influences portfolio selection. Investors experience a variety of emotions as they consider alternatives, decide how much risk to take, watch their decisions play out, assess whether the initial strategy needs modification, and finally learn how far they have succeeded in achieving their financial objectives.

The emotions experienced by a person with respect to investment may be expressed along an emotional time line as shown in Exhibit 10.3. Investment decisions lie at the left end of the time line and investment goals at the right end. According to psychologist Lola Lopes, investors experience a variety of emotions, positive and negative. Positive emotions are shown above the time line and negative emotions below the time line. On the positive side, hope becomes anticipation which finally converts into pride. On the negative side, fear turns into anxiety which finally transforms into regret.

Exhibit 10.3 ***Emotional Time Line***

Hope	Anticipation	Pride
Decisions	———————————	**Goals**
Fear	Anxiety	Regret

Hope and fear have a bearing on how investors evaluate alternatives. Fear induces investors to look at the downside of things, whereas hope causes them to look at the upside. The downside perspective emphasises security; the upside perspective focuses on potential gains. According to Lopes, these two perspectives reside in everyone, as polar opposites. However, they are often not equally matched, as one pole tends to dominate the other. The relative importance of these conflicting emotions determines the tolerance for risk.

Herd Instincts and Overreaction There is a natural desire on the part of human beings to be part of a group. So people tend to herd together. Moving with the herd, however, magnifies the psychological biases. It induces one to decide on the "feel" of the herd rather than on rigorous independent analysis. This tendency is accentuated in the case of decisions involving high uncertainty.

The heightened sensitivity to what others are doing squares well with a recent theory about fads, trends, and crowd behaviour. In a 1992 paper in the *Journal of Political Economy,* Sushil Bikhchandani, David Hirshleifer, and Ivo Welsh referred to a phenomenon called **information cascade**. Essentially, their theory says that large trends or fads begin when individuals ignore their private information but take cues from the actions of others. Imagine a traffic jam on a highway and you find that the driver ahead of you suddenly takes a little used exit. Even if you are not sure whether it will save you time, you are likely to follow him. Few others follow you and this in turn leads to more people imitating that behavior.

What is interesting about this story is that a small bit of new information can cause a rapid and wholesale change in behavior. As Sushil Bikhchandani *et al*. wrote, "If even a little new information arrives, suggesting that a different course of action is optimal, or if people even suspect that underlying circumstances have changed (whether or not they really have), the social equilibrium may radically shift".

This observation appears very apt for financial markets which are constantly bombarded by new information. In such markets information cascades lead investors to overreact to both good and bad news. That's how a stock market bubble– and, in the opposite direction, a stock market crash– get started. Eventually, however, the market corrects itself, but it also reminds us that the market is often wrong.

10.4 MARKET INEFFICIENCY

Behavioural finance argues that, thanks to various behavioural influences discussed in the previous sections, often there is a discrepancy between market price and intrinsic value. The argument of behaviouralists rests on two key assumptions:

1. Some investors - they call them **noise traders** - are not rational as their demand for risky assets is influenced by beliefs or sentiments that are not fully supported by fundamentals.
2. Arbitrage operation by rational investors tends to be limited as there are risks associated with it.

Noise Trading Many investors trade on pseudo-signals, or noise, and not on fundamentals. As long as these investors trade randomly, their trades cancel out and are likely to have no perceptible impact on demand. True, this happens to some extent because the market is thronged by noise traders who employ different models and, hence, cancel each other out. However, a good portion of noise traders employ similar strategies, as they suffer from similar judgmental biases while processing information. For example:

- They tend to be overconfident and hence assume more risk.
- They tend to extrapolate past time series and hence *chase* trends.
- They tend to put lesser weight on base rates and more weight on new information and hence overreact to news.
- They follow market gurus and forecasts and act in a similar fashion.

Given the correlated behaviour of noise traders, their actions lead to aggregate shifts in demand.

Limits to Arbitrage One can expect the irrationality of 'noise traders' to be countered by the rationality of 'arbitrageurs' as the latter are supposed to be guided by fundamentals and immune to sentiments. However, arbitrage in the real world is limited by two types of risk. The first risk is fundamental. Buying 'undervalued' securities tends to be risky because the market may fall further and inflict losses. The fear of such a loss may restrain arbitrageurs from taking large enough long positions that will push price to fully conform to fundamentals.

The second risk is resale price risk and it arises mainly from the fact that arbitrageurs have finite horizons. Why? There are two principal reasons:

1. Arbitrageurs usually borrow money or securities to implement their trades and, therefore, have to pay fees periodically. So they can ill-afford to keep an open position over a long horizon.
2. Portfolio managers are evaluated every few months. This limits their horizon of arbitrage.

Price Behaviour Given the substantial presence of noise traders whose behaviour is correlated and the limits to arbitrage, investor sentiment does influence prices. In such a market, prices often vary more than what is warranted by changes in fundamentals.

Indeed, arbitrageurs may also contribute to price volatility as they try to take advantage of the mood swings of noise traders. For example, when some investors follow a positive feedback strategy that says "buy when the price increases and sell when the price decreases", it is no longer optimal for arbitrageurs to counter the actions of noise traders all the time. Instead, they may profit by jumping on the bandwagon themselves for a while. It pays them to buy stocks which excite feedback traders, stimulate price increases, fuel the purchase of other investors, and sell near the top and collect their profits. Likewise, it is profitable for them to sell stocks that positive feedback traders dislike, trigger price decreases, induce sales by other investors, and buy them back near the nadir. Of course, finally their actions would align prices to fundamentals. Thus, while arbitrageurs eventually help in aligning prices to fundamentals, in the short run they inflate the bubble rather than dissolve it.

Given such actions of noise traders and arbitrageurs, one would expect the following: (a) returns over horizons of few weeks or months would be positively correlated because of positive feedback trading, and (b) returns over horizons of few years would be negatively correlated because arbitrageurs eventually help prices to return to fundamentals. This implies that returns tend to be mean reverting.

Several empirical studies have documented these predictions. Culler, Poterba, and Summers found evidence of positive correlations of returns over horizons of few weeks or months and negative correlations of returns over horizons of few years in several markets for stocks, bonds, foreign exchange, and gold. Debondt and Thaler[3] found that stocks that have appreciated in the past tend to perform poorly in future and vice versa.

Summers' Model

Lawrence Summers[4] proposed the following model as a plausible alternative to the efficient market hypothesis:

$$P_t = P_t^* + u_t$$

$$u_t = au_{t-1} + v_t$$

where P_t = price at time t

P_t^* = fundamental value at time t

u_t, v_t = random shocks

In the above model a is presumed to lie between 0 and 1.

Essentially, Summers' model says that errors in security prices persist but they tend to fade away. This model is consistent with overreactions, 'fads', and speculative bubbles.

Views of Experts While the efficient market hypothesis implies that the market establishes the right price of equities, the behavioural paradigm argues that there is often a divergence between the fundamental value and market price. Many distinguished economists, investment professionals, and finance experts seem to hold views that are sympathetic with what the behavioural paradigm says. Here is a sampling of their views.

John Train: "Any publicly traded market will swing wildly back and forth between euphoria and despair. So if you can get the facts right, buying good value that is out of vogue will do very well."[5]

John Kenneth Galbraith: "... there is the possibility, even the likelihood, of self-approving and extravagantly error-prone behaviour on the part of those closely associated with money."[6]

Graham and Dodd:"The market's evaluation of the same data can vary over a wide range, dependent on bullish enthusiasm, concentrated speculative interest and similar influences, or bullish disillusionment. Knowledge is only one ingredient in arriving at a stock's price. The other ingredient, fully as important as information, is sound judgment."[7]

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[3] Werner F.M. Debondt and Richard Thaler, "Does the Market Overreact?" *Journal of Finance* 40 (1985).

[4] Lawrence Summers, "Does the Stock Market Rationally Reflect Fundamental Values," *Journal of Finance* 41 (1986).

[5] John Train, *The Craft of Investing*, New York: Harper Business, 1994.

[6] John Kenneth Galbraith, *A Short History of Financial Euphoria*, Whittle, 1994.

[7] Benjamin Graham, and David L. Dodd, *Security Analysis*, McGraw-Hill, 1957.

J.M. Keynes: "In point of fact, all sorts of consideration enter into the market valuation which are in no way relevant to the prospective yield."[8]

Manmohan Singh: "Well, I think the stock market's behaviour in India has often had no relation with the fundamental strength of the economy. It is often in response to the sentiments that are shared in the market."

Louis Rukeyser: "But the market's short-term capriciousness can be a source of hypnotic fascination and a joy when you analyse it correctly. For what the market truly represents is not a crystal ball or anything else of such mystic magnitude; it is an instant photograph of the ephemeral mood of a significant chunk of Americans."

C. Rangarajan: "Share price in India tends to be considerably influenced by short-term technical considerations and speculation. The fundamentals affect the share price after a considerable time lag. This disparity of perception leads to volatility and over-heating of the stock market."

L.C. Gupta: "Our findings suggest that the market's evaluation processes work haphazardly, almost like a blind man firing a gun rather than on the basis of informed beliefs about the long-term prospects of individual firms."

In essence, the views expressed above imply that the market may at times display high irrationality causing substantial discrepancy between intrinsic values and market prices. This is evident from the following:

- In Mexico, stock prices increased by over seven times and then declined by 73 percent from the peak during the period 1978–81.
- Taiwan stocks rose nearly ten times and then sharply declined by 80 percent during the period 1986–90.
- The Nikkei share index in Japan fell by more than 50 percent from end 1989 to mid 1992.
- In India, the Sensex index rose by more than 100 percent in a period of 2–3 months and then lost over 45 percent in a short time in 1992.

A Reconciliation There is considerable evidence that stock prices respond to changes in fundamental factors. Similarly on numerous occasions stock prices have been influenced by psychological whims and fads. So many believe that price changes we observe cannot be regarded as purely rational or entirely bubbles, but a combination of the two. It is as if the bubble component is superimposed on the fundamentals.

Why Are Stock Prices so much more Volatile than Dividends?

If stock prices reflect the discounted value of all expected future dividends (a basic proposition of finance) then why are stock prices far more volatile than dividends? According to Robert Shiller, the excess volatility in stock prices is not due to changing expectations about future dividends, but due to the propensity of investors to trade on fads and fashions, thus inducing speculative bubbles.

(*Contd.*)

[8] J.M. Keynes, *op. cit*.

As Shiller observes: "Investing in speculative assets is a social activity. Investors spend a substantial part of their leisure time discussing investments, reading about investments, or gossiping about others' success or failures in investing… It is plausible that attitudes or fashions regarding investments would also change spontaneously or in arbitrary social reaction to some widely noted events."[9]

For example, there was no evidence of a change in the expected growth rate or discount rate when the US market fell by 23 percent in October 1987. The crash was caused by some sort of a vicious circle, when people seeing prices fall deciding to sell before prices dropped further.

Shiller's view of financial markets is similar to Pigou's view of business cycle. To answer the question "What causes the business cycle?", Pigou wrote a book in which he argued that business cycles are caused by "real" factors and "psychological factors" that are more or less of equal importance.

10.5 CRITIQUE OF BEHAVIOURAL FINANCE

Efficient market advocates find the evidence on stock market inefficiency puzzling, for it suggests that there are profitable investment strategies that border on being 'free lunches.' So their first reaction was to contend that the observed evidence does not suggest that investors make mistakes but simply reflects risk. For example, they argued that stocks in the 'loser' portfolio are fundamentally riskier than those in the 'winner' portfolio. But further empirical work indicated that even after risk-adjustment, 'loser' portfolios outperform 'winner' portfolios. The second reaction of efficient market advocates was that 'data mining' is bound to throw up some anomalies and inefficiencies, but the same are not likely to persist in non-sample data. But empirical evidence suggests that certain anomalies persist over time.

Thus, it appears that the risk story and data mining critique have not been able to demolish the inefficient markets point of view. Yet, the behaviouralist view faces a stiff challenge: Apart from presenting evidence of investor under-reaction (or over-reaction), they must demonstrate that such investor behaviour is firmly grounded in human psychology.

True, behaviouralists talk about things like 'representativeness heuristic' and 'conservatism'. But, a substantial proportion of academic finance community regards such links with skepticism. They argue that behavioural finance theorists go on a 'fishing' expedition, sifting through literature on human psychology until they find something that could be related to what they are trying to explain."

The debate over the findings of behaviouralists continues. On the one hand, behavioural finance researchers are trying to develop more robust models of the interplay of psychology and finance. On other hand, efficient markets are trying to

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[9] Robert J. Shiller, *Irrational Exuberance*, 2/e, New York: Currency Doubeday, 2005.

deepen their understanding of the relationship between risk and return. As Nichoas Barberis put it: "Ultimately, the battle between efficient markets theory and behavioural finance theory will be decided by each theory's ability to predict phenomena not previously known. If behavioural finance comes through this process successfully, its place in financial economics will be secure."[10]

It may be instructive to close this discussion with an insightful passage from John Maurice Clarke, a Chicago economist of an earlier generation. In an article published in the *Journal of Political Economy*, the house journal of the University of Chicago, in 1918, Clark wrote this: "The economist may attempt to ignore psychology, but it is a sheer impossibility for him to ignore human nature. If the economist borrows his conception of man from the psychologist, his constructive work may have some chance of remaining purely economic in character. But if he does not, it will not thereby avoid psychology. Rather, he will force himself to make his own, and it will be bad psychology." Perhaps behavioural finance is an attempt to borrow some good psychology rather than invent more bad psychology.

10.6 STRATEGIES FOR OVERCOMING PSYCHOLOGICAL BIASES

This chapter has discussed many psychological biases that impair the quality of investment decision making. We will close the chapter by suggesting strategies for overcoming the psychological biases:

Understand the Biases Pogo, the folk philosopher created by the cartoonist Walt Kelly, provided an insight that is particularly relevant for investors, "We have met the enemy—and it's us". So, understand your biases (the enemy within) as this is an important step in avoiding them.

Focus on the Big Picture Develop an investment policy and put it down on paper. Doing so will make you react less impulsively to the gyrations of the market.

Follow a Set of Quantitative Investment Criteria It is helpful to use a set of quantitative criteria such as the price-earnings ratio being not more than 15, the price to book ratio being not more than 4, the growth rate of earnings being at least 12 percent, and so on. Quantitative criteria tend to mitigate the influence of emotion, hearsay, rumour, and psychological biases.

Diversify If you own a fairly diversified portfolio of say 12 to 15 stocks from different industries, you are less prone to do something drastically when you incur losses in one or two stocks because these losses are likely to be offset by gains elsewhere.

Control Your Investment Environment If you are on a diet, you should not have tempting sweets and savouries on your dining table. Likewise, if you want to discipline your investment activity, you should regulate or control your investment environment. Here are some ways of doing so:

[10] Nicholas Barberis, "Investors Seek Lessons in Thinking" in James Pickford (ed.) *Mastering Investment*, London, FT Prentice Hall, 2002.

- Check your stocks only once every month.
- Trade only once every month and preferably on the same day of the month.
- Review your portfolio once or twice a year.

Strive to Earn Market Returns Seek to earn returns in line with what the market offers. If you strive to outperform the market, you are likely to succumb to psychological biases.

Review Your Biases Periodically Once in a year review your psychological biases. This will throw up useful pointers to contain such biases in future.

SUMMARY

- The central assumption of the **traditional finance model** is that people are rational. The **behavioural finance model,** however, argues that people suffer from cognitive and emotional biases and act in a seemingly irrational manner.
- The important heuristic-driven biases and cognitive errors that impair judgment are: **representativeness**, **overconfidence**, **anchoring**, **aversion to ambiguity**, and **innumeracy**.
- The form used to describe a problem has a bearing on decision making. **Frame dependence** stems from a mix of cognitive and emotional factors.
- The **prospect theory** describes how people frame and value a decision involving uncertainty.
- People feel more strongly about the pain from a loss than the pleasure from an equal gain—about two and half times as strongly. This phenomenon is referred to as **loss aversion**.
- People tend to separate their money into various **mental accounts** and treat a rupee in one account differently from a rupee in another because each account has a different significance to them.
- Investors engage in **narrow framing—**they focus on changes in wealth that are narrowly defined, both in a cross-sectional as well as a temporal sense. Since people are loss-averse, narrow framing leads to **myopic risk aversion.**
- The psychological tendencies of investors prod them to build their portfolios as a **pyramid** of assets.
- In general, people are willing to take more risk after earning gains and less risk after incurring losses.
- Hope and fear have a bearing on how investors evaluate alternative. The relative importance of these conflicting emotions determines the tolerance for risk.
- The heightened sensitivity to what others are doing leads to the phenomenon called **information cascade.**

- Behaviouralists believe that given the substantial presence of **noise traders** whose behaviour is correlated and the limits to arbitrage operation by rational traders, investor sentiment plays an important role. In such a market, prices often vary more than what is warranted by fundamentals.
- The strategies for overcoming psychological biases are: (a) Understand the biases, (b) Focus on the big picture, (c) Follow a set of quantitative investment criteria, (d) Diversify, (e) Control your investment environment, (f) Strive to earn market returns, (g) Review your biases periodically.

QUESTIONS

1. What are the key differences between "traditional finance" and "behavioural finance"?
2. Discuss the following heuristic-driven biases and cognitive errors:
   - Representativeness
   - Overconfidence
   - Anchoring
   - Aversion to ambiguity
   - Innumeracy
3. How do people value gains/losses according to the prospect theory?
4. What is mental accounting and what are its common manifestations?
5. Describe what 'narrow framing' means.
6. Discuss the salient features of the pyramid of behavioural portfolio.
7. What are the ways in which the past has a bearing on the present decisions, actions and beliefs?
8. Discuss the emotional time line.
9. Explain the phenomenon of "information cascade".
10. How noise trading and limits to arbitrage influence price behaviour.
11. Discuss the critique of behavioural finance.
12. Discuss the strategies for overcoming psychological biases.

PART

4

Fixed Income Securities

Chapter **11**

Bond Prices and Yields

Figuring out the Assured Returns

Learning Objectives

After studying this chapter, you should be able to:

- Estimate the price of a bond.
- Calculate various measures of bond yield.
- Show how bond prices vary in response to interest rate changes.
- Identify the risks in bonds.
- Understand the meaning and functions of credit rating.
- Explain what determines the term structure of interest rates.
- Analyse the factors that determine interest rates.

In our previous discussion on risk and return relationship, we looked at securities at a high level of abstraction. We assumed that each security had been analysed in detail and its risk and return assessment had been done.

We now turn our attention to the assessment of risk and return characteristics of securities in some detail. This chapter looks at fixed income securities or bonds. The basic character of these instruments is that they promise to pay a stipulated stream of cash flows. This generally comprises of periodic interest payments over the life of the instrument and principal payment at the time of maturity.

The bond market in India has registered an impressive growth particularly from mid-1990s and, not surprisingly, this has been accompanied by increasing complexity of instruments, interest rates, and methods of analysis. It is instructive to compare the characteristics of the pre-liberalisation scenario with those of the post-liberalisation scenario. This comparison is given in Exhibit 11.1.

11.1 BOND CHARACTERISTICS

A bond represents a security issued in connection with a borrowing arrangement. In essence, it is an "IOU" issued by the borrower. A bond obligates the issuer to make specified payments (interest and principal) to the bondholder. A bond may be described in terms of par value, coupon rate, and maturity date. The *par value* is the value stated on the face of the bond. It represents the amount the issuer promises to pay at the time of maturity. The *coupon rate* is the interest rate payable to the bondholder. The *maturity date* is the date when the principal amount is payable to the bondholder. The bond indenture, the contract between the issuer and the bondholder, specifies the par value, coupon rate, and maturity date. For example, an issuer may sell a bond with a par value of Rs. 1,000, a coupon rate of eight percent payable semi-annually, and a maturity period of 12 years. The buyer of such a bond would receive an interest of Rs. 40 every six months for 12 years and a principal amount of Rs 1000 at the end of 12 years.

Exhibit 11.1 ***Changing Complexion of Bond Market in India***

	Pre-liberalisation Scenario	*Post-liberalisation Scenario*
Instruments	The plain vanilla bond was the most popular instrument	Bonds with complex features are gaining in importance
Interest rates	Stable and administered interest rates prevailed	Volatile and market-determined interest rates have come into vogue
Number of players	There were only a few players in the debt market	Many players have entered the debt market
Reference rate	Practically, there was no reference rate	A reference rate is gradually emerging
Methods of analysis	Investors used simplistic measures like current yield and years to maturity and followed *ad hoc* rules of thumb	Investors have begun calculating more precise measures like yield to maturity and duration and are applying more scientific methods
Nature of market	The market was by and large highly illiquid	There are signs of increasing liquidity; of course, a lot needs to be done
Approach to portfolio management	In general, investors followed a fairly passive approach	The active approach is now receiving more attention

Government Bonds The largest borrowers in India, and in most other countries, are the central and state governments. The Government of India periodically issues bonds which are called government securities (G-secs) or gilt-edged securities. These are essentially medium to long-term bonds issued by the Reserve Bank of India on behalf of the Government of India. Interest payments on these bonds are typically semi-annual. State governments also sell bonds. These are also essentially medium to long-term bonds issued by the Reserve Bank of India on behalf of state governments. Interest payments on these bonds are typically semi-annual.

Apart from the central and state governments, a number of governmental agencies issue bonds that are guaranteed by the central government or some state government. Interest payments on these bonds are typically semi-annual.

Corporate Bonds Companies, like the governments, borrow money by issuing bonds called corporate bonds (also called corporate debentures). Internationally, a secured corporate debt instrument is called a corporate bond whereas an unsecured corporate debt instrument is called a corporate debenture. In India, corporate debt instruments have traditionally been referred to as debentures, although typically they are secured. For the sake of simplicity, we will refer to all corporate debt instruments as corporate bonds.

A wide range of innovative bonds have been issued in India, particularly from the early 1990s. This innovation has been stimulated by a variety of factors, the most important being the increased volatility of interest rates and changes in the tax and regulatory framework. A brief description of various types of corporate bonds is given below.

Straight Bonds The straight bond (also called plain vanilla bond) is the most popular type of bond. It pays a fixed periodic (usually semi-annual) coupon over its life and returns the principal on the maturity date.

Zero Coupon Bonds A zero coupon bond (or just zero) does not carry any regular interest payment. It is issued at a steep discount over its face value and redeemed at face value on maturity. For example, the Industrial Development Bank of India (IDBI) issued deep discount bonds in 1996 which have a face value of Rs. 200,000 and a maturity period of 25 years. The bonds were issued at Rs. 5,300. These bonds also had call and put options.

Floating Rate Bonds Straight bonds pay a fixed rate of interest. Floating rate bonds, on the other hand, pay an interest rate that is linked to a benchmark rate such as the Treasury bill interest rate. For example, in 1993 the State Bank of India came out with the first ever issue of floating interest rate bonds in India. It issued 5 million (Rs.1000 face value) unsecured, redeemable, subordinated, floating interest rate bonds carrying interest at three percent per annum over the bank's maximum term deposit rate.

Bonds with Embedded Options Bonds may have options embedded in them. These options give certain rights to investors and/or issuers. The more common types of bonds with embedded options are:

> *Convertible Bonds* Convertible bonds give the bond holder the right (option) to convert them into equity shares on certain terms.
>
> *Callable Bonds* Callable bonds give the issuer the right (option) to redeem them prematurely on certain terms.
>
> *Puttable Bonds* Puttable bonds give the investor the right to prematurely sell them back to the issuer on certain terms.

Commodity-Linked Bonds The payoff from a commodity linked bond depends to a certain extent on the price of a certain commodity. For example, in June 1986, Standard Oil Corporation issued zero coupon notes that would mature in 1992. The payoff from each note was defined as: $1,000 + 200 [Price per barrel of oil in dollars—$25]. The second term of the payoff, however, was subject to a floor of zero.

11.2 BOND PRICES

The value of a bond—or any asset, real or financial—is equal to the present value of the cash flows expected from it. Hence, determining the value of a bond requires:

- An estimate of expected cash flows
- An estimate of the required return

To simplify our analysis of bond valuation we will make the following assumptions:

- The coupon interest rate is fixed for the term of the bond
- The coupon payments are made every year and the next coupon payment is receivable exactly a year from now
- The bond will be redeemed at par on maturity

Given these assumptions, the cash flow for a noncallable bond comprises of an annuity of a fixed coupon interest payable annually and the principal amount payable at maturity. Hence the value of a bond is:

$$P = \sum_{t=1}^{n} \frac{C}{(1+r)^t} + \frac{M}{(1+r)^n} \tag{11.1}$$

where P is the value (in rupees), n is the number of years to maturity, C is the annual coupon payment (in rupees), r is the periodic required return, M is the maturity value, and t is the time period when the payment is received.

Since the stream of annual coupon payments is an ordinary annuity, we can apply the formula for the present value of an ordinary annuity. Hence the bond value is given by the formula:

$$P = C \times \text{PVIFA}_{r,n} + M \times \text{PVIF}_{r,n} \tag{11.2}$$

To illustrate how to compute the value of a bond, consider a 10-year, 12 percent coupon bond with a par value of 1,000. Let us assume that the required yield on this bond is 13 percent. The cash flows for this bond are as follows:

- 10 annual coupon payments of Rs. 120
- Rs. 1000 principal repayment 10 years from now

The value of the bond is:

$$\begin{aligned} P &= 120 \times \text{PVIFA}_{13\%,10\text{yrs}} + 1{,}000 \times \text{PVIF}_{13\%,10\text{yrs}} \\ &= 120 \times 5.426 + 1{,}000 \times 0.295 \\ &= 651.1 + 295 = \text{Rs } 946.1 \end{aligned}$$

Bond Value with Semi-annual interest Most of the bonds pay interest semi-annually. To value such bonds, we have to work with a unit period of six months, and not one year. This means that the bond valuation equation has to be modified along the following lines:

- The annual interest payment, C, must be divided by two to obtain the semi-annual interest payment
- The number of years to maturity must be multiplied by two to get the number of half-yearly periods
- The discount rate has to be divided by two to get the discount rate applicable to half-yearly periods

With the above modifications, the basic bond valuation becomes:

$$P = \sum_{t=1}^{2n} \frac{C/2}{(1+r/2)^t} + \frac{M}{(1+r/2)^{2n}}$$

$$= C/2\ (\text{PVIFA}_{r/2,2n}) + M(\text{PVIF}_{r/2,2n}) \qquad (11.3)$$

where P is the value of the bond, $C/2$ is the semi-annual interest payment, $r/2$ is the discount rate applicable to a half-year period, M is the maturity value, and $2n$ is the maturity period expressed in terms of half-yearly periods.

As an illustration, consider an eight-year, 12 percent coupon bond with a par value of Rs. 100 on which interest is payable semi-annually. The required return on this bond is 14 percent.

Applying Eq. 11.3, the value of the bond is:

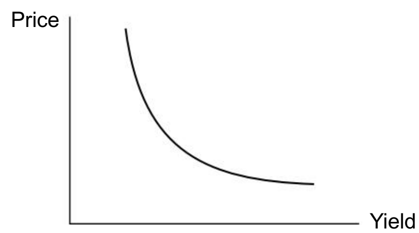
$$P = \sum_{t=1}^{16} \frac{6}{(1.07)^t} + \frac{100}{(1.07)^{16}}$$

$$= 6\ (\text{PVIFA}_{7\%,16\text{yrs}}) + 100\ (\text{PVIF}_{7\%,16\text{yrs}})$$

$$= \text{Rs.}6\ (9.447) + \text{Rs.}100\ (0.339) = \text{Rs.}90.6$$

Price-Yield Relationship A basic property of a bond is that its price varies inversely with yield. The reason is simple. As the required yield increases, the present value of the cash flow decreases; hence the price decreases. Conversely, when the required yield decreases, the present value of the cash flow increases; hence the price increases. The graph of the price-yield relationship for any non-callable bond has a convex shape as shown in Exhibit 11.2.

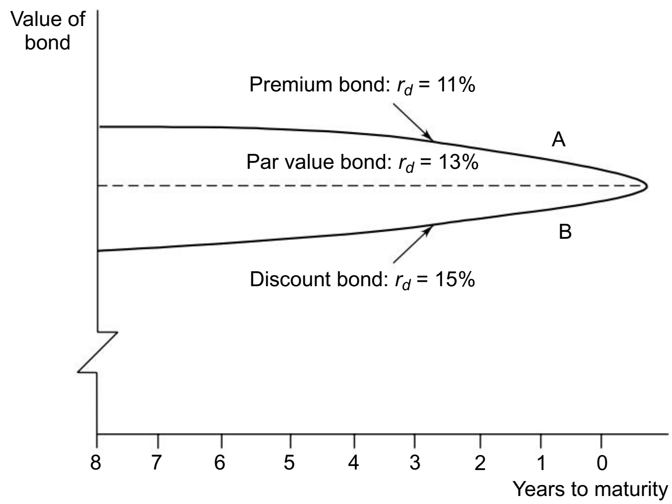
Exhibit 11.2 ***Price–Yield Relationship***



Relationship between Bond Price and Time Since the price of a bond must equal its par value at maturity (assuming that there is no risk of default), the bond prices change with time. For example, a bond that is redeemable for Rs.1000 (which is its par value) after five years when it matures, will have a price of Rs.1,000 at maturity, no matter what the current price is. If its current price is, say, Rs.1,100, it is said to be a premium bond. If the required yield does not change between now and the maturity date, the premium will decline over time as shown by curve *A* in Exhibit 11.3.

On the other hand, if the bond has a current price of say Rs.900, it is said to be a discount bond. The discount too will disappear over time as shown by curve *B* in Exhibit 11.3. Only when the current price is equal to par value - in such a case the bond is said to be a par bond—there is no change in price as time passes, assuming that the required yield does not change between now and the maturity date. This is shown by the dashed line in Exhibit 11.3.

Exhibit 11.3 ***Price Changes with Time***



11.3 BOND YIELDS

Bonds are generally traded on the basis of their prices. However, they are usually not compared in terms of prices because of significant variations in cash flow patterns and other features. Instead, they are typically compared in terms of yields.

In the previous section we learned how to determine the price of a bond and discussed how price and yield were related. We now discuss various yield measures.

The commonly employed yield measures are: current yield, yield to maturity, yield to call, and realised yield to maturity. Let us examine how these yield measures are calculated.

Current Yield The current yield relates the annual coupon interest to the market price. It is expressed as:

$$\text{Current yield} = \frac{\text{Annual interest}}{\text{Price}}$$

For example, the current yield of a 10 year, 12 percent coupon bond with a par value of Rs. 1000 and selling for Rs. 950 is 12.63 percent.

$$\text{Current yield} = \frac{120}{950} = 0.1263 \text{ or } 12.63 \text{ percent}$$

The current yield calculation reflects only the coupon interest rate. It does not consider the capital gain (or loss) that an investor will realise if the bond is purchased at a discount (or premium) and held till maturity. It also ignores the time value of money. Hence it is an incomplete and simplistic measure of yield.

Yield to Maturity When you purchase a bond, you are not quoted a promised rate of return. Using the information on bond price, maturity date, and coupon payments, you figure out the rate of return offered by the bond over its life. Popularly referred to as the yield to maturity (YTM), it is the discount rate that makes the present value of the cash flows receivable from owning the bond equal to the price of the bond. Mathematically, it is the interest rate (r) which satisfies the equation:

$$P = \frac{C}{(1+r)} + \frac{C}{(1+r)^2} + \ldots + \frac{C}{(1+r)^n} + \frac{M}{(1+r)^n} \tag{11.4}$$

where P is the price of the bond, C is the annual interest (in rupees), M is the maturity value (in rupees), and n is the number of years left to maturity.

The computation of YTM requires a trial and error procedure. To illustrate this, consider a Rs. 1,000 par value bond, carrying a coupon rate of nine percent, and maturing after eight years. The bond is currently selling for Rs. 800. What is the YTM on this bond? The YTM is the value of r in the following equation:

$$800 = \sum_{t=1}^{8} \frac{90}{(1+r)^t} + \frac{1000}{(1+r)^8}$$

$$= 90\ (\text{PVIFA}_{r,8\text{yrs}}) + 1{,}000\ (\text{PVIF}_{r,8\text{yrs}})$$

Let us begin with a discount rate of 12 percent. Putting a value of 12 percent for r we find that the right-hand side of the above expression is:

$$\text{Rs. } 90\ (\text{PVIFA}_{12\%,8\text{yrs}}) + \text{Rs. } 1{,}000\ (\text{PVIF}_{12\%,8\text{yrs}})$$

$$= \text{Rs. } 90(4.968) + \text{Rs } 1{,}000(0.404) = \text{Rs } 851.1$$

Since this value is greater than Rs. 800, we have to try a higher value for r. Let us try r = 14 percent. This makes the right-hand side equal to:

$$\text{Rs. } 90\ (\text{PVIFA}_{14\%,8\text{yrs}}) + \text{Rs. } 1{,}000\ (\text{PVIF}_{14\%,8\text{yrs}})$$

$$= \text{Rs. } 90\ (4.639) + \text{Rs. } 1{,}000\ (0.351) = \text{Rs } 768.1$$

Since this value is less than Rs 800, we try a lower value for r. Let us try r = 13 percent. This makes the right-hand side equal to:

$$\text{Rs. } 90\ (\text{PVIFA}_{13\%,8\text{yrs}}) + \text{Rs. } 1{,}000\ (\text{PVIF}_{13\%,8\text{yrs}})$$

$$= \text{Rs. } 90\ (4.800) + \text{Rs. } 1{,}000\ (0.376) = \text{Rs } 808$$

Thus r lies between 13 percent and 14 percent. Using a linear interpolation[1] in the range 13 percent to 14 percent, we find that r is equal to 13.2 percent:

---

[1] The procedure for linear interpolation is as follows:

(a) Find the difference between the present values for the two rates, which in this case is Rs.39.9 (Rs.808-Rs.768.1).

(b) Find the difference between the present values corresponding to the lower rate (Rs.808 at 13 percent) and the target value (Rs.800), which in this case is Rs.8.0.

(c) Divide the outcome of (b) with the outcome of (a), which is 8.0/39.9 or 0.2. Add this fraction to the lower rate, i.e., 13 percent. This gives the YTM of 13.2 percent.

$$13\% + (14\% - 13\%)\frac{808 - 800}{808 - 768.1} = 13.2\%$$

An Approximation If you are not inclined to follow the trial-and-error approach described above, you can employ the following formula to find the approximate YTM on a bond:

$$\text{YTM} \simeq \frac{C + (M - P)/n}{0.4M + 0.6P} \tag{11.5}$$

where YTM is the yield to maturity, C is the annual interest payment, M is the maturity value of the bond, P is the present price of the bond, and n is the years to maturity.

This formula was suggested by Gabriel A. Hawawini and Ashok Vora, in an article published in the *Journal of Finance* March 1982 issue.

While the approximate YTM formula gives a close approximation, note that the formula tends to understate the exact YTM when the bond trades at a discount (below its par value). The opposite happens when the bond trades at a premium (above its par value).

To illustrate the use of this formula, let us consider the bond discussed above. The approximate YTM of the bond works out to:

$$\text{YTM} = \frac{90 + (1000 - 800)/8}{0.4 \times 1000 + 0.6 \times 800} = 13.1\%$$

Thus, we find that this formula gives a value which is very close to the true value. Hence it is very useful.

The YTM calculation considers the current coupon income as well as the capital gain or loss the investor will realise by holding the bond to maturity. In addition, it takes into account the timing of the cash flows.

The YTM of a bond is the internal rate of return on an investment in the bond. It can be interpreted as the compound rate of return over the life of the bond, assuming that all the coupons can be reinvested at a rate of return equal to the YTM of the bond.

Yields are reported in the financial press on an annualised basis. Annualisation, however, is done by simply doubling the semi-annual yield. Thus, if the semi-annual yield is, say, four percent, the annualised yield, referred to as the **annual percentage rate** or APR is stated as eight percent. Essentially, APR is based on simple interest – annualised yields based on simple interest are also called **bond equivalent yields**. However, if you want to calculate the **effective annual yield** of a bond you have to use compound interest. If the bond earns 4 percent every six months, then one rupee of investment grows to $1 \times (1.04)^2 = 1.0816$ after one year. Hence, the effective annual yield works out to 8.16 percent.

Spreadsheet Application Excel has a function for calculating the bond price, given the maturity period, annual coupon rate,required yield, and the redemption value. Excel also has a function for calculating the bond yield, given the maturity period, annual coupon rate, current price, and the redemption value.For the bond considered above the price and the yield(yield to maturiy) are calculated in the following Excel spreadsheet.

	A	B	C	D	E	F	G	H	I	J
1	Settlement	1/1/2006	This is the date of purchase. If not certain fill in any date							
2	Maturity	12/30/2013	The formula in this case is=B3+365*8, as the maturity period is 8 years							
3	Rate	9%	The annual coupon rate							
4	Yield	13.2%	The required return per annum							
5	Redemption	100	Fill in the redemption value as a percentage of the par value							
6	Frequency	1	This represents the number of times interest is paid in a year							
7	Basis	3	3 represents the day count convention :actual no of days/365, in interest calculation							
8	Price	79.99	To get the result in B8, use the function =PRICE(B1,B2,B3,B4,B5,B6,B7)							
9	Bond price is obtained per Rs.100 of the face value of the bond. Here, the redemption value being									
10	Rs. 1000, the price would be Rs.79.99 x 1000/100 = Rs.799.9 or Rs.800									
11	Given the bond price you can use the spreadshet to calculate the yield to maturity. In the above									
12	worksheet, if you type the Price as 80 in cell B8 and wish to calculate the yield to maturity in cell B4									
13	(of course all other data remaining unchanged), type =YIELD(B1,B2,B3,B8,B5,B6,B7) in cell B4 and									
14	press enter and you will get the value as 13.2% in that cell. The cell references in the formula for the									
15	yield respectively stand for Settlement, Maturity,Rate, Price(per Rs.100).Redemption value(per Rs.100),									
16	Frequency and Basis.									

Yield to Call Some bonds carry a call feature that entitles the issuer to call (buy back) the bond prior to the stated maturity date in accordance with a call schedule (which specifies a call price for each call date). For such bonds, it is a practice to calculate the yield to call (YTC) as well as the YTM.

The procedure for calculating the YTC is the same as for the YTM. Mathematically the YTC is the value of r in the following equation:

$$P = \sum_{t=1}^{n^*} \frac{C}{(1+r)^t} + \frac{M^*}{(1+r)^{n^*}} \tag{11.6}$$

where C is the annual interest (in rupees), M^* is the call price (in rupees), and n^* is the number of years until the assumed call date.

Realised Yield to Maturity The YTM calculation assumes that the cash flows received through the life of a bond are reinvested at a rate equal to the yield to maturity. This assumption may not be valid as reinvestment rate/s applicable to future cash flows may be different. It is necessary to define the future reinvestment rates and figure out the realised yield to maturity. How this is done may be illustrated by an example.

Consider a Rs. 1000 par value bond, carrying an interest rate of 15 percent (payable annually) and maturing after 5 years. The present market price of this bond is Rs. 850. The reinvestment rate applicable to the future cash flows of this bond is 16 percent. The future value of the benefits receivable from this bond, calculated in Exhibit 11.4, works out to Rs. 2032. The realised yield to maturity is the value of r^* in the following equation:

$$\text{Present market price } (1 + r^*)^5 = \text{Future value}$$

$$850\,(1 + r^*)^5 = 2032$$

$$(1 + r^*)^5 = 2032/850 = 2.391$$

$$r^* = 0.19 \text{ or } 19 \text{ percent.}$$

Exhibit 11.4 ***Future Value of Benefits***

	0	1	2	3	4	5
■ Investment	850					
■ Annual interest		150	150	150	150	150
■ Re-investment period (in years)		4	3	2	1	0
■ Compound factor (at 16 percent)		1.81	1.56	1.35	1.16	1.00
■ Future value of intermediate cash flows		271.5	234.0	202.5	174.0	150.0
■ Maturity value						1000
Total future value	= 271.5 + 234.0 + 202.5 + 174.0 + 150.0 + 1000 = 2032					

The realised yield to maturity appears to be conceptually superior to the conventional yield to maturity. However, its appeal seems to be dubious because it is difficult to forecast the future reinvestment rates, given the uncertainty characterising them. While the conventional yields to maturity on coupon bonds are *difficult to interpret,* realised yields to maturity are *difficult to implement.*

Yield to Maturity and Default Risk Corporate bonds are subject to default risk. So, you must distinguish between the bond's stated YTM and the bond's expected YTM. The stated or promised YTM will be realised only if the issuing firm meets all the obligations on the bond issue. Thus, the stated YTM is the maximum possible YTM on the bond. The expected YTM, however, takes into account the possibility of a default.

An example may be given to illustrate the difference between the two measures of YTM. Alpha Corporation issued a Rs.1,000 par 12 percent coupon bonds 10 years ago. The bonds now have five years left until its maturity. Alpha is experiencing financial difficulties. Bondholders believe that Alpha will meet the remaining interest payments, but at the time of maturity bondholders will receive only 80 percent of par value. The bond is currently selling at Rs 850.

The following inputs would be used to calculate YTM:

Inputs	*Expected YTM*	*Stated YTM*
Coupon payment	Rs. 60	Rs 60
Number of semiannual periods	10 periods	10 periods
Final payment	Rs. 800	Rs 1000
Price	Rs. 850	Rs 850

Using the approximate formula the YTM based on expected payments works out 6.63 percent, whereas the YTM based on promised payments works out to 8.24 percent.

Yield to Maturity versus Holding Period Return Don't confuse the yield to maturity (YTM) of a bond with its holding period return. The YTM is the single discount rate at which the present value of payments received from the bond equals its price. It represents the average rate of return from the bond if it is held till maturity. In contrast, the holding period return is the income earned over a given holding period as a percentage of its price at the beginning of the period.

For example, if a 10 year Rs. 1000 par bond paying an annual coupon of Rs. 90 is bought for Rs. 1,000, its YTM is 9 percent. If the bond price increases to Rs. 1060 by year end, its YTM will fall below 9 percent (because it is selling at a premium), but its holding-period return for the year exceeds 9 percent:

$$\text{Holding period return} = \frac{90 + (1060 - 1000)}{1000} = 0.15 \text{ or } 15 \text{ percent}$$

11.4 RISKS IN BONDS

Like any other investment, bonds should be viewed in terms of their risk and return. Bonds are subject to diverse risks, such as interest rate risk, inflation risk, real interest rate risk, default risk, call risk, liquidity risk, and reinvestment risk.

Interest Rate Risk Interest rates tend to vary over time, causing fluctuations in bond prices. A rise in interest rates will depress the market prices of outstanding bonds whereas a fall in interest rates will push the market prices up.

Interest rate risk, also referred to as market risk, is measured by the percentage change in the value of a bond in response to a given interest rate change. It is a function of the maturity period of the bond and its coupon interest rate. You can appreciate this easily by looking at the general formula for the current price of a bond.

$$\text{Current price of bond} = \text{Present value of interest payments} + \text{Present value of principal repayment}$$

$$P = \sum_{t=1}^{n} \frac{C}{(1+r)^t} + \frac{M}{(1+r)^n} \tag{11.7}$$

An examination of this formula reveals that:

Longer maturity period → Greater sensitivity of price to changes in interest rates

Larger coupon (interest) payment → Lesser sensitivity of price to changes in interest rates

Duration, a precise measure of interest rate sensitivity, is discussed in the following chapter.

Inflation Risk Interest rates are defined in nominal terms. This means that they express the rate of exchange between current and future rupees. For example, a nominal interest of 12 percent on a one-year loan means that Rs. 112 is payable a year hence for Rs. 100 borrowed today. However, what really matters is the real rate of interest, the rate of exchange between current and future goods and services.

Since financial contracts are typically stated in nominal terms, the real interest rate should be adjusted for the expected inflation. According to the Fisher effect, the following relationship holds between the nominal rate r, the real rate a, and the expected inflation rate, α.

$$(1 + r) = (1 + a)(1 + \alpha) \tag{11.8}$$

or,
$$r = a + \alpha + a\alpha \tag{11.9}$$

For example, if the required real rate is 6 percent and the expected inflation rate is eight percent, the nominal rate will be:

$$(0.06) + (0.08) + (0.06)(0.08) = 0.1448 \text{ or } 14.48 \text{ percent}$$

When the inflation is higher than expected, the borrower gains at the expense of the lender and vice versa. Put differently, inflation is a zero-sum game.

The impact of a change in inflation rate is similar to that of a change in interest rate. This means that inflation risk is greater for long-term bonds. Hence, in a period of volatile inflation rates, borrowers will be disinclined to issue long-term fixed-interest bonds and investors, too, will be reluctant to buy such bonds. During such times, floating rate bonds and shorter-maturity bonds become more popular.

Real Interest Rate Risk Even if there is no inflation risk, borrowers and lenders are still exposed to the risk of change in the real interest rate. Shifts in supply and/or demand for funds will change the real rate of interest.

To understand the implications of real interest rate risk consider an example. Suppose that the real interest rate falls from 6 to 4 percent because a combination of tax law changes and heightened competition drives down the real interest rate. In this case a firm that has borrowed funds at six percent real interest rate suffers. While it may earn only four percent on its assets, it has to pay six percent on its debt. Irrespective of whether it gains or loses from a change in the real rate of interest, a firm that has locked itself into a long-term debt at a fixed real cost can experience a dramatic impact whenever the real rate of interest changes. As such changes can scarcely be predicted, they represent a source of risk that borrowers and lenders have to face.

Default Risk Default risk is the risk that a borrower may not pay interest and/or principal on time.

Other things being equal, bonds which carry a higher default risk (lower credit rating) trade at a higher yield to maturity. Put differently, they sell at a lower price compared to government securities which are considered free from default risk (as the government has the power to print money, it is believed that it will not default in honouring its commitments).

Except in the case of highly risky debt instruments, referred to as junk bonds, investors seem to be more concerned with the perceived risk of default rather than the actual occurrence of default. Even though the actual default may be highly unlikely, they believe that a change in the perceived default risk of a bond would have an immediate impact on its market price.

Call Risk A bond may have a call provision that gives the issuer the option to redeem the bond before its scheduled maturity. The issuer would generally exercise the call option when interest rates decline. While this is attractive from the issuer's point of view, it exposes the investors to call risk. Since bonds are typically called for prepayment after interest rates have fallen, investors will not find comparable investment vehicles. They almost invariably have to accept a lower yield when they reinvest the amount received on premature redemption.

Liquidity Risk Barring some of the popular Government of India securities which are traded actively, most debt instruments do not seem to have a very liquid market. The market for debt is mainly an over-the-counter market and much of the activity seems to occur in the primary (new issues) market. Given the poor liquidity in the debt market, investors face difficulty in trading debt instruments, particularly when the quantity is large. They may have to accept a discount over the quoted price while selling and pay premium while buying. This seems to be a major problem in certain segments of debt market—far bigger than most investors realise.

Reinvestment Risk When a bond pays periodic interest there is a risk that the interest payments may have to be reinvested at a lower interest rate. This is called *reinvestment risk.* The reinvestment risk is greater for bonds with longer maturity and for bonds with higher interest payments.

Foreign Exchange Risk If a bond has payments that are denominated in a foreign currency its rupee cash flows are uncertain. The risk that the foreign currency will depreciate in relation to the Indian rupee is referred to as the foreign exchange risk (or currency risk).

11.5 RATING OF BONDS

Default risk, also referred to as 'credit risk', is normally gauged by the rating assigned to the bond by an independent credit rating agency. Rating of the debt securities issued by companies, quasi-government organisations, and governments first originated in the United States where presently there are at least five firms offering such services. In recent years, rating agencies have been set up in several other countries. In India, too, five rating agencies, viz. CRISIL, ICRA, CARE, Fitch Ratings, and Phelps and Duff have been set up.

Meaning of Debt Ratings To understand the meaning of debt ratings, consider some descriptions offered by well known rating agencies.

Moody's : "Ratings are designed exclusively for the purpose of grading bonds according to their investment qualities."[2]

[2] Moody's Investor Service, *Moody's Bond Record*, New York: Moody's Investor Service, December 1984.

Standard and Poor's : "A Standard and Poor's corporate or municipal debt rating is a current assessment of the credit worthiness of an obligor with respect to specific obligation."[3]

Australian Ratings : "A corporate credit rating provides lenders with a simple system of gradation by which the relative capacities of companies to make timely repayment of interest and principal on a particular type of debt can be noted."[4]

Looking at the above descriptions we find that a debt rating essentially reflects the probability of timely payment of interest and principal by a borrower. The higher the debt rating, the greater the likelihood that the borrower will fulfill his obligation to pay the interest and principal.

Having described what a debt rating is, we should also clarify what it is not.

- A debt rating is not a recommendation for purchasing, selling, or holding a security. The important elements relevant for investment decision-making in a debt security are (i) yield to maturity, (ii) risk tolerance of the investor, and (iii) credit risk of the security.

  Clearly, the focus of debt rating is on only one of these three elements, viz. credit risk of the security, and hence it cannot be the sole basis for investment decision making.
- A debt rating is not a general evaluation of the issuing organisation. If a debt issue of firm X is rated higher than a debt issue of firm Y, it does not mean that firm X is better than firm Y. Remember that debt rating being security-specific is supposed to assess the credit risk of a particular debt security, nothing less and nothing more.
- A debt rating does not create a fiduciary relationship between the rating agency and the users of rating since there is no legal basis for such a relationship.
- A debt rating does not imply that the rating agency performs an audit function. While the rating agency may examine various facets of a company's working and gather information relevant to its task, it is not expected to perform an audit function or attest to the veracity of information shared by the issuer.
- A debt rating is not a one-time evaluation of credit risk, which can be regarded as valid for the entire life of the security. Changes in the dynamic world of business may imply a change in the risk characteristics of the security. Hence debt rating agencies monitor the business and financial conditions of the issuer to determine whether a modification in rating is warranted.

Functions of Debt Ratings Debt ratings (or debt rating firms) are supposed to:

- Provide superior information
- Offer low-cost information

[3] Standard & Poor, *Credit Overview: Corporate and International Ratings*, New York: Standard & Poor's, 1984.

[4] Australian Ratings, *An Introduction to Australian Ratings*, Melbourne : Australian Ratings, 1984.

- Serve as a basis for a proper risk-return tradeoff
- Impose healthy discipline on corporate borrowers
- Lend greater credence to financial and other representations
- Facilitate the formulation of public policy guidelines on institutional investment

Superior Information Debt rating by an independent, professional rating firm offers a superior and more reliable source of information on credit risks for three interrelated reasons: (i) An independent rating firm, unlike brokers and underwriters who have a vested interest in an issue, is likely to provide an unbiased opinion. (ii) Due to its professional resources, a rating firm has greater ability to assess risks. (iii) A rating firm has access to a lot of information which may not be publicly available.

Low Cost Information A rating firm which gathers, analyses, interprets, and summarises complex information in a simple and readily understood format (like a nine-point scale) for wide public consumption represents a cost-effective arrangement. Such an arrangement is extremely useful to most investors who would find it prohibitively expensive or simply impossible to do such a credit evaluation on their own.

Basis for a Proper Risk-return Tradeoff If debt securities are rated professionally and such ratings enjoy widespread investor acceptance and confidence, a more rational risk-return tradeoff would be established in the capital market. Securities which have a high rating would have a lower expected return and vice versa.

Healthy Discipline on Corporate Borrowers Public exposure is a good motivator for improving performance. The rating of a firm's debt security increases its public 'visibility' and normally has a healthy influence over its management because of its desire to have a clear image. The influence of a rating firm is somewhat analogous to that of a score-keeper in a game - if you know that someone is keeping the score you tend to play well.

Greater Credence to Financial and Other Representations When a rating firm rates the debt security of an issuer, its own reputation is at stake. So it seeks financial and other information of a quality that is acceptable to it. As the issuer complies with the demands of the rating agency on a continuing basis, its financial and other representations acquire greater credibility.

Formulation of Public Policy Guidelines on Institutional Investment Public policy guidelines on what kinds of securities are eligible for inclusion in different kinds of institutional portfolios can be developed with greater confidence if debt securities are rated professionally by independent rating firms.

It must be emphasised that the fulfillment of the above functions hinges critically on the credibility of debt ratings. This point has been expressed eloquently by Standard and Poor's:

"Ratings are of value only so long as they are credible… Credibility is fragile … S&P operates with no governmental mandate, subpoena powers, or any other official authority. It simply has a right, as part of the media, to express its opinions in the form of letter symbols."[5]

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[5] Standard & Poor's, *Debt Ratings Criteria: Industrial Overview*, New York: Standard & Poor's, 1985.

Rating Methodology Despite variations across individual rating agencies, the following features appear to be common in the rating methodology employed by different agencies.

1. Two broad types of analyses are done: (i) industry and business analysis, and (ii) financial analysis.
2. The key factors considered in industry and business analysis are: (i) growth rate and relationship with the economy, (ii) industry risk characteristics, (iii) structure of industry and nature of competition, (iv) competitive position of the issuer, and (v) managerial capability of the issuer.
3. The important factors considered in financial analysis are: (i) earning power, (ii) business and financial risks, (iii) asset protection, (iv) cash flow adequacy, (v) financial flexibility, and (vi) quality of accounting.
4. Subjective judgment seems to play an important role in the assessment of the issue/issuer on various factors.
5. While each factor is normally scored separately, no mechanical formula is used for combining the scores on different factors to arrive at the rating conclusion. In the ultimate analysis, all variables are viewed as interdependent.
6. Industry risk characteristics are likely to set the upper limit on rating.

Key Financial Ratios The level and trend of the issuer's financial ratios have an important bearing on bond ratings. The key ratios used are:

- Coverage ratios such as times-interest-earned ratio and fixed charge coverage ratio
- Leverage ratios such as debt-equity ratio
- Liquidity ratios such as current ratio and quick ratio
- Profitability ratios such as return on capital employed and return on equity
- Cash flow to debt ratio

CRISIL Debenture Rating Symbols CRISIL is the largest credit rating agency in India. *Inter alia*, it rates debentures, preference shares, fixed deposits, and short-term instruments (commercial paper). The rating symbols employed by CRISIL for debentures are mainly of three types:

1. **High Investment Grades** Debentures rated 'AAA' are judged to offer highest safety of timely payment of interest and principal. Though the circumstances providing this degree of safety are likely to change, such changes as can be envisaged are most unlikely to adversely affect the fundamentally strong position of such issues.

   Debentures rated 'AA' are judged to offer high safety of timely payment of interest and principal. They differ in safety from 'AAA' issues only marginally.
2. **Investment Grades** Debentures rated 'A' are judged to offer adequate safety of timely payment of interest and principal; however, changes in circumstances can adversely affect such issues more than those in the higher rated categories.

   Debentures rated 'BBB' are judged to offer sufficient safety of timely payment of interest and repayment of principal; however, changing circumstances are more likely to lead to a weakened capacity to pay interest and repay principal than for debentures in higher rated categories.

3. **Speculative Grades** Debentures rated 'BB' are judged to carry inadequate safety of timely payment of interest and principal; while they are less susceptible to default than other speculative grade debentures in the immediate future, the uncertainties that the issuer faces could lead to inadequate capacity to make timely interest and principal payments.

   Debentures rated 'B' are judged to have greater susceptibility to default; while currently interest and principal payments are met, adverse business or economic conditions would lead to lack of ability or willingness to pay interest or principal.

   Debentures rated 'C' are judged to have factors present that make them vulnerable to default; timely payment of interest and principal is possible only if favourable circumstances continue.

   Debentures rated 'D' are in default and in arrears of interest or principal payments and are expected to default on maturity. Such debentures are extremely speculative and return from these debentures may be realised only on reorganisation or liquidation.

Note: (1) CRISIL may apply '+' (plus) or '–' (minus) signs for ratings from AA to D to reflect comparative standing within the category.
(2) The contents within parenthesis are a guide to the pronunciation of the rating symbols.
(3) Preference share rating symbols are identical to debenture rating symbols except that the letters are prefixed to the debenture rating symbols, e.g., pf AAA ("pf Triple A").

Rating Structures of Moody's and Standard & Poor's

Moody's and Standard & Poor's are the most widely recognised credit rating agencies internationally. The rating structures of these organisations are shown below. Note that Moody's uses numbers to rate between Aaa and C, whereas Standard & Poor's uses a system of plus and minus from AAA to C. Some rating agencies also employ a D grade to indicate that the issuer is in default.

Investment grades	*Moody's* *Highest → Lowest*	*Standard & Poor's* *Highest → Lowest*
Highest quality	Aaa, Aaa1, Aaa2, Aaa3	AAA, AAA –, AA+
Excellent	Aa, Aa1, Aa2, Aa3	AA, AA –, A+
Good	A, A1,A2, A3	A, A –, BBB+
Medium	Baa, Baa1, Baa2, Baa3	BBB, BBB –, BB+
Speculative grade		
Questionable	Ba, Ba1, Ba2, Ba3	BB, BB –, B+
Poor	B,B1,B2,B3	B, B –, CCC+
Very poor	Caa, Caa1, Caa2, Caa3	CCC, CCC –, CC+
Extremely poor	Ca, Ca1, Ca2, Ca3	CC, CC –, C+
Lowest	C	C

11.6 THE YIELD CURVE

The term structure of interest rates, popularly called the yield curve, shows how yield to maturity is related to term to maturity for bonds that are similar in all respects, excepting maturity. Consider the following data for government securities:

Face Value	*Interest Rate*	*Maturity (years)*	*Current Price*	*Yield to maturity*
100,000	0	1	88,968	12.40
100,000	12.75	2	99,367	13.13
100,000	13.50	3	100,352	13.35
100,000	13.50	4	99,706	13.60
100,000	13.75	5	99,484	13.90

The yield curve for the above bonds is shown in Exhibit 11.5. It slopes upwards, indicating that long-term rates are greater than short-term rates. Yield curves, however, do not have to necessarily slope upwards. They may follow any pattern. Four patterns are depicted in Exhibit 11.6.

Another perspective on the term structure of interest rates is provided by the forward interest rates, viz., the interest rates applicable to bonds in the future.

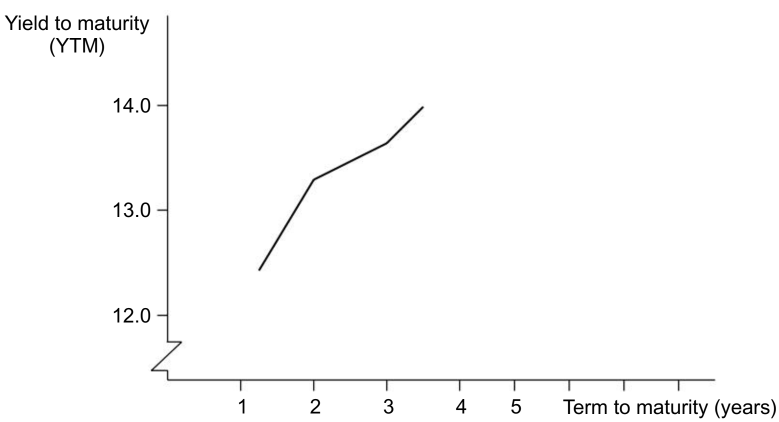
To get forward interest rates, begin with the one-year treasury bill:

$$88{,}968 = 100{,}000 \;/\; (1 + r_1)$$

where r_1 is the one-year spot rate i.e. the discount rate applicable to a riskless cash flow receivable a year hence. Solving for r_1 gives $r_1 = 0.124$. Next, consider the two-year government security and split its benefits into two parts, the interest of Rs. 12,750 receivable at the end of year 1 and Rs.112,750 (representing the interest and principal repayment) receivable at the end of year 2. The present value of the first part is:

$$\frac{12{,}750}{(1 + r_1)} = \frac{12{,}750}{1.124} = 11{,}343.4$$

Exhibit 11.5 ***Yield Curve***



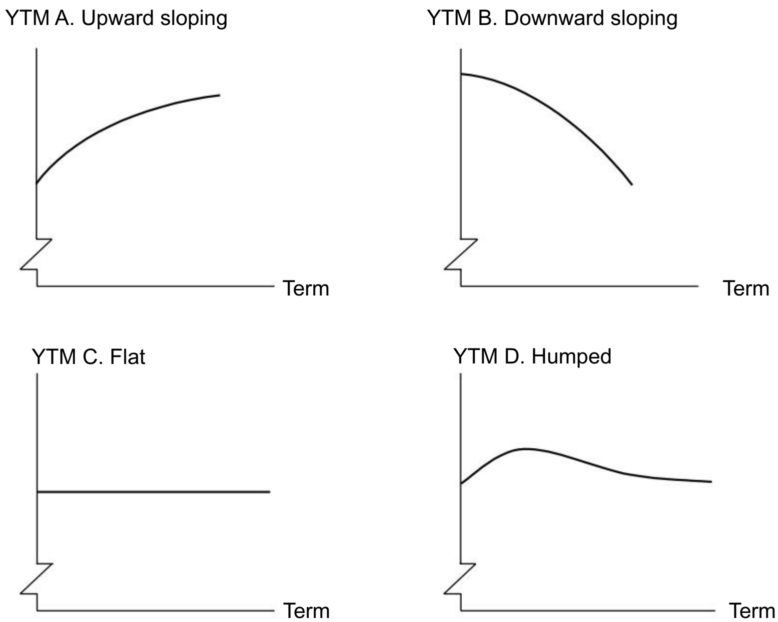
To get the present value of the second year's cash flow of Rs.112,750, discount it twice at r_1 (the discount rate for year 1) and r_2 (the discount rate for year 2):

$$\frac{112{,}750}{(1+r_1)(1+r_2)} = \frac{112{,}750}{(1.124)(1+r_2)}$$

r_2 is called the 'forward rate' for year two, that is, the current estimate of the next year's one-year spot interest rate. Since r_1, the market price of the bond, and the cash flow associated with the bond are known the following equation can be set up:

$$99{,}367 = \frac{12{,}750}{(1.124)} + \frac{112{,}750}{(1.124)(1+r_2)}$$

Exhibit 11.6 ***Types of Yield Curve***



Solving this equation gives $r_2 = 0.1396$

To get the forward rate for year $3(r_3)$, set up the equation for the value of the three-year bond:

$$100{,}352 = \frac{13{,}500}{(1+r_1)} + \frac{13{,}500}{(1+r_1)(1+r_2)} + \frac{113{,}500}{(1+r_1)(1+r_2)(1+r_3)}$$

$$100{,}352 = \frac{13{,}500}{(1.124)} + \frac{13{,}500}{(1.124)(1.1396)} + \frac{113{,}500}{(1.124)(1.1396)(1+r_3)}$$

Solving this equation gives $r_3 = 0.1389$. This is the forward rate for year three.

Continuing in a similar vein, set up the equation for the value of the four-year bond:

$$99{,}706 = \frac{13{,}500}{(1+r_1)} + \frac{13{,}500}{(1+r_1)(1+r_2)} + \frac{13{,}500}{(1+r_1)(1+r_2)(1+r_3)} + \frac{113{,}500}{(1+r_1)(1+r_2)(1+r_3)(1+r_4)}$$

$$= \frac{13{,}500}{(1.124)} + \frac{13{,}500}{(1.124)(1.396)} + \frac{13{,}500}{(1.124)(1.1396)(1.1389)} + \frac{113{,}500}{(1.124)(1.1396)(1.1389)(1+r_4)}$$

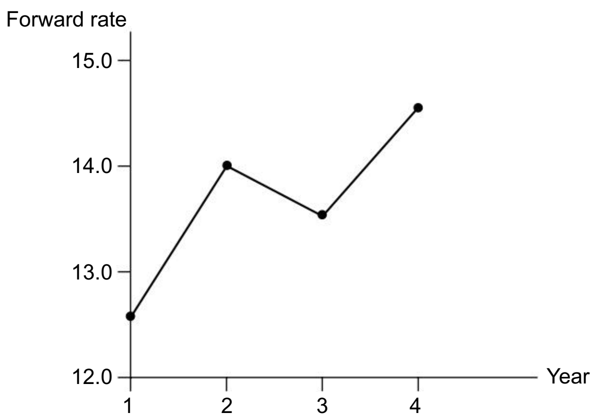
Solving this equation for r_4, leads to $r_4 = 0.1458$. Exhibit 11.7 plots the one-year spot rate and forward rates r_2, r_3, r_4. Notice that while the current spot rate and forward rates are known, the future spot rates are not known—they will be revealed as the future unfolds.

Given this information on yields to maturity and forward rates, there are two distinct, yet equivalent, ways of valuing a riskless cash flow.

Discount at the yield to maturity : (R_t) $\quad \text{PV[CF}(t)] = \dfrac{\text{CF}(t)}{(1+R_t)^t}$ (11.10)

Discount by the product of a spot rate plus the forward rates $\quad \text{PV[CF}(t)] = \dfrac{\text{CF}(t)}{(1+r_1)(1+r_2)\ldots(1+r_t)}$ (11.11)

Exhibit 11.7 ***Forward Rates***



Explaining the Term Structure What determines the term structure of interest rates? This question has long puzzled academicians and practitioners. Four principal explanations have been offered: the expectations theory, the liquidity preference theory, the preferred habitat theory, and the market segmentation theory.

Expectations Theory This theory holds that the shape of the yield curve can be explained by the interest rate expectations of those who participate in the market. More precisely, the expectations theory holds that any long-term rate is equal to the geometric mean of current and future one-year rates expected by the market participants.

In general terms, the expectations theory may be expressed as follows:

$$(1 + {}_tR_n) = [(1 + {}_tR_1)\,(1 + {}_{t+1}R_1) \ldots (1 + {}_{t+n-1}R_1)]^{1/n} \quad (11.12)$$

where ${}_tR_n$ is the actual long-term rate, n is the term to maturity (in years) of the long issue, ${}_tR_1$ is the current year rate, ${}_{t+i}R_1$ is the expected one year rate during some future period, ($i = 1, \ldots, n-1$),

Clearly, the expectations hypothesis can explain any shape of yield curve:

Yield Curve	*Explanation*
Ascending	Short-term rates are expected to rise in future
Descending	Short-term rates are expected to fall in future
Humped	Short-term rates are expected to rise for a while and then fall
Flat	Short-term rates are expected to remain unchanged in future

Liquidity Preference Theory An important criticism levelled against the expectations theory is that it assumes that investors know with certainty what lies ahead of them. The future, however, is not known. There is uncertainty about the one-year period return from a bond whose maturity is greater than one period. And this uncertainty regarding the one-period return increases with the maturity of the bond.

Since investors are risk-averse, J. R. Hicks, a Nobel Laureate, argued that they require an inducement to hold long-term bonds. They want a long-term rate which is higher than the average of expected future rates. Put differently, forward rates should incorporate interest rate expectations as well as a risk (or liquidity) premium.

In formal terms, the liquidity preference hypothesis may be expressed as a variation of Eq. (11.12):

$$(1 + {}_tR_n) = [(1 + {}_tR_1)\,(1 + {}_{t+1}R_1 + L_2) \ldots (1 + {}_{t+n-1}R_1 + L_n)]^{1/n} \quad (11.13)$$

where ${}_tR_n$ is the actual long-term rate, n is the term to maturity (in years) of the long issue, ${}_tR_1$ is the current one year rate, ${}_{t+i}R_1$ is the expected one-year rate during some future period ($i = 1, \ldots, n-1$), and L_i is the risk (liquidity) premium for year i ($i = 2, \ldots, n$).

Thus, according to the liquidity preference theory, an upward-sloping yield curve suggests that future interest rates will rise (or will be flat) or even fall if the liquidity premium increases fast enough to compensate for the decline in the future interest rates.

Preferred Habitat Theory The liquidity preference theory assumes that the risk premium must necessarily rise with maturity because investors wish to liquidate their investments at the earliest and borrowers want to borrow long. This assumption, however, may not be realistic.

According to Modigliani and Sutch, who originally formulated the preferred habitat theory, risk-aversion implies that investors will prefer to match the maturity of investment to their investment objective. Investors with long investment horizons would like to invest in instruments of longer maturities; otherwise they will be exposed to a reinvestment risk, i.e. the risk that the interest rate will decline when the proceeds of a short-term instrument have to be reinvested. Likewise, short-term investors would like to invest in instruments of shorter maturity; otherwise they will be exposed to a price risk, i.e. the risk that the price of an asset will fall when it is sold prematurely because of a rise in interest rates. Similar considerations apply to borrowers; risk-aversion implies that borrowers would like to match the maturity of their borrowings to the length of time for which they need funds.

If there is a mismatch between the demand and supply of funds in a certain maturity range, the preferred habitat theory asserts that some lenders and borrowers may have to be induced to shift out of their preferred maturity ranges. Of course, they will have to be compensated for this in the form of a suitable risk premium which depends on the degree of risk aversion.

The shape of the yield curve, according to the preferred habitat theory, is influenced by expectations of future interest rates as well as risk premia, positive or negative, required to move market participants out of the preferred habitats. Clearly, all types of yield curves, viz. upward sloping, downward-sloping, flat, or humped, are possible.

Market Segmentation Theory In a way, the market segmentation theory is an extreme form of the preferred habitat theory. It states that investors as well as borrowers are unwilling to shift from their preferred maturity range, come what may. Hence, according to this theory the shape of the yield curve is determined entirely by the supply and demand forces within each maturity range.

Since it presupposes absolute risk aversion, the market segmentation theory appears untenable. In reality, market participants do shift out of their preferred habitats when there are large differences between market and expected rates.

11.7 DETERMINANTS OF INTEREST RATES

Other things being equal, the price of a bond falls when the required rate of return rises and the price of a bond rises when the required rate of return falls. Since the required rate of return has an important bearing on bond price, you should know what drives the required rate of return, which will hereafter, for the sake of simplicity, be referred to as the interest rate.

The interest rate on a bond is determined by four factors or variables: short-term risk-free interest rate, maturity premium, default premium, and special features. These are discussed below in some detail.

Short-term Risk-free Interest Rate The short-term risk-free interest rate is the yield on a one-year government security, say a 364-day Treasury bill (note that government securities are considered to be risk-free because the government is not expected to default on its obligations). This may be decomposed into two parts:

Short-term risk–free interest rate = Expected real rate of return + Expected inflation

Expected Real Rate of Return Intuitively, the expected real rate of return represents the rate at which society is willing to trade current consumption for future consumption. For example, if the society is willing to give up 100 units of real goods in return for 103 units a year from now, the expected real rate of return is three percent. As there is a preference for current consumption over future consumption, the expected real rate is positive, but it tends to vary widely across time and across economies.

Expected Rate of Inflation To get a handle over the determinants of the expected rate of inflation, let us look at the following identity:

$$\text{Price level} = \frac{(\text{Money supply in the economy})\ (\text{Velocity of money in circulation})}{\text{Real output in the economy}}$$

Hence, the expected rate of inflation which is nothing but the expected change in price level is:

$$\begin{matrix}\text{Expected rate of} \\ \text{inflation}\end{matrix} = \frac{\begin{pmatrix}\text{Change in money supply} \\ \text{in the economy}\end{pmatrix}\begin{pmatrix}\text{Change in the velocity of money} \\ \text{in circulation}\end{pmatrix}}{\text{Change in the real output of the economy}}$$

For example, if money supply increases by 13 percent and velocity of money in circulation increases by one percent when the real output rises by seven percent, the expected inflation rate is:

$$\frac{(1.13)\,(1.01)}{(1.07)} - 1 = 0.067 \text{ or } 6.7 \text{ percent}$$

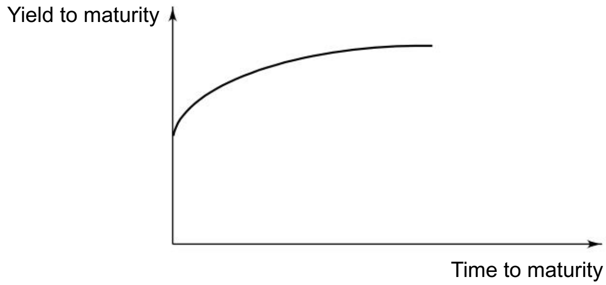
Maturity Premium Maturity premium represents the difference between the yield to maturity on a short-term (one year) risk-free security and the yield to maturity on a risk-free security of a longer maturity.

The yield curve is depicted in Exhibit 11.8. It shows graphically how the yield to maturity is related to the term to maturity. The yield curve ordinarily slopes upward because investors expect a higher yield for making investment over a longer period of time. This implies that the maturity premium increases with time.

What determines the yield curve? As discussed in the previous section, some of the explanations are as follows:

Expectations Theory The yield curve depends on the expectations of the investors. If investors expect short-term rates to rise (fall) in the future the yield curve will be ascending (descending).

Exhibit 11.8 ***Yield Curve***



Liquidity Preference Theory Investors have a preference for liquidity. So they ask for a higher yield as an inducement to hold bonds of longer maturity.

Preferred Habitat Theory The shape of the yield curve is determined by the supply and demand of funds in different maturity ranges (habitats).

Default Premium While there is no risk of default on government securities, corporate bonds may default on interest and/or principal payment. When such a possibility exists, investors will ask for a default premium in addition, of course, to the maturity premium.

The default premium increases with default risk which *inter alia* is a function of the following:

- The business risk of the issuer as reflected in the volatility of its operating income.
- The financial risk of the issuer measured usually by the ratio of outside liabilities to shareholders funds.
- The size of the business and the value of collateral assets that are offered as security.

Credit rating agencies consider these factors and several others and express their opinion on default risk through their ratings.

Note that default premiums reflect default risk as well as the state of the economy. Other things being equal, default premiums tend to increase during economic recession when investors turn more risk-averse and decrease during economic expansion when investors become more confident.

Special Features The factors discussed above determine the interest rate on a plain vanilla bond, i.e. a bond which pays a fixed amount of interest (I) periodically and a certain principal sum (P) at a given maturity date. The time line of such a bond is depicted in Exhibit 11.9.

Exhibit 11.9 ***Time Line of a Plain Vanilla Bond***

0	1	2	3	4	n
	I	I	I	I	I
					+
					P

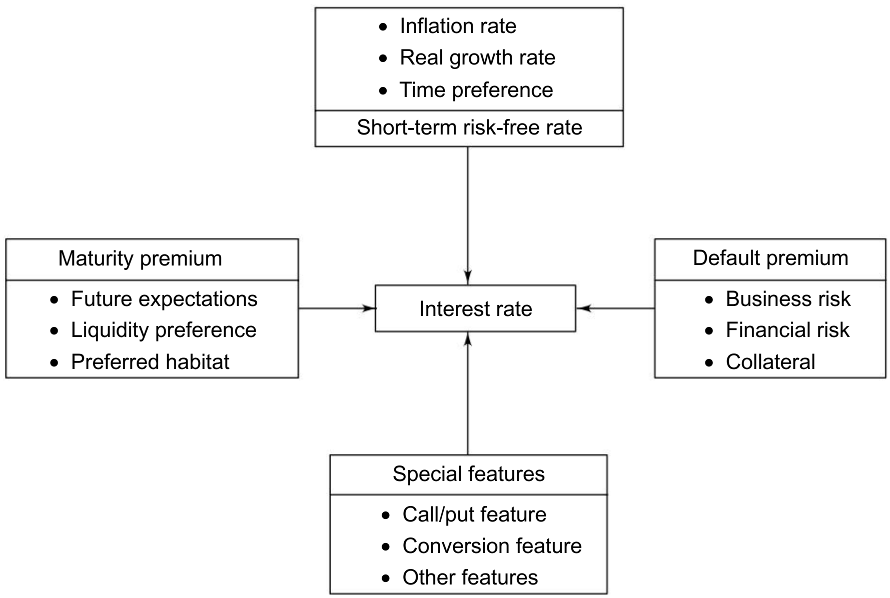
While plain vanilla bonds remain popular, bonds often have some special feature(s). They may have a call feature (which entitles the issuer to prematurely redeem them) or a put feature (which gives the investor the option to redeem them prematurely) or a combination of a call and put feature; they may be convertible, partly or fully, into equity shares on certain terms; they may carry a floating rate of interest, rather than a fixed rate of interest; they may be zero coupon bonds issued at deep discount and redeemed at par; so on and so forth.

The effect of special features on interest rates is expected to be as follows:

- A call feature raises the interest rate because the investors are exposed to call risk.
- A put feature lowers the interest rate because the investors enjoy the put option.
- A conversion feature lowers the interest rate because the investors enjoy the option to convert.
- A floating interest rate feature may lower the interest rate as investors are protected against inflation risk.
- A zero coupon feature may lower the interest rate as investors are protected against reinvestment risk.

Summing Up To sum up, the interest rate on corporate bonds is determined by four factors viz., short-term risk-free interest rate, maturity premium, default premium, and special features, as portrayed in Exhibit 11.10.

Exhibit 11.10 ***Determinants of Interest Rate***



11.8 ANALYSIS OF CONVERTIBLE BONDS[6]

With the repeal of the Capital Issues Control Act and the enactment of SEBI Act in 1992, the rules of the game applicable to convertible bonds have changed. As per SEBI guidelines issued in June 1992, the provisions applicable to fully convertible bonds and partially convertible bonds are as follows:

- The conversion premium and the conversion timing shall be predetermined and stated in the prospectus.
- Any conversion, partial or full, will be optional at the hands of the bond holder, if the conversion takes place at or after 18 months but before 36 months from the date of allotment.
- A conversion period of more than 36 months will not be permitted unless conversion is made optional with 'put' and 'call' options.
- Compulsory credit rating will be required if the conversion period for fully convertible bonds exceeds 18 months.

From the SEBI guidelines it is clear that convertible bonds in India presently can be of three types:

- Compulsorily convertible bonds which provide for conversion within 18 months.
- Optionally convertible bonds which provide for conversion within 36 months.
- Bonds which provide for conversion after 36 months but which carry 'call' and 'put' features.

My guess is that the bulk of the convertible bonds in the immediate future will be of types (a) and (b). Hence, our discussion on valuation of convertible bonds will focus on these two types.

Valuation of Compulsorily Convertible (Partly or Fully) Bonds If you own a compulsorily convertible (partly or fully) bond you receive:

- A certain number of equity shares on part/ full conversion
- A certain stream of interest and principal repayments

Hence the value of such a bond is equal to the sum of two components:

- The present value of equity shares receivable on conversion
- The present value of interest and principal payments receivable on the bond

Valuation of Optionally Convertible Bonds An optionally convertible bond may be viewed as a bond-warrant package. Its value is a function of three factors:

- Straight bond value
- Conversion value
- Option value

[6] Convertible bonds partake some characteristics of straight bonds and some features of equity shares. Since this book does not have a separate chapter on convertible bonds, they are being discussed in this chapter.

Straight Bond Value The straight bond value of a convertible bond is the discounted value of the interest and principal repayments receivable on it, if it is retained as a straight debt instrument. The discount rate used in this calculation depends on the general interest rates and the credit rating of the bond.

The value of a straight bond depends on the value of the firm. If a firm's value declines, the value of its straight bond may fall. In the extreme, if the value of a firm shrinks to zero, the value of its straight bonds becomes nil. The maximum value of a firm's straight bond would be equal to the value of an equivalent risk-free bond. Exhibit 11.11A illustrates the relationship between the value of the firm and the value of its straight bonds.

Conversion Value The conversion value is the value of the bond if the bond holders seek conversion. It is equal to the stock price multiplied by the conversion rate. Thus the conversion value is linearly related to the value of the firm as shown in Exhibit 11.11B.

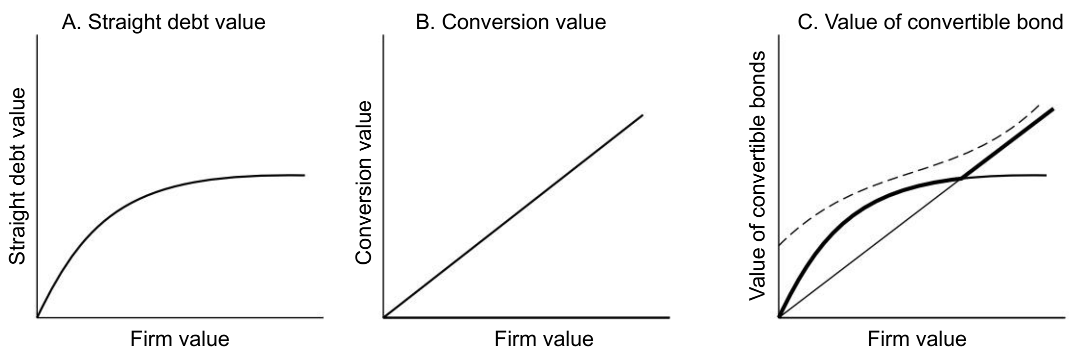
We have defined the straight bond value and the conversion value of a convertible bond. The value of a convertible bond theoretically cannot fall below its straight bond value as well as its conversion value. Put differently, the convertible bond has two floor values: its straight bond value and its conversion value. The combined effect of these two lower bounds is shown by the heavy line in Exhibit 11.11C, which simply reflects Max (Straight bond value, Conversion value).

Option Value If you hold a convertible bond, you are not compelled to make an immediate choice in favour of or against conversion. You can wait, learn from hindsight, and finally choose the most profitable alternative. The option to wait is valuable. Hence, the value of the convertible bond lies above its floor value. It is shown as the dashed line in Exhibit 11.11C. The difference between the dashed line and the thick lower bound line represents the value of the option to convert.

Thus, the value of a convertible bond may be expressed as follows:

$$\begin{array}{c}\text{Value of the}\\ \text{convertible bond}\end{array} = \text{Max}\begin{pmatrix}\text{Straight} & \text{Conversion}\\ \text{bond value,} & \text{value}\end{pmatrix} + \text{Option value}$$

Exhibit 11.11 ***Valuation of Convertible Bonds***



SUMMARY

- The debt market in India has registered an impressive growth particularly since mid-1990s and, not surprisingly, has been accompanied by increasing complexity in instruments, interest rates, methods of analysis, and so on.
- The variety of debt instruments may be classified as follows: money market instruments, government's securities and government guaranteed bonds, and corporate debentures.
- The value of a noncallable bond is:

$$P = \sum_{t=1}^{n} \frac{C}{(1+r)^t} + \frac{M}{(1+r)^n}$$

- The commonly employed yield measures are: **current yield**, **yield to maturity**, **yield to call**, and **realised yield to maturity**.
- The **current yield** of a bond is: annual interest/price.
- The **yield to maturity** (YTM) of a bond is the interest rate that makes the present value of the cash flows receivable from owning the bond equal to the price of the bond.
- The following formula may be used to find the approximate YTM on a bond:

$$\text{YTM} \simeq \frac{C + (M-P)/n}{0.4M + 0.6P}$$

- Bonds are subject to diverse risks, such as interest rate risk, inflation risk, real interest rate risk, default risk, call risk, and liquidity risk.
- **Interest rate risk**, also referred to as 'market risk', is measured by the percentage change in the value of a bond in response to a given interest rate change.
- **Default risk** refers to the risk that the borrower may not pay the interest and/ or principal on time. Default risk, also referred to as 'credit risk', is normally gauged by the rating assigned to the debt instrument by an independent rating agency.
- The **term structure of interest rates,** popularly called the **yield curve,** shows how yield to maturity is related to the term to maturity for bonds that are similar in all respects, excepting maturity.
- Three principal explanations have been offered to explain the term structure of interest rates: the **expectations theory**, the **liquidity preference theory**, and the **preferred habitat theory.**
- The interest rate is determined by four factors or variables: short-term risk-free interest rate, maturity premium, default premium, and special features.
- The value of an optionally convertible debenture is:

$$\text{Max}\begin{pmatrix} \text{Straight} & \text{Conversion} \\ \text{debenture value,} & \text{value} \end{pmatrix} + \text{Option value}$$

QUESTIONS

1. Discuss the changes that have started taking place in the debt market in the post-liberalisation scenario.
2. Briefly describe various types of corporate bonds.
3. State the basic bond valuation formula.
4. State the valuation formula for a bond which pays interest semi-annually.
5. What is the relationship between bond price and time?
6. Explain and illustrate the following yield measures: current yield, yield to maturity, yield to call, and realised yield to maturity.
7. State and illustrate the formula to find the approximate YTM on a bond.
8. Discuss the risks which debt instruments are subject to.
9. What is the meaning of debt rating?
10. Discuss the functions of debt rating.
11. Describe the key features of the methodology used for debt rating.
12. What symbols are employed by CRISIL for rating debentures?
13. What is a yield curve?
14. How would you calculate the forward interest rates?
15. Discuss the following theories: expectations theory, liquidity preference theory, and preferred habitat theory.
16. Discuss the key determinants of interest rates.
17. Explain the method for valuing a debenture that is compulsorily convertible (partially or fully) into equity shares.
18. Show how the value of an optionally convertible debenture is influenced by its straight debenture value, its conversion value, and its option value.

SOLVED PROBLEMS

1. A Rs 100 par value bond bearing a coupon rate of 12 percent will mature after five years. What is the value of the bond, if the discount rate is 15 percent ?

Solution

Since the annual interest payment will be Rs 12 for five years and the principal repayment will be Rs 100 after five years, the value of the bond, at a discount rate of 15 percent, will be

$$V = \text{Rs } 12\ (\text{PVIFA}_{15\%,\ 5\text{ yrs}}) + \text{Rs } 100\ (\text{PVIF}_{15\%,\ 5\text{ yrs}})$$
$$= \text{Rs } 12\ (3.352) + \text{Rs } 100\ (0.497)$$
$$= 40.\ 22 + 49.70 = \text{Rs } 89.92$$

2. The market price of a Rs 1,000 par value bond carrying a coupon rate of 14 percent and maturing after five years is Rs 1050. What is the yield to maturity (YTM) on this bond?

What is the approximate YTM? What will be the realised yield to maturity if the re-investment rate is 12 percent?

Solution

The YTM is the value of r in the following equation:

$$1{,}050 = \sum_{t=1}^{5} \frac{140}{(1+r)^t} + \frac{1{,}000}{(1+r)^5}$$

$$= 140\ (\text{PVIFA}_{r,\,5\text{ yrs}}) + 1{,}000\ (\text{PVIF}_{r,\,5\text{ yrs}})$$

Let us try a value of 13 percent for r. The right hand side of the above expression becomes:

$$140\ (\text{PVIFA}_{13\%,\,5\text{ yrs}}) + 1{,}000\ (\text{PVIF}_{13\%,\,5\text{ yrs}})$$

$$= 140\ (3.517) + 1{,}000\ (0.543)$$

$$= 492.4 + 543.0 = \text{Rs } 1035.4$$

Since this is less than Rs 1,050, we try a lower value for r. Let us try r = 12 percent. This makes the right-hand side equal to:

$$140\ (\text{PVIFA}_{12\%,\,5\text{ yrs}}) + 1{,}000\ (\text{PVIF}_{12\%,\,5\text{ yrs}})$$

$$= 140\ (3.605) + 1{,}000\ (0.567)$$

$$= 504.7 + 567.0 = \text{Rs } 1071.7$$

Thus, r lies between 12 percent and 13 percent. Using a linear interpolation in this range, we find that r is equal to:

$$12\% + (13\% - 12\%)\ \frac{1071.7 - 1050.0}{1071.7 - 1035.4} = 12.60 \text{ percent}$$

(b) The approximate YTM works out to:

$$\text{YTM} = \frac{140 + (1{,}000 - 1{,}050)/5}{0.40 \times 1000 + 0.6 \times 1050} = 12.62 \text{ percent}$$

(c) The realised yield to maturity may be calculated as follows:
Future value of interest and principal repayment

$$= 140\ (1.12)^4 + 140\ (1.12)^3 + 140\ (1.12)^2 + 140\ (1.12) + 140 + 1000$$

$$= \text{Rs } 1889.39$$

$$\text{Present market price } (1+r^*)^5 = \text{Rs } 1889.39$$

$$\text{Rs } 1050\ (1+r^*)^5 = \text{Rs } 1889.39$$

$$(1+r^*)^5 = 1.7994$$

$$r^* = 1.7994^{1/5} - 1$$

$$= 1.1247 - 1 = 12.47 \text{ percent}$$

3. A Rs 100 par value bond bears a coupon rate of 14 percent and matures after five years. Interest is payable semi-annually. Compute the value of the bond if the required rate of return is 16 percent.

Solution

In this case the number of half-yearly periods is 10, the half-yearly interest payment is Rs. 7, and the discount rate applicable to a half-yearly period is 8 percent. Hence, the value of the bond is:

$$V = \sum_{t=1}^{10} \frac{7}{(1.08)^t} + \frac{100}{(1.08)^{10}}$$

$$= 7\,(\text{PVIFA}_{8\%,\,10\text{ yrs}}) + 100\,(\text{PVIF}_{8\%,\,10\text{ yrs}})$$

$$= 7\,(\text{PVIFA}_{8\%,\,10\text{ yrs}}) + 100\,(\text{PVIF}_{8\%,\,10\text{ yrs}})$$

$$= 7\,(6.710) + 100\,(0.463)$$

$$= 46.97 + 46.30$$

$$= \text{Rs } 93.27$$

4. Consider the following data for government securities:

Face value	*Interest Rate (%)*	*Maturity (Years)*	*Current Price*
100,000	0	1	91,000
100,000	10.5	2	99,000
100,000	11.0	3	99,500
100,000	11.5	4	99,900

Calculate the forward rates.

Solution

To get forward interest rates, begin with the one-year treasury bill

$$91{,}000 = 100{,}000/(1+r_1) \rightarrow r_1 = 0.099$$

Next consider the two-year government security

$$99{,}000 = \frac{10{,}500}{(1.099)} + \frac{110{,}500}{(1.099)\,(1+r_2)}$$

$$r_2 = 0.124$$

Then consider the three-year government security

$$99{,}500 = \frac{11{,}000}{(1.099)} + \frac{11{,}000}{(1.099)\,(1.124)} + \frac{111{,}000}{(1.099)\,(1.124)\,(1+r_3)}$$

$$r_3 = \quad 0.115$$

Finally consider the four-year government security

$$99{,}500 = \frac{11{,}500}{(1.099)} + \frac{11{,}500}{(1.099)\,(1.124)} + \frac{11{,}500}{(1.099)\,(1.124)\,(1.115)} + \frac{111{,}500}{(1.099)\,(1.124)\,(1.115)\,(1+r_4)}$$

$$r_4 = 0.134$$

PROBLEMS

1. A Rs 100 par value bond, bearing a coupon rate of 11 percent will mature after five years. What is the value of the bond, if the discount rate is 15 percent?
2. A Rs 100 par value bond, bearing a coupon rate of 12 percent will mature after seven years. What is the value of the bond if the discount rate is 14 percent ? 12 percent?
3. The market value of Rs 1,000 par value bond, carrying a coupon rate of 12 percent and maturing after seven years, is Rs 750. What is the yield to maturity on this bond?
4. The market value of a Rs 100 par value bond, carrying a coupon rate of 14 percent and maturing after 10 years, is Rs 80. What is the yield to maturity on this bond?
5. A Rs 100 par value bond bears a coupon rate of 12 percent and matures after 6 years. Interest is payable semi-annually. Compute the value of the bond if the required rate of return is 16 percent, compounded semi-annually.
6. You are considering investing in one of the following bonds:

	Coupon rate	*Maturity*	*Price/Rs 100 par value*
Bond *A*	12%	10 yrs	Rs 70
Bond *B*	10%	6 yrs	Rs 60

   Your income tax rate is 30 percent and your capital gains tax is effectively 10 percent. Capital gains taxes are paid at the time of maturity on the difference between the purchase price and par value. What is your post-tax yield to maturity from these bonds? Use the approximate formula.
7. A company's bonds have a par value of Rs 100, mature in seven years, and carry a coupon rate of 12 percent payable semi-annually. If the appropriate discount rate is 16 percent, what price should the bond command in the market place?
8. Consider the following data for government securities:

Face value	*Interest Rate*	*Maturity (years)*	*Current price*
100,000	0	1	89,000
100,000	12.5	2	99,000
100,000	13.0	3	99,500
100,000	13.5	4	100,050
100,000	13.75	5	100,100

   What is the yield curve on these bonds? Calculate the forward rates.
9. Shiva Limited issues a partly convertible debenture for Rs.600, carrying an interest rate of 10 percent. Rs 200 will get compulsorily converted into two equity shares of Shiva Limited a year from now. The expected price per share of Shiva Limited's equity a year from now would be Rs 150. The non-convertible portion will be redeemed in two equal instalments of Rs 200 each at the end of years five and six respectively.

   What is the pre-tax rate of return earned by the debenture holders?

   Assume that the price per share after a year would be Rs 120.
10. A Rs 1,000 par value bond carries a coupon of 10 percent (payable annually) and has a remaining maturity of four years. The bond is presently selling for Rs.1020. The re-investment rate applicable to the future cash inflows of the bonds is nine percent per annum. What will be the realised yield to maturity?

MINICASE

Ravi Rao is the Chief Executive Officer of Capmart Limited, an investment advisory firm. Ravi Rao has been requested to give a seminar to a group of finance executives drawn from state run universities. He has been requested to explain the basic concepts and tools useful in bond analysis. Ravi Rao has asked you to help him to make his presentation. In particular, you have to answer the following questions.

a. How is the value of a bond calculated?
b. What is the value of a 9-year, Rs 1,000 par value bond with a 10 percent annual coupon, if its required rate of return is 8 percent?
c. What is the value of the bond described in part (b) if it pays interest semi-annually, other things being equal?
d. What is the YTM of a 6-year, Rs 1,000 par value bond with a 10 percent annual coupon, if it sells for Rs 1,050?
e. What is the YTM of the bond described in part (d) if the approximate formula is used?
f. What is the yield to call of the bond described in part (d) if the bond can be called after 3 years at a premium of Rs 50?
g. What is the realised yield to maturity of the bond described in part (d) if the reinvestment rate applicable to the future cash flows from the bond is 8 percent ?
h. The holders of the bond described in part (d) expect that the bond will pay interest as promised, but on maturity bondholders will receive only 90 percent of par value. What will be difference between the expected YTM and stated YTM? Use the approximate YTM formula.
i. What is the difference between the annual percentage rate and the effective annual yield?
j. What is the difference between interest rate risk and reinvestment risk?
k. List the key financial ratios that have a bearing on debt rating.
l. What is a yield curve?
m. What factors determine interest rates?

Chapter 12

Bond Portfolio Management

The Passive and Active Stances

LEARNING OBJECTIVES

After studying this chapter, you should be able to:

- Understand the sensitivity of bond prices to changes in market rates.
- Explain the concept of duration and describe the properties of duration.
- Discuss the passive and active strategies of bond portfolio management.
- Show how a bond portfolio can be immunised against interest rate risk.
- Explain how the interest rate swap works.

Having learnt the basics of bond pricing and bond yields in the preceding chapter, let us turn our attention to the strategies followed by bond portfolio managers. Very broadly, a distinction may be made between passive and active strategies. Assuming that securities are fairly priced, a passive strategy seeks to maintain an appropriate balance between risk and return. A very important passive strategy is the immunisation strategy that tries to insulate the portfolio from interest rate risk.

An active strategy strives to achieve returns that are more than commensurate with the risk exposure. Active portfolio managers may resort to interest rate forecasting or try to exploit mispricing of securities.

12.1 INTEREST RATE RISK

We have seen that bond prices and yields are inversely related. As interest rates fluctuate, bondholders experience capital losses and gains. Why? The reason is that in a competitive market securities are priced to offer fair expected rates of return. If a bond is issued with a 10 percent coupon when the competitive yield is 10 percent, then it will sell at par. If the market rate rises to 11 percent, the bond price must fall so that its yield rises to 11 percent; conversely if the market rate falls to nine percent, its price must rise.

Interest Rate Sensitivity

Investors are concerned about the sensitivity of bond prices to changes in market rates. The following bond-pricing relationships throw light on the determinants of that sensitivity:

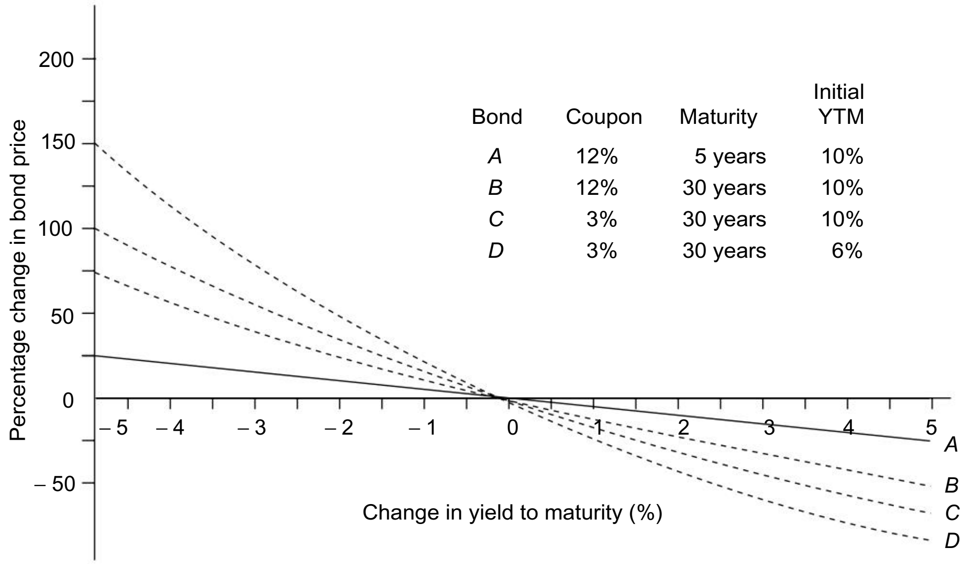
1. There is an inverse relationship between bond prices and yields
2. An increase in yield causes a proportionately smaller price change than a decrease in yield of the same magnitude
3. Prices of long-term bonds are more sensitive to interest rate changes than prices of short-term bonds
4. As maturity increases, interest rate risk increases but at a decreasing rate
5. Prices of low-coupon bonds are more sensitive to interest rate changes than prices of high-coupon bonds
6. Bond prices are more sensitive to yield changes when the bond is initially selling at a lower yield

The above rules are illustrated in Exhibit 12.1[1] which presents the percentage changes in price corresponding to changes in yield for four bonds differing in time to maturity, coupon rate, and initial yield to maturity. From the exhibit we find that:

- All four bonds illustrate rules 1 and 2: Prices vary inversely with yield, but the price curve is convex, implying that yield decreases have a greater impact on price than yield increases of equal magnitude.
- Bonds *A* and *B* illustrate rules 3 and 4: The price of bond *B*, which has a longer maturity than bond *A*, is more sensitive to interest rate changes. However, while bond *B* has six times the maturity of bond *A*, its interest rate sensitivity is less than six times.
- Bonds *B* and *C* illustrate rule 5: Bond *C*, which has a lower coupon rate, exhibits greater sensitivity to interest rate changes.
- Bonds *C* and *D* illustrate rule 6: Bond *D*, which has a lower yield, is more sensitive to interest rate changes.

[1] This exhibit is drawn from Z. Bodie, A. Kane, and A.J. Marcus, *Investments*, 4th Ed; Boston: Irwin McGraw-Hill, 1999. It has been reproduced with permission of The McGraw-Hill Companies.

Exhibit 12.1 ***Relationship between Change in Yield to Maturity and Change in Bond Price***



Valuation of Bank Bond Portfolio

Banks have huge portfolios of government bonds which have to be split into two parts: 'available-for-sale' category and 'held-to-maturity' category. The 'available-for-sale' category portion of the bank bond portfolio has to be 'marked-to-market' periodically. For this purpose, banks have to value their bond portfolios. Prior to July 2006, the Reserve Bank of India (RBI) used to publish the rates (or YTMs) for valuing government bonds. Since July 2006, this function has been assigned to The Fixed Income Money Markets and Derivatives Association (Fimmda). For example, as on March 31, 2007, Fimmda announced a YTM of 7.92 percent for a 5-year paper, a YTM of 7.94 percent for a 10-year paper, and a YTM of 8.22 percent for a 20-year paper.

Duration

Duration is a measure of the weighted average life of a bond, which considers the size and timing of each cash flow. The weight assigned to each time period is the present value of the cash flow paid at that time as a proportion of the price of the bond. Mathematically, duration is defined as:

$$\text{Duration} = [\text{PV}(C_1) \times 1 + \text{PV}(C_2) \times 2 + \ldots + \text{PV}(C_n) \times n]/V_0 \qquad (12.1)$$

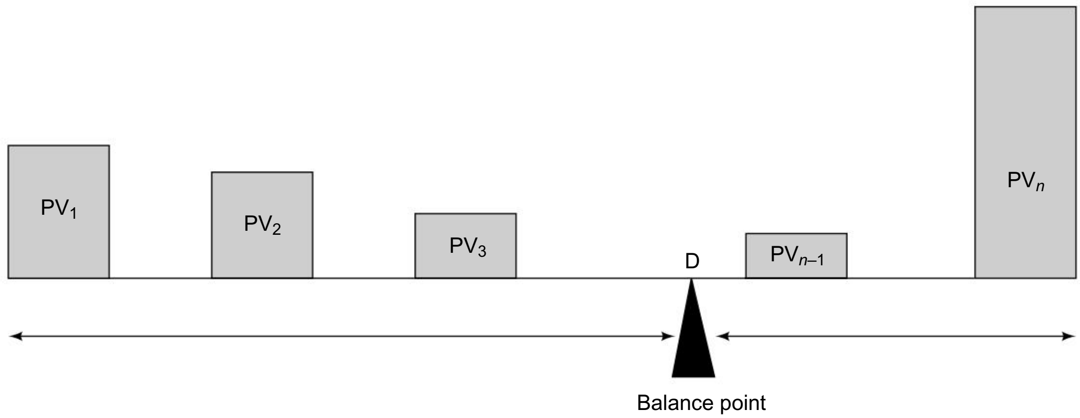
where PV (C_t) is the present value of the cash flow receivable at the end of year t (t =1,2, …, n) and V_0 is the current value of the bond.

For calculating the present value of cash flow, the yield to maturity (the internal rate of return) of the bond is used as the discount rate.

The duration of a bond, in effect, represents the length of time that elapses before the "average" rupee of present value from the bond is received.

Graphically, duration is represented by point D, the balance point in Exhibit 12.2. D is the point at which all the weighted coupon payments on the left exactly balance all the weighted coupon and principal payments on the right.

Exhibit 12.2 ***Duration***



To illustrate how duration is calculated, consider Bond A.

	Bond A
Face value	Rs 100
Coupon (interest rate)	15 percent payable annually
Years to maturity	6
Redemption value	Rs 100
Current market price	Rs 89.50
Yield to maturity	18 percent

Exhibit 12.3 shows the calculation of duration for this bond.

Exhibit 12.3 ***Calculation of Duration***

Bond A : 15 percent coupon				
Year	*Cash flow*	*Present value at 18 per cent*	*Proportion of the bond's value*	*Proportion of the bond's value × time*
1	15	12.71	0.142	0.142
2	15	10.77	0.120	0.241
3	15	9.13	0.102	0.306
4	15	7.74	0.086	0.346
5	15	6.56	0.073	0.366
6	115	42.60	0.476	2.856
			Duration	4.257 years

Spreadsheet Application Calculation of duration using the Excel spreadsheet involves the following steps.

1. Enter the values of face value, coupon rate, years to maturity, redemption value, current market price, settlement date, maturity date, frequency, and basis in cells C1 to C9.
2. Calculate the yield to maturity using the built-in financial function RATE. Its value is obtained in cell F2.
3. Calculate the duration using the built-in function DURATION. Its value is obtained in cell F7.

	A	B	C	D	E	F
1	Face value		100			
2	Coupon payable per annum		15%	=RATE(C3,C1* C2,-C5,C4)	→	18%
3	Years to maturity in years		6			
4	Redemption value		100			
5	Current market price		89.5			
6	Settlement	Any date, if the date of purchase is not certain	1/1/2006			
7	Maturity	= C6 + 365*C3	12/31/2011	=DURATION(C6,C7, C2F3,C8,C9)	→	4.254
8	Frequency	No of times interest paid in a year	1			
9	Basis	3 represents the day count convention: actual no, of days/365, in interest calculation	3			

Duration is a key concept in bond analysis for the following reasons:

- It measures the interest rate sensitivity of a bond.
- It is a useful tool for immunising against interest rate risk.

Duration and Price Change Duration reflects coupon, maturity, and yield, the three key variables that determine the response of price to interest rate changes. Hence, duration can be used to measure interest rate exposure. In particular a variant of duration called **modified duration** is used for this purpose.

$$D^* = D/(1 + y) \tag{12.2}$$

where D^* is the modified duration, D is the duration, and y is the bond's yield to maturity.

Using the bond example presented earlier for which the duration is 4.257 years and the yield to maturity is 18 percent, the modified duration works out to:

$$D^* = 4.257/(1.18) = 3.608$$

For small changes in yield, the price change is proportional to modified duration as shown in Eq. (12.3), which is an approximation.

$$\Delta P/P \simeq -D^*\,\Delta y \tag{12.3}$$

where $\Delta P/P$ is the percentage change in price, $-D^*$ is the modified duration with a negative sign (a negative sign is put because yield change and price change are inversely related), and Δy is the change in yield in decimal form.

Using the bond for which the modified duration is 3.608, assume a change in the yield of 0.2 percent (20 basis points). The percentage change in price would be:

$$\Delta P/P = -3.608 \times (.002) = -0.007216 \text{ or } -0.7216 \text{ percent}$$

Properties of Duration The following rules apply to duration:

1. The duration of a *zero coupon bond* is the same as its *maturity*.
2. For a given maturity, a bond's duration is *higher* when its coupon rate is *lower*.
3. For a given coupon rate, a bond's duration generally *increases* with maturity.
4. Other things being equal, the duration of a coupon bond varies *inversely* with its *yield* to maturity.
5. The duration of a level perpetuity is:

   $$(1 + \text{yield})/\text{yield}$$

   For example, at a nine percent yield, the duration of a perpetuity that pays Rs 100 per year forever will be equal to: (1.09/.09) = 12.11

   From this rule it is clear that maturity and duration can be substantially different. While the maturity of a perpetuity is infinite, the duration of the bond at a nine percent yield is only 12.11 years.
6. The duration of a level annuity approximately is:

   $$\frac{1+\text{yield}}{\text{yield}} - \frac{\text{Number of payments}}{(1+\text{yield})^{\text{Number of payments}} - 1}$$

   For example, a 15-year annual annuity with a yield of 10 percent will have a duration of:

   $$\frac{1.10}{0.10} - \frac{15}{1.10^{15} - 1} = 6.28 \text{ years}$$
7. The duration of a coupon bond approximately is:

   $$\frac{1+y}{y} - \frac{(1+y) + T(c-y)}{c\,[(1+y)^T - 1] + y} \tag{12.4}$$

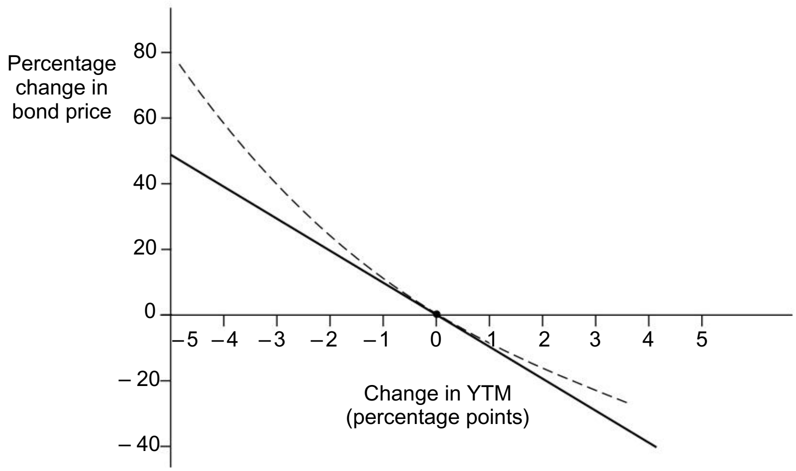
   where y is the bond's yield per payment period, T is the number of payment periods, and c is the coupon rate per payment period.

Convexity

Equation (12.3) says that the percentage price change is directly proportional to the change in yield. If this were precisely so, the percentage change in price would be linearly related to the change in yield. Yet we know from the bond-pricing relationships discussed earlier and graphically displayed in Exhibit 12.1 that the actual relationship is *curvilinear*. The duration rule provides an approximation which is fairly close, for small changes in the yield. However, as the yield change becomes larger, the approximation becomes poorer.

To illustrate this point consider a 20-year maturity, 9 percentage bond, selling at an initial yield to maturity of 9 percent. The modified duration of this bond is 9.95 years. Exhibit 12.4 shows the straight line plot of $-D^* \Delta y = -9.95 \times \Delta y$ as well as the curved line reflecting the actual relationship between yield change and price change. Note that for small changes in the yield, the duration rule is fairly accurate. However, as the yield change increases, the duration rule becomes less accurate.

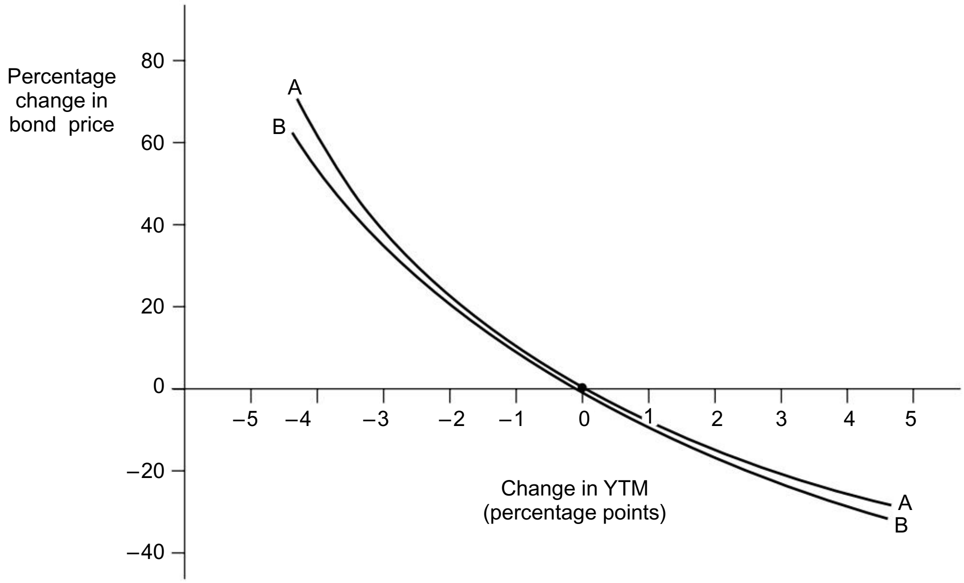
Exhibit 12.4 ***Bond-Price Convexity***



From Exhibit 12.4 it is clear that the straight line (the duration approximation) always understates the value of the bond. This is because the true price-yield relationship is convex, meaning that it opens upward.

Clearly, convexity is a desirable feature in bonds. Prices of bonds with greater convexity (curvature) increase more when yields falls and decline less when yields rise. Exhibit 12.5 presents two bonds, *A* and *B*. While both the bonds have the same duration at the initial yield, bond *A* is more convex than bond *B*. Compared to *B*, *A* enjoys greater price increase when the bond yield falls. Since convexity is a desirable feature, it does not come free. Investors have to pay for it in some way or the other.

Exhibit 12.5 ***Convexity of Bonds A and B***



Formula The formula for computing convexity is given below:

$$\text{Convexity} = \sum_{t=1}^{n} \frac{\dfrac{(t^2 + t) \times C_t}{(1+y)^t}}{P \times (1+y)^2} \tag{12.5}$$

where C_t is the cash flow at the end of year t, y is the yield to maturity, and P is the price of the bond.

The convexity of the bond described in Exhibit 12.3 is:

$$\text{Convexity} = \frac{\left(\dfrac{(1^2+1)\times 15}{(1.18)} + \dfrac{(2^2+2)\times 15}{(1.18)^2} + \dfrac{(3^2+3)\times 15}{(1.18)^3} + \dfrac{(4^2+4)\times 15}{(1.18)^4} + \dfrac{(5^2+5)\times (115)}{(1.18)^5}\right)}{89.5\,(1.18)^2}$$

$$= 14.94$$

By using both duration and convexity we can estimate more accurately the effect of interest rate change on bond price changes. Adding the effect of convexity to Eq. (12.3) results is:

$$\%\ \text{change in bond price} = -\ \text{modified duration} \times \%\ \text{yield change} + \tfrac{1}{2} \times \text{convexity} \times (\text{yield change})^2$$

In the above example it works out to:

$$-3.608 \times (0.002) + ½ \times 14.94\ (0.002)^2$$
$$= -0.007216 + .000030$$
$$= -0.007186 = -\ 0.7186 \text{ or } -0.7186 \text{ percent}$$

12.2 PASSIVE STRATEGIES

Bonds have acquired tremendous significance and managing a portfolio of bonds has become fairly complex. Bond investors may follow a variety of strategies ranging from passive to active.

Many investors believe that securities are fairly priced in the sense that expected returns are commensurate with risks. Such a belief supports a passive strategy, implying that the investor does not actively try to outperform the market.

Of course, a passive strategy does not mean that the investor does nothing. Even a passive investor will have to (a) determine whether bonds are suitable investment avenues for him, (b) assess risks (default risk, call risk, and so on) and reasonably diversify his holdings, and (c) periodically monitor his bond portfolio to ensure that his holdings match his risk preferences and objectives.

Two commonly followed strategies by passive bond investors are: buy and hold strategy and indexing strategy.

Buy and Hold Strategy An investor who follows a buy and hold strategy selects a bond portfolio and stays with it. He does not churn his bond portfolio in an attempt to improve returns and/ or reduce risks. Obviously, such an investor chooses a bond portfolio that promises to meet his investment objectives and hence spends time and effort in his initial selection.

Indexing Strategy If the capital market is efficient, efforts to find under-priced securities or to time the market may be futile. Empirical research on this issue suggests that most investors are unlikely to outperform the market. Hence, they may find an indexing strategy appealing. Such a strategy calls for building a portfolio that mirrors a well-known bond index. In the US, two well known bond indices are the Shearson Lehman Index and the Salomon Brothers Index. i-BEX is a popular bond index in India.

12.3 IMMUNISATION: A HYBRID STRATEGY

As interest rates tend to change over time, bondholders are exposed to interest rate risk. Interest rate risk may be split into two parts: (a) the **price risk**, stemming from the inverse relationship between bond prices and required rate of return, and (b) the **reinvestment risk** arising from the rate at which interest income can be reinvested in future.

Note that the price risk and the reinvestment risk move in opposite directions. If the interest rate goes up it has two consequences for the bondholder: (a) the price of the bond falls, and (b) the return on reinvestment of interest income improves. By the same token, if the interest rate declines, it has two consequences for the bondholder: (a) the price of the bond rises, and (b) the return on reinvestment of interest income decreases.

Can a bondholder ensure that these two opposite effects are equal so that he is immunised against interest rate risk? Yes, it is possible if the bondholder chooses a bond whose duration is equal to his investment horizon. For example, if the bondholder's investment horizon is four years he should choose a bond that has a duration of four years if he wants to insulate himself against interest rate risk. If he does so, whenever there is a change in interest rate, losses (or gains) in capital value will be exactly offset by gains (or losses) on reinvestments.

The concept of immunisation may be illustrated with an example. An investor who has a four-year investment horizon wants to invest Rs. 1,000 so that his initial investment along with reinvestment of interest grows to Rs. 1607.5. This means that the investor wants his investment to earn a compound return of 12.6 percent [1000 $(1.126)^4$ = 1607.5].

The investor is evaluating two bonds, A and B:

	Bond A	*Bond B*
Par value	Rs 1,000	Rs 1,000
Market price	Rs 1,000	Rs 1,000
Coupon rate	12.6%	12.6%
Yield to maturity	12.6%	12.6%
Maturity period	4 years	5 years
Duration	Less than 4 years	4 years
Rating	A	A

Exhibit 12.4 shows what happens when the investor buys bond A and bond B, under different assumptions about market yield. Part I of the exhibit shows that bond A cumulates to Rs. 1607.6 if the market yield remains at 12.6 percent. Part II of the exhibit shows that bond A cumulates to Rs. 1584.8 if the market yield falls to 10.0 percent in year 2. Part III of the exhibit shows that bond B will produce Rs. 1607.6 at the end of year four if the market yield remains at 12.6 percent. Part IV of the exhibit shows that bond B will produce Rs. 1608.4 at the end of year four if the market yield falls to 10.0 percent in year 2. Note that in the case of bond B it will have to be sold at the end of year 4. If the yield remains unchanged, it will sell at par, but if the yield falls it will sell at a premium.

From Exhibit 12.6 it is clear that bond B, whose duration equals the investment horizon, immunises the portfolio against interest rate risk, whereas bond A, whose duration is not equal to investment horizon, does not immunise the portfolio against interest rate risk. Remember that we are talking of duration not maturity.

Building an Immunised Portfolio The steps involved in building an immunised portfolio may be illustrated with an example. An insurance company has an obligation to pay Rs. 160,578 after seven years. The market interest rate is seven percent, so the present value of the obligation is Rs. 100,000. The insurance company's portfolio manager wants to fund the obligation with a mix of five year zero coupon bonds and perpetuities paying annual coupons (For the sake of simplicity, we consider zero coupon bonds and perpetuities).

Exhibit 12.6 ***Terminal Value with Bonds A and B***

Part I	Bond A: Market Yield Remains at 12.6%				
Year	Cash flow	Reinvestment rate	Accumulated value		
1	Rs 126	12.6%	$126\ (1.126)^3$	=	179.9
2	Rs 126	12.6%	$126\ (1.126)^2$	=	159.8
3	Rs 126	12.6%	$126\ (1.126)^1$	=	141.9
4	Rs 1126	NA			1126.0
			Total		1607.6
Part II	**Bond A: Market Yield Falls to 10.0% in year two**				
Year	Cash flow	Reinvestment rate	Accumulated value		
1	Rs 126	12.6%	126 (1.10) (1.10) (1.10)	=	167.7
2	Rs 126	10.0%	126 (1.10) (1.10)	=	152.5
3	Rs 126	10.0%	126 (1.10)	=	138.6
4	Rs 1126	NA			1126.0
			Total		1584.8
Part III	**Bond B: Market Yield Remains at 12.6%**				
Year	Cash flow	Reinvestment rate	Accumulated value		
1	126	12.6%	$126\ (1.126)^3$	=	179.9
2	126	12.6%	$126\ (1.126)^2$	=	159.8
3	126	12.6%	$126\ (1.126)^1$	=	141.9
4	126	NA	126.0		126.0
4	1000* (sale of bond)	NA			1000.0
			Total		1607.6
Part IV	**Bond B: Market Yield Falls to 10% in year two**				
Year	Cash flow	Reinvestment rate	Accumulated value		
1	126	12.6%	126 (1.10) (1.10) (1.10)	=	167.7
2	126	10.0%	126 (1.10) (1.10)	=	152.5
3	126	10.0%	126 (1.10)	=	138.6
4	126	NA			126.0
4	1023.6** (sale of bond)	NA			1023.6
			Total		1608.4

* (126 + 1000)/(1.126) = 1000

** (126 + 1000)/(1.10) = 1023.6

Because immunisation calls for equating the duration of the portfolio of assets with the duration of the liability, the insurance company's portfolio manager can proceed as follows:

1. Figure out the duration of the liability. In this case, it is seven years.
2. Calculate the duration of the asset portfolio. The duration of a portfolio is the weighted average of the duration of its component assets, the weight assigned to each asset being proportional to the amount invested in that asset. In this case, the duration of the zero coupon bond is five years and the duration of the perpetuity is 1.07/.07 = 15.3 years. If the weight assigned to the zero coupon bond is W, the weight assigned to perpetuity would be (1–W). So the portfolio duration will be:

$$\text{Portfolio duration} = W \times 5 \text{ years} + (1 - W) \times 15.3 \text{ years}$$

3. Find the asset mix whose duration equals seven years, the duration of liabilities:

$$W \times 5 \text{ years} + (1 - W) \times 15.3 \text{ years} = 7 \text{ years}$$

This gives $W = 0.806$ and $(1 - W) = 0.194$

4. Fund the obligation fully. Since the obligation has a present value of Rs. 100,000 and it has to be invested in zero coupon bonds and perpetuities in the ratio 0.806: 0.194, the portfolio manager must purchase Rs. 80,600 of zero coupon bonds and Rs. 19,400 of perpetuities.

Cash Flow Matching There appears to be a simple solution to the problem associated with immunisation: buy a zero coupon bond that promises a payment that exactly matches the projected cash requirement. This is called cash flow matching. It automatically immunises a portfolio from interest rate risk because the cash flow from the bond offsets the future obligation.

A dedication strategy involves matching cash flows on a multiperiod basis. In this case, the bond portfolio manager buys a series of zero coupon bonds that match the stream of future obligations. Such a strategy eliminates interest rate risk and the need for periodic rebalancing.

Although appealing, cash flow matching is not widely used. This is mainly because it imposes constraints on bond selection. While the dedication strategy appeals to firms that do not want to bet on interest rate movements, these firms may like to immunise using bonds they consider as "underpriced". However, it may not be possible to follow a dedication strategy using only "underpriced" bonds.

In some cases, dedication may not be feasible. For example, a pension fund that has obligations going far out in future, may simply not get zero coupon bonds of the maturities it wants. In such a case, immunisation is the easy option. For example, if the interest rate is seven percent, the duration of the pension fund obligations is 1.07/.07 = 15.3 years. Hence the pension fund can immunise itself against interest rate risk by buying zero coupon bonds of 15.3 years maturity and a market value that equals pension liabilities.

12.4 ACTIVE STRATEGIES

While bonds are often purchased to be held to maturity, many a time they are not. Henry Kaufman, a renowned bond expert, argues that bonds are bought for their price appreciation and less for their steady income. Many bond investors subscribe to this view and pursue active strategies. Peter L. Berstein, an eminent investment guru, too, argues in favour of active management of bonds.

Forecasting Interest Rate Change Bond prices and interest rates are inversely related. Hence, if an investor expects interest rates to fall, he should buy bonds, preferably bonds with longer maturity (more precisely, longer duration), for price appreciation. On the other hand, if an investor expects interest rates to rise, he should shun bonds, particularly bonds with longer maturity. While this approach may appear tempting, it must be borne in mind that interest rate forecasting is a difficult and uncertain task. Hence betting on interest rate movements is a risky proposition.

Interest Rate Forecasting Models A wide range of models are used for interest rate forecasting. Some models are based on forecasting the expected inflation rate, the key determinant of interest rates. The advantages of these models are: (a) There is a solid link between expected inflation and interest rates. (b) They are relatively simple. The disadvantages of such models are: (a) They may not be very helpful in short-term forecasting. (b) It is not easy to predict expected inflation.

Then there are models that forecast interest rates based on past interest rate changes. These models emphasise the time series behaviour of interest rates and predict future interest rates using distributed lags of past interest rates. These models are simple to implement as they rely on available information. However, shifts in fundamental factors may alter the distributed lag relationship.

Some other models assume that interest rates move in a normal range, thanks to the mean reversion tendency. If the normal range is known it is simple to build such models. However, the normal range may shift over time if fundamental variables change.

Finally, there are comprehensive multisector models of the economy that attempt to predict interest rates. These models look at the supply and demand of funds in the economy from all sources and their likely impact on interest rate changes. While these models are comprehensive in their nature, they require numerous inputs which may be difficult to obtain accurately.

Horizon Analysis Horizon analysis is a method of forecasting the total return on a bond over a given holding period. It involves the following steps:

- Select a particular investment period and predict bond yields at the end of that period.
- Calculate the bond price at the end of the investment period.
- Estimate the future value of coupon incomes earned over the investment period.
- Add the future value of coupon incomes over the investment period to the predicted capital gain or loss to get a forecast of the total return on the bond for the holding period.
- Annualise the holding period return.

An example may be given to illustrate horizon analysis. A Rs.100,000 par 10-year maturity bond with a 10 percent coupon rate (paid annually) currently sells at a yield to maturity of nine percent. A portfolio manager wants to forecast the total return on the bond over the coming two years, as his horizon is two years. He believes that two years from now, eight-year maturity bonds will sell at a yield of eight percent and the coupon income can be reinvested in short-term securities over the next two years at a rate of seven percent.

The two-year return on the bond is calculated as follows.

$$\begin{aligned}\text{Current price} &= 10{,}000 \times \text{PVIFA } (9\%, 10 \text{ years}) + 100{,}000 \times \text{PVIF } (9\%, 10 \text{ years})\\ &= 10{,}000 \times 6.418 + 100{,}000 \times 0.422 = \text{Rs } 106{,}380\end{aligned}$$

$$\begin{aligned}\text{Forecast price} &= 10{,}000 \times \text{PVIFA } (8\%, 8 \text{ years}) + 100{,}000 \times \text{PVIF } (8\%, 8 \text{ years})\\ &= 10{,}000 \times 5.747 + 100{,}000 \times 0.540 = \text{Rs } 111{,}470\end{aligned}$$

$$\text{Future value of reinvested coupons} = 10{,}000\ (1.07) + 10{,}000 = 20{,}700$$

$$\text{Two-year return} = \frac{20{,}700 + (111{,}470 - 106{,}380)}{106{,}380} = 0.242 \text{ or } 24.2\%$$

The annualised rate of return over the two-year period would be: $(1.242)^{0.5} - 1 = 0.114$ or 11.4 percent.

A particular version of horizon analysis is **riding the yield curve**. An investor pursuing this strategy buys an intermediate or long-term bond when the yield curve is upward sloping and the investor expects the yield curve to remain unchanged. As the bond approaches maturity, it moves toward the lower end of the upward-sloping yield curve and hence appreciates in value. Thus, the investor earns interest and also enjoys capital appreciation. The risk in this strategy is that the level of interest rates may rise or the yield curve may become downward sloping thereby causing the bond value to erode.

Exploiting Mispricings Among Securities Bond portfolio managers regularly monitor the bond market to identify temporary relative mispricings. They try to exploit such opportunities by engaging in bond swaps—purchase and sale of a bond—to improve the rate of the return. The most popular bond swaps are described below.

Substitution Swap A substitution swap involves bonds that are very similar in terms of credit rating, coupon payments, maturity, call provisions, and liquidity. The only difference between them, at a particular time, is that they sell at different prices and hence different yields. The swap is made from the lower yield bond to the higher yield bond. If the yield on the latter declines to that of the former, the bond holder enjoys capital appreciation.

Pure Yield Pickup Swap A pure yield pickup swap involves a switch from a lower yield bond to a higher yield bond of almost identical quality and maturity. Unlike a substitution swap, this swap is not based on expectations about price changes. It is motivated strictly by a desire to earn a higher yield.

Intermarket Spread Swap An intermarket spread swap seeks to benefit from the expected changes in the yield differences between various sectors of the bond market. For example, a bond investor may believe that the yields of utility bonds and Treasury bonds are misaligned. If the difference between the yields is perceived to be too wide, the bond investor would switch from Treasury bonds to utility bonds, in the hope that the difference will become narrow in future.

Tax Swap A tax swap involves selling an existing bond at a capital loss, using the capital loss to offset capital gains in other securities, and purchasing another bond with similar features.

12.5 INTEREST RATE SWAPS

An **interest rate swap** is a transaction involving an exchange of one stream of interest obligations for another. Typically, it results in an exchange of fixed rate interest payments for floating rate interest payments. Occasionally, it involves an exchange of one stream of floating rate interest payments for another.

The principal features of an interest rate swap are:

- It effectively translates a floating rate borrowing into a fixed rate borrowing and vice versa. The net interest differential is paid or received, as the case may be.
- There is no exchange of principal repayment obligations.
- It is structured as a separate contract distinct from the underlying loan agreement.
- It is applicable to new as well as existing borrowings.
- It is treated as an off-the-balance sheet transaction.

To understand how swaps work, consider a portfolio manager who has Rs.100 million par value of long-term bonds earning a fixed coupon of six percent. He thinks that interest rates are about to rise. So, he would like to sell fixed-rate long-term bonds and buy short-term bonds or floating rate bonds. However, replacing the portfolio every time the forecast for interest rate so warrants would entail considerable transaction costs. A cheaper and more convenient option is to “swap” the Rs. 6 million a year of interest income currently generated by the portfolio for an amount that is linked to short-term interest rates. This will ensure that if rates rise, so will the portfolio’s interest income.

To do the 'swap', the portfolio manager may approach a swap dealer who agrees to exchange a six-month MIBOR rate for a fixed rate of six percent (the MIBOR, or Mumbai Interbank Offer Rate, is the rate at which banks borrow from each other in the money market). Once the swap deal is done, the portfolio manager would pay the dealer 6 percent on a notional principal of Rs.100 million and receive in return the MIBOR rate on the same amount of notional principal. Thus, the portfolio manager's periodic *net* cash flow from the swap deal will be Rs. 100 million (MIBOR – 0.06).

It may be instructive to look at the cash flow from the portfolio in different interest rate scenarios.

	MIBOR Rate		
	5.5%	6.0%	6.5%
■ Interest income from the 6 percent Rs 100 million bond portfolio	6,000,000	6,000,000	6,000,000
■ Swap cash flow [= Rs 100 million (MIBOR – .06)]	(500,000)	0	500,000
■ Total (= Rs 100 million × MIBOR)	5,500,000	6,000,000	6,500,000

Thus, the bond portfolio plus the swap deal provides a MIBOR rate. The swap in effect has converted a fixed-rate bond portfolio into a synthetic floating-rate portfolio.

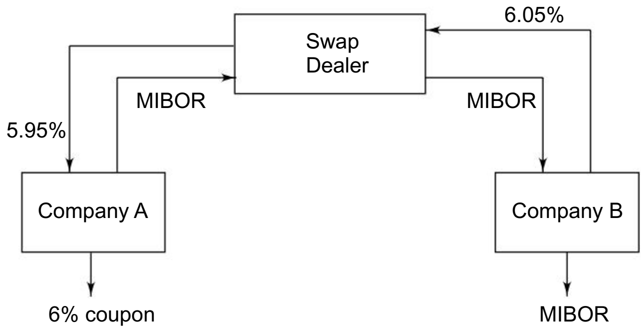
Swaps are useful for a variety of purposes:

- A company that has issued a fixed rate bond can convert it into a synthetic floating-rate bond by entering into a swap deal under which it receives a fixed rate (that offsets its fixed rate coupon obligation) and pays a floating rate.
- A bank that pays a floating rate interest to its depositors might enter into a swap agreement to pay a fixed rate and receive a floating rate on some notional principal. Once the swap has converted its floating rate obligation into a fixed rate obligation, the bank can offer long-term fixed rate loans without bothering about interest rate risk.

Who is the swap dealer and what is its motivation? Typically, the swap dealer is a bank willing to take the opposite side of the swap. In the example given above, the swap dealer would be willing to pay MIBOR rate and receive six percent fixed rate. The swap dealer does so because it hopes to find another party willing to pay MIBOR rate and receive six percent fixed rate. By doing so, the swap dealer neutralises its position. In effect, it then acts as an intermediary, funneling payments from one party to another.

The swap dealer, of course, expects to be compensated to play the role of the intermediary. Its compensation is generally in the form of a bid-ask spread on the transaction. If the bid-ask spread is say 0.05 percent on each leg of the transaction, the swap dealer effectively earns 0.10 percent. Exhibit 12.7 shows diagrammatically the swap arrangement.

Exhibit 12.7 ***Interest Rate Swap***



SUMMARY

- The **duration** of a bond is the weighted average maturity of its cash flow stream, where the weights are proportional to the present value of cash flows.
- The proportional change in the price of a bond in response to the change in its yield is as follows:

$$\frac{\Delta P}{P} \simeq -D^* \, \Delta y$$

- The two commonly followed passive strategies for bond portfolio management are: **buy and hold strategy** and **indexing strategy**.
- If the duration of a bond equals the investment horizon, the investor is immunised against interest rate risk.
- There appears to be a simple solution to the problem associated with immunisation: Buy a zero coupon bond that promises a payment that exactly matches the projected cash requirement.
- Those who follow an active approach to bond portfolio management seek to profit by (a) forecasting interest rate changes and/or (b) exploiting relative mispricings among bonds.
- **Horizon analysis** is a method of forecasting the total return on a bond over a given holding period.
- Bond portfolio managers try to exploit temporary relative mispricings by engaging in bond swaps–to improve the rate of return. The most popular bond swaps are substitution swap, pure yield pickup swap, intermarket spread swap, and tax swap.
- An **interest rate swap** is a transaction involving an exchange of one stream of interest obligations for another.

QUESTIONS

1. State the important bond pricing relationships.
2. What is duration and how it is calculated?
3. How is the volatility of a bond related to its duration?
4. What are the important properties of duration?
5. Discuss the passive strategies for managing a bond portfolio.
6. What is immunisation?
7. What is cash flow matching?
8. Explain the steps involved in horizon analysis.
9. Describe the swaps done by bond portfolio managers to exploit relative mispricings.
10. What is an interest rate swap? Explain how it works.
11. What is convexity? How is it calculated?

SOLVED PROBLEMS

1. The following information is available on a bond:
Face value: Rs 100
Coupon rate: 12 percent payable annually
Years to maturity: 6
Current market price: Rs 110
What is the duration of the bond? Use the approximate formula for calculating the yield to maturity.

Solution

The yield to maturity, using the approximate formula, is:

$$\frac{12+(100-110)/6}{0.6\times 110+0.4\times 100} = 9.75 \text{ percent}$$

The duration is calculated below:

Year	*Cash flow*	*Present value at 9.75 percent*	*Proportion of the bond's value*	*Proportion of the bond's value × time*
1	12	10.93	.099	0.099
2	12	9.96	.091	0.181
3	12	9.07	.082	0.247
4	12	8.27	.075	0.301
5	12	7.54	.069	0.343
6	112	64.06	.058	3.494
				4.665 years

2. A 10 year annual annuity has a yield of nine percent. What is its duration?

Solution

The duration of a level annuity is:

$$\frac{1+\text{Yield}}{\text{Yield}} - \frac{\text{Number of payments}}{(1+\text{Yield})^{\text{Number of payments}} - 1}$$

$$\frac{1.09}{0.09} - \frac{10}{(1.09)^{10} - 1} = 4.798 \text{ years}$$

3. A 10 percent coupon bond has a maturity of 12 years. It pays interest semi-annually. Its yield to maturity is four percent per half-year period. What is its duration?

Solution

The duration is:

$$\frac{1+y}{y} - \frac{(1+y)+T(c-y)}{c[(1+y)^T - 1]+y}$$

The bond has five percent semi-annual coupon and 24 payment periods (half-year periods). Its duration would be:

$$\frac{1.04}{.04} - \frac{1.04+24(.05-0.04)}{.05\,[1.04^{24}-1]+.04} = 15.17 \text{ half-years} = 7.58 \text{ years}$$

4. An insurance company has an obligation to pay Rs 215,900 after 10 years. The market interest rate is eight percent, so the present value of the obligation is Rs 100,000. The insurance company's manager wants to fund the obligation with a mix of six year zero coupon bonds and perpetuities paying annual coupons. In what proportions should he buy these debt instruments?

Solution

The liability has a duration of 10 years. The duration of the zero coupon bonds is six years and the duration of the perpetuities is:

$$1.08/.08 = 13.5 \text{ years}$$

The portfolio duration will be:

$$W \times 6 + (1 - W) \times 13.5$$

Equating this to 10 years we get:

$$W \times 6 + (1 - W) \times 13.5 = 10$$

$$W = 0.467 \text{ and } (1 - W) = 0.533$$

Thus the proportions in which the zero coupon bonds and the perpetuities should be bought are 0.467 and 0.533 respectively.

5. A Rs 100,000 par five-year maturity bond with a 9 percent coupon rate (paid annually) currently sells at a yield to maturity of 8 percent. A portfolio manager wants to forecast the total return on the bond over the coming two years, as his horizon is two years. He believes that two years from now, three-year maturity bonds will sell at a yield of 7 percent and the coupon income can be reinvested in short-term securities over the next two years at a rate of 6 percent. What is the expected annualised rate of return over the two-year period?

Solution

The two year return on the bond is calculated as follows:

$$\text{Current price} = 9{,}000 \times \text{PVIFA } (8\%, 5 \text{ years}) + 100{,}000 \times \text{PVIF } (8\%, 5 \text{ years})$$
$$= 9{,}000 \times 3.993 + 100{,}000 \times 0.681 = \text{Rs } 104{,}037$$

$$\text{Forecast price} = 9{,}000 \times \text{PVIFA } (7\%, 3 \text{ years}) + 100{,}000 \times \text{PVIF } (7\%, 3 \text{ years})$$
$$= 9{,}000 \times 2.624 + 100{,}000 \times 0.816 = \text{Rs } 105{,}216$$

$$\text{Future value of reinvested coupons} = 9{,}000\,(1.06) + 9{,}000 = \text{Rs.}18{,}540$$

$$\text{Two year return} = \frac{18{,}540 + (105{,}216 - 104{,}037)}{104{,}037} = 0.1895 \text{ or } 18.95\%$$

The annualised rate of return over the two-year period would be:

$$(1.1895)^{0.5} - 1 = .0906 = 9.06\%.$$

PROBLEMS

1. The following information is available for a bond.
   Face value: Rs 100
   Coupon rate: 9 percent payable annually
   Years to maturity: 5
   Current market price: Rs 105
   What is the duration of the bond? Use the approximate formula for calculating the yield to maturity.
2. A zero coupon bond of Rs 10,000 has a term to maturity of eight years and a market yield of 10 percent at the time of issue.
   (a) What is the issue price?
   (b) What is the duration of the bond?
   (c) What is the modified duration of the bond?
   (d) What will be the percentage change in the price of the bond, if the yield declines by 0.5 percentage points (50 basis points)
3. You are considering the following bond for inclusion in your fixed income portfolio:
   Coupon rate 10%
   Yield to maturity 10%
   Term to maturity 10 years
   (a) What is the duration of this bond?
   (b) Why is the bond's duration less than its maturity?
   (c) What will be the effect of the following changes on the duration of the bond:
      (i) The coupon rate is 8% rather than 10%
      (ii) The yield to maturity is 12% rather than 10%
      (iii) The maturity period is eight years rather than 10 years.
      Consider one change at a time.
4. A 15-year level annuity has a yield of 8.5 percent. What is its duration ?
5. A 12 percent coupon bond has a maturity of five years. It pays interest semi-annually. Its yield to maturity is 5 percent per half year period. What is its duration?

6. An insurance company has an obligation to pay Rs 196,700 after 10 years. The market interest rate is 7 percent, so the present value of the obligation is Rs 100,000. The insurance company's portfolio manager wants to fund the obligation with a mix of six year bonds and perpetuities paying annual coupons. How much should he invest in these two instruments?
7. A Rs 100,000 par eight-year maturity bond with a 9 percent coupon rate (paid annually) currently sells at a yield to maturity of 8 percent. A portfolio manager wants to forecast the total return on the bond over the coming three years, as his horizon is three years. He believes that three years from now, five-year maturity bonds will sell at a yield of 7 percent and the coupon income can be reinvested in short-term securities over the next two years at a rate of 6.5 percent. What is the expected annualised rate of return over the three year period?

MINICASE

Madhav Dhar set up Magnum Securities in 1985 as a stock broking firm which acquired membership of Bombay Stock Exchange. The business of the firm expanded steadily and in 1995 Magnum Securities acquired membership of National Stock Exchange. Magnum Securities made an IPO in 2004. Till 2002, the bulk of the income of Magnum Securities came from stock broking. From 2003, Magnum Securities offered portfolio management service dedicated to equity portfolios.

After graduating from a premier business school, you have worked in a mutual fund organisation looking after their debt schemes. Recently, Madhav Dhar met you at an investment conference where you gave a talk on debt mutual funds.

Impressed by your understanding of the debt market, Madhav Dhar has invited you to give a seminar to the board of directors of Magnum Securities to educate them on certain concepts in bond analysis, as Magnum Securities has recently set up a debt division. Madhav Dhar sees great potential in the debt market.

He also hinted, without making a firm offer, that he would like a person like you to head the debt division of Magnum Securities.

To elucidate certain concepts in bond analysis he has requested you to use the following data on bond A which is currently one of the most actively traded bonds:

	Bond A
Face value	Rs. 1,000
Coupon (interest rate)	9 percent payable annually
Term to maturity	6 years
Redemption value	Rs. 1,000
Current market price	Rs. 1,046

a. What is the yield to maturity of bond A?
b. What is the duration of bond A?
c. What is the conceptual difference between years to maturity and duration?
d. What is the convexity of bond A?
e. What des convexity reflect?
f. If the yield on bond A increases by 50 basis points, what will be the percentage change in the bond price?
g. Two years from now, bond A will sell at a yield of 8.5 precent and the coupon incomes over the next two years can be reinvested in short-term securities at a rate of 7.0 peresent. What is the expected annualised rate of return over the two-year period?

PART

5

Equity Shares

Chapter **13**

Equity Valuation

How to Find Your Bearings

LEARNING OBJECTIVES

After studying this chapter, you should be able to:

- Calculate the intrinsic value of a stock using the zero growth model, the constant growth model, the two stage growth model, and the H model.
- Analyse the determinants of the P/E ratio.
- Evaluate the popular rules of thumb to establish benchmark P/E ratios.
- Describe the passive and active strategies used in managing an equity portfolio.

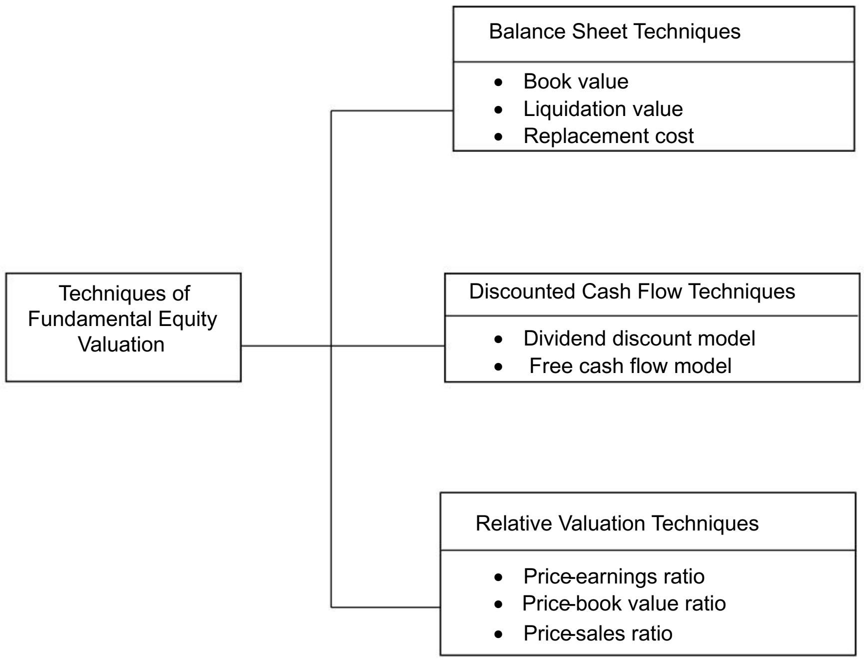
Equity shares can be described more easily than fixed income securities. However, they are more difficult to analyse. Fixed income securities typically have a limited life and a well-defined cash flow stream. Equity shares have neither. While the basic principles of valuation are the same for fixed income securities as well as equity shares, the factors of growth and risk create greater complexity in the case of equity shares.

As our discussion of market efficiency suggested, identifying mispriced securities is not easy. Yet there are enough chinks in the efficient market hypothesis and hence the search for mispriced securities cannot be dismissed out of hand. Moreover, remember that it is the ongoing search for mispriced securities by an army of equity analysts that contributes to a high degree of market efficiency.

Equity analysts employ two kinds of analysis, viz., fundamental analysis and technical analysis. Fundamental analysts assess the fair market value of equity shares by examining the assets, earnings prospects, cash flow projections, and dividend potential. Fundamental analysts differ from technical analysts who essentially rely on price and volume trends and other market indicators to identify trading opportunities.

This chapter discusses the techniques for fundamental valuation which may broadly be divided into three categories as shown in Exhibit 13.1.

Exhibit 13.1 ***Techniques of Fundamental Equity Valuation***



13.1 BALANCE SHEET VALUATION

Analysts often look at the balance sheet of a firm to get a handle on some valuation measures. Three measures derived from the balance sheet are: book value, liquidation value, and replacement cost.

Book Value The book value per share is simply the net worth of the company (which is equal to paid up equity capital plus reserves and surplus) divided by the number of outstanding equity shares. For example, if the net worth of Zenith Limited is Rs. 37 million and the number of outstanding equity shares of Zenith is 2 million, the book value per share works out to Rs. 18.50 (Rs. 37 million divided by 2 million).

How relevant and useful is the book value per share as a measure of investment value? The book value per share is firmly rooted in financial accounting and hence can be established relatively easily. Due to this, its proponents argue that it represents an 'objective' measure of value. A closer examination, however, quickly reveals that what is regarded as 'objective' is based on accounting conventions and policies which are characterised by a great deal of subjectivity and arbitrariness. An allied and a more powerful criticism, against the book value measure, is that the historical balance sheet figures on which it is based are often very divergent from current economic value. Balance sheet figures rarely reflect earning power and hence the book value per share cannot be regarded as a good proxy for true investment value.

Liquidation Value The liquidation value per share is equal to:

$$\frac{\text{Value realised from liquidating all the assets of the firm} - \text{Amount to be paid to all the creditors and preference shareholders}}{\text{Number of outstanding equity shares}}$$

To illustrate, assume that Pioneer Industries would realise Rs. 45 million from the liquidation of its assets and pay Rs. 18 million to its creditors and preference shareholders in full settlement of their claims. If the number of outstanding equity shares of Pioneer is 1.5 million, the liquidation value per share works out to:

$$\frac{\text{Rs 45 million} - \text{Rs 18 million}}{\text{1.5 million}} = \text{Rs. } 18$$

While the liquidation value appears more realistic than the book value, there are two serious problems in applying it. First, it is very difficult to estimate what amounts would be realised from the liquidation of various assets. Second, the liquidation value does not reflect earning capacity. Given these problems, the measure of liquidation value seems to make sense only for firms which are 'better dead than alive'—such firms are not viable and economic values cannot be established for them.

Replacement Cost Another balance sheet measure considered by analysts in valuing a firm is the replacement cost of its assets less liabilities. The use of this measure is based on the premise that the market value of a firm cannot deviate too much from its replacement cost. If it did so, competitive pressures will tend to align the two.

This idea seems to be popular among economists. The ratio of market price to replacement cost is called *Tobin q*, after James Tobin a Nobel Laureate in economics. The proponents of replacement cost believe that in the long run Tobin's q will tend to 1. The empirical evidence, however, is that this ratio can depart significantly from 1 for long periods of time.

A major limitation of the replacement cost concept is that organisational capital, a very valuable asset, is not shown on the balance sheet. Organisational capital is the value created by bringing together employees, customers, suppliers, managers, and others in a mutually beneficial and productive relationship. An important characteristic of organisational capital is that it cannot be easily separated from the firm as a going entity.

Although balance sheet analysis may provide useful information about book value, liquidation value, or replacement cost, the analyst must focus on expected future dividends, earnings, and cash flows to estimate the value of a firm as a going entity. We examine the quantitative models used for this purpose in the following sections.

13.2 DIVIDEND DISCOUNT MODEL

According to the dividend discount model, conceptually a very sound and appealing model, the value of an equity share is equal to the present value of dividends expected from its ownership plus the present value of the sale price expected when the equity share is sold. For applying the dividend discount model, we will make the following assumptions: (i) dividends are paid annually—this seems to be a common practice for business firms in India; and (ii) the first dividend is received one year after the equity share is bought.

Single-period Valuation model Let us begin with the case where the investor expects to hold the equity share for one year. The price of the equity share will be:

$$P_0 = \frac{D_1}{(1+r)} + \frac{P_1}{(1+r)} \tag{13.1}$$

where P_0 is the current price of the equity share, D_1 is the dividend expected a year hence, P_1 is the price of the share expected a year hence, and r is the rate of return required on the equity share.

Example Prestige's equity share is expected to provide a dividend of Rs 2.00 and fetch a price of Rs. 18.00 a year hence. What price would it sell for now if investors' required rate of return is 12 percent?

The current price will be:

$$P_0 = \frac{2.0}{(1.12)} + \frac{18.00}{(1.12)} = \text{Rs. } 17.86$$

What happens if the price of the equity share is expected to grow at a rate of g percent annually? If the current price, P_0, becomes $P_0(1 + g)$ a year hence, we get:

$$P_0 = \frac{D_1}{(1+r)} + \frac{P_0(1+g)}{(1+r)} \tag{13.2}$$

Simplifying Eq. (13.2)[1] we get:

$$P_0 = \frac{D_1}{r-g} \tag{13.3}$$

[1] The steps in simplification are:

$$P_0 = \frac{D_1}{(1+r)} + \frac{P_0(1+g)}{(1+r)} \tag{1}$$

$$P_0 = \frac{D_1 + P_0(1+g)}{(1+r)} \tag{2}$$

$$P_0(1 + r) = D_1 + P_0(1 + g) \tag{3}$$

$$P_0(1 + r) - P_0(1 + g) = D_1 \tag{4}$$

$$P_0(r - g) = D_1 \tag{5}$$

$$P_0 = \frac{D_1}{r-g} \tag{6}$$

Example The expected dividend per share on the equity share of Roadking Limited is Rs. 2.00. The dividend per share of Roadking Limited has grown over the past five years at the rate of 5 percent per year. This growth rate will continue in future. Further, the market price of the equity share of Roadking Limited, too, is expected to grow at the same rate. What is a fair estimate of the intrinsic value of the equity share of Roadking Limited if the required rate is 15 percent?

Applying Eq. (13.3) we get the following estimate:

$$P_0 = \frac{2.00}{0.15 - .05} = \text{Rs. } 20.00$$

Expected Rate of Return In the preceding discussion we calculated the intrinsic value of an equity share, given information about (i) the forecast values of dividend and share price, and (ii) the required rate of return. Now we look at a different question: What rate of return can the investor expect, given the current market price and forecast values of dividend and share price? The expected rate of return is equal to:

$$r = D_1 / P_0 + g \tag{13.4}$$

Example The expected dividend per share of Vaibhav Limited is Rs. 5.00. The dividend is expected to grow at the rate of 6 percent per year. If the price per share now is Rs. 50.00, what is the expected rate of return?

Applying Eq. (13.4), the expected rate of return is:

$$r = 5/50 + 0.06 = 16 \text{ percent}$$

Multi-period Valuation Model Having learnt the basics of equity share valuation in a single-period framework, we now discuss the more realistic, and also the more complex, case of multiperiod valuation.

Since equity shares have no maturity period, they may be expected to bring a dividend stream of infinite duration. Hence the value of an equity share may be put as:

$$P_0 = \frac{D_1}{(1+r)} + \frac{D_2}{(1+r)^2} + \cdots + \frac{D_\infty}{(1+r)^\infty} = \sum_{t=1}^{\infty} \frac{D_t}{(1+r)^t} \tag{13.5}$$

where P_0 is the price of the equity share today, D_1 is the dividend expected a year hence, D_2 is the dividend expected two years hence, D_∞ is the dividend expected at the end of infinity, and r is the expected return.

Equation (13.5) represents the valuation model for an infinite horizon. Is it applicable to a finite horizon? Yes. To demonstrate this, consider how an equity share would be valued by an investor who plans to hold it for n years and sell it thereafter for a price of P_n. The value of the equity share to him is:

$$P_0 = \frac{D_1}{(1+r)^1} + \frac{D_2}{(1+r)^2} + \cdots + \frac{D_n}{(1+r)^n} + \frac{P_n}{(1+r)^n}$$

$$= \sum_{t=1}^{n} \frac{D_t}{(1+r)^t} + \frac{P_n}{(1+r)^n} \tag{13.6}$$

Now, what is the value of P_n in Eq. (13.6)? Applying the dividend capitalisation principle, the value of P_n would be the present value of the dividend stream beyond the nth year, evaluated as at the end of the nth year. This means:

$$P_n = \frac{D_{n+1}}{(1+r)} + \frac{D_{n+2}}{(1+r)^2} + \cdots + \frac{D_\infty}{(1+r)^{\infty-n}} \tag{13.7}$$

Substituting this value of P_n in Eq. (13.6) we get:

$$\begin{aligned} P_0 &= \frac{D_1}{(1+r)^1} + \frac{D_2}{(1+r)^2} + \cdots + \frac{D_n}{(1+r)^n} \\ &\quad + \frac{1}{(1+r)^n}\left[\frac{D_{n+1}}{(1+r)} + \frac{D_{n+2}}{(1+r)^n} + \cdots + \frac{D_\infty}{(1+r)^{\infty-n}}\right] \\ &= \frac{D_1}{(1+r)} + \frac{D_2}{(1+r)^2} + \cdots + \frac{D_n}{(1+r)^n} + \frac{D_{n+1}}{(1+r)^{n+1}} + \cdots + \frac{D_\infty}{(1+r)^\infty} \\ &= \sum_{t=1}^{\infty} \frac{D_t}{(1+r)^t} \end{aligned} \tag{13.8}$$

This is the same as Eq. (13.5) which may be regarded as a general multiperiod valuation formula. Eq. (13.5) is general enough to permit any dividend pattern—constant, rising, declining, or randomly fluctuating. For practical applications, it is helpful to make simplifying assumptions about the pattern of dividend growth. The more commonly used assumptions are as follows:

- The dividend per share remains constant forever, implying that the growth rate is nil (the zero growth model).
- The dividend per share grows at a constant rate per year forever (the constant growth model).
- The dividend per share grows at a constant extraordinary rate for a finite period, followed by a constant normal rate of growth forever thereafter (the two-stage model).
- The dividend per share, currently growing at an above-normal rate, experiences a gradually declining rate of growth for a while and, thereafter, it grows at a constant normal rate (the H model).

Zero Growth Model If we assume that the dividend per share remains constant year after year at a value of D, Eq. (13.5) becomes:

$$P_0 = \frac{D}{(1+r)} + \frac{D}{(1+r)^2} + \cdots + \frac{D}{(1+r)} + \cdots + \frac{D}{(1+r)^\infty} \tag{13.9}$$

Equation (13.9), on simplification, becomes:

$$P_0 = \frac{D}{r} \tag{13.10}$$

Remember that this is a straightforward application of the present value of perpetuity formula discussed in Chapter 5.

Constant Growth Model (Gordon Model) One of the most popular dividend discount models, called the Gordon model as it was originally proposed by Myron J. Gordon, assumes that the dividend per share grows at a constant rate (g). The value of a share, under this assumption, is:

$$P_0 = \frac{D_1}{(1+r)} + \frac{D_1(1+g)}{(1+r)^2} + \cdots \frac{D_1(1+g)^n}{(1+r)^{n+1}} + \cdots \tag{13.11}$$

Applying the formula for the sum of a geometric progression, the above expression simplifies to:

$$P_0 = \frac{D_1}{r-g} \qquad (13.12)^2$$

Example Ramesh Engineering Limited is expected to grow at the rate of 6 percent per annum. The dividend expected on Ramesh's equity share a year hence is Rs. 2.00. This too will grow at 6 percent per annum. What price will you put on it if your required rate of return for this share is 14 percent?

---

[2] Start with

$$P_0 = \frac{D_1}{(1+r)} + \frac{D_1(1+g)}{(1+r)^2} + \cdots + \frac{D_1(1+g)^n}{(1+r)^{n+1}} \cdots \tag{1}$$

Multiplying both the sides of (1) by [(1+g)/(1+r)] gives:

$$P_0\left[\frac{1+g}{1+r}\right] = \frac{D_1(1+g)}{(1+r)^2} + \frac{D_1(1+g)^2}{(1+r)^3} + \cdots + \frac{D_1(1+g)^{n+1}}{(1+r)^{n+2}} \; (n \to \infty) \tag{2}$$

Subtracting (2) from (1) yields:

$$\frac{P_0(r-g)}{(1+r)} = D_1\left[\frac{1}{(1+r)} - \frac{(1+g)^{n+1}}{(1+r)^{n+2}}\right] \qquad (n \to \infty) \tag{3}$$

As $(n \to \infty)$, $\frac{(1+g)^{n+1}}{(1+r)^{n+2}} \to 0$ because $g < r$

Hence (2) becomes:

$$\frac{P_0(r-g)}{(1+r)} = \frac{D_1}{(1+r)} \tag{4}$$

This means:

$$P_0 = \frac{D_1}{r-g} \tag{5}$$

The price of Ramesh's equity share would be:

$$P_0 = \frac{2.00}{0.14 - 0.06} = \text{Rs.}25.00$$

What Drives Growth Most stock valuation models are based on the assumption that dividends grow over time. What drives this growth? The two major drivers of growth are: (a) ploughback ratio and (b) return on equity (ROE). To see why this is so let us consider an example.

Omega Limited has an equity (net worth) base of 100 at the beginning of year 1. It earns a return on equity of 20 percent. It pays out 40 percent of its equity earnings and ploughs back 60 percent of its equity earnings. The financials of Omega Limited for a 3 year period are shown in Exhibit 13.1. From this exhibit we find that the dividend grows at a rate of 12 percent per annum—from Rs. 8 to Rs 8.96 and then from Rs 8.96 to Rs 10.04. The growth figure is the product of:

$$\text{Ploughback ratio} \times \text{Return on equity} = 0.6 \times 20\% = 12\%$$

Exhibit 13.1 ***Financials of Omega Limited***

	Year 1	*Year 2*	*Year 3*
■ Beginning equity	100	112	125.44
■ Return on equity	20%	20%	20%
■ Equity earning	20	22.4	25.1
■ Dividend payout ratio	0.4	0.4	0.4
■ Dividend	8	8.96	10.04
■ Ploughback ratio	0.6	0.6	0.6
■ Retained earning	12	13.44	15.06

Two Stage Growth Model The simplest extension of the constant growth model assumes that the extraordinary growth (good or bad) will continue for a finite number of years and thereafter the normal growth rate will prevail indefinitely.

Assuming that the dividend moves in line with the growth rate, the price of the equity share will be:

$$P_0 = \left[\frac{D_1}{(1+r)} + \frac{D_1(1+g_1)}{(1+r)^2} + \frac{D_1(1+g_1)^2}{(1+r)^3} \cdots + \frac{D_1(1+g_1)^{n-1}}{(1+r)^n}\right] + \frac{P_n}{(1+r)^n} \qquad (13.13)$$

where P_0 is the current price of the equity share, D_1 is the dividend expected a year hence, g_1 is the extraordinary growth rate applicable for n years, and P_n is the price of the equity share at the end of year n.

The first term on the right hand side of Eq. (13.13) is the present value of a growing annuity. Its value is equal to:

$$D_1\left[\frac{1-\left[\dfrac{1+g_1}{1+r}\right]^n}{r-g_1}\right] \tag{13.14}$$

Remember that this is a straightforward application of Eq. (5.7) developed in Chapter 5. Hence,

$$P_0 = D_1\left[\frac{1-\left[\dfrac{1+g_1}{1+r}\right]^n}{r-g_1}\right] + \frac{P_n}{(1+r)^n} \tag{13.15}$$

Since the two-stage growth model assumes that the growth rate after n years remains constant, P_n will be equal to:

$$\frac{D_{n+1}}{r-g_2} \tag{13.16}$$

where D_{n+1} is the dividend for year $n + 1$, and g_2 is the growth rate in the second period.

D_{n+1}, the dividend for year n+1, may be expressed in terms of the dividend in the first stage.

$$D_{n+1} = D_1\,(1+g_1)^{n-1}\,(1+g_2) \tag{13.17}$$

Substituting the above expression, we have:

$$P_0 = D_1\left[\frac{1-\left[\dfrac{1+g_1}{1+r}\right]^n}{r-g_1}\right] + \left[\frac{D_1\,(1+g_1)^{n-1}(1+g_2)}{r-g_2}\right]\left[\frac{1}{(1+r)^n}\right] \tag{13.18}$$

Example The current dividend on an equity share of Vertigo Limited is Rs. 2.00. Vertigo is expected to enjoy an above-normal growth rate of 20 percent for a period of 6 years. Thereafter the growth rate will fall and stabilise at 10 percent. Equity investors require a return of 15 percent. What is the intrinsic value of the equity share of Vertigo?

The inputs required for applying the two-stage model are:

g_1 = 20 percent

g_2 = 10 percent

n = 6 years

$$r = 15 \text{ years}$$

$$D_1 = D_0\ (1 + g_1) = \text{Rs. } 2\ (1.20) = 2.40$$

Plugging these inputs in the two-stage model, we get the intrinsic value estimate as follows:

$$P_0 = 2.40\left[\frac{1-\left[\frac{1.20}{1.15}\right]^6}{.15-.20}\right] + \left[\frac{2.40\,(1.20)^5\,(1.10)}{.15-.10}\right]\left[\frac{1}{(1.15)^6}\right]$$

$$= 240\left[\frac{1-1.291}{-0.05}\right] + \left[\frac{2.40\,(2.488)\,(1.10)}{.15-.10}\right][0.4323]$$

$$= 13.968 + 56.79$$

$$= \text{Rs.}70.76$$

A **spreadsheet** application of the above example is given below.

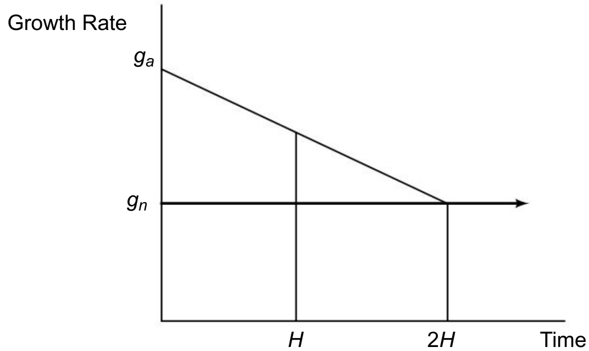
	A	B
1	Current dividend (D_0)	2
2	No. of years of initial above-normal growth (n)	6
3	Rate of above-normal growth (g_1)	20%
4	Stable growth rate (g_2)	10%
5	Required return (r)	15%
6	Dividend expected a year hence (D_1)	2.40
7	Intrinsic value of the equity share (P_0)	
8	=B6*(1-((1+B3)/(1+B5))^B2))/(B5-B3)+((B6*((1+B3)^(B2-1)*(1+B4))/(B5-B4))/((1+B5)^B2)	70.76

H Model The H model of equity valuation is based on the following assumptions:

- While the current dividend growth rate, g_a, is greater than g_n, the normal long-run growth rate, the growth rate declines linearly for 2H years.
- After 2H years the growth rate becomes g_n.
- At H years the growth rate is exactly halfway between g_a and g_n.

The graphical representation of the dividend growth rate pattern for the H-model is shown in Exhibit 13.2.

Exhibit 13.2 ***Dividend Growth Rate Pattern for H Model***



While the derivation of the H model is rather complex, the valuation equation for the H model is quite simple:

$$P_0 = \frac{D_0\,[(1+g_n) + H\,(g_a - g_n)]}{r - g_n} \tag{13.19}$$

where P_0 is the intrinsic value of the share, D_0 is the current dividend per share, r is the rate of return expected by investors, g_n is the normal long-run growth rate, g_a is the current above-normal growth rate, H is the one-half of the period during which g_a will level off to g_n.

Equation (13.19) may be re-written as:

$$P_0 = \frac{D_0\,(1+g_n)}{r - g_n} + \frac{D_0\,H\,(g_a - g_n)}{r - g_n} \tag{13.20}$$

Expressed this way, the H model may be interpreted in a simple, intuitive manner. The first term on the right hand side of Eq.(13.20).

$$\frac{D_0\,(1+g_n)}{r - g_n}$$

represents the value based on the normal growth rate, whereas the second term

$$\frac{D_0\,H\,(g_a - g_n)}{r - g_n}$$

reflects the premium due to abnormal growth rate.

Example The current dividend on an equity share of International Computers Limited is Rs 3.00. The present growth rate is 50 percent. However, this will decline linearly over a period of 10 years and then stabilise at 12 percent. What is the intrinsic value per share of International Computers Limited, if investors require a return of 16 percent?

The inputs required for applying the H-model are:

$$D_0 = \text{Rs } 3.00$$
$$g_a = 50 \text{ percent}$$
$$H = 5 \text{ years}$$
$$g_n = 12 \text{ percent}$$
$$r = 16 \text{ percent}$$

Plugging these inputs in the H-model we get the intrinsic value estimate as follows:

$$P_0 = \frac{3.00\,[(1.12) + 5(0.50 - 0.12)]}{.16 - .12}$$
$$= \text{Rs.}226.5$$

A **spreadsheet** application of the above example of H model is as follows..

	A	B
1	Current dividend (D_0)	3
2	Present growth rate (g_a)	50%
3	No. of years of linear decline in growth rate ($2H$)	10
4	Stable growth rate (g_n)	12%
5	Required rate of return (r)	16%
6	Intrinsic value of the share (P_0)	
7	=B1*((1+B4)+(B3/2)*(B2-B4))/(B5-B4)	226.50

Impact of Growth on Price, Returns, and P/E Ratio The expected growth rates of companies differ widely. Some companies are expected to remain virtually stagnant or grow slowly; other companies are expected to show normal growth; still others are expected to achieve supernormal growth rate.

Assuming a constant total required return, differing expected growth rates mean differing stock prices, dividend yields, capital gains yields, and price-earnings ratios. To illustrate, consider three cases:

	Growth rate (%)
Low growth firm	5
Normal growth firm	10
Supernormal growth firm	15

The expected earnings per share and dividend per share of each of the three firms are Rs. 3.00 and Rs. 2.00 respectively. Investors' required total return from equity investments is 20 percent.

Given the above information, we may calculate the stock price, dividend yield, capital gains yield, and price-earnings ratio for the three cases as shown in Exhibit 13.3.

The results in Exhibit 13.3 suggest the following points:

1. As the expected growth in dividend increases, other things being equal, the expected return[3] depends more on the capital gains yield and less on the dividend yield.
2. As the expected growth rate in dividend increases, other things being equal, the price-earnings ratio increases.
3. High dividend yield and low price-earnings ratio imply limited growth prospects.
4. Low dividend yield and high price-earnings ratio imply considerable growth prospects.

Exhibit 13.3 ***Price, Dividend Yield, Capital Gains Yield, and Price-Earnings Ratio under Differing Growth Assumptions for 15 percent Return***

	Price $P_0 = \frac{D_1}{r-g}$	Dividend yield (D_1/P_0)	Capital gains yield $(P_1–P_0)/P_0$	Price earnings ratio (P/E)
Low growth firm	$P_0 = \frac{\text{Rs } 2.00}{0.20 - 0.05}$ = Rs 13.33	15.0%	5.0%	4.44
Normal growth firm	$P_0 = \frac{\text{Rs } 2.00}{0.20 - 0.10}$ = Rs 20.00	10.0%	10.0%	6.67
Supernormal growth firm	$P_0 = \frac{\text{Rs } 2.00}{0.20 - 0.15}$ = Rs 40.00	5.0%	15.0%	13.33

13.3 FREE CASH FLOW MODEL

The free cash flow model broadly involves determining the value of the firm as a whole (this value is called the enterprise value) by discounting the free cash flow to investors and then subtracting the value of preference and debt to obtain the value of equity. More specifically, it involves the following procedure.

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[3] Note that the total return is the sum of the dividend yield and the capital gain yield:

$$\frac{D_t + P_t - P_{t-1}}{P_{t-1}} = \frac{D_t}{P_{t-1}} + \frac{P_t - P_{t-1}}{P_{t-1}}$$

Total return = Dividend yield + Capital gains yield

1. **Divide the future into two parts, the explicit forecast period and the balance period**. The explicit forecast period (which is usually 5 to 15 years) represents the period during which the firm is expected to evolve and finally reach a steady state—a state in which the return on invested capital (or return on capital employed), growth rate, and cost of capital stabilise.
2. **Forecast the free cash flow, year by year, during the explicit forecast period**. The free cash flow (FCF) is the cash flow available for distribution to capital providers (shareholders and debtholders) after providing for the investments in fixed assets and net working capital required to support the growth of the firm. The FCF is equal to:

$$\text{NOPAT} - \text{Net investment}$$

   NOPAT is net operating profit adjusted for taxes. It is equal to: Profit before interest and tax (1 – tax rate). Net investment is simply: Change in net fixed assets + Change in net working capital.
3. **Calculate the weighted average cost of capital** The weighted average cost of capital (WACC) is the blended post-tax cost of equity, preference, and debt employed by the firm.

$$\text{WACC} = W_e\, r_e + W_p\, r_p + W_d\, r_d\,(1\text{-}t)$$

   where W_e, W_p, and W_d are the weights associated with equity, preference, and debt and r_e, r_p, and r_d are the costs associated with equity, preference, and debt. Note that the cost of debt, r_d, is adjusted for taxes because the interest on debt is a tax-deductible payment.
4. **Establish the horizon value of the firm.** The horizon value (V_H) is the value placed on the firm at the end of the explicit forecast period (H years). Since the FCF is expected to grow at a constant rate of g beyond H, the horizon value is equal to:

$$V_H = \frac{\text{FCF}_{H+1}}{\text{WACC} - g} \tag{13.21}$$

5. **Estimate the enterprise value** The enterprise value (EV) or the firm value is the present value of the FCF during the explicit forecast period plus the present value of the horizon value.

$$\text{EV} = \underbrace{\frac{\text{FCF}_1}{(1+\text{WACC})} + \frac{\text{FCF}_2}{(1+\text{WACC})^2} + \ldots + \frac{\text{FCF}_H}{(1+\text{WACC})^H}}_{\text{Present value of the FCF during the explicit forecast forecast period}} + \underbrace{\frac{V_H}{(1+\text{WACC})^H}}_{\text{Present value of horizon value}} \tag{13.22}$$

6. **Derive the equity value** The equity value is:

$$\text{Enterprise value} - \text{Preference value} - \text{Debt value}$$

7. **Compute the value per share** The value per share is simply the equity value divided by the number of outstanding equity shares.

Illustration The balance sheet of Azura Limited at the end of year 0 (the present point of time) is as follows.

Rs. in crore

Liabilities		*Assets*	
■ Shareholders' funds	250	■ Net fixed assets	400
■ Equity capital (10 crore shares of Rs. 10 each)	100	■ Net working capital	100
■ Reserves and surplus	150		
■ Loan funds rate (9 percent)	250		
	500		500

The return on invested capital (ROIC), which is defined as NOPAT/Invested capital, of Azura is expected to be 12 percent. The growth rate in assets and revenues will be 20 percent for the first three years, 12 percent for the next two years, and 8 percent thereafter. The cost of equity is 16 percent.

The effective tax rate of the firm is 33.33 percent and the pre-tax cost of debt is 9 percent. The debt-equity ratio of the firm will be maintained at 1:1.

Based on the above information we can calculate the intrinsic value of the equity share as follows:

1. The explicit forecast period is 6 years because the firm reaches a steady state at the end of 6 years.
2. The free cash flow forecast for the explicit forecast period is given in Exhibit 13.4.

Exhibit 13.4 ***Free Cash Flow Forecast***

Rs. in crore

Year	*1*	*2*	*3*	*4*	*5*	*6*
Asset value (Beginning)	500.0	600.0	720.0	864.0	967.7	1083.2
NOPAT	60.0	72.0	86.4	103.7	116.1	130.1
Net investment	100.0	120.0	144.0	103.7	116.1	86.7
FCF	(40.0)	(48.0)	(57.6)	–	–	43.4
Growth rate (%)	20	20	20	12	12	8

3. The weighted average cost of capital is:

$$\text{WACC} = 0.5 \times 16 + 0.5 \times 9\ (1\text{–}0.333) = 11 \text{ percent}$$

4. The horizon value of the firm is

$$V_H = \frac{\text{FCF}_{H+1}}{r-g} = \frac{\text{FCF}_H(1+g)}{0.11-0.08} = \frac{43.4\,(1.08)}{0.11-0.08} = \text{Rs. } 1562.4 \text{ crore}$$

5. The enterprise value of Azura is:

$$\text{EV} = \frac{-40.00}{(1.11)} - \frac{48}{(1.11)^2} - \frac{57.6}{(1.11)^3} + \frac{0}{(1.11)^4} + \frac{0}{(1.11)^5} + \frac{43.4}{(1.11)^6} + \frac{1562.4}{(1.11)^6}$$

$$= \text{Rs. } 741.4 \text{ crore}$$

6. The equity value of Azura is:

   Enterprise value – Debt value = 741.4 – 250.0 = Rs. 491.4 crore

7. The value per share of Azura is:

   Rs. 491.4 crore / 10 crore = Rs. 49.1

13.4 EARNINGS MULTIPLIER APPROACH

An approach to valuation, practised widely by investment analysts, is the P/E ratio or the earnings multiplier approach. The value of a stock, under this approach, is estimated as follows:

$$P_0 = E_1 \times P_0 / E_1 \tag{13.23}$$

where P_0 is the estimated value, E_1 is the estimated earnings per share, and P_0/E_1 is the justified price-earnings ratio.

Determinants of the P/E Ratio The determinants of the P/E ratio can be derived from the dividend discount model, which is the foundation for valuing equity stocks.

Let us start with the constant growth dividend discount model:

$$P_0 = \frac{D_1}{r - g} \tag{13.24}$$

where D_1 is E_1 $(1 - b)$, b stands for the ploughback ratio, and g is ROE $\times$ b. Note that ROE is return on equity. Making these substitutions we find that:

$$P_0 = \frac{E_1(1-b)}{r - \text{ROE} \times b} \tag{13.25}$$

Dividing both the sides by E_1, we get:

$$P_0/E_1 = \frac{(1-b)}{r - \text{ROE} \times b} \tag{13.26}$$

Equation (13.26) indicates that the factors that determine the P/E ratio are:

- The dividend payout ratio, $(1 - b)$
- The required rate of return, r
- The expected growth rate, ROE $\times$ b

P/E Ratio and Ploughback Ratio Note that b, the ploughback ratio, appears in the numerator as well as the denominator of the ratio on the right hand side of Eq. (13.26). What is the effect of a change in b on the P/E ratio? It depends on how ROE compares with r. If ROE is greater than r, an increase in b leads to an increase in P/E; if ROE is equal to r an increase in b has no effect on P/E; if ROE is less than r an increase in b leads to decrease in P/E.

P/E Ratio and Interest Rate The required rate of return on equity stocks reflects interest rate and risk. When interest rates increase, required rates of return on all securities, including equity stocks, increase, pushing security prices downward. When interest rates fall security prices rise. Hence there is an inverse relationship between P/E ratios and interest rates.

P/E Ratio and Risk Other things being equal, riskier stocks have lower P/E multiples. This can be seen easily by examining the formula for the P/E ratio of the constant growth model:

$$\text{P/E} = \frac{1-b}{r-g} \tag{13.27}$$

Riskier stocks have higher required rates of return (r) and hence lower P/E multiples. This is true in all cases, not just the constant growth model. For any expected earnings and dividend stream, the present value will be lower when the stream is considered to be riskier. Hence the P/E multiple will be lower.

P/E Ratio and Liquidity Other things being equal, stocks which are highly liquid command higher P/E multiples and stocks which are highly illiquid command lower P/E multiples. The reason for this is not far to seek. Investors value liquidity just the way they value safety and hence are willing to give higher P/E multiples to liquid stocks.

Other Influences In addition to the above factors, there are some other influences too that seem to have a bearing on the price-earnings multiple. These are described below:

- *Size of the company* Other things being equal, a larger company (measured, say, in terms of paid-up capital) tends to command a higher price-earnings multiple because of greater investor interest in it.
- *Reputation of management* If the management of a company is reputed for its rationality, integrity, and investor-friendliness, its shares are likely to command a higher price-earnings multiple.

Empirical Estimation Numerous studies have been conducted to empirically relate the price-earnings multiple to key fundamental and economic variables. Typically, these studies have employed cross-section regression analysis. Two examples of such studies are discussed below:

Whitbek and Kisor, in one of the earlier studies conducted in the US, found the following relationship:

Price-earnings multiple = 8.2 + 1.5 Growth rate in earnings + 6.7 Payout ratio – 0.2 Variability of earnings

Obaidullah and Kalyani Ramachandran estimated the following relationship for the Indian stock market, in a study conducted in early 1992:

Price-earnings multiple = 0.0003 + 1.153 Growth rate in earnings – 0.392 Required rate of return + 0.2 Growth rate in funds flowing into the securities market

In scores (or even hundreds, if unpublished works are considered) of such studies conducted with data relating to various capital markets, empirical researchers have tried every conceivable variable and every possible combination of variables. Most of these models have been fairly successful in explaining the price-earnings multiples at a given point of time. However, they are not so successful in selecting the appropriate stocks to buy or sell. Why? There appear to be three main reasons:

- *Shift in market taste* The mode of valuation employed by the market rarely, if ever, remains the same over time. As the market taste shifts, the weights assigned to various factors change. Moreover, new factors may become relevant.
- *Change in input values* The values of input variables like dividends, earnings, growth rate, and risk change over time. A lacklustre performer may suddenly have glowing growth prospects because of some fortuitous developments. On the other hand, a strong and stable firm may unexpectedly become highly vulnerable to competition.
- *Firm effects* Stock valuation models typically focus on certain fundamental factors. They do not, and indeed they are not meant to, capture idiosyncratic factors specific to individual firms. Of course, such an omission means that when some firm effect is strong—and this is not uncommon—the utility of the model is impaired.

The preceding discussion suggests that while using empirically derived stock valuation models, bear in mind the following guidelines: (i) Update the model periodically to reflect the most current valuation mode. (ii) Define input variables taking into account the changing corporate fortunes. (iii) Adjust the value estimate provided by the model in the light of firm effects which the model does not capture.

Rules of Thumb As a practical expedient, investment analysts apply simple rules of thumb to establish benchmark price-earnings multiples. Three popular rules of thumb used in practice are described and evaluated below:

Thumb Rule 1 The price-earnings multiple for a share may be equated with the projected growth rate in earnings. For example, if the projected growth rate in earnings for a firm is 20 percent, a price-earnings multiple of 20 may be considered reasonable for it.

A metric commonly used by investment analysts is the price-earnings to growth ratio, popularly referred to by its abbreviation as the PEG ratio. *Prime facie* if the PEG ratio exceeds 1, the stock is deemed overvalued; if the PEG ratio equals 1, the stock is deemed fairly valued; and if the PEG ratio is less than 1, the stock is deemed undervalued.

This thumb rule has some merit because the projected growth rate in earnings is an important determinant of the price-earnings multiple. However, it ignores the rate of return required by equity shareholders, another important determinant of the price-earnings multiple. Hence, this rule of thumb is only partially supported by stock valuation theory.

Thumb Rule 2 For the market as a whole, a reasonable price-earnings multiple would be the inverse of the prime interest rate (the rate of interest charged by commercial banks to prime borrowers). For example, if the prime interest rate is 10 percent, a reasonable price-earnings multiple for the market as a whole would be 10.00 (1/0.10).

This thumb rule is implicitly based on the assumption that there is no relationship between the prime interest rate and the level of corporate earnings. As the prime rate of interest is driven substantially by the rate of inflation, which also has an impact on the level of corporate earnings, the key premise underlying this rule of thumb is wrong. The basic flaw in this rule of thumb is that it employs a nominal discount rate to capitalise real income.

Thumb Rule 3 For the market as a whole, a reasonable price-earnings multiple would be the inverse of the real rate of return required by investors from equity stocks. For example, if the real rate of return required by investors from equity stocks is 6 percent, a reasonable price-earnings multiple for the market as a whole would be 16.67 (1/0.06).

This thumb rule stems from the argument that equities represent claim over real assets. Hence, a rupee of equity income represents a rupee of real income. This means that the value of equity income is protected in the face of inflation. Put differently, during an inflationary period, equity income will rise in nominal terms in such a way that its real value is unimpaired. Since equity income represents real income, it should be capitalised by using the real rate of return, not the nominal rate of return. The validity of this rule of thumb, of course, depends on whether corporate profitability is protected in real terms in the wake of inflation.

Growth and Price-Earnings Multiple One often hears that a high price-earnings multiple is justified because of superior growth prospects. Is this always true? To answer this question, let us look at Alpha Company which has an asset base of 100 and a net worth of 100 (Alpha is an all-equity financed company and wants to remain that way. Further, it does not want to go in for external equity financing). Alpha's expected turnover for the current year (referred to hereafter as year 0) is 200 and it would earn a profit after tax of 20. This means that its return on equity is 20 percent.

The financial aspects of Alpha may be analysed for two cases.

Case A: Alpha pays its entire earnings as dividends and remains stationary (Remember that the only sinew of Alpha's growth is retained earnings).

Case B: Alpha pays one-half of its earnings as dividends and ploughs back the balance one-half. As a result, it grows at a rate of 10 percent. (The growth rate is the product of the retention ratio and the return on equity: $0.5 \times 0.20 = 0.10$)

Exhibit 13.5 presents the financial profile of Alpha for both the cases described above.

Exhibit 13.5 ***Financial Profile for Alpha Company***

	Case A : No Growth		*Case B : 10 Percent Growth*	
	Year 0	*Year* 1	*Year* 0	*Year* 1
Total assets	100	100	100	110
Net worth	100	100	100	110
Sales	100	100	100	110
Profit after tax	20	20	20	22
Dividends	20	20	10	11
Retained earnings	–	–	10	11

Now, let us examine the value of Alpha's equity as well as its price-earnings multiple for three levels of discount rate (investors' required rate of return): 15 percent, 20 percent, and 25 percent. The value is calculated by employing the constant growth dividend discount model:

$$\text{Value} = \frac{\text{Dividend}}{\text{Discount rate} - \text{Growth rate}}$$

Given the value estimate, the price-earnings multiple is simply:

$$\frac{\text{Value}}{\text{Earnings}}$$

Exhibit 13.6 shows the value and the price-earnings multiple for Alpha under the two cases described earlier for three different discount rates. Looking at Exhibit 13.6 we find that:

- When the discount rate is less than the return on equity, an increase in the growth rate enhances the price-earnings multiple.
- When the discount rate is equal to the return on equity, growth rate has no bearing whatsoever on the price-earnings multiple.
- When the discount rate is more than the return on equity, an increase in the growth rate depresses the price-earnings multiple.

Thus, the impact of growth on the price-earnings multiple depends on whether the return on equity earned by the firm is greater than or less than the discount rate (or investors' required rate of return). Growth has a favourable effect on the price-earnings multiple only when the return on equity exceeds the discount rate; otherwise, not.

Exhibit 13.6 ***Value and Price-earnings Multiple for Alpha Company***

	Case A No Growth			*Case B Growth*		
	Discount rate: 15%	*Discount rate: 20%*	*Discount rate: 25%*	*Discount rate: 15%*	*Discount rate: 20%*	*Discount rate: 25%*
Value	20 / 0.15 = 133.3	20 / 0.20 = 100	20 / 0.25 = 80	10 / (0.15 – 0.10) = 200	10 / (0.20 – 0.10) = 100	10 / (0.25 – 0.10) = 66.7
Price-earnings Multiple	133.3 / 20 = 6.67	100 / 20 = 5.0	80 / 20 = 4.0	200 / 20 = 10.0	100 / 20 = 5.0	66.7 / 20 = 3.33

13.5 EARNINGS — PRICE RATIO, EXPECTED RETURN, AND GROWTH

We often hear about growth stocks and income stocks. Growth stocks are supposed to provide returns primarily in the form of capital appreciation whereas income stocks are expected to provide returns mainly in the form of cash dividends. Does such a distinction make sense? Let us examine.

Consider the case of Maturity Limited, a firm that does not grow at all. It pays all its earnings as dividends and does not plough back anything. Put differently, it pays a constant stream of dividends and hence its stock is like a perpetual bond. Hence the expected return on its stock is its dividend per share divided by the share price (i.e. the dividend yield) which is also the same as its earnings per share divided by the share price (i.e. the E/P ratio). If the earnings per share as well as the dividend per share is Rs. 15 and the stock price is Rs. 100, we have:

Expected return = Dividend yield = Earnings-price ratio

$$= \frac{D_1}{P_0} \qquad = \frac{E_1}{P_0}$$

= 15/100 or 15 percent

The price is equal to:

$$P_0 = \frac{D_1}{r} = \frac{E_1}{r} \tag{13.28}$$

where r is the expected return.

Even for a growing firm the expected return can equal the E/P ratio if retained earnings earn a return equal to the market capitalisation ratio. Suppose Maturity Limited identifies a proposal to invest Rs. 15 a share next year which is expected to earn a return of 15 percent, just equal to the opportunity cost of capital. To undertake this investment, Maturity Limited decides to skip the dividend for year 1. The investment of Rs. 15 a share will generate an additional earnings of Rs. 2.25 (Rs. 15 times 15 percent) per share in future thereby raising the dividend per share to Rs 17.25 per share from year 2 onwards.

The net present value (NPV) per share for this proposal will be:

$$-15 + \frac{2.25}{0.15} = 0$$

Since the prospective return on this investment is equal to the opportunity cost of capital, it makes no contribution to the value of the firm and has no effect on the share price. The reduction in value caused by a zero dividend in year 1 is offset by an increase in value due to higher dividends in subsequent years. Hence, the market capitalisation rate equals the E/P ratio:

$$r = \frac{E_1}{P_0} = \frac{15}{100} = 0.15$$

Exhibit 13.7 presents our example for varying assumptions about the profitability of the proposed investment. Note that the earnings-price ratio (E_1/P_0) is equal to the market capitalisation rate (r) only when the proposed investment has a zero NPV. This is a very important point because managers often confuse E/P ratio with the market capitalisation rate and tend to make poor financial decisions.

Exhibit 13.7 ***Impact of Project Rate of Return on E/P Ratio***

Rate of Return	*Incremental Cash Flow*	*Project's NPV in Year 1*	*Impact on Share Price in Year 0*	*Share Price in Year 0, P_0*	*E_1/P_0*	*r*
0.05	0.75	– 10	–8.70	91.30	0.164	0.15
0.10	1.50	– 5	–4.35	95.65	0.157	0.15
0.15	2.25	0	0	0	0.150	0.15
0.20	3.00	5	4.35	104.35	0.144	0.15
0.25	3.75	10	8.70	108.70	0.138	0.15

In general, we can think of the stock price as the capitalised value of the earnings under the assumption of no growth plus the present value of growth opportunities (PVGO).

$$P_0 = \frac{E_1}{r} + \text{PVGO} \tag{13.29}$$

Manipulating this a bit, we get

$$\frac{E_1}{P_0} = r\left(1 - \frac{\text{PVGO}}{P_0}\right) \tag{13.30}$$

From this equation, it is clear that:

- Earnings-price ratio is equal to r when PVGO is zero.
- Earnings-price ratio is less than r when PVGO is positive.
- Earnings-price ratio is more than r when PVGO is negative.

13.6 OTHER COMPARATIVE VALUATION RATIOS

Apart from the price-earnings ratio, perhaps the most commonly used comparative valuation ratio, equity analysts use several other comparative valuation ratios. Two of them are worth discussing: price to book value ratio and price to sales ratio.

Price to Book Value Ratio The book value per share is the net worth of the company (total assets minus total liabilities) divided by the number of equity shares issued. The book value is determined by economic events as well as accounting conventions. The market price of the share, in contrast, is mainly determined by how the market assesses its earning power.

The ratio of market price to book value is:

$$\text{PBV ratio} = \text{Price/book value ratio} = \frac{\text{Market price per share at time } t}{\text{Book value per share at time } t}$$

The PBV ratio has always drawn the attention of investors. During the 1990s Eugene Fama and others suggested that the PBV ratio explained to a significant extent the returns from stocks. The findings of researchers like Kim and others, however, have cast some shadow over the role of the PBV ratio.

Determinants of the PBV Ratio To understand the determinants of the PBV ratio, let us start with the constant growth dividend discount model:

$$P_o = \frac{D_1}{r - g} \tag{13.31}$$

D_1, the dividend for the next period, may be stated in terms of this period's earnings per share, E_o, growth rate, g, and the dividend payout ratio, $(1–b)$, as follows:

$$\begin{aligned} D_1 &= E_1(1 - b) \\ &= E_o\,(1 + g)\,(1 - b) \end{aligned} \tag{13.32}$$

Substituting this in Eq. (13.31) gives:

$$P_o = \frac{E_o\,(1+g)\,(1-b)}{r - g} \tag{13.33}$$

Since E_o is the product of book value per share (BV_o) and return on equity (ROE), Eq. (13.33) can be rewritten as:

$$P_o = \frac{BV_o\,(ROE)\,(1+g)\,(1-b)}{r - g} \tag{13.34}$$

Dividing both sides of Eq. (13.32) by BV_o results in:

$$\text{PBV ratio} = \frac{P_0}{BV_0} = \frac{\text{ROE}\,(1+g)\,(1-b)}{r-g} \tag{13.35}$$

The numerator of Eq.(13.35) shows that, other things being equal, a higher ROE increases the PBV ratio. The denominator of Eq. (13.35) shows that a higher ROE increases the PBV ratio indirectly as well because g = (Retention ratio) (ROE) = (b) (ROE).

Price to Sales Ratio In recent years, the price/sales ratio (PS ratio) has received a lot of attention as a valuation tool. The PS ratio is calculated by dividing a company's current stock price by its revenue per share for the most recent twelve months. Alternatively, it may be obtained by dividing the current market value of equity capital by annual sales of the firm. The PS ratio essentially reflects what the market is willing to pay per rupee of sales.

Investors may have certain concerns or problems in using the PE ratio: earnings may be highly erratic; earnings may be negative; earnings may be defined in different ways; earnings may be 'managed'. These concerns or problems are eliminated or substantially mitigated when the PS ratio is used.

In the book *What Works on Wall Street*, published by McGraw Hill Publishing Company James O' Shaugnessy analysed various investment tools used to select equity stocks, such as book value, return on equity, PE ratio, yield, PS ratio, and so forth. He found the PS ratio to be a useful tool: portfolios of low PS ratio stocks tend to outperform portfolios of high PS ratio stocks.

A popular rule of thumb says that a PS ratio of 1.0 may be used as a norm for all companies. Hence stocks which trade at a PS ratio that is considerably less than 1.0, say 0.5, may be regarded as bargains. Obviously, such a simplistic approach is likely to have very limited applicability. PS ratios are bound to differ across industries and firms due to variations in factors like net profit margin, growth rate, asset turnover, and so on.

So, a more sophisticated approach would call for interpreting the PS ratio in relation to the drivers of PS ratio. Since the net profit margin is a key driver of PS ratio, it makes sense to look at PS ratio/Net profit margin. Further, a company's PS ratio should be compared with that of the industry average and its own history, as PS ratio is a technique of relative valuation.

Determinants of the PS Ratio To understand the determinants of the PS ratio, let us start with Eq. (13.36)

$$P_o = \frac{E_o\,(1+g)\,(1-b)}{r-g} \tag{13.36}$$

Since E_o (earnings per share) is equal to sales per share (S_o) times net profit margin (NPM), Eq. (13.36) can be written as:

$$P_o = \frac{S_o\,(\text{NPM})\,(1+g)\,(1-b)}{r-g} \tag{13.37}$$

Dividing both sides of Eq. (13.37) by S_o results in:

$$\text{PS ratio} = \frac{P_0}{S_0} = \frac{\text{NPM}\,(1+g)\,(1-b)}{r-g} \tag{13.38}$$

Companion Variables and Modified Multiples Let us look at the equations for P/E ratio, PBV ratio, and PS ratio.

$$\text{P/E} = \frac{(1-b)}{r-g}$$

$$\text{PBV} = \frac{\text{ROE}\,(1+g)\,(1-b)}{r-g}$$

$$\text{PS} = \frac{\text{NPM}\,(1+g)\,(1-b)}{r-g}$$

Looking at these equations, we find that there is one variable that dominates when it comes to explaining each multiple—it is g for P/E, ROE for PBV, and NPM for PS. This variable—the dominant explanatory variable – is called the companion variable.

Taking into account the importance of the companion variable, investment practitioners often use modified multiples which are defined below.

- P/E to growth multiple, referred to as PEG : $\dfrac{\text{P/E}}{g}$
- PBV to ROE, referred to as value ratio : $\dfrac{\text{PBV}}{\text{ROE}}$
- PS to NPM, referred to as PSM : $\dfrac{\text{PS}}{\text{Net profit margin}}$

13.7 SUM OF THE PARTS METHOD

Many companies have subsidiaries or associate companies in which they have significant equity stakes that usually range between 25 percent and 100 percent. To ascertain the intrinsic value per share of such companies the sum of the parts (SOTP) method of valuation is commonly employed. The SOTP method involves the following steps:

1. Determine the value per share attributable to the core business. One way to do is to calculate the earnings per share from the core business and apply a suitable multiple to it.
2. Find the value per share for each of the listed subsidiaries. In computing this value a discount factor of 15 to 20 percent is generally applied to the observed market value of the equity stake in the listed subsidiary.

3. Assess the value per share for each of the unlisted subsidiaries. To do this, the analyst has to first estimate the market value using an earnings multiple or some other basis as there is no observed market value and then apply a discount factor of 15 to 25 percent to the same.
4. Add the per share values for the core business, for listed subsidiaries, and for unlisted subsidiaries, to get the total value per share.

An illustrative sum of the parts (SOTP) valuation of Mahindra and Mahindra, done in 2007, is given in Exhibit 13.8.

Exhibit 13.8 ***SOTP Valuation – Based on FYO8E***

Business	*M&M Stake*	*Multiple*	*Parameter*	*Discount (%)*	*Per Share Value*
Core Auto Business	-	10.5	EPS	-	451.7
Mahindra and Mahindra Financial Services	68%		Market Cap	20%	48.6
Mahindra Gesco Developers	39%		Market Cap	20%	27.6
Tech Mahindra	44%		Market Cap	20%	250.2
Mahindra Ugine Steel Co Ltd	55%		Market Cap	20%	5.2
Mahindra Forgings	47%		Market Cap	20%	11.6
Mahindra Holidays and Resorts	100%		PAT	25%	37.0
Mahindra Holdings and Finance	100%		PAT	25%	8.0
Total Subsidiaries Value					388.3
Total Value per share (Rs.)					840.0

Source: Company, CSEC Research

13.8 EQUITY PORTFOLIO MANAGEMENT

Two broad approaches are followed in managing an equity portfolio: passive strategy and active strategy.

Passive Strategy Investors who subscribe to the view that the market is efficient, typically adopt a passive strategy. The most commonly followed passive strategies are: buy and hold strategy, and indexing strategy.

Buy and Hold Strategy This is a very simple strategy which essentially says, "Buy a portfolio of equity stocks using some method and hold the portfolio over the investment horizon." Hence, under this strategy, once the portfolio is created there is no active buying and selling of stocks.

Indexing Strategy This strategy is based on the maxim, "If you can't beat them, join them." An index fund exactly replicates a well-defined index of equity stocks such as Nifty-50 or BSE-National Index. (In the US, S&P 500 is a popular index for this purpose). This means that the composition of the index fund is identical to that of the index it imitates. If Hindustan Unilever Limited constitutes 1 percent of the index, the fund places 1 percent of its money in Hindustan Lever stock; if Reliance Industries Limited constitutes 8 percent of the index, the fund places 8 percent of its money in Reliance Industries stock; so on and so forth.

While exact replication is the simplest technique for building an index fund, most index funds are not constructed this way because the transaction costs involved in ensuring that the composition of the index fund is perfect all the time may be very high. In practice, a smaller set of stocks that matches the index in terms of its broad sectoral composition may be held.

Active Strategy An active strategy is followed by most investment professionals and aggressive investors who strive to earn superior returns. The four principal vectors of an active strategy are: market timing, sector rotation, security selection, and use of a specialised concept.

Market Timing This involves departing from the normal (or strategic or long run) asset mix to reflect one's assessment of the prospects of various assets in the near future. Strictly speaking, it is an asset allocation strategy, not an equity strategy.

Sector Rotation This essentially involves shifting the weightings for various industrial sectors based on their assessed outlook.

Security Selection This involves an active search for under-priced stocks based on fundamental and/or technical analysis.

Use of a Specialised Investment Concept This calls for the use of a specialised concept or philosophy to achieve superior returns.

13.9 FORECASTING THE AGGREGATE STOCK MARKET RETURNS

While the stock market appears very complex and mysterious, its returns are determined by an interaction of just two factors **investment returns** and **speculative returns**. Investment returns are represented by the sum of dividend yield and earnings growth and speculative returns are represented by the change in the price-earnings ratio. In formal terms:

$$SMR_n = \left[\underbrace{DY_n + EG_n}_{\text{Investment return}}\right] + \left[\underbrace{(PE_n / PE_o)^{1/n} - 1}_{\text{Speculative return}}\right]$$

where SMR_n is the annual stock market return over a period of n years, DY_n is the annual dividend yield over a period of n years, EG_n is the annual earnings growth over a period on n years, PE_n is the price-earnings ratio at the end of n years, and PE_o is the price-earnings ratio at the beginning of n years.

Suppose you want to forecast the annual return from the stock market over the next five years (n is equal to 5). You come up with the following estimates. $DY_5 = 0.025$ (2.5 percent), $EG_5 = 0.125$ (12.5 percent), and $PE_5 = 18$. The current PE ratio, PE_o, is 15. The forecast of the annual return from the stock market is determined as follows:

$$SMR_5 = [0.025 + 0.125] + [18/15)^{1/5} - 1]$$
$$= [0.15] + [0.037]$$
$$= 15 \text{ percent} + 3.7 \text{ percent} = 18.7 \text{ percent}$$

15 percent represents the investment return and 3.7 percent represents the speculative return.

While it is almost impossible to forecast the near term movements of stock prices, it is fairly easy to predict what is likely to happen over the long term. Benjamin Graham told us why: 'Though the stock market functions as a voting machine in the short run, it acts as a weighing machine in the long run." Fear and greed matter when votes are being cast, but they don't register on the scale.

SUMMARY

- Equity analysts employ two kinds of analysis viz., **fundamental analysis** and **technical analysis.**
- Techniques of fundamental equity valuation fall into three broad categories: **balance sheet techniques**, **discounted cash flow techniques**, and **relative valuation techniques.**
- Three measures derived from the balance sheet are **book value**, **liquidation value**, and **replacement cost.**
- According to the **dividend discount model**, the value of an equity share is equal to the present value of dividends expected from its ownership.
- If the dividends per share remains constant year after year, the value of the share is:

$$P_0 = D/r$$

- If the dividend per share grows at a constant rate, the value of the share is:

$$P_0 = D_1/\ (r - g)$$

  This is a popular model. It is also referred to as the **Gordon model** because it was originally proposed by Myron J. Gordon.
- The two key drivers of dividend growth are (a) ploughback ratio and (b) return on equity.
- The simplest extension of the constant growth model assumes that the extraordinary growth (good or bad) will continue for a finite number of years and thereafter the normal growth rate will prevail indefinitely. This represents the **two-stage growth model**:

$$P_0 = D_1\left(\frac{1-\left(\dfrac{1+g_1}{1+r}\right)^n}{r-g_1}\right) + \left(\frac{D_1(1+g_1)^{n-1}(1+g_2)}{r-g_2}\right)\left(\frac{1}{(1+r)^n}\right)$$

- The ***H* model** of equity valuation assumes that the abnormal current dividend growth rate, g_a, will decline linearly over a period of 2*H* years and remain thereafter at a constant level of g_n (the normal growth rate). The valuation equation for the *H* model is:

$$P_0 = \frac{D_0\left[(1+g_n)+H(g_a-g_n)\right]}{r-g_n}$$

- High dividend yield and low price-earnings ratio imply limited growth prospects. Low dividend yield and high price-earnings ratio imply considerable growth prospects.
- The **free cash flow model** involves determining the value of the firm as a whole (this is called the enterprise value) by discounting the free cash flow to investors and then subtracting the value of preference and debt to obtain the value of equity.
- A widely practised approach to valuation is the P/E ratio or earnings multiplier approach. The value of a stock, under this approach, is estimated as follows:

$$P_0 = E_1 \times P_0/E_1$$

- The factors that determine the P/E are: the dividend payout ratio, the required rate of return, and the expected growth rate, the liquidity of the stock, the size of the company, and the reputation of management.
- As a practical expedient, investment analysts apply simple rules of thumb to establish benchmark **price-earnings multiples**.
- In general, we can think of the stock price as the capitalised value of the earnings under the assumption of no growth plus the present value of growth opportunities (PVGO)

$$P_0 = \frac{E_1}{r} + \text{PVGO}$$

- Apart from the price-earnings ratio, equity analysts use **price to book value** (PBV) ratio and **price to sales** (PS) ratio.
- There is one variable that dominates when it comes to explaining each multiple: it is g for P/E, ROE for PBV, and NPM for PS. This variable is called the **companion variable.**
- Taking into account the importance of the companion variable, investment practitioners often use modified multiples: **PEG**, **value ratio**, and **PSM**.
- **Sum of the parts (SOTP) method** may be used for valuing the equity of a company that has subsidiaries.
- Investors who subscribe to the view that the market is efficient, typically adopt a passive strategy. The most commonly followed passive strategies are: buy and hold strategy and indexing strategy.
- An active strategy is followed by most investment professionals and aggressive investors. The four principal vectors of an active strategy are: market timing, sector rotation, security selection, and use of a specialised concept.
- Stock market returns are determined by the interaction of two factors, **investment returns** and **speculative returns**.

QUESTIONS

1. Describe the following measures of value: book value, liquidation value and replacement cost. How useful are they?
2. Discuss the constant growth dividend model (the Gordon model).
3. What factors drive growth?
4. Explain the two stage growth model.
5. Discuss the *H* model.
6. What is the impact of growth on price, dividend yield, capital gains yield, and price-earnings ratio?
7. What are the key determinants of the price-earnings multiple?
8. Describe and evaluate the rules of thumb employed by investment analysts to establish benchmark price-earnings multiples.
9. What is E/P ratio? How is it used?
10. How is the E/P linked to the required return and the present value of growth opportunities (PVGO)?
11. What are the determinants of the PBV ratio? PS ratio?
12. Describe the SOTP method of valuation.
13. How can one forecast the aggregate stock market returns?

SOLVED PROBLEMS

1. The equity stock of Rax Limited is currently selling for Rs.30 per share. The dividend expected next year is Rs.2.00. The investors' required rate of return on this stock is 15 per cent. If the constant growth model applies to Rax Limited, what is the expected growth rate ?

Solution

According to the constant growth model

$$P_0 = \frac{D_1}{r-g}$$

This means

$$g = r - D_1 / P_0$$

Hence, the expected growth rate (g) for Rax Limited is:

$$g = 0.15 - \frac{2.00}{30.00} = .083 \text{ or } 8.3 \text{ per cent}$$

2. Vardhman Limited's earnings and dividends have been growing at a rate of 18 per cent per annum. This growth rate is expected to continue for 4 years. After that the growth rate will fall to 12 per cent for the next 4 years. Thereafter, the growth rate is expected to be 6 per cent forever. If the last dividend per share was Rs.2.00 and the investors' required rate of return on Vardhman's equity is 15 per cent, what is the intrinsic value per share ?

Solution

The intrinsic value per share of Vardhman may be computed using a 3-step procedure.

Step 1: The dividend stream during the first eight years when Vardhman would enjoy a relatively high rate of growth will be

$$
\begin{aligned}
D_1 &= 2.00\,(1.18) &&= 2.36\\
D_2 &= 2.00\,(1.18)^2 &&= 2.78\\
D_3 &= 2.00\,(1.18)^3 &&= 3.29\\
D_4 &= 2.00\,(1.18)^4 &&= 3.88\\
D_5 &= 2.00\,(1.18)^4\,(1.12) &&= 4.34\\
D_6 &= 2.00\,(1.18)^4\,(1.12)^2 &&= 4.86\\
D_7 &= 2.00\,(1.18)^4\,(1.12)^3 &&= 5.45\\
D_8 &= 2.00\,(1.18)^4\,(1.12)^4 &&= 6.10
\end{aligned}
$$

The present value of this dividend stream is:

$$
\begin{aligned}
& 2.36\,(PVIF_{15\%,\,1\text{ yrs}}) + 2.78\,(PVIF_{15\%,\,2\text{ yrs}})\\
+\;& 3.29\,(PVIF_{15\%,\,3\text{ yrs}}) + 3.88\,(PVIF_{15\%,\,4\text{ yrs}})\\
+\;& 4.34\,(PVIF_{15\%,\,5\text{ yrs}}) + 4.86\,(PVIF_{15\%,\,6\text{ yrs}})\\
+\;& 5.45\,(PVIF_{15\%,\,7\text{ yrs}}) + 6.10\,(PVIF_{15\%,\,8\text{ yrs}})\\
=\;& 2.36\,(0.870) + 2.78\,(0.756) + 3.29\,(0.658)\\
+\;& 3.88\,(0.572) + 4.34\,(0.497) + 4.86\,(0.432)\\
+\;& 5.45\,(0.376) + 6.10\,(0.327)\\
=\;& 2.05 + 2.10 + 2.16 + 2.22 + 2.16 + 2.10 + 2.05 + 1.99 = \text{Rs.}16.83
\end{aligned}
$$

Step 2: The price of the share at the end of 8 years, applying the constant growth model at that point of time, will be:

$$P_8 = \frac{D_9}{r - g_n} = \frac{D_8(1+g_n)}{r - g_n}$$

$$= \frac{2.00(1.18)^4(1.12)^4(1.06)}{0.15 - 0.06} = \text{Rs.}71.84$$

The present value of this price is :

$$\frac{71.84}{(1.15)^8} = 23.49$$

Step 3 : The sum of the above components is :

$$P_0 = \text{Rs.}16.83 + \text{Rs.}23.49 = \text{Rs.}40.32$$

3. The current dividend on an equity share of Pioneer Technology is Rs.3.00. Pioneer is expected to enjoy an above-normal growth rate of 40 per cent for 5 years. Thereafter, the growth rate will fall and stabilise at 12 per cent. Equity investors require a return of 15 per cent from Pioneer's stock. What is the intrinsic value of the equity share of Pioneer?

Solution

The inputs required for applying the two-stage growth model are:

$$g_1 = 40\%, g_2 = 12\%, n = 5 \text{ years}, r = 15\ \%$$

$$D_1 = D_0(1+ g_1) = \text{Rs.}3\ (1.40) = \text{Rs.}4.20$$

Plugging these inputs in the two-stage growth model, we get the intrinsic value estimate as follows:

$$P_0 = 4.20 \left(\frac{1 - \left(\frac{1.40}{1.15}\right)^5}{0.15 - 0.40} \right) + \left(\frac{4.20\,(1.40)^4\,(1.12)}{0.15 - 0.12} \right) \left(\frac{1}{(1.15)^5} \right)$$

$$= 28.12 + 299.37 = \text{Rs.}327.49$$

4. The current dividend on an equity share of National Computers Limited is Rs.5.00. The present growth rate is 50 per cent. However, this will decline linearly over a period of 8 years and then stabilise at 10 per cent. What is the intrinsic value per share of National Computers, if investors require a return of 18 per cent from its stock?

Solution

The inputs required for applying the H-model are:

$$D_0 = \text{Rs.}5.00, g_a = 50\%, H = 4 \text{ years}, g_n = 10\ \%, r = 18\%$$

Plugging these inputs in the H-model we get the intrinsic value estimate as follows:

$$P_0 = \frac{5.00[(1.10) + 4(0.50 - 0.10)]}{0.18 - 0.10}$$

$$= \text{Rs.}168.75$$

PROBLEMS

1. The share of a certain stock paid a dividend of Rs 2.00 last year (D_0 = Rs 2.00). The dividend is expected to grow at a constant rate of 6 percent in the future. The required rate of return on this stock is considered to be 12 percent. How much should this stock sell for now? Assuming that the expected growth rate and required rate of return remain the same, at what price should the stock sell 2 years hence?
2. Sherief Corporation's previous dividend was Rs 12.00. Earnings and dividends are expected to grow at a rate of 10 percent. The required rate of return on Sherief's stock is 15 percent. What should be the market price of Sherief's stock now?
3. The equity stock of Max Limited is currently selling for Rs 32 per share. The dividend expected next is Rs 2.00. The investors' required rate of return on this stock is 12 percent. Assume that the constant growth model applies to Max Limited. What is the expected growth rate of Max Limited?
4. Fizzle Limited is facing gloomy prospects. The earnings and dividends are expected to decline at the rate of 4 percent. The previous dividend was Rs 1.50. If the current market price is Rs 8.00, what rate of return do investors expect from the stock of Fizzle Limited?

5. The Commonwealth Corporation's earnings and dividends have been growing at the rate of 12 percent per annum. This growth rate is expected to continue for 4 years. After that the growth rate would fall to 8 percent for the next four years. Beyond that the growth rate is expected to be 5 percent forever. If the last dividend was Rs 1.50 and the investors' required rate of return on the stock of Commonwealth is 14 percent, how much should be the market value per share of Commonwealth Corporation's equity stock?
6. Determine the intrinsic value of an equity share, given the following data:

Last dividend (D_0)	: Rs 2.00
Growth rate for the next five years	: 15 percent
Growth rate beyond 5 years	: 10 percent

   Assume a required rate of return
7. The current dividend on an equity share of Dizzy Limited is Rs 2.00. Dizzy is expected to enjoy an above-normal growth rate of 18 percent for 6 years. Thereafter the growth rate will fall and stabilise at 12 percent. Equity investors require a return of 16 percent from Dizzy's stock. What is the intrinsic value of the equity share of Dizzy.
8. The current dividend on an equity share of International Chemicals Limited is Rs 4.00. The present growth rate is 20 percent. However, this will decline linearly over a period of 8 years and stabilise at 10 percent. What is the intrinsic value per share of International Chemicals Limited if investors require a return of 18 percent?
9. Consider three cases:

	Growth rate (%)
Low growth firm	4
Normal growth firm	8
Supernormal growth firm	12

   The expected earnings per share and dividend per share next year for each of the three firms are Rs 4.00 and Rs 2.00 respectively. Investors' required total return from equity investment is 16 percent. Calculate the stock price, dividend yield, capital gains yield, and price-earnings ratio for the three cases.
10. The price of a share currently is Rs 30. The expected EPS for the next year is Rs 2.50. Investors require a return of 16 percent from this share. What proportion of the price is accounted for by the present value of growth opportunities (PVGO)?

■ ■

MINICASE

Anand heads the portfolio management schemes division of Phoenix Investments, a well known financial services company. Anand has been requested by Arrow Technologies to give an investment seminar to its senior managers interested in investing in equities through the portfolio management schemes of Phoenix Investments. Manish, the contact person of Arrow Technologies, suggested that the thrust of the seminar should be on equity valuation. Anand has asked you to help him with his presentation.

To illustrate the equity valuation process, you have been asked to analyse Acme Pharmaceuticals which manufactures formulations and bulk drugs. In particular, you have to answer the following questions:

a. What is the general formula for valuing any stock, irrespective of its dividend pattern?
b. How is a constant growth stock valued?
c. What is the required rate of return on the stock of Acme Pharmaceuticals? Assume that the risk-free rate is 7 percent, the market risk premium is 6 percent, and the stock of Acme has a beta of 1.2.
d. Assume that Acme Pharmaceuticals is a constant growth company which paid a dividend of Rs 5.00 yesterday (D_o = Rs 5.00) and the dividend is expected to grow at the rate of 10 percent per year forever.
   (i) What is the expected value of the stock a year from now?
   (ii) What is the expected dividend yield and capital gains yield in the first year?
e. If the stock is currently selling for Rs 110, what is the expected rate of return on the stock? Assume D_0 = Rs. 5 and g = 10 percent.
f. Assume that Acme Pharmaceuticals is expected to grow at a supernormal growth rate of 25 percent for the next 4 years, before returning to the constant growth rate of 10 percent. What will be the present value of the stock under these conditions? What is the expected dividend yield and capital gains yield in year 2? year 5? Hereafter assume D_0 = Rs. 5.00 and a 15 percent required return.
g. Assume that Acme Pharmaceuticals will have zero growth during the first 2 years and then resume its constant growth of 10 percent in the third year. What will be the present value of the stock under these conditions?
h. Assume that the stock currently enjoys a supernormal growth rate of 30 percent. The growth rate, however, is expected to decline linearly over the next four years before settling down at 10 percent. What will be the present value of the stock under these conditions?
i. Assume that the earnings and dividends of Acme Pharmaceuticals are expected to decline at a constant rate of 5 percent per year. What will be the present value of the stock? What will be the dividend yield and capital gains yield per year?
j. Assume that the earnings and dividends of Acme Pharmaceuticals are expected to grow at a rate of 30 percent per year for the next 3 years and thereafter the growth rate is expected to decline linearly for the following four years before settling down at 10 percent per year forever. What will be the present value of the stock under these conditions?

Chapter **14**

Macroeconomic and Industry Analysis

Understanding the Broad Picture

LEARNING OBJECTIVES

After studying this chapter, you should be able to:

- Appreciate the major global economic influences.
- Understand broadly the key governmental policies.
- Explain how macroeconomic variables affect the stock market.
- Analyse industry prospects.

To determine the intrinsic value of an equity share, the security analyst must forecast the earnings and dividends expected from the stock and choose a discount rate which reflects the risk of the stock. This is what is involved in fundamental analysis, perhaps the most popular method used by investment professionals.

The earnings potential and risk of a firm are linked to the prospects of the industry to which it belongs. The prospects of various industries, in turn, are largely influenced by the developments in the macroeconomy.

Researchers have found that stock price changes can be attributed to the following factors:

- Economy-wide factors: 30–35 percent
- Industry factors: 15–20 percent
- Company factors: 30–35 percent
- Others factors: 15–25 percent

Based on the above evidence, a commonly advocated procedure of fundamental analysis involves a three-step examination, which calls for:

- Understanding of the macro-economic environment and developments
- Analysing the prospects of the industry to which the firm belongs
- Assessing the projected performance of the company and the intrinsic value of its shares.

This chapter looks at the macroeconomy and the industry and the following chapter focuses on the individual company.

Skills Required for Fundamental Analysis

To succeed as a fundamental analyst you require a wide mix of skills. You need a good grasp of how the macroeconomy functions, a feel for the general direction of the market, an understanding of the profit potential of various industries, an ability to analyse financial statements, and an insight into the competitive advantage of individual firms. Obviously, these skills can be developed and honed over time with practical experience. This chapter lays out a basic framework to help you in getting started in a structured manner in your endeavour to become a fundamental analyst.

14.1 THE GLOBAL ECONOMY

In a globalised business environment, the top-down analysis of the prospects of a firm must begin with the global economy. The global economy has a bearing on the export prospects of the firm, the competition it faces from international competitors, and the profitability of its overseas investments.

While monitoring the global macroeconomy, bear in mind the following:

- Although the economies of most countries are linked, economic performance varies widely across countries at any time.
- From time to time, countries may experience turmoil due to a complex interplay between political and economic factors. The currency and stock market crisis of Asian economies such as Thailand, Indonesia, and South Korea in 1997 and 1998 and the shock waves that followed the devaluation of the Russian rouble in 1998 are reminders of this phenomenon.
- The exchange rate between a country's currency and other currencies is a key factor affecting the international competitiveness of its industries. Many believe that Chinese industries are currently very competitive internationally because the Chinese currency is undervalued vis-à-vis the US dollar and other currencies.

Global Economic Sense The salient features of the present global economic scene are as follows:

- United States, Eurozone, Japan, and China account for about 72 percent of the global GDP, their respective shares being 30 percent, 18 percent, 12 percent, and 12 percent.
- A good part of East Asia and Latin America is driven by external sector demand emanating from the above regions.
- During the six year period 1999–2004, the average GDP growth rates in the US Eurozone, Japan, and China have been 2.9 percent, 1.9 percent, 1.6 percent and 8.6 percent respectively.
- The global real GDP growth, which was about 3 percent in 1970, has gently risen in the last 35 years to about 4 percent.

- The global real long-term interest rate is currently about 3 percent.
- The growth rate in the global trade of goods and services has increased from about 6 percent to 7 percent over the period 1970 to 2005.
- Global expansion has become less balanced. While the US, China, and emerging countries have shown robust growth, Europe and Japan have been disappointing.
- In most developing countries, the volatility of economic growth has decreased over the last thirty years.

Changing Global Economic Order The US economy has been the principal engine of the world economy in the 1980s and 1990s, thanks to its huge size and robust growth. At its peak in the late 1990s it accounted for nearly one-half of the incremental growth in the global economy. This dominance continued in the initial years of the first decade of this millennium. To be sure, it still dominates the world economic scene and hence developments in the US like employment figures, housing starts, interest rates, and current account deficits, are keenly watched by economists, businessmen, and investment analysts all over the world.

However, in recent years a new world economic order has been emerging. At present, China's contribution to the incremental growth in the global economy matches or even slightly outpaces the contribution of the US. Although the Chinese economy with a GDP of nearly $3 trillion is about one-quarter the size of the US economy whose GDP is about $12 trillion, its growth rate is four times that of the US growth rate.

Another force eroding the dominance of the US economy is the revival of Europe led by Germany. It appears that Europe is breaking out of the US ball-and-chain. With China and Europe now accounting for a larger share of the global GDP, the US is no longer the only major force driving the world economy. The emergence of these alternative locomotives of growth are shaping a more balanced global economy.

Global Savings Glut The most important global trend today is what Ben Bernanke, the US Federal Reserve Board chairman, calls a glut of global savings. China (which currently has a savings rate of 50 percent of GDP, the highest in recorded history), Russia and other oil exporters, Brazil (a beneficiary of commodity boom), and most Asian countries seem to be fuelling the global savings glut.

In the wake of the global savings glut, interest rates have fallen across the globe. Presently, the real interest on a 10-year US bond is zero or slightly negative. Thanks to such low real interest rate, investors are looking for alternative assets with a better yield. The high price-earning ratios in mature economies like the US provide limited prospects for appreciation. Hence the global glut has gone into the housing market, junk bond market, and the equities in emerging markets. This seems to be the principal force that was driving the stock market boom in the emerging countries.

A Strange Global Equilibrium According to the conventional economic wisdom, capital flows from rich countries (which have trade surplus and excess savings) to poor countries (which have trade deficit and capital scarcity). Presently, this theory has been turned topsy-turvy.

The US, the richest country in the world, has the lowest savings rate and the largest trade deficit. Meanwhile China and most Asian countries have large savings and trade surpluses which their central banks invest, to a considerable extent, in the US Treasury securities. Thanks to this topsy-turvy equilibrium, at the end of 2006 the yield on 30-year US Treasury bonds was just 4.8 percent, even lower than US short-term rate of 5.25 percent.

Several factors have contributed to this topsy-turvy equilibrium. First, Asian central banks seem to have a preference for US securities. Second, Asian central banks try to keep the exchange rates of their currencies low to stimulate export and economic growth. Indeed they buy dollars in the forex market to keep their currencies low. Third, central banks with huge dollar-denominated assets have a vested interest in a strong dollar. So, they have a somewhat perverse incentive to buy more dollars and artificially prop it up.

True, this kind of a situation is not sustainable in the long-run. However, as long as there is a global appetite for the US dollar, a topsy-turvy equilibrium based on American profligacy and Asian frugality will continue. As S.S.A. Aiyar put It: "A crunch will come only when central banks publicly admit that their dollar trove is somewhat illusory. That will be like the emperor recognising that he has no clothes. This could lead to a panicky exit of central banks from dollars. That day still looks some way off."

Goldman Sachs Forecast*

Goldman Sachs, a leading international investment banking organisation, forecasts that BRIC countries, viz. Brazil, Russia, India, and China will grow rapidly in the coming decades and become a much larger force in the global economy by the year 2050. Thanks to their growth potential, Goldman Sachs report envisages that these countries will attract substantial foreign direct and portfolio investment that may prompt major currency alignments. Of course, as a note of caution, the report argues that these forecasts would materialise if these countries maintain macroeconomic stability and develop institutions that are conducive to growth.

* Goldman Sachs, *Dreaming with BRICS: The Path to 2050*, Global Economics Paper No.99, October 2003. Available from www.gs.com/

14.2 CENTRAL GOVERNMENT POLICY

The government employs two broad classes of macroeconomic policies, viz. demand side policies and supply side policies. The former are meant to influence the demand for goods and services and the latter the supply for goods and services. Traditionally, the focus was mostly on fiscal and monetary policies, the two major tools of demand-side economics. From 1980s onward, however, supply-side economics has received a lot of attention.

Fiscal Policy Fiscal policy is concerned with the spending and tax initiatives of the government. It is perhaps the most direct tool to stimulate or dampen the economy. An increase in government spending stimulates the demand for goods and services, whereas a decrease deflates the demand for goods and services. By the same token, a decrease in tax rates increases the consumption of goods and services and an increase in tax rates decreases the consumption of goods and services.

Although fiscal policy has the most immediate impact on the economy, its formulation and implementation is often cumbersome and involved because of the prolonged legislative process that precedes it. Moreover, a significant portion of government spending such as interest on outstanding debt, defence expenditure, and salaries of government employees is non-discretionary. This may severely limit the flexibility in formulating fiscal policy.

The deficit or surplus in the governmental budget summarises the net effect of fiscal policy. A large deficit may stimulate the economy and a large surplus may dampen the economy.

Monetary Policy Monetary policy, which is concerned with the manipulation of money supply in the economy, is the other main plank of demand-side economics. Monetary policy affects the economy mainly through its impact on interest rates.

An expansionary monetary policy lowers short-term interest rates, thereby stimulating investment and consumption demand. A contractionary monetary policy has the opposite effects. Most economists, however, believe that a higher money supply only raises the price level without any enduring effect on economic activity. Hence, monetary authorities have to perform a difficult balancing act between stimulating the economy in the short run and containing inflation in the long run.

Fiscal policy is cumbersome to formulate and implement but impacts the economy directly. Monetary policy, on the other hand, is easy to formulate and implement but impacts the economy in a roundabout way.

Open market operation, bank rate, reserve requirements, and direct credit controls are the main tools of monetary policy. **Open market operation** involves buying or selling of government securities by the Reserve Bank of India (RBI), the central banking authority. When the RBI buys government bonds it issues a cheque that augments money supply. (Unlike others, the RBI can pay for its purchases without diminishing funds at a bank account). On the other hand, when the RBI sells government securities, it receives money which means that money supply diminishes. Open market operations may be employed by the RBI to fine-tune money supply.

The **bank rate** is the rate at which the RBI provides financial accommodation to scheduled commercial and cooperative banks. It is essentially the rate at which the RBI buys or rediscounts bills of exchange and commercial paper. The bank rate presently is 6.00 percent. A reduction in bank rate signals an expansionary monetary policy and an increase in bank rate a contractionary monetary policy.

Reserve requirements in India are in the form of the cash reserve ratio and the statutory liquidity ratio. The **cash reserve ratio** (CRR) refers to the cash as a percentage of demand and time liabilities that banks maintain with the RBI. The **statutory liquidity**

ratio (SLR) is the ratio of cash in hand (exclusive of cash balances under the CRR), balances in current account with public sector banks and the RBI, gold, and approved securities to the demand and time liabilities. Of course, approved securities (central and state government securities, securities of local bodies and government-guaranteed securities) loom large in this list. From time to time the RBI stipulates the required CRR and SLR. A decrease in CRR and SLR signals an expansionary monetary policy and an increase a contractionary monetary policy.

The Reserve Bank of India may resort to **direct credit controls** like asking banks to lend a certain percentage of their funds to priority sectors. Whatever may be the merit of such controls, they tend to breed inefficiency and diminish competition.

Supply Side Policies Demand side policies assume that the economy on its own is not likely to reach full employment equilibrium and, hence, macroeconomic policy intervention is required to achieve that goal. Supply side policies, on the other hand, focus on creating an environment in which the productive potential of the economy is increased.

Supply side economists pay attention to tax policy from a different angle. While the demand-siders focus on the impact of taxes on consumption demand, supply-siders look at the effect of taxes on incentives to work and invest. They believe that lower tax rates encourage investment and strengthen incentives to work, thereby stimulating economic growth. Some even argue that reduction in tax rates eventually leads to increase in tax revenues because the higher level of economic activity and tax base, induced by tax reduction, more than offsets the lower tax rate.

14.3 MACROECONOMIC ANALYSIS

The macroeconomy is the overall economic environment in which all firms operate. The key variables commonly used to describe the state of the macroeconomy are:

- Growth rate of gross domestic product
- Industrial growth rate
- Agriculture and monsoons
- Savings and investments
- Government budget and deficit
- Price level and inflation
- Interest rates
- Balance of payment, forex reserves, and exchange rate
- Infrastructural facilities and arrangements
- Sentiments

Growth Rate of Gross Domestic Product (GDP) The gross domestic product (GDP) - or some variant of it, like the gross national product (GNP) - is a measure of the total production of final goods and services in the economy during a specified period usually a year. The GDP of the Indian economy for the fiscal 2007–2008 was estimated at about four million crore in current rupees.

The growth rate of GDP is the most important indicator of the performance of the economy. The average rate of GDP growth in India during 1950 to 1980 was around 3.5 percent in real terms (the real growth rate is the nominal growth rate less the inflation rate) with wide year-to-year fluctuations though. The GDP growth rate had risen to about 5 percent in the decade of 1980s. The GDP growth rate during 1995-2003 average was around 6.0 percent. From 2004 to 2007 the average growth rate in India has been slightly above 8 percent. The global economic crisis may subdue it for a while.

Does this represent a cyclical upswing or has there been a secular shift? Some argue that a global growth boom of the last few years has lifted the Indian growth rate to 8 percent and, hence, a global downturn will bring the Indian growth rate back to 6 percent. Others believe that the cumulative effect of reforms since 1991 has reached a tipping point and pushed India into a virtuous cycle of higher growth rate, higher savings rate, and higher investment rate (the savings rate in India has moved up from 24 to 34 percent). Thanks to this virtuous cycle, the updated BRIC report of Goldman Sachs maintains that India can sustain a growth rate of 8 percent for over a decade. The Planning Commission has set its target even higher.

As of now there is increasing evidence that the current phase of economic growth is more due to structural changes in the economy and less due to cyclical forces. The important structural changes have been the steady increase in savings/GDP ratio, increase in foreign direct investment (FDI) in comparison to foreign institutional investment (FII) with its attendant benefits (like superior technology, better management practices, and greater competition), faster growth in the manufacturing sector, rising exports, increasing degree of openness of the Indian economy (as reflected in the increase in the proportion of exports and imports to GDP), increase in total factor productivity (TFP), and greater efficiency and robustness of the financial sector.

Forecasting the GDP Growth Rate A commonly employed procedure for forecasting the GDP growth rate is to (a) estimate the most likely growth rates of three sectors of the economy, viz. agriculture, industry, and services, and (b) calculate the weighted arithmetic average of the three rates, the weight of a sector being its share in the GDP. For example, if the most likely growth rates of agriculture, industry, and services are 3.0 percent, 9.0 percent, and 10.0 percent and the shares of these sectors in the GDP are 0.25, 0.25, and 0.50, the GDP growth rate forecast would be: 0.25 (3.0) + 0.25 (9.0) + 0.50 (10.0) = 8.0 percent.

Professional economists, however, find this procedure simplistic and unsatisfactory as it does not build on the fundamentals that drive a country's economic performance and ignores the close inter-linkages among major parts of the economy. Notwithstanding this criticism, for short-time horizons of a year or so, a forecast derived from a simplistic method described above may not be inferior to a forecast based on underlying economic forces.

Industrial Growth Rate The GDP growth rate represents the average of the growth rates of the three principal sectors of the economy, viz. the services sector, the industrial sector, and the agricultural sector.

Publicly listed companies play a major role in the industrial sector but only a minor role in the services sector and the agricultural sector. Hence stock market analysts focus more on the industrial sector. They look at the overall industrial growth rate as well as the growth rates of different industries.

The higher the growth rate of the industrial sector, other things being equal, the more favourable it is for the stock market.

Agriculture and Monsoons Agriculture accounts for about a quarter of the Indian economy and has important linkages, direct and indirect, with industry. Hence, the increase or decrease of agricultural production has a significant bearing on industrial production and corporate performance. Companies using agricultural raw materials as inputs or supplying inputs to agriculture are directly affected by the changes in agricultural production. Other companies also tend to be affected due to indirect linkages.

A spell of good monsoons imparts dynamism to the industrial sector and buoyancy to the stock market. Likewise, a streak of bad monsoons casts its shadow over the industrial sector and the stock market.

Savings and Investments The demand for corporate securities has an important bearing on stock price movements. So investment analysts should know what is the level of investment in the economy and what proportion of that investment is directed toward the capital market.

The level of investment in the economy is equal to: Domestic savings + Inflow of foreign capital – Investment made abroad. In India, as in many other countries, the domestic savings is the dominant component in this expression. The rate of savings in India has risen appreciably over what it was in the 1950s, 1960s, and even early 1970s. During the decade of 1980s the rate of savings in India hovered around 21 percent. Currently it is about 34 percent. This rate compares favourably with the savings rate in most of the other countries in the world. Given a reasonably high level of savings rate in India, it appears that there is very little scope for further increase.

In addition to knowing what the savings are you should also know how the same are allocated over various instruments like equities, bonds, bank deposits, small savings schemes, and bullion.

Other things being equal, the higher the level of savings and investments and the greater the allocation of the same to equities, the more favourable it is for the stock market.

Where Are Household Financial Savings in India Invested

The bulk of the household financial savings (nearly 85 percent) in India are invested or parked in the following forms:

- Bank deposits (30 percent)
- Provident and pension funds (about 20 percent)
- Insurance funds (about 15 percent)
- Small savings schemes (about 10 percent)
- Currency (about 10 percent)

The balance of household savings are invested in other avenues like government securities, corporate bonds, equity shares, and mutual funds.

It is expected that equity shares and mutual funds will account for a higher allocation of household financial savings in future.

Government Budget and Deficit Governments play an important role in most economies, including the Indian economy. The central budget (as well as the state budgets) prepared annually provides information on revenues, expenditures, and deficit (or surplus, in rare cases).

In India, governmental revenues come more from indirect taxes such as excise duty and customs duty and less from direct taxes such as income tax. The bulk of the governmental expenditures goes toward administration, interest payment, defence, and subsidies, leaving very little for public investment. The excess of governmental expenditures over governmental revenues represents the deficit. While there are several measures of deficit, the most popular measure is the fiscal deficit.

The fiscal deficit has to be financed with government borrowings which are done in three ways. First, the government can borrow from the Reserve Bank of India. This leads to increase in money supply which has an inflationary impact on the economy. Second, the government can resort to borrowing in domestic capital market. This tends to push up domestic interest rates and crowd out private sector investment. Third, the government may borrow from abroad.

Borrowing *per se* is not bad but if the borrowed money is not put to productive purpose, servicing the debt becomes very onerous leading to fiscal crisis.

Investment analysts examine the government budget to assess how it is likely to impact on the stock market. They generally classify favourable and unfavourable influences as follows:

Favourable	*Unfavourable*
A reasonably balanced budget	A budget with a high surplus or deficit
A level of debt (both internal and external) which can be serviced comfortably	A level of debt (both internal and external) which is difficult to service
A tax structure which provides incentive for stock market investment	A tax structure which provides disincentive for stock market investment

Money Supply There are several definitions of money. The two more commonly used ones are:

M_1 = currency with public + demand deposits with bank + "other deposits" with RBI
M_3 = M_1 + time deposits with banks

M_1 is a narrow measure of money supply and M_3 is a broad measure. When we talk of money supply, we usually refer to M_3. The growth rate of M_3 in India has been around 15 percent per year. This growth can be explained by three factors in the main: growth in the real economy, monetisation of a portion of deficit financing (this means that the Reserve Bank of India buys the securities issued by the government), and financial deepening of the economy.

Price Level and inflation Not in itself an indication of aggregate economic activity, the price level measures the degree to which the nominal rate of growth in GDP is attributable to the factor of inflation. The secular inflation rate in the Indian economy has been around 7 percent till the late 1990s, with wide year-to-year fluctuations though. In recent years, the inflation rate has fallen significantly.

The effect of inflation on the corporate sector tends to be uneven. While certain industries may benefit, others tend to suffer. Industries that enjoy a strong market for their products and which do not come under the purview of price control may benefit. On the other hand, industries that have a weak market and which come under the purview of price control tend to lose.

On the whole, it appears that a mild level of inflation is good for the stock market.

Interest Rate Interest rates vary with maturity, default risk, inflation rate, productivity of capital, special features, and so on. The interest rates on money market instruments (short-term debt instruments) like Treasury bills which are virtually risk free tend to be the lowest. Long dated government securities generally carry slightly higher interest rates. Finally, corporate debentures which have some default risk associated with them carry still higher interest rates.

Traditionally, interest rates in India were fairly high and most of the interest rates in the organised sector were regulated. In the last decade several interest rates have been deregulated. More important, in the last few years interest rates have softened significantly.

A rise in interest rates depresses corporate profitability and also leads to an increase in the discount rate applied by equity investors, both of which have an adverse impact on stock prices. On the other hand, a fall in interest rates improves corporate profitability and also leads to a decline in the discount rate applied by equity investors, both of which have a favourable impact on stock prices.

Balance of Payments, Forex Reserves, and Exchange Rates The balance of payments is equal to:

Balance of trade (imports minus exports)

+ Balance on 'invisibles' like tourism, software services, and interest rates (payment on account of invisibles minus receipts on account of invisibles)
+ Balance on account of capital account (repayment on account of loans minus receipt of loans)

A balance of payments deficit depletes the forex reserves of the country and has an adverse impact on the exchange rate; on the other hand, a balance of payments surplus augments the forex reserves of the country and has a favourable impact on the exchange rate.

If the rupee weakens vis-à-vis the dollar it hurts importers but benefits exporters and vice versa.

Foreign Investment Foreign investment in India comes in two forms, foreign direct investment and foreign portfolio investment. The former represents investment for setting up new projects and hence is long-term in nature; the latter is in the form of purchase of outstanding securities in the capital market and hence can be reversed easily.

Although foreign direct investment is more desirable than foreign portfolio investment, India has received more of the latter to date. This imbalance is now getting corrected.

Foreign institutional investors (FIIs) have had a significant impact on the Indian stock market from the earlier years of 2000s. Their impact, however, seems to be diminishing.

To a considerable extent, the buoyancy in the Indian stock market from 2003 to 2007 was due to substantial FII inflows. By the middle of 2007, it appeared that the influence of FIIs had diminished, thanks to a sharp rise in market capitalisation and the increasing presence of domestic mutual funds and insurance companies. In 2008, however, substantial disinvestments by FIIs, inter alia, led to a collapse in the market.

Huge inflows of foreign institutional investment in the Indian equity market has raised two kinds of concerns.

- At the micro level, the concern is that too much money is chasing too few stocks, thereby leading to a possible liquidity bubble.
- At the macro level, the concern is that India's ability to absorb huge forex inflows is low as it does not allow free forex outflows. Countries like Taiwan absorb inflows better, thanks to easier capital account convertibility. The cost of cumulating forex reserves has to be borne by the Reserve Bank of India.

Participatory Notes

Participatory Notes (or P-notes) are contract notes issued by SEBI-registered foreign institutional investors (FIIs) to foreign investors such as hedge funds. Through P-notes hedge funds can indirectly invest in the Indian securities market. To illustrate how it works, let us consider an example. Suppose a foreign hedge fund wants to invest in the equity of an Indian company. It transmits funds to a SEBI-registered FII which, in turn, invests in the equity of the Indian company. The FII issues the P-note, which is a derivative instrument, to the hedge fund. Thus, the hedge fund is able to take a position anonymously in the Indian market without registering with SEBI.

Infrastructural Facilities and Arrangements Infrastructural facilities and arrangements significantly influence industrial performance. More specifically, the following are important:

- Adequate and regular supply of electric power at a reasonable tariff.
- A well developed transportation and communication system (railway transportation, road network, inland waterways, port facilities, air links, and telecommunications system).
- An assured supply of basic industrial raw materials like steel, coal, petroleum products, and cement.
- Responsive financial support for fixed assets and working capital.

The infrastructural bottlenecks have traditionally been the bane of the Indian industry. While the situation has improved in some ways over the years, the industrial sector often has to contend with inadequate and irregular availability of infrastructural inputs.

Sentiments The sentiments of consumers and businessmen can have an important bearing on economic performance. Higher consumer confidence leads to higher expenditure on big ticket items. Higher business confidence gets translated into greater business investment that has a stimulating effect on the economy. Thus, sentiments influence consumption and investment decisions and have a bearing on the aggregate demand for goods and services.

Economic Variables and their Impact on Stock Prices Michael W. Keran had developed a flow diagram of stock price determination, showing how economic variables interact to determine stock prices. Presented in Exhibit 14.1, this classic model provides a very good description of stock price determination.

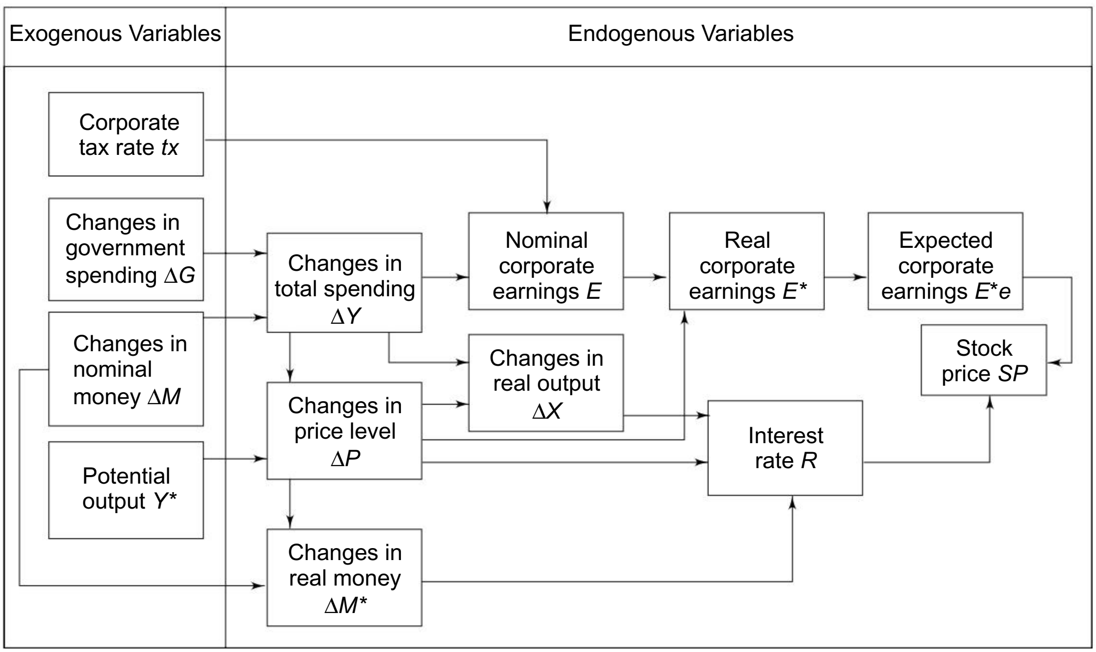
The ET-NCAER Business Confidence Index (BCI)

The Economic Times – National Council of Applied Economic Research Business Confidence Index (BCI) attempts to capture the expectations of business houses in India on a quarterly basis. It is based on responses received from a broad sample of firms across regions, sectors, and sizes. The BCI is based on responses to four questions that relate to the following:

- Overall economic conditions
- Financial position of firms
- Investment climate
- Capacity utilisation

All the four factors are assigned equal weight. The BIC reflects the average proportion of positive responses in relation to the proportion in the base period (first quarter of 1993-94) set at 100.

Exhibit 14.1 ***A Flow Diagram of Stock Price Determination***



Source: Michael W. Keran, "Expectations, Money, and the Stock Market", *Review*, Federal Reserve Bank of St. Louis, January, 1971.

Story of Indian Economic Reforms

While there was a spurt of economic reforms in 1985-1987 under Rajiv Gandhi, major economic reforms occurred in 1991-1992 when the Narasimha Rao – Manmohan Singh combine abolished industrial licensing, did away with import licensing on capital goods and raw materials, opened most industries to foreign investment, significantly reduced industrial tariffs, radically reformed direct and indirect taxes, cut fiscal deficit, liberalised the financial sector, and introduced current account convertibility. Although these reforms brought about significant improvement in economic performance, the reforms came to a virtual standstill in mid-1994 and there was very little progress in the next few years.

The next wave of significant economic reforms occurred during 1999-2004 under Atal Bihari Vajpayee and Yashwant Sinha. In this period, the telecom sector was reformed with the promulgation of the New Telecom Policy 1999, the import licensing on consumer goods was abolished, the highest industrial tariff was brought down from 45 percent to 20 percent, several public sector enterprises were privatised, the Urban Land Ceilings and Regulation Act, 1976 was repealed, a massive programme of highway construction was initiated, the system of indirect taxes and tax administration were reformed substantially, and a giant step was taken to reform the power sector through the Electricity Act, 2003.

Interestingly, the pace of reforms has slowed down after the UPA government came to power in mid-2004.

From the above review we find that periods of significant reforms are punctuated by periods of slowdown. It appears that determined political leadership is the key factor during the reform process

Indian Economy: Some Key Developments

There have been some important developments in the Indian economy in the last few years. These are briefly described below:

- The GDP growth rate has moved into a higher trajectory. It has averaged nearly 8.5 percent from 2004 onward.
- The savings and investment rate has moved up from about 28 percent in 2004 to nearly 35 percent in 2007.
- In recent years, government finances in India have improved remarkably, both at the centre and in the states. The combined revenue deficit has declined to 2.1 percent of GDP in 2006-07 from a level of 6.6 percent of GDP in 2000-01. (Revenue deficit is the gap between the current expenditure of the government and its revenue receipts from taxes, fees, and so on). Likewise, the combined fiscal deficit, which was nearly 10 percent of the GDP in the early years of this decade, dropped to 6.4 percent of GDP in 2006-07. Fiscal deficit is the difference between total government spending (capital and revenue) and its revenue receipts from taxes, fees, and so on.

- Several factors have contributed to fiscal improvement. First, strong economic growth generated potential tax buoyancy. Second, improved tax design and systems (such as introduction of state VAT) helped. Third, the passage of fiscal responsibility and budget management laws in Parliament and State legislatures has brought a measure of restraint.
- The merchandise trade deficit has increased—Higher oil import and bullion import have contributed significantly to this. This has been substantially offset by invisibles, mainly in the form of software, information technology enabled services, and inward private remittances. As a result the current account deficit has been between 1.0 and 1.5 percent of the GDP.
- There has been a surge of capital flows in the form of foreign direct investment, portfolio investment, and external commercial borrowings leading to a huge capital account surplus. This has led to a significant increase in foreign exchange reserves.
- From 2004–05 onward, the RBI has been issuing Market Stabilisation Bonds to sterilise the effects of its intervention in the foreign exchange market.
- Inflationary pressures which were building up since the latter part of 2005 have eased by the end of 2007, but again resurfaced in 2008.
- Interest rates have more or less followed the path of inflation.
- Thanks to robust credit demand and large capital inflows that ended up substantially as the reserve assets of RBI, money supply growth rate over the past several years has been fairly strong.

14.4 INDUSTRY ANALYSIS

In the previous section we looked at the macroeconomic picture. In accordance with the recommended economy-industry-company analysis sequence, we now move on to industry analysis. The objective of this analysis is to assess the prospects of various industrial groupings. Admittedly, it is almost impossible to forecast exactly which industrial sectors will appreciate the most. Yet careful analysis can suggest which industries have a brighter future than others and which industries are plagued with problems that are likely to persist for a while.

Concerned with the basics of industry analysis, this section is divided into four parts:

- Sensitivity to the business cycle
- Industry life cycle analysis
- Study of the structure and characteristics of an industry
- Profit potential of industries: Porter model.

Sensitivity to the Business Cycle

Once you have a forecast of the state of the macroeconomy, you can examine its implications for different industries.

Industries vary in their sensitivity to the business cycle. For example, the automobile industry is more responsive to the business cycle. During expansionary periods, the demand for automobiles tends to rise sharply and during recessionary periods the demand for automobiles tends to fall sharply.

By contrast, the cigarette industry is more or less independent of the business cycle. The demand for cigarettes is hardly affected by the state of the macroeconomy. This is not surprising because cigarette consumption is largely a matter of habit and hence is not responsive to the business cycle.

The sensitivity of a firm's earnings to the business cycle is determined by three factors: the sensitivity of the firm's sales to business conditions, the operating leverage, and the financial leverage.

Sensitivity of Sales The sales of firms in industries that sell necessities such as food, drugs, and personal care products are less sensitive to business conditions. On the other hand, sales of firms in industries such as automobiles, air transport, and machine tools are more sensitive to business conditions.

Operating Leverage Operating leverage reflects the division between fixed and variable costs. Fixed costs remain constant irrespective of changes in the volume of output. Depreciation charges, interest on long term debt, rent, insurance, lease rentals, managerial salaries, and so on represent fixed costs. Variable costs vary with the volume of output. Material cost, power cost, interest on working capital advance, selling commission, and so on are examples of variable costs.

Firms with high fixed costs as opposed to variable costs are said to have high operating leverage. The profits of such firms are more sensitive to business conditions. Firms with high variable costs as opposed to fixed costs are said to have low operating leverage. The profits of such firms are less sensitive to business conditions.

A numerical example may be given to illustrate the concept of operating leverage. Consider two firms, *P* and *Q* which have identical revenues under different phases of the business cycle, viz. recession, normal, and expansion. The two firms, however, differ in their operating leverage. Firm Q has higher fixed costs compared with firm P; on the other hand, firm *P* has higher variable costs compared with firm *Q*. Exhibit 14.2 presents the financial performance of the two firms under different economic scenarios.

Exhibit 14.2 ***Financial Performance under Different Economic Scenarios***

	Recession		*Normal*		*Expansion*	
	P	*Q*	*P*	*Q*	*P*	*Q*
Sales (million units)	8	8	10	10	12	12
Price per unit	Rs. 50	Rs. 50	Rs. 50	Rs. 50	Rs. 50	Rs. 50
Revenues (Rs. in million)	400	400	500	500	600	600
Fixed costs (Rs. in million)	200	320	200	320	200	320
Variable costs (Rs. in million)	200	100	250	125	300	150
Total costs (Rs. in million)	400	420	450	445	500	470
Profit	0	(20)	50	55	100	130

Firm P, with its lower operating leverage, does better than firm Q during a downturn; on the other hand, firm Q with its higher operating leverage performs better during an upturn.

Financial Leverage Financial leverage, which stems from the use of debt funds, is the third factor that influences the sensitivity of a firm to business cycle. Other things being equal, the higher the degree of financial leverage the greater the sensitivity of a firm to business cycle.

Industry Life Cycle Analysis

Many industrial economists believe that the development of almost every industry may be analysed in terms of a life cycle with four well-defined stages:

- Pioneering stage
- Rapid growth stage
- Maturity and stabilisation stage
- Decline stage

Pioneering Stage During this stage, the technology and/or the product is relatively new. Lured by promising prospects, many entrepreneurs enter the field. As a result, there is keen, and often chaotic, competition. Only a few entrants may survive this stage.

Rapid Growth Stage Once the period of chaotic developments is over, the rapid growth stage arrives. Thanks to a relatively orderly growth during this period, firms which survive the intense competition of the pioneering stage, witness significant expansion in their sales and profits.

Maturity and Stabilisation Stage After enjoying an above-average rate of growth during the rapid growth, the industry enters the maturity and stabilisation stage. During this stage, when the industry is more or less fully developed, its growth rate is comparable to that of the economy as a whole.

Decline Stage With the satiation of demand, encroachment of new products, and changes in consumer preferences, the industry eventually enters the decline stage, relative to the economy as a whole. In this stage, which may continue indefinitely, the industry may grow slightly during prosperous periods, stagnate during normal periods, and decline during recessionary periods.

Evaluation and Investment Implications The experience of most industries suggest that they go through the four phases of the industry life cycle, though there are considerable variations in terms of the relative duration of various stages and the rates of growth during these stages. Because of these variations, it may not be easy to define what the current stage is, how long it will last, and what would be its precise growth rate.

The broad validity of this theory and its general message that there is a definite trend towards retardation of growth rates has several implications for you as an investor.

- Give industry analysis prior attention in your investment selection process.
- Display caution during the pioneering stage—this stage has an appeal primarily for speculators.
- Respond quickly and expand your commitments during the rapid growth stage.
- Moderate your investment during the maturity stage.
- Sensibly disinvest when signals of decline are evident.

Study of the Structure and Characteristics of an Industry

Since each industry is unique, a systematic study of its specific features and characteristics must be an integral part of the investment decision process. Industry analysis should focus on the following:

I. Structure of the Industry and Nature of Competition

- The number of firms in the industry and the market share of the top few (four to five) firms in the industry
- Licensing policy of the government
- Entry barriers, if any
- Pricing policies of the firm
- Degree of homogeneity or differentiation among products
- Competition from foreign firms
- Comparison of the products of the industry with substitutes in terms of quality, price, appeal, and functional performance.

II. Nature and Prospects of Demand

- Major customers and their requirements
- Key determinants of demand
- Degree of cyclicality in demand
- Expected rate of growth in the foreseeable future.

III. Cost, Efficiency, and Profitability

- Proportions of the key cost elements, namely, raw materials, labour, utilities, and fuel
- Productivity of labour
- Turnover of inventory, receivables, and fixed assets
- Control over prices of outputs and inputs
- Behaviour of prices of inputs and outputs in response to inflationary pressures
- Gross profit, operating profit, and net profit margins
- Return on assets, earning power, and return on equity.

IV. Technology and Research

- Degree of technological stability
- Important technological changes on the horizon and their implications
- Research and development outlays as a percentage of industry sales
- Proportion of sales growth attributable to new products.

Profit Potential of Industries: Porter Model

Michael Porter[1] has argued that the profit potential of an industry depends on the combined strength of the following five basic competitive forces:

- Threat of new entrants
- Rivalry among the existing firms
- Pressure from substitute products
- Bargaining power of buyers
- Bargaining power of sellers

Threat of New Entrants New entrants add capacity, inflate costs, push prices down, and reduce profitability. Hence, if an industry faces the threat of new entrants, its profit potential would be limited. The threat from new entrants is low if the entry barriers confer an advantage on existing firms and deter new entrants. Entry barriers are high when:

- The new entrants have to invest substantial resources to enter the industry.
- Economies of scale are enjoyed by the industry.
- Existing firms control the distribution channels, benefit from product differentiation in the form of brand image and customer loyalty, and enjoy some kind of proprietary experience curve.
- Switching costs—these are essentially one-time costs of switching from the products of one supplier to another—are high.
- The government policy limits or even prevents new entrants.

Rivalry among Existing Firms Firms in an industry compete on the basis of price, quality, promotion, service, warranties, and so on. Generally, a firm's attempts to improve its competitive position provoke retaliatory action from others. If the rivalry between the firms in an industry is strong, competitive moves and countermoves dampen the average profitability of the industry. The intensity of rivalry in an industry tends to be high when:

- The number of competitors in the industry is large.
- At least a few firms are relatively balanced and capable of engaging in a sustained competitive battle.
- The industry growth is sluggish, prodding firms to strive for a higher market share.
- The level of fixed costs is high, generating strong pressure for all firms to achieve a higher capacity utilisation level.
- There is chronic over capacity in the industry.
- The industry's product is regarded as a commodity or near-commodity, stimulating strong price and service competition.
- The industry confronts high exit barriers.

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[1] Micheal E.Porter, *Competitive Strategy: Techniques for Analysing Industries and Competition*, The Free Press, 1980.

Pressure from Substitute Products In a way, all firms in an industry face competition from industries producing substitute products. Performing the same function as the product of the industry, substitute products may limit the profit potential of the industry by imposing a ceiling on the prices that can be charged by the firms in the industry. The threat from substitute products is high when:

- The price-performance tradeoff offered by the substitute products is attractive.
- The switching costs for prospective buyers are minimal.
- The substitute products are being produced by industries earning superior profits.

Bargaining Power of Buyers Buyers are a competitive force. They can bargain for price cut, ask for superior quality and better service, and induce rivalry among competitors. If they are powerful, they can depress the profitability of the supplier industry. The bargaining power of a buyer group is high when:

- Its purchases are large relative to the sales of the seller.
- Its switching costs are low.
- It poses a strong threat of backward integration.

Bargaining Power of Suppliers Suppliers, like buyers, can exert a competitive force in an industry as they can raise prices, lower quality, and curtail the range of free services they provide. Powerful suppliers can hurt the profitability of the buyer industry. Suppliers have strong bargaining power when:

- A few suppliers dominate and the supplier group is more concentrated than the buyer group.
- There are hardly any viable substitutes for the products supplied.
- The switching costs for the buyers are high.
- Suppliers do present a real threat of forward integration.

Application of Industry Analysis: The Personal Computer Industry

For all practical purposes, the personal computer industry began in 1981 when IBM introduced its PC with Intel's microprocessor and Microsoft's DOS operating system. Since then the PC industry has grown spectacularly. However, it has been characterised by low profitability, in general. What can explain this?

The following factors have contributed to low profitability.

1. There is intense rivalry among existing players and there are few barriers to entry as virtually all components required to make a computer can be outsourced.
2. The bargaining power of suppliers is high. For example, Intel dominates the microprocessor production and Microsoft controls the operating system market.

3. Corporate buyers, who account for a substantial portion of the market, are highly price sensitive and enjoy bargaining power.
4. It is fairly easy to switch from one brand of personal computers to another as most of the computers use Intel microprocessors and Microsoft window operating systems.
5. As the products offered by different firms are virtually identical, the room for product differentiation is very limited.

To sum up, the intense rivalry among existing players, ease of entry, strong bargaining power of suppliers and buyers, low switching costs, and limited room for product differentiation depressed the average profitability of the personal computer industry. No wonder, IBM sold its personal computer business to Lenovo of China.

SUMMARY

- In a globalised business environment, the top-down analysis of the prospects of a firm must begin with the global economy.
- The government employs two broad classes of macroeconomic policies, viz., **demand-side policies** and **supply side policies**. The former are meant to influence the demand for goods and services and the latter the supply for goods and services.
- **Fiscal policy** is concerned with the spending and tax initiatives of the government. **Monetary policy** is concerned with the manipulation of money supply in the economy.
- To determine the intrinsic value of an equity stock the security analyst must forecast the earnings and dividends expected from the stock and choose a discount rate which reflects the riskiness of the stock.
- The earnings potential and riskiness of a firm are linked to the prospects of the industry to which it belongs. The prospects of various industries, in turn, are largely influenced by the developments in the macroeconomy.
- The **macroeconomy** is the overall economic environment in which all firms operate.
- The development of almost every industry may be analysed in terms of a life cycle with four well defined stages: pioneering stage, rapid growth stage, maturity and stabilisation stage, and decline stage.
- Since each industry is unique, a systematic study of its specific features and characteristics must be an integral part of the investment decision process.
- Michael Porter has argued that the profit potential of an industry depends on the combined strength of five basic competitive forces: (i) Threat of new entrants, (ii) Rivalry among the existing firms, (iii) Pressure from substitute products, (iv) Bargaining power of buyers, and (v) Bargaining power of sellers.

QUESTIONS

1. What should you bear in mind while monitoring the global macroeconomy?
2. Discuss the following: (i) demand-side policies, and (ii) supply-side policies.
3. Discuss the key macroeconomic variables and their impact on stock market.
4. Describe the industry life cycle. What are its implications for the investor?
5. What factors would you look at while studying the characteristics of an industry?
6. Discuss the forces that drive competition and influence profit potential for industries according to Michael Porter.

Chapter **15**

Company Analysis

Establishing the Value Benchmark

LEARNING OBJECTIVES

After studying this chapter, you should be able to:

- Analyse the financials of a company.
- Identify the qualitative factors that affect a company's prospects.
- Explain the procedure to estimate the intrinsic value of a share.
- Understand the tools for judging undervaluation or overvaluation.

A financial analyst is a person who analyses securities and makes recommendations thereon. In determining whether a security is worth buying, holding, or selling, financial analysts employ fundamental analysis and technical analysis. Fundamental analysis looks at matters like future earnings and dividends to assess intrinsic value, whereas technical analysis involves a study of past prices and volumes to determine the direction of price movement.

This chapter is concerned with fundamental analysis of equity shares. Although technical analysis is employed by many financial analysts, fundamental analysis is more commonly used. Moreover, fundamental analysis is essential for market efficiency, while technical analysis is not.

Fundamental analysts take two somewhat different approaches in their search for mispriced securities. The first approach involves estimating the intrinsic value and comparing the same with the prevailing market price to determine whether the security is underpriced or fairly priced or overpriced. The second approach involves estimating a security's expected return, given its current price and intrinsic value, and then comparing it with the "appropriate" return for securities with similar characteristics. We will discuss the first approach.

To get a handle over intrinsic value, the analyst must forecast future performance and translate the same into a value estimate. As a prelude to this, the analyst must understand the strategy of the firm, evaluate the quality of the firm's accounting data, analyse the past performance of the firm, and assess non-financial dimensions. This chapter discusses these issues.

15.1 STRATEGY ANALYSIS

Strategy analysis seeks to explore the economics of a firm and identify its profit drivers so that the subsequent financial analysis reflects business realities.

The profit potential of a firm is largely influenced by the industry or industries in which it participates (industry choice), by the strategy it follows to compete in its chosen industry or industries (competitive strategy), and by the way in which it exploits synergies across its business portfolio (corporate strategy).

We have considered industry analysis in the previous chapter. So, the present discussion focuses on competitive strategy and corporate strategy.

Competitive Strategy

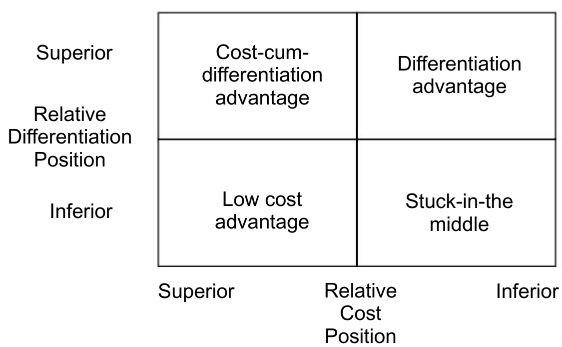
Among the various frameworks of strategy formulation, the one developed by Michael E. Porter in his seminal work *Competitive Strategy* has been perhaps the most influential in shaping management practice. Michael Porter argues that the firm can explore two generic ways of gaining sustainable competitive advantage viz., **cost leadership** and **product differentiation.**

Cost leadership can be attained by exploiting economies of scale, exercising tight cost control, minimising costs in area like R&D and advertising, and deriving advantage from cumulative learning. Firms which follow this strategy include Bajaj Auto in two wheelers, Mittal in steel, WalMart in discount retailing, and Reliance Industries in petrochemicals.

Product differentiation involves creating a product that is perceived by customers as distinctive or even unique so that they can be expected to pay a higher price. Firms which have excelled in this strategy include Mercedes in automobiles, Rolex in wristwatches, Mont Blanc in pens, and Raymond in textiles.

Exhibit 15.1 depicts the competitive position of the firm based on its relative cost and differentiation positions. The most attractive position of course is the cost-cum-differentiation advantage position.

Exhibit 15.1 ***Competitive Position of the Firm***



Gaining Competitive Advantage By choosing an appropriate strategy, a firm does not necessarily gain competitive advantage. To do so the firm must develop the required core competencies (the key economic assets of the firm) and structure its value chain (the set of activities required to convert inputs into outputs) appropriately. As Palepu *et.al*. say: "The uniqueness of a firm's core competencies and its value chain and the extent to which it is difficult for competitors to imitate them determines the sustainability of a firm's competitive advantage."[1]

To assess whether a firm is likely to gain competitive advantage, the analyst should examine the following:

- The key success factors and risks associated with the firm's chosen competitive strategy.
- The resources and capabilities, current and potential, of the firm to deal with the key success factors and risks.
- The compatibility between the competitive strategy chosen by the firm and the manner in which it has structured its activities (R&D, design, manufacturing, marketing and distribution, and support).
- The sustainability of the firm's competitive advantage.
- The potential changes in the industry structure and the adaptability of the firm to address these changes.

Strategy of Cost Leadership: Dell Computer Corporation

In the highly competitive personal computer industry, Dell Computers achieved a very respectable market share and high profitability by effectively pursuing the strategy of cost leadership. The key elements of Dell's strategy are as follows:

Direct Selling: Dell sells most of its computers directly to its customers, thereby saving the retailer's margin.

Built-to-order manufacturing Dell sells machines which are built to order. It relies on an efficient and flexible supply chain of component makers and just-in-time assemblers. This enables it to avoid locking funds in working capital and reduce inventory obsolescence costs which can be substantial in the rapidly changing computer industry.

Low-cost service Dell uses the following low-cost approaches to after sales service: (a) telephone-based service offered by its technical support representatives who use a comprehensive electronic maintenance system and (b) third-party service for on-site maintenance.

Negative working capital Dell carries minimal inventories because of its build-to-order manufacturing and Dell has low receivables as it encourages customers to pay by credit card at the time of purchase or immediately thereafter through electronic payment. Its low investment in inventories and receivables along with the credit that it gets from its suppliers means that Dell has a negative working capital.

Thanks to the above strategy, Dell achieved a significant cost edge over its competitors. This enabled it to expand market share, grow rapidly, and achieve high profitability.

[1] Krisha G Palepu, Paul M. Healey, and Victor L. Bernard, *Business Analysis & Valuation*, 3/e Thomson South-Western, 2004.

Corporate Strategy Analysis

When you analyse a multi-business firm, you have to evaluate not only the profit potential of individual businesses but also the economic implications (positive as well as negative) of managing different businesses under one corporate canopy. For example, General Electric has succeeded immensely in creating significant value by managing a highly diversified set of businesses ranging from light bulbs to aircraft engines, whereas Sears failed in managing retailing with financial services.

Corporate Sources of Value Creation What factors influence a firm's ability to create value through a broad scope? The optimal scope depends on how the costs of performing activities inside the firm compare with the costs of using the market mechanism. Transaction cost economics suggest that a diversified firm is more efficient if coordination among independent, focused firms costs more on account of market transaction costs.

Transaction costs inside a firm may be less compared to market based transactions for the following reasons: (a) Communication costs inside a firm are lower because it is easier to protect confidentiality and assume credibility. (b) The corporate office can reduce the costs of enforcing agreements between the various units of the firm. (c) Valuable nondivisible assets (brand names, distribution channels, and so on) and nontradable assets (systems, processes, and so on) can be shared by the various units of the firm.

However, there are some forces that increase transaction costs inside the firm. Top management may not have the capability and expertise to manage diverse businesses. Such managerial inadequacy diminishes the possibility of realising the economies of scope, even when such a potential exists. This problem can perhaps be addressed by setting up a decentralised organisational structure, hiring specialist managers who are empowered, and incentivising them properly. But decentralisation almost invariably diminishes goal congruence among managers of various subunits which makes it difficult to realise economies of scope.

Thus, whether a multibusiness firm is more valuable compared to a collection of focused firms finally depends on the context. The analyst should examine the following factors to assess whether a firm's corporate strategy has the potential to create value.

- Imperfections in the product, labour, or financial markets in the business in which the firm operates.
- Existence of special resources such as brand name, proprietary knowledge, scarce distribution channels, and organisational processes that potentially create economies of scope.
- The degree of fit between the company's specialised resources and its portfolio of businesses.
- The allocation of decision rights between the corporate office and business units and its effect on the potential economies of scope.
- The system of performance measurement and incentive compensation and its effect on agency costs.

15.2 ACCOUNTING ANALYSIS

Accounting analysis seeks to evaluate the extent to which the firm's accounting reports capture its business reality. As an analyst you must be familiar with the institutional framework for financial reporting, the potential sources of noise and bias in accounting, and the differences between good accounting quality and bad accounting quality.

The Institutional Framework for Financial Reporting The salient features of the institutional framework for financial reporting are as follows:

1. Corporate financial reports are prepared on the basis of accrual accounting and not cash accounting. Under accrual accounting, revenues are recognised when sales are made or services rendered, irrespective of when cash is received. Likewise expenses are recognised when goods are used or services received, regardless of when cash is paid.
2. Preparation of financial statements involves complex judgments. Because operating managers are knowledgeable about their business, they have the primary responsibility for making appropriate judgments in reflecting business transactions using the basic accrual accounting framework. The discretion given to the operating managers is valuable because it enables them to bring to bear their inside knowledge in financial statements. However, operating managers have an incentive to manipulate reported profits. To check this tendency, accounting rules are prescribed and the mechanism of external auditing is used.
3. Because outside investors have difficulty in determining whether managers have used accounting flexibility for conveying proprietary information or managing the bottom line, a number of accounting rules and conventions (collectively referred to as Generally Accepted Accounting Principles or GAAP) have evolved to check this problem.
4. External auditing is now a near universal requirement. It is meant to verify the integrity of the reported financial statements by an independent, external agent – the statutory auditor. The statutory auditor is supposed to ensure that accounting rules and conventions are consistently followed over time and the accounting estimates are reasonable.

Sources of Noise and Bias in Accounting There are several sources of potential noise and bias in accounting data.

1. Accounting rules themselves introduce noise and bias as it is often not possible to restrict managerial discretion without diminishing the informational content of accounting reports. For example, the accounting standards in India, as in several other countries, call for expensing all research and development outlays as and when incurred. Clearly, some of these outlays are expected to have future value, while others may not. However, the accounting rules don't permit management to distinguish between the two types of outlays and this leads to a systematic distortion in the reported accounting numbers.

2. Forecasting errors are practically unavoidable because it may be impossible for managers to predict correctly the future consequences of current transactions. For example, when a firm sells goods on credit, it may have to make a provision for bad debts. However, actual bad debts may be different from estimated bad debts, leading to a forecasting error.
3. Managers may introduce noise and bias in accounting reports, while making their accounting decisions. For example, they may choose accounting policies and estimates to increase the reported profit if their bonus is linked to the same.

Accounting Quality Here are the key pointers of good and bad accounting quality:

Good Accounting Quality	*Bad Accounting Quality*
■ The accounting data focuses on key success factors and risks	■ The accounting data fails to highlight key success factors and risks
■ Managers use their accounting discretion to make accounting numbers more informative	■ Managers use their accounting discretion to disguise reality
■ The firm provides adequate disclosures to describe its strategy, its current performance, and future prospects	■ The firm just fulfills the minimal disclosure requirements prescribed by accounting regulations
■ There are no red flags	■ There are serious red flags[2]

15.3 FINANCIAL ANALYSIS

We learnt in a previous chapter that the two principal methods of equity valuation are the dividend discount method and the earnings multiplier method. In practice, the earnings multiplier method is the most popular method.

The key questions to be addressed in applying the earnings multiplier method are: What is the expected EPS for the forthcoming year? What is a reasonable PE ratio given the growth prospects, risk exposure, and other characteristics of the firm?

To answer these questions, investment analysts start with a historical analysis of earnings (and dividends), growth, risk, and valuation multiples and use this as a foundation for developing the forecasts required for estimating the intrinsic value.

This section discusses the key financial metrics examined in historical financial analysis. For this discussion we will work with the financials of Horizon Limited given in Exhibit 15.2.

[2] Like unexplained changes in accounting policies to cover poor performance, unexplained transactions that inflate profits, large fourth quarter adjustments, significant related party transactions, qualified audit opinions, and so on.

Exhibit 15.2 ***Financials of Horizon Limited***

	20X1	20X2	20X3	20X4	20X5	20X6	20X7
■ Net sales	475	542	605	623	701	771	840
■ Cost of goods sold	352	380	444	475	552	580	638
■ Gross profit	123	162	161	148	149	191	202
■ Operating expenses	35	41	44	49	60	60	74
■ Operating profit	88	121	117	99	89	131	128
■ Non-operating surplus/deficit	4	7	9	6	–	–7	2
■ Profit before interest and tax (PBIT)	92	128	126	105	89	124	130
■ Interest	20	21	25	22	21	24	25
■ Profit before tax	72	107	101	83	68	100	105
■ Tax	30	44	42	41	34	40	35
■ Profit after tax	42	63	59	42	34	60	70
■ Dividend	20	23	23	27	28	30	30
■ Retained earnings	22	40	36	15	6	30	40
■ Equity share capital (Rs 10 par)	100	100	150	150	150	150	150
■ Reserves and surplus	65	105	91	106	112	142	182
■ Shareholders' funds	165	205	241	256	262	292	332
■ Loan funds	150	161	157	156	212	228	221
■ Capital employed	315	366	398	412	474	520	553
■ Net fixed assets	252	283	304	322	330	390	408
■ Investments	18	17	16	15	15	20	25
■ Net current assets	45	66	78	75	129	110	120
■ Total assets	315	366	398	412	474	520	553
■ Earnings per share					2.27	4.00	4.67
■ Market price per share (End of the year)				21.00	26.50	29.10	31.50

• Earnings and Dividend Level

To assess the earnings and dividend level, investment analysts look at metrics like the return on equity, the book value per share, the earnings per share, the dividend payout ratio, and the dividend per share.

Return on Equity Perhaps the most important indicator of financial performance, the return on equity is defined as[3]:

$$\frac{\text{Equity earnings}}{\text{Equity}}$$

[3] In Chapter 6 the return on equity was defined as: Equity earnings/Average equity. In this chapter the return on equity is defined as Equity earnings/Equity. Put in other words, the denominator is the year-end equity and not the average equity.

The return on equity of Horizon Limited for the previous three years (20X5–20X7) was:

	20X5	20X6	20X7
Return on equity	34/262 = 13.0%	60/292 = 20.5%	70/332 = 21.1%

As discussed in Chapter 6, the return on equity (ROE) can be decomposed into three factors:

$$\text{ROE} = \underbrace{\frac{\text{Profit after tax}}{\text{Sales}}}_{\text{Net Profit margin}} \times \underbrace{\frac{\text{Sales}}{\text{Assets}}}_{\text{Asset turnover}} \times \underbrace{\frac{\text{Assets}}{\text{Equity}}}_{\text{Equity multiplier}}$$

The break-up of the return on equity in terms of its determinants for the period 20X5 – 20X7 for Horizon Limited is given below:

	Return on equity	= *Net profit margin*	× *Asset turnover*	× *Equity multiplier*
20X5	13.0 %	= 4.85%	× 1.48	× 1.81
20X6	20.5%	= 7.78%	× 1.48	× 1.78
20X7	21.1%	= 8.33%	× 1.52	× 1.67

Investment analysts use one more formulation of the ROE wherein it is analysed in terms of five factors:

$$\text{ROE} = \frac{\text{PBIT}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Assets}} \times \frac{\text{Profit before tax}}{\text{PBIT}} \times \frac{\text{Profit after tax}}{\text{Profit before tax}} \times \frac{\text{Assets}}{\text{Equity}}$$

ROE = PBIT efficiency × Asset turnover × Interest burden × Tax burden × Leverage

The ROE break-up for Horizon Limited is given below:

	ROE	= *PBIT efficiency*	× *Asset turnover*	× *Interest burden*	× *Tax burden*	× *Leverage*
20X5	13.0%	= 12.70%	× 1.48	× 0.764	× 0.50	× 1.81
20X6	20.5%	= 16.08%	× 1.48	× 0.81	× 0.60	× 1.78
20X7	21.1%	= 15.48%	× 1.52	× 0.81	× 0.67	× 1.67

Book Value per Share The book value per share is equal to:

$$\frac{\text{Paid-up equity capital} + \text{Reserves and surplus}}{\text{Number of outstanding equity shares}}$$

The book value per share of Horizon Limited as at the end of 20X5, 20X6, and 20X7 is given below:

	20X5	20X6	20X7
Book value per share	262/15 = 17.47	292/15 = 19.47	332/15 = 22.13

Earnings per Share The earnings per share is equal to:

$$\frac{\text{Equity earnings}}{\text{Number of outstanding shares}}$$

The earnings per share of Omega Company for the years 20X5, 20X6, and 20X7 is given below:

	20X5	20X6	20X7
Earnings per share	34/15 = 2.27	60/15 = 4.00	70/15 = 4.67

Dividend Payout Ratio The dividend payout ratio represents the proportion of equity earnings which is paid out as dividends. It is defined as:

$$\frac{\text{Equity dividends}}{\text{Equity earnings}}$$

The dividend payout ratio of Horizon Limited for the years 20X5, 20X6, and 20X7 is given below:

	20X5	20X6	20X7
Dividend payout ratio	28/34 = 0.82	30/60 = 0.50	30/70 = 0.43

Dividend per Share The dividend per share is simply the dividend declared per share. In India the dividend is stated as a percentage of the paid up value per share. For example, a firm may declare a dividend of 50 percent. If the paid up value of its share is Rs. 10, it means that the dividend per share is Rs. 5 (50 percent of Rs. 10).

The dividend per share of Horizon Limited for the years 20X5, 20X6, and 20X7 is given below:

	20X5	20X6	20X7
Dividend per share	1.86	2.00	2.00

Note that the dividend per share is equal to: Earnings per share × Dividend payout ratio.

Growth Performance

To measure the historical growth, the **compound annual growth rate** (CAGR) in variables like sales, net profit, earnings per share, and dividend per share is calculated. To get a handle over the kind of growth that can be maintained, the **sustainable growth rate** is calculated.

Compound Annual Growth Rate The compound annual growth rate (CAGR) of sales, earnings per share, and dividend per share for a period of five years 20X2 – 20X7 for Horizon Limited is calculated below:

CAGR of Sales $$\left(\frac{\text{Sales for 20X7}}{\text{Sales for 20 X 2}}\right)^{1/5} - 1 = \left(\frac{840}{542}\right)^{1/5} - 1 = 9.2\%$$

CAGR of earnings per share (EPS) : $$\left(\frac{\text{EPS for 20X7}}{\text{EPS for 20X2}}\right)^{1/5} - 1 = \left(\frac{7.00^{4}}{6.30}\right)^{1/5} - 1 = 2.1\%$$

[4] EPS for 20X7 was Rs. 4.67. This was multiplied by a factor of 1.5 because bonus shares were issued in the ratio of 1:2 during the period 20X2-20X7.

CAGR of dividend: per share (DPS) $\left(\dfrac{\text{DPS for 20X7}}{\text{DPS for 20X2}}\right)^{1/5} - 1 = \left(\dfrac{3.00}{2.30}\right)^{1/5} - 1 = 5.5\%$

Sustainable Growth Rate The sustainable growth rate is defined as follows:

Sustainable growth rate = Retention ratio × Return on equity

Based on the average retention ratio and the average return on equity for the three year period (20X5 – 20X7) the sustainable growth rate of Horizon Limited is:

Sustainable growth rate = 0.417 × 18.2 % = 7.58%

Risk Exposure

Risk is a multi-faceted phenomenon. You may find the following measures quite useful in getting a handle over risk:

- Beta
- Volatility of return on equity

Beta As we have learnt in Chapter 8, the capital asset pricing model (CAPM) is currently the most popular risk-return model. According to the CAPM, the risk of a stock is denoted by its beta which measures how sensitive is the return on the stock to variations in the market return. The manner in which beta is calculated was discussed in Chapter 8.

According to the CAPM, the required return on an equity stock is calculated as follows:

Required return = Risk-free return + Beta [Market risk premium]

Volatility of Return on Equity The volatility of return on equity may be defined as:

$$\frac{\text{Range of return on equity over } n \text{ years}}{\text{Average return on equity over } n \text{ years}}$$

If we set n equal to say 5, the volatility of return on equity of Horizon Limited works out to:

$$\text{Volatility of return on equity} = \frac{\text{Range of return on equity over 20X3 – 20X7 years}}{\text{Average return on equity over 20X3 – 20X7 years}}$$

$$\frac{11.5\%}{19.2\%} = 0.60$$

Exhibit 15.3 shows the favourable and unfavourable factors:

Exhibit 15.3 ***Favourable and Unfavourable Factors***

	Favourable factors	*Unfavourable factors*
Earnings level	■ High book value per share	■ Low book value per share
Growth rate	■ High return on equity	■ Low return on equity
	■ High CAGR in sales and EPS	■ Low CAGR in sales and EPS
	■ High sustainable growth rate	■ Low sustainable growth rate
Risk exposure	■ Low volatility of return on equity	■ High volatility of return on equity
	■ Low beta	■ High beta

Valuation Multiples

The most commonly used valuation multiples are:

- Price to earnings ratio
- Price to book value ratio

Price to Earnings Ratio A very popular financial statistic, the price to earnings ratio (PE ratio) reflects the price investors are willing to pay for every rupee of earnings per share. The PE ratio may be calculated in a retrospective or prospective manner. The retrospective PE ratio is defined as:

$$\frac{\text{Price per share at the end of year } n}{\text{Earnings per share for year } n}$$

The prospective PE ratio is defined as:

$$\frac{\text{Price per share at the beginning of year } n}{\text{Earnings per share for year } n}$$

In investment analysis, prospective PE ratio is more widely used. This ratio for Horizon Limited for the years 20X5–20X7 is given below:

	20X5	20X6	20X7
PE ratio (Prospective)	9.25	6.63	6.23

Price to Book Value Ratio Another popular valuation statistic is the price to book value ratio which reflects the price investors are willing to pay for every rupee of book value per share. The price to book value ratio may also be defined in prospective or retrospective manner. In investment analysis the retrospective measure is more commonly used. The price to book value ratio for Horizon Limited for the years 20X5 – 20X7 is given below:

	20X5	20X6	20X7
Price to book value ratio (Retrospective)	1.52	1.49	1.42

15.4 GOING BEYOND THE NUMBERS

Analysis of financial statistics must be supplemented with an appraisal, mostly of a qualitative nature, of the company's present situation and prospects and the quality of its management.

Sizing up the Present Situation and Prospects

To size up the company's present situation and prospects, you may ask questions along the following lines:

Availability and Cost of Inputs Is the company well-placed with respect to the availability of basic raw materials, power, fuel, and other production inputs? What are the cost advantages/disadvantages of the company vis-à-vis its competitors?

Order Position What is the order position of the company? How many months or years of production does it represent? Is the order position improving or deteriorating?

Regulatory Framework What is the licensing policy applicable to the industry to which the firm belongs? Are there any price and/or distribution controls applicable to the company? If so, what are their implications for profitability?

Technological and Production Capabilities What is the technological competence of the firm? What is the state of its plant and machinery? Does the company have unutilised capacity to exploit favourable market development?

Marketing and Distribution What is the image of the company in the marketplace? How strong is the loyalty of its customers/clients? What is the reach of the distribution network?

Finance and Accounting What are the internal accruals? How much access does the company have to external financing? How conservative or liberal are the accounting policies of the firm? Does the company take great efforts to manage the bottom line? Is the depreciation charge adequate? What are the products in the portfolio of the company? What are the prospects of these products? How competitive is the position of the company in these products? What are the overall prospects of the company?

Human Resources and Personnel How competent and skilled is the workforce of the company? Is the company over-staffed or under-staffed? What is the extent of employee turnover and absenteeism? How high is employee productivity? What is the state of industrial relations? What is the level of employee motivation and morale?

Some information relating to the above questions may be available in the annual report of the company, some can be gathered from the financial press, and the rest may be obtained from the officials of the company.

Warren Buffett on the Key to Investing

The key to investing is not assessing how much an industry is going to affect society, or how much it will grow, but rather determining the competitive advantage of any company and, above all, the durability of that advantage.

Evaluation of Management

Many financial analysts believe that there is no need to consider management as an independent factor in company analysis because the quality of management is reflected in sales growth, profit margins, return on equity, and so forth. Management experts, however, argue that management and 'the numbers' should be regarded as separate aspects. Peter F. Drucker, for example, observed that: "The performance of a business today is largely a result of the performance, or lack of it, of earlier managements of years past. Good management means doing a good job in preparing today's business for the future."[5] Echoing a similar thought, Theodore Levitt wrote that "the mark of good management is not simply how it runs its businesses but how well it changes them."[6] We subscribe to the view that the quality of management is an important factor shaping the success of the firm and returns to shareholders and hence calls for a separate evaluation.

While a firm may earn superior returns on account of competitive advantage arising from factors like proprietary technology, strategic location, access to cheap raw materials, scale of operations, and brand equity, the quality of management is perhaps the key factor shaping the profitability of a firm. The sterling performance of firms like Infosys, Reliance, WIPRO, HDFC, Asian Paints, and Bharati Teleservices can be attributed mainly to their outstanding management.

To assess the quality of management, the analyst should ask questions like.

- What is the grand design of management? Does it believe in "staying close to the knitting" or unrelated diversification?
- What is the calibre, motivation, integrity, dynamism, and commitment of the top management personnel?
- Does the management have specific objectives, plans, and time-bound programmes?
- What emphasis is accorded to research and development?
- How effective is the organisational structure?
- How sound are the management systems of the company?
- What is the importance assigned to management development?
- How investor-friendly is the management?
- How strong is the execution capability of the management?

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5 Peter F. Drucker "A New Scorecard for Management", *The Wall Street Journal*, September 24, 1976.

6 Theodore Levitt, "Dinosaurs Among the Bears and Bulls", *Harvard Business Review*, January-February 1975.

15.5 ESTIMATION OF INTRINSIC VALUE

The procedure commonly employed by investment analysts to estimate the intrinsic value of a share consists of the following steps:

1. Estimate the expected earnings per share
2. Establish a PE ratio
3. Develop a value anchor and a value range

Estimate the Expected Earnings per Share (EPS)

Based on how the company has done in the past, how it is faring currently, and how it is likely to do in future, the investment analyst estimates the future (expected) EPS. An estimate of EPS is an educated guesses about the future profitability of the company. A good estimate is based on a careful projection of revenues and costs. Analysts listen to what customers say about the products and services of the company, talk to competitors and suppliers, and interview management to understand the evolving prospects of the company.

As an illustration, the expected EPS for Horizon Limited for the year 20X8 is developed in Exhibit 15.4.

Exhibit 15.4 ***EPS Forecast***

	20X7 (Actual)	*20X8 (Projected)*	*Assumption*
Net sales	840	924	Increase by 10 percent
Cost of goods sold	638	708	Increase by 11 percent
Gross profit	202	216	
Operating expenses	74	81	Increase by 9.5 percent
Depreciation	30	34	
Selling & general administration expenses	44	47	
Operating profit	128	135	
Non-operating surplus/deficit	2	2	No change
Profit before interest and tax (PBIT)	130	137	
Interest	25	24	Decrease by 4 percent
Profit before tax	105	113	
Tax	35	38	Increase by 8.57 percent
Profit after tax	70	75	
Number of equity shares	15 million	15	
Earnings per share	Rs 4.67	Rs 5.00	

Note that the EPS forecast is based on a number of assumptions about the behaviour of revenues and costs. So the reliability of the EPS forecast hinges critically on how realistic are these assumptions.

As an investor when you look at an earnings forecast, examine the assumptions underlying the forecast. What assumptions has the analyst made for demand growth, market share, raw material prices, import duties, product prices, interest rates, asset turnover, and income tax rate? Based on this assessment you can decide how optimistic or pessimistic is the earnings forecast. It is better to work with a range rather than a single number. Paint a few scenarios—optimistic, pessimistic, and normal—and examine what is likely to happen to the company under these circumstances.

In addition to the EPS, the cash flow per share which is defined as:

$$\frac{\text{Profit after tax + Depreciation and other non-cash charges}}{\text{Number of outstanding equity shares}}$$

is also estimated. The cash flow per share in the above illustration is (75+34)/15 = Rs. 7.27. The rationale for using the cash flow per share is that the depreciation charge in the books is merely an accounting adjustment, devoid of economic meaning. Well managed companies, it may be argued, maintain plant and equipment in excellent condition through periodic repairs, overhauling, and conditioning. As the expenses relating to these are already reflected in manufacturing costs, one can ignore the book depreciation charge. (This argument, however, may not be valid for all companies. So, you must look into the specific circumstances of the company to judge what adjustments may be appropriate).

Establish a PE Ratio

The other half of the valuation exercise is concerned with the price-earnings ratio which reflects the price investors are willing to pay per rupee of EPS. In essence, it represents the market's summary evaluation of a company's prospects.

The PE ratio may be derived from the constant growth dividend model, or cross-section analysis, or historical analysis.

Constant Growth Dividend Model In Chapter 13, we derived the PE ratio for a constant growth firm from the constant growth dividend discount model.

$$\text{PE ratio} = \frac{\text{Dividend payout ratio}}{\text{Required return on equity} - \text{Expected growth rate in dividends}}$$

Dividend Payout Ratio Most companies consider their dividend commitment seriously. Consequently, once dividends are set at a certain level they are not reduced unless there is no alternative. Further, dividends are not increased unless it is clear that a higher level of dividends can be sustained. Thanks to these policies, dividends adjust with a lag to earnings.

Different PE Ratios

Note that different PE ratios can be calculated for the same stock at any given point in time:

- PE ratio based on last year's reported earnings
- PE ratio based on trailing 12 months earnings
- PE ratio based on current year's expected earnings
- PE ratio based on the following year's expected earnings

An example may be given to illustrate the different PE ratios. The equity stock of ABC Limited is trading on August 1, 20X5 for Rs.120 and the following EPS data is available:

EPS for last year (April 1, 20X4 – March 31, 20X5): Rs.8
EPS for trailing 12 months (July 1, 20X4 – June 30, 20X5): Rs.8.5
EPS expected for the current year (April 1, 20X5 – March 31, 20X6): Rs.9.0
EPS expected for the following year (April 1, 20X6 – March 31, 20X7): Rs.10.0

The different PE ratios are as follows:

- PE ratio based on last year's reported earnings: 120/8 = 15.0
- PE ratio based on trailing 12 months earnings: 120/8.5 = 14.1
- PE ratio based on current year's expected earnings: 120/9.0 = 13.3
- PE ratio based on the following year's expected earnings: 120/10.0 = 12.0

In our discussion we will use the PE ratio based on current year's expected earnings.

If the dividend payout ratio increases the above ratio increases which has a favourable effect on the price-earnings multiple. However, an increase in the dividend payout ratio has the effect of lowering the expected growth rate of dividends in the denominator of the above ratio which leads to a decrease in the price-earnings multiple. On the whole, in most cases, these two effects are likely to balance out.

Required Return on Equity The required return on equity is a function of the risk-free rate of return and a risk premium. According to the capital asset pricing model, a popularly used risk-return model, the required return on equity is:

Risk-free return + (Beta of equity) (Expected market risk premium)

Expected Growth Rate in Dividends The third variable influencing the PE ratio is the expected growth rate in dividends. The expected growth rate in dividends is equal to:

$$\text{Retention ratio} \times \text{Return on equity}$$

As an illustration, the dividend payout ratio, the required return on equity, and the expected growth rate in dividends for Horizon Limited are developed below:

1. The dividend payout ratio for 20X8 is set equal to the average dividend payout ratio for the period 20X5 – 20X7

$$\frac{0.82 + 0.50 + 0.43}{3} = 0.58$$

2. To get the required rate of return, the following assumptions have been made: (a) The risk-free rate is 9 percent, (b) the beta of Horizon's stock is 1.1, and (c) the expected market risk premium is 7 percent. Given these assumptions the required return on the equity stock of Horizon Limited is:

$$9 + 1.1\ (7) = 16.7 \text{ percent}$$

3. The expected growth rate in dividends may be set equal to the product of the average retention ratio and the average return on equity for the previous three years, 20X5–20X7. This works out to:

$$0.417 \times 18.2\% = 7.58\%$$

Using the above inputs the PE ratio for the stock of Horizon Limited works out to:

$$\frac{0.58}{0.167 - .0758} = 6.36$$

Cross-Section Analysis You can look at the PE ratios of similar firms in the industry and take a view on what is a reasonable PE ratio for the subject company.

Alternatively, you can conduct cross-section regression analysis wherein the PE ratio is regressed on several fundamental variables. Here is an illustrative specification:

$$\text{PE ratio} = a_1 + a_2 \text{ Growth rate in earnings} + a_3 \text{ Dividend payout ratio} + a_4 \text{ Variability of earnings} + a_5 \text{ Company size}$$

Based on the estimated coefficients of such cross-section regression analysis, the PE ratio for the subject firm may be derived.

Historical Analysis You can look at the historical PE ratio of the subject company and take a view on what is a reasonable PE ratio, taking into account the changes in the capital market and the evolving competition.

As an illustration, the prospective PE ratio for Horizon Limited for the past three years was

	20X5	20X6	20X7
PE Ratio	9.25	6.63	6.23

The average PE ratio for Horizon Limited was:

$$\frac{9.25 + 6.63 + 6.23}{3} = 7.37$$

Considering the changing conditions in the capital market and the emerging competition for Horizon Limited you may say that the average PE for the past three years is applicable in the immediate future as well.

The Weighted PE Ratio We arrived at two PE ratio estimates:

PE ratio based on the constant growth dividend discount model	: 6.36
PE ratio based on historical analysis	: 7.37

We can combine these two estimates by taking a simple arithmetic average of them - this means that both the estimates are accorded equal weight. Doing so, we get the weighted PE ratio of:

$$\frac{6.36 + 7.37}{2} = 6.87$$

- **Determine a Value Anchor and a Value Range**

The value anchor is obtained as follows:

Projected EPS × Appropriate PE ratio

In our illustration, the projected EPS is Rs 5.00 and the appropriate PE multiple is 6.87. Hence the value anchor is Rs 34.35. However, as valuation is inherently an uncertain and imprecise exercise, it would be naïve to put great faith in a single point intrinsic value estimate. Practical wisdom calls for defining an intrinsic value range around the single point estimate. For example, in the above illustration, where an intrinsic value estimate of Rs 34.35 has been arrived at, it may be more sensible to talk of an intrinsic value range of say Rs 30 to Rs 38. When you define a range like this, you are essentially saying that a "there may be a bias and error is my estimate. In view of this, I feel that the value range is Rs 30 to Rs 38." Given this value range, your decision rule may be as follows:

Market Price	*Decision*
Less than Rs 30	Buy
Between Rs 30 and Rs 38	Hold
More than Rs 38	Sell

15.6 TOOLS FOR JUDGING UNDERVALUATION OR OVERVALUATION

Investment practitioners have developed a variety of tools to judge whether a stock is undervalued or overvalued. A few tools are briefly described below.

PBV-ROE Matrix Consider the matrix presented in Exhibit 15.5. According to this matrix, a stock is deemed to be undervalued if it has a low PBV (price to book value) and a high ROE (return on equity) — ROE is assessed in relation to the required returns; on the other hand, a stock is deemed to be overvalued if it has a high PBV and low ROE.

Growth-Duration Matrix Consider one more matrix presented in Exhibit 15.6. According to this matrix, a stock is deemed to be undervalued if it has a high expected five-year EPS growth rate and a low duration[7] (or high dividend yield); on the other hand a stock is deemed to be overvalued if it has a low expected five-year EPS growth rate and a high duration (or low dividend yield).

[7] The duration of an equity stock is in practice equated with the inverse of its dividend yield.

Exhibit 15.5 ***PBV-ROE Matrix***

PBV Ratio	Low ROE	High ROE
High	**Overvalued** Low ROE High PBV	High ROE High PBV
Low	Low ROE Low PBV	**Undervalued** High ROE Low PBV

ROE

Exhibit 15.6 ***Growth-Duration Matrix***

Expected 5-Yr EPS Growth	Low	High
High	**Undervalued**	**Promises of growth**
Low	**Dividend cows**	**Overvalued**

Duration (1/Dividend Yield)

Expectations Risk Index Developed by Al Rappaport[8], the expectations risk index (ERI) essentially reflects the risk in realising the expectations embedded in the current market price. To estimate the ERI, you have to answer two questions:

- What proportion of the stock's price depends on future value-creating growth?
- How difficult will it to be achieve the growth rate expected by the market?

To understand how these questions are answered, let us consider an example. The price per share of Omega Limited is Rs. 150. Omega's operating cash flow (before growth investment) per share is Rs. 10. Omega's cost of equity is 15 percent. Omega's after-tax "cash" operating earnings grew by 20 percent over the past three years; the market expects the same to grow by 50 percent over the next three years.

Given the above numbers, Omega's base line value is Rs. 10/0.15 = Rs. 66.7. So, the proportion of the stock price coming from investors' expectations of future growth opportunities is:

[8] Al Rappaport, "Three Lessons for Investors, Including a New Stock Picking Tool, the ERI," *Wall Street Journal*, February 27, 1997.

$$\frac{\text{Rs }150 - \text{Rs }66.7}{\text{Rs }150} = 0.56$$

Omega's ratio of expected future growth to recent growth (called the acceleration ratio) is:

$$\frac{1.50}{1.20} = 1.25$$

The ERI is defined as:

ERI = Proportion of the stock price coming from investors' expectations of future growth × Acceleration ratio

Omega's ERI is

$0.56 \times 1.25 = 0.70$

In general, the lower the ERI, the greater the chance of achieving expectations and the higher the expected return for investors. Likewise, the higher the ERI, the smaller the chance of achieving expectations and the lower the expected return for investors.

15.7 OBSTACLES IN THE WAY OF AN ANALYST

There are three main obstacles in the way of successful fundamental analysis:

- Inadequacies or incorrectness of data
- Future uncertainties
- Irrational market behaviour

Inadequacies or Incorrectness of Data An analyst has to often wrestle with inadequate or incorrect data. While deliberate falsification of data may be rare, subtle misrepresentation and concealment are common. Often, an experienced and skilled analyst may be able to detect such ploys and cope with them. However, in some instances, he too is likely to be misled by them into drawing wrong conclusions.

Future Uncertainties Future changes are largely unpredictable; more so when the economic and business environment is buffeted by frequent winds of change. In an environment characterised by discontinuities, the past record is a poor guide to future performance.

Irrational Market Behaviour The market itself presents a major obstacle to the analyst. On account of neglect or prejudice, undervaluations may persist for extended periods; likewise, overvaluations arising from unjustified optimism and misplaced enthusiasm may endure for unreasonable lengths of time. The slow correction of under or overvaluation poses a threat to the analyst. Before the market eventually reflects the values established by the analyst, new forces may emerge. The appearance of new factors, before the market adjusts itself to the value discovered by the analyst, represents a danger to the analyst.

15.8 EXCELLENT VERSUS UNEXCELLENT COMPANIES

In their bestseller, *In Search of Excellence: Lessons from America's Best-Run Corporations,*[9] Thomas J. Peters and Robert H. Waterman, Jr. profiled companies that were identified as "excellent" on the basis of six measures of long-term financial performance computed over the period 1961-1980: compound asset growth, compound equity growth, average market value to book value ratio, average return on total capital, average return on equity, and average return on sales. After studying 43 companies (of which 36 were publicly traded at that time) that qualified on these criteria, the authors identified the following attributes of excellent companies: (i) a bias toward action; (ii) close relations with customers; (iii) autonomy and entrepreneurship; (iv) productivity through people; (v) hands-on and value driven; (vi) sticking to the knitting; (vii) simple form, lean staff; and (viii) simultaneous loose-tight properties.

In a study published in the May-June 1987 issue of *Financial Analysts Journal*, Michelle Clayman examined 29 of the original 36 publicly traded "excellent companies" that still existed as separate publicly traded companies in December 1985. She found that the financial health of these companies, as measured by the same six ratios employed by Peters and Waterman, deteriorated more or less across the board over the five year period, 1981 through 1985.

Out of curiosity, Michelle Clayman looked at 39 companies that ranked at the bottom in terms of the same financial ratios. Interestingly, these companies, labeled as "unexcellent companies," registered, in general, significant improvement in performance over the five year period, 1981 through 1985.

The comparison is striking. Over the five year period (1981-1985), the portfolio of "excellent companies" had 11 outperformers and 18 underperformers and it beat S & P 500 by 1 percent per year. During the same period the portfolio of "unexcellent" companies had 25 outperformers and 14 underperformers and it beat the S & P 500 by a whopping 12 percent per year.

In a study done with the financial data for Indian companies, Sandeep Revankar identified "excellent" and "non-excellent" companies based on an analysis of seven financial parameters (compound asset growth, compound equity growth, average return on equity, average return on sales, average return on capital employed, average return on assets, and average cash profit/sales) for the four year period 1995-1999. He examined the performance of the "excellent" companies and "non-excellent" companies during the following four year period, 2000-2004. In general, he found that the financial performance of "excellent" companies deteriorated, whereas the financial performance of "non-excellent" companies improved. More important, the investment returns provided by "excellent" companies were far inferior to those provided by "non-excellent" companies.

Empirical evidence of this kind reflects the phenomenon of **reversion to the mean** which says that, over time, financial performance of companies tends to converge to

[9] Published by Harper and Row in 1982.

the average value of the group as a whole. Thanks to this tendency, "good" past performers are likely to produce inferior investment results and "poor" past performers are likely to produce superior investment results. As Michelle Clayman put it: "The 'good' companies underperform because the market overestimates their future growth and future return on equity and, as a result, accords the stocks overvalued price-to-book ratios; the converse is true of the 'poor' companies."

15.9 EQUITY RESEARCH IN INDIA

Traditionally, lip sympathy was paid to equity research. Financial institutions (mutual funds, in particular) had a research cell because it was in good form to have one. Likewise, large brokers set up equity research cells to satisfy their institutional clients. In the mid-1980s more progressive firms like Enam Financial, DSP Financial Consultants, and Motilal Oswal Securities Limited set up research divisions to exploit the opportunities in the equity market. With the entry of foreign institutional investors and the emergence of more discerning investors, the need for equity research is felt more widely. Indeed, currently equity research is a growing area.

Equity researchers who are able to do their job well have bright prospects. The future belongs to those who will:

- Have a clear understanding of what their research is supposed to do and how they should go about doing it.
- Learn to interpret financial numbers and assess qualitative factors which may not be immediately reflected in numbers.
- Develop a medium-term or long-term perspective based on an incisive understanding of the dynamics of the companies analysed.

SUMMARY

- Strategy analysis seeks to explore the economics of a firm and identify its profit drivers so that the subsequent financial analysis reflects business realities.
- The profit potential of a firm is influenced by the industry or industries in which it participates (industry choice), by the strategy it follows to compete in its chosen industry or industries, and by the way in which it exploits synergies across its business portfolio (corporate strategy).
- Accounting analysis seeks to evaluate the extent to which the firm's accounting reports capture its business reality.
- The salient features of the institutional framework for financial reporting are: accrual accounting, exercise of judgments by managers, generally accepted accounting principles (GAAP), and external auditing.
- The two principal methods of equity valuation are the dividend discount method and the earnings multiplier method.
- In practice, the earnings multiplier method is the most popular method. The key questions to be addressed in the earnings multiplier method are: What is the

expected EPS for the forthcoming year? What is a reasonable PE ratio given the growth prospects, risk exposure, and other characteristics of the firm? To answer these questions, the investment analyst starts with a historical analysis of earnings (and dividends), growth, risk, and valuation and uses this as a foundation for developing the forecasts required for estimating the intrinsic value.

- To assess the earnings and dividend level, investment analysts look at metrics like the return on equity, the book value per share, the EPS, the dividend payout ratio, and the dividend per share.
- The return on equity (ROE), perhaps the most important metric of financial performance, is decomposed in two ways for analytical purposes.

  ROE = Net profit margin × Asset turnover × Equity multiplier

  ROE = PBIT efficiency × Asset turnover × Interest burden × Tax burden × Equity multiplier

- To measure the historical growth, the compounded annual growth rate (CAGR) in variables like sales, net profit, earnings per share, and dividend per share are calculated. To get a handle over the kind of growth that can be maintained, the sustainable growth rate is calculated.
- Risk is a multi-faceted phenomenon. You may find the following measures quite useful in getting a handle over risk: beta and volatility of return on equity.
- The most commonly used valuation multiples are: price-to-earnings (PE) ratio and price-to-book value ratio.
- Analysis of financial statistics must be supplemented with an appraisal, mostly of a qualitative nature, of the company's present situation and prospects and the quality of its management.
- The procedure commonly employed by investment analysts to estimate the intrinsic value of a share consists of the following steps: (i) Estimate the expected EPS. (ii) Establish a PE ratio. (iii) Develop a value anchor and the value range.
- Based on how the company has done in the past, how it is faring currently, and how it is likely to do in future, the investment analyst estimates the expected EPS. An estimate of EPS is an educated guess about the future profitability of the company. A good estimate is based on a careful projection of revenues and costs. Analysts listen to what customers say about the products and services of the company, talk to competition and suppliers, and interview management to understand the evolving prospects of the company.
- The PE ratio may be derived from the constant growth dividend model, or cross-section analysis, or historical analysis. According to the constant growth dividend model, the PE ratio is determined by the dividend payout ratio, the required return on equity, and the expected growth rate in dividends.
- You can look at the PE ratios of similar firms in the industry or take a view on what is a reasonable PE ratio for the subject company. Alternatively, you can conduct cross-section regression analysis and use that as a basis for deriving the PE ratio for the subject company.

- You can look at the historical PE ratio of the subject company and take a view on what is a reasonable PE ratio, taking into account the changes in the capital market and the evolving competition.
- The value anchor is obtained as follows:

  Projected EPS × Appropriate PE ratio

  Since valuation is inherently an uncertain and imprecise exercise, practical wisdom calls for defining an intrinsic value range around the value anchor.
- Investment practitioners have developed a variety of matrices for taking a view on whether a stock is undervalued or overvalued. According to one matrix, a stock is deemed to be overvalued if it has a low return on equity and high price to book value; on the other hand, a stock is deemed to be undervalued if it has a high return on equity and low price to book value. According to another matrix, a stock is deemed to be overvalued if it has low dividend yield and low expected 5-year EPS growth; on the other hand, a stock is deemed to be undervalued if it has high dividend yield and high expected 5-year EPS growth.
- There are three main obstacles in the way of successful fundamental analysis: inadequacies or incorrectness of data; future uncertainties, and irrational market behaviour.

QUESTIONS

1. What factors should the analyst examine to determine whether a firm is likely to gain competitive advantage?
2. When are transaction costs inside a firm likely to be less compared to market based transactions?
3. What factors should the analyst examine to assess whether a firm's competitive strategy has the potential to create value?
4. Describe the salient features of the institutional framework for financial reporting.
5. Discuss the potential sources of noise and bias in accounting data.
6. Compare good accounting quality with bad accounting quality.
7. What are the key financial metrics employed in historical financial analysis of a company?
8. Describe two commonly used ways of decomposing ROE into its underlying determinants.
9. What non-financial company factors will you consider in fundamental analysis?
10. Explain the procedure commonly employed by investment analysts to estimate the intrinsic value of a share.
11. Describe tools for judging undervaluation or overvaluation of shares.
12. What are the obstacles in the way of an equity analyst?
13. Comment on equity research in India.

SOLVED MINICASE

1. The financials of GSM Limited are given below:

Financials of GSM Limited

(Rs in million)

	20 X 1	20 X 2	20 X 3	20 X 4	20 X 5
■ Net sales	1020	1090	1210	1350	1520
■ Cost of goods sold	734	807	883	959	1095
■ Gross profit	286	283	327	391	425
■ Operating expenses	72	74	85	105	120
■ Operating profit	214	209	242	286	305
■ Non-operating surplus/deficit	11	14	18	–12	–5
■ PBIT	225	223	260	274	300
■ Interest	40	45	60	66	55
■ Profit before tax	185	178	200	208	245
■ Tax	35	38	40	52	50
■ Profit after tax	150	140	160	156	195
■ Dividends	60	60	65	65	70
■ Retained earnings	90	80	95	91	125
■ Equity share capital (Rs 10 par)	200	200	200	250*	250
■ Reserves and surplus	400	480	575	616	741
■ Shareholders'funds	600	680	775	866	991
■ Loan funds	400	450	550	600	615
■ Capital employed	1000	1130	1325	1466	1606
■ Net fixed assets	600	650	710	850	900
■ Investments	50	55	60	70	80
■ Net current assets	350	425	555	546	626
■ Total assets	1000	1130	1325	1466	1606
■ Market price per share (End of year)	60	55	65	57	75

Required

(a) Calculate the following for the last five years: Return on equity; Book value per share; EPS; Bonus adjustment factor; Adjusted EPS; PE ratio (prospective); PB ratio (retrospective); Retention ratio.

(b) Calculate the CAGR of sales, CAGR of EPS, and volatility of ROE

(c) Calculate the sustainable growth rate based on the average retention ratio and average return on equity for the past 3 years.

(d) Decompose the ROE for the last two years in terms of five factors.

(e) Estimate the EPS for the next year (20X6) using the following assumptions: (i) Net sales will increase by 12%. (ii) Cost of goods sold will increase by 11% (iii) Operating expenses will increase by 10%. (iv) There will be nil non-operating surplus or deficit. (v) Interest will decrease by 2%. (vi) Effective tax rate will increase by 2%.

(f) Derive the PE ratio using the constant growth dividend model. For this purpose use the following assumptions: (i) The dividend payout ratio for 20 X 6 is set equal to the average dividend payout ratio for the period 20X3 – 20X5. (ii) The required rate of return is estimated with the help of the capital asset pricing model (Risk-free return = 9%, Beta of GSM's stock = 0.9, Market risk premium = 8%). (iii) The expected growth rate in dividends is set equal to the product of the average retention ratio and the average return on equity for the previous three years.

(g) Establish a value anchor.

Solution

Return on equity = Profit after tax / Shareholders' funds
Book value per share = Shareholders' funds / Number of shares
EPS = Profit after tax / Number of shares

$$\text{Bonus adjustment factor} = \frac{\text{Capital after bonus issue}}{\text{Capital before bonus issue}}$$

$$\text{PE ratio (prospective)} = \frac{\text{Price per share at the beginning of the year}}{\text{Earnings per share for the year}}$$

$$\text{CAGR in sales} = \left(\frac{\text{Sales for } 20\times5}{\text{Sales for } 20\times1}\right)^{1/4} - 1$$

$$\text{CAGR in EPS} = \left(\frac{\text{EPS for } 20\times5}{\text{EPS for } 20\times1}\right)^{1/4} - 1$$

Sustainable growth rate = Retention ratio X ROE

(a)

	20X1	*20X2*	*20X3*	*20X4*	*20X5*
Return on equity	150/ 600 = 25%	140/ 680 = 20.6%	160/ 775 = 20.6%	156/ 866 = 18.0%	195/ 991 = 19.7%
Book value per share	600/ 20 = Rs 30	680/ 20 = Rs 34	775/ 20 = Rs 38.8	866/ 25 = Rs 34.6	991/ 25 = Rs 39.6
EPS	150/ 20 Rs 7.50	140/ 20 = Rs 7.00	160/ 20 = Rs 8.00	156/ 25 = Rs 6.24	195/ 25 = Rs 7.80
Bonus adjustment factor	1	1	1	1.25	1.25
Adjusted EPS	Rs 7.50	Rs 7.00	Rs 8.00	Rs 7.80	Rs 9.75
PE ratio (prospective)	60/ 7.00 = 8.6	55/ 8.00 = 6.9	65/ 6.24 = 10.4	57/ 7.80 = 7.3	
PB ratio (retrospective)	60/ 30 = 2.0	55/ 34 = 1.6	65/ 38.8 = 1.7	57/ 34.6 = 1.6	75/ 39.6 = 1.9
Retention ratio	95/ 160	91/ 156	125/ 195 = 0.59	= 0.58	= 0.64

(b) CAGR of sales = $\left(\frac{1520}{1020}\right)^{1/4} - 1 = 0.105 = 10.5\%$

$$\text{CAGR of EPS} = \left(\frac{9.75}{7.50}\right)^{1/4} - 1 = 0.068 = 6.8\%$$

$$\text{Volatility of ROE} = \frac{25-18}{20.8} = 0.34$$

(c) $$\text{Sustainable growth rate} = \left(\frac{0.59+0.58+0.64}{3}\right)\left(\frac{20.6+18.0+19.7}{3}\right)$$

$$= (.603)\ (19.43) = 11.72\%$$

(d) $$\text{ROE} = \frac{\text{PBIT}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Assets}} \times \frac{\text{Profit before tax}}{\text{PBIT}} \times \frac{\text{Profit after tax}}{\text{Profit before tax}} \times \frac{\text{Assets}}{\text{Equity}}$$

The decomposition of ROE for the last two years, viz., 20 X 4 and 20 X 5 is shown below:

	$\frac{\text{PBIT}}{\text{Sales}}$		$\frac{\text{Sales}}{\text{Assets}}$		$\frac{\text{Profit before tax}}{\text{PBIT}}$		$\frac{\text{Profit after tax}}{\text{Profit before tax}}$		$\frac{\text{Assets}}{\text{Equity}}$
20×4	0.203	×	0.921	×	0.759	×	0.750	×	1.693
20×5	0.197	×	0.946	×	0.817	×	0.796	×	1.621

(e) EPS estimate for 20 X 6 is

	20 X 5	*20 X 6*	*Remarks*
Net sales	1520	1702.4	Increase by 12%
Cost of goods sold	1095	1215.5	Increase by 11%
Operating expenses	120	132	Increase by 10%
Non-operating surplus/deficit	–5	0	Nil
PBIT	300	354.9	
Interest	55	53.9	Decrease by 2%
Profit before tax	245	301	
Tax	50	67.4	Increase of tax rate 2%
Profit after tax	195	233.6	
EPS		Rs 9.34	

(f) Average retention ratio for the period $20 \times 3 - 20 \times 5$ was 0.603. So the average payout ratio was $1 - 0.603 = 0.397$

Required rate of return

$= 9\% + 0.9 \times 8\% = 16.2\%$

Expected growth rate in dividends

Average retention ratio × Average return on equity
= in the last three years × in the last three years

$$\text{Average return on equity in the last three years} = \frac{20.6+18.0+19.7}{3} = 19.43$$

So, the expected growth rate in dividends is:

$$0.603 \times 19.43 = 11.72\%$$

The PE ratio as per the constant growth model is:

$$\frac{0.397}{.1620 - 0.1172} = 8.86$$

(g) The value anchor is:
Expected EPS × PE ratio
= Rs 9.34 × 8.86 = Rs 82.8

PROBLEMS

1. The financials of Manotech Limited are given below:

(Rs in million)

	20 X 1	*20 X 2*	*20 X 3*	*20 X 4*	*20 X 5*
■ Net sales	250	290	345	480	520
■ Cost of goods sold	190	222	270	378	404
■ Gross profit	60	68	75	102	116
■ Operating expenses	15	18	20	28	30
■ Operating profit	45	50	55	74	86
■ Non-operating surplus/deficit	5	8	9	6	8
■ PBIT	50	58	64	80	94
■ Interest	15	18	20	24	28
■ Profit before tax	35	40	44	56	66
■ Tax	9	11	12	14	17
■ Profit after tax	26	29	32	42	49
■ Dividends	10	12	12	16	16
■ Retained earnings	16	17	20	26	33
■ Equity share capital (Rs. 5 par)	80	80	80	120*	120
■ Reserves and surplus	40	57	77	63	96
■ Shareholders' funds	120	137	157	183	216
■ Loan funds	60	63	73	90	100
■ Capital employed	180	200	230	273	316
■ Net fixed assets	105	128	150	195	210
■ Investments	10	12	15	5	16
■ Net current assets	65	60	65	73	90
■ Total assets	180	200	230	273	316
■ Market price per share (End of year)	Rs 17.50	21.00	24.5	21.6	24.2

* Bonus shares were issued in the ratio of 1:2.

(a) Calculate the following for the last five years: Return on equity; Book value per share; EPS; Bonus adjustment factor; Adjusted EPS; PE ratio (prospective); PB ratio (retrospective); Retention ratio.

(b) Calculate the CAGR of sales, CAGR of EPS, and volatility of ROE.
(c) Calculate the sustainable growth rate based on the average retention ratio and average return on equity for the past 3 years.
(d) Decompose the ROE for the last two years in terms of five factors.

MINICASE

1. The financials of MM Limited are given below:

(Rs in million)

	20 X 1	*20 X 2*	*20 X 3*	*20 X 4*	*20 X 5*
■ Net sales	780	910	1120	1400	1780
■ Cost of goods sold	600	720	850	1030	1210
■ Gross profit	180	190	270	370	570
■ Operating expenses	70	80	100	120	170
■ Operating profit	110	110	170	250	400
■ Non-operating surplus/deficit	10	20	30	20	10
■ PBIT	120	130	200	270	410
■ Interest	40	50	60	80	120
■ Profit before tax	80	80	140	190	290
■ Tax	20	20	30	40	50
■ Profit after tax	60	60	110	150	240
■ Dividends	20	20	30	40	50
■ Retained earnings	40	40	80	110	190
■ Equity share capital (Rs 10 par)	300	300	300	300	300
■ Reserves and surplus	200	240	320	430	620
■ Shareholder's funds	500	540	620	730	920
■ Loan funds	500	550	600	700	980
■ Capital employed	1000	1090	1220	1430	1900
■ Net fixed assets	570	650	780	920	1100
■ Investments	30	30	20	40	40
■ Net current assets	400	410	420	470	760
■ Total assets	1000	1090	1220	1430	1900
■ Market price per share (End of year)	Rs 20	22	45	56	78

Required

(a) Calculate the following for the last five years: Return on equity; Book value per share; EPS; Bonus adjustment factor; Adjusted EPS; PE ratio (prospective); PB ratio (retrospective); Retention ratio.
(b) Calculate the CAGR of sales, CAGR of EPS, and volatility of ROE.
(c) Calculate the sustainable growth rate based on the average retention ratio and average return on equity for the past 3 years.
(d) Decompose the ROE for the last two years in terms of five factors.

(e) Estimate the EPS for the next year (20 X 6) using the following assumptions: (i) Net sales will increase by 15%. (ii) Cost of goods sold will increase by 16%. (iii) Operating expenses will increase by 20%. (iv) Non-operating surplus will be Rs 10 million. (v) Interest will increase by 10%. (vi) The effective tax rate will increase by 5%.

(f) Derive the PE ratio using the constant growth dividend model. For this purpose use the following assumptions: (i) The dividend payout ratio for 20 X 6 is set equal to the average dividend payout ratio for the period 20 X 3 – 20 X 5. (ii) The required rate of return is estimated with the help of the capital asset pricing model (Risk-free rate = 10%, Beta of MM's stock = 1.1, Market risk premium = 8%). (iii) The expected growth rate in dividends is set equal to the product of the average retention ratio and the average return on equity for the previous three years.

(g) Established a value anchor.

APPENDIX 15A
AN ILLUSTRATIVE EQUITY RESEARCH REPORT

The following equity research report has been prepared by CLSA ASIA-PACIFIC MARKETS (Analysts: Somshankar Sinha and Dheeraj Vaidya), and released on October 8, 2007. It is reproduced here with the permission of CLSA ASIA-PACIFIC MARKETS. This report is meant to illustrate how a real life equity research report looks like. *It is given here purely with a pedagogic objective*. The views expressed in this illustrative report do not reflect the views of the author of this book.

CLSA ASIA-PACIFIC MARKETS

Reliance Industries

Rs2,483.90 - OUTPERFORM

On the cusp of $100bn

Reliance is on the cusp of becoming India's first $100bn market-cap stock. With an ambitious management team at its helm which obsesses over world-class project execution, scale and operational efficiency, it was only a matter of time before its growth initiatives across businesses propelled it past this milestone. With organised retail and SEZ still not fully reflected in valuations, this is not the end of the road. We have been surprised, though, by the pace of its meteoric rise which has made it one of the most expensive stocks in this elite 74-member club (avg PE = 16x).

$100bn market cap club

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08 October 2007

India

Energy

Reuters RELI.BO
Bloomberg RIL IN

Priced on 5 October 2007
India Sensex @ 17,773.4

12M hi/lo Rs2,539.00/1,138.20

Shares in issue 1,453.6m
Free float (est.) 49.2%

Market cap US$91,480m

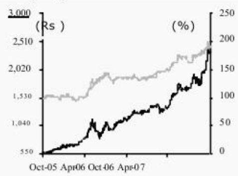
3M average daily volume
Rs7,581.3m (US$187.4m)

Major shareholders
Ambani Family 37.1%
Treasury Stock 13.7%

Foreign s'holding 23.9%

Stock performance (%)

	1M	3M	12M
Absolute	26.9	45.4	115.0
Relative	10.3	21.6	49.9
Abs (US$)	31.5	49.0	148.7



Source: Bloomberg

www.clsa.com

Reliance is on the cusp of $100bn in market cap

Reliance is on the cusp of becoming a $100bn market cap stock; in fact it did touch the milestone intraday on Friday based on its fully diluted share capital (1574m shares). It will be the first Indian company to break into this elite club of 74 stocks which has companies from diverse sectors but is dominated by financials (23 stocks) and energy (#13). Not surprisingly, developed economies dominate the list with only 13 stocks from the emerging markets (9 from China, 2 from Brazil and one each from Russia and Mexico).

A matter of time and more to come

With an ambitious management team at its helm which obsesses over world-class project execution, global-scale and operational efficiency, it was only a matter of time before Reliance's growth initiatives across businesses propelled it past this milestone. With the recent foray into organised retail and infrastructure (SEZ developments) still at their nascent stages of execution and not fully reflected in valuations, this is clearly not the end of the road.

We have been surprised by its meteoric rise

We had anticipated Reliance's potential entry into the century club in our reports *The $100bn club* (May-2006) and *The century club beckons* (Jan-2007), but even we have been surprised by its meteoric 115% rise over the last year. This has made Reliance one of the most expensive $100bn stocks; on average the club trades at a PEx of 16.3x (14.9x ex Chinese stocks).

$7bn in profits and implications for growth and valuations

In fact, with organised retail and SEZ still at nascent stages, Reliance is more likely to remain a world-class integrated energy company for the near future. The 13 energy stocks in the $100bn club trade at a modest 13x PE (12.2x ex China); perhaps reflecting their growth challenges from an elevated base. With Reliance reaching $11-12bn in ebitda and $6.5-7bn in profits by FY10 it may not remain immune either making its 14.4x FY10 PE uncomfortable.

Financials

Year to 31 Mar	06A	07CL	08CL	09CL	10CL
Revenue (Rsm)	830,248	1,156,411	1,197,396	1,420,793	1,885,185
Ebitda (Rsm)	144,575	208,251	211,261	309,121	448,804
Net profit (Rsm)	93,982	122,494	120,700	194,179	264,477
EPS (Rs)	67.4	84.3	83.1	128.3	168.1
CL/consensus(19)(EPS%)	-	102	94	121	101
EPS (% YoY)	23.4	24.9	(1.4)	54.4	31.0
ROAE (%)	26.6	32.2	23.5	26.8	26.5
Net gearing (%)	68.6	56.1	63.2	31.8	14.4
PEx (@Rs2,483.9)	36.8	29.5	29.9	19.4	14.8
Price/book (x)	11.6	7.8	6.4	4.4	3.5
EV/Op Ebitda (x)	25.4	18.9	19.1	13.7	9.2

Source: CLSA Asia-Pacific Markets. Note: All numbers are consolidated and diluted.

CLSA

On the cusp of $100bn **Reliance - O-PF**

Reliance is at the cusp of entering the $100bn market-cap club

The treasury stock is currently worth $12.5bn

Figure 1

Reliance touched $100bn in market cap intraday on Friday

	# shares (million)	Market Price (Rs)	Market Cap ($bn)
Reliance			
Current	1,394	2,484	87.7
After IPCL merger	1,454	2,484	91.5
After warrant conversion	1,574	2,484	99.0
Reliance ex treasury stock			
Current	1,223	2,484	77.0
After IPCL merger	1,255	2,484	78.9
After warrant conversion	1,375	2,484	86.5

Source: CLSA Asia-Pacific Markets

There are only 74 stocks globally with market-caps higher than $100bn

The developed economies dominate but China as seen several enter the club in the last year

The companies trade at 16.1x t12m PEx and 14.8x t12m PE ex China

Figure 2

The century club of 74 stocks – only 13 are from emerging markets

HQ	# stocks	Mkt Cap ($bn)	T12m profits ($bn)	PE (x)
USA	**31**	**5,757**	**362**	**15.9**
Developed Europe	**27**	**3,909**	**281**	**13.9**
UK	5	900	75	12.1
France	3	368	29	12.7
Switzerland	4	598	35	17.2
Germany	4	468	31	15.3
Italy	5	738	44	16.7
Netherlands	1	144	8	18.6
Finland	1	103	6	16.5
Norway	3	468	42	11.2
Spain	1	123	12	10.7
Developed APac	**3**	**456**	**35**	**13.0**
Japan	2	321	22	14.9
Australia	1	135	13	10.1
Emerging Markets	**13**	**2,774**	**113**	**24.7**
Russia	1	254	23	11.3
Mexico	1	114	5	23.8
China	9	2,086	65	31.9
Brazil	2	319	20	16.2
Total	**74**	**12,896**	**791**	**16.3**
Total ex China	**65**	**10,810**	**725**	**14.9**

Source: CLSA Asia-Pacific Markets. Note: Most of these companies have operations across the world.

Financials and energy companies have the best chance to make the club

Wal-Mart is the only retailer in the list although there are seven telecom companies

Figure 3

Financials and energy dominate the century club

Sector	# stocks	Mkt Cap ($bn)	T12m profits ($bn)	PE (x)
Financials	23	3,650	251	14.5
Energy	13	2,841	216	13.2
Technology	8	1,358	55	24.7
Telecom	7	1,306	57	23.0
Pharma	7	1,063	64	16.7
Consumer	5	791	40	19.6
Materials	4	511	33	15.4
Industrials	2	556	27	20.7
Autos	2	320	20	15.6
Utilities	2	318	15	21.8
Retail	1	185	12	14.9
Total	**74**	**12,896**	**791**	**16.3**
China	9	2,086	65	31.9
Total ex China	**65**	**10,810**	**725**	**14.9**

Source: CLSA Asia-Pacific Markets

CLSA

On the cusp of $100bn **Reliance - O-PF**

The energy companies trade at an average t12m PE of 12.2x (ex China)

This relatively modest multiple reflects the growth challenges for these companies in the face of both commodity price risks and resource constraints

Figure 4

Energy companies of this size trade at 12x PE on average

Name	Mkt Cap ($bn)	T12m profits ($bn)	PE (x)
Exxon Mobil	507	40.3	12.6
Petrochina	345	18.3	18.8
Royal Dutch Shell	255	27.2	9.4
Gazprom	254	22.6	11.3
BP	222	21.2	10.5
Sinopec	199	8.8	22.7
Chevron	197	18.9	10.4
Total	186	14.5	12.8
Petrobras	164	11.0	14.8
ENI	147	11.5	12.8
ConocoPhillips	137	10.9	12.5
Schlumberger	125	4.6	27.4
StatoilHydro	103	6.2	16.5
Total	**2,841**	**216**	**13.2**
Total ex China	**2,297**	**189**	**12.2**

Source: CLSA Asia-Pacific Markets

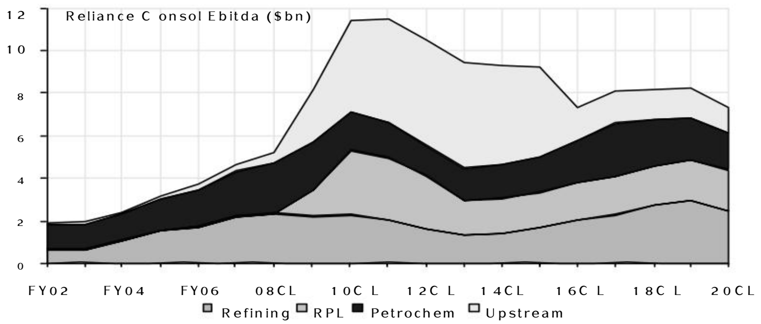
Organised retail and SEZ developments may change the character of Reliance but this is unlikely in the near term

This means it may continue to be seen as an integrated energy company

Given Reliance's earnings surge ($7bn in profits by FY10), it may face similar growth challenges as its other $100bn energy peers

Figure 5

Reliance ebitda profile without new projects – a stiff base to contend with



Source: CLSA Asia-Pacific Markets. Note: Does not include any new projects or E&P monetisation.

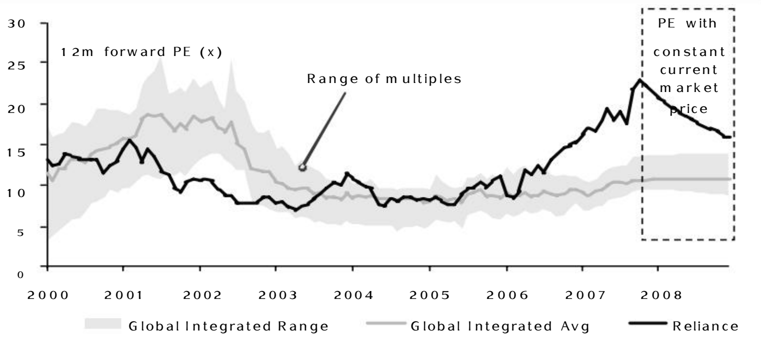
This makes its current PE multiples appear uncomfortable

Reliance is 110% more expensive on PE today than the global majors

It is 45% more expensive on PEx even on FY10 (2009) estimates when all its current projects are onstream

Figure 6

Reliance is more expensive– even adjusted for the surge in earnings over FY08-10



Source: CLSA Asia-Pacific Markets. Note: For the seven largest integrated energy companies

Figure 7

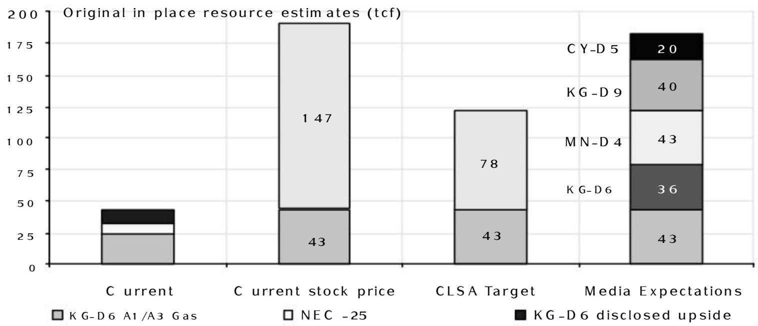
Reliance's stock price is implying over $50bn in value for E&P in our view

	CLSA estimates			Reliance	
($bn)	May-06	Jan-07	Current	CMP	Comments
Current Businesses	26.2	27.5	40.6	40.6	Implied 6x EV/Ebitda for refining and petrochems and RPL at current market price
Upstream E&P	28.8	43.4	38.8	55.6	Current stock price implies an additional ~150tcfe of implied resources over and above the ~45tcfe currently disclosed
Organized Retail	20.0	12.6	2.8	2.8	Pantaloon has a market cap of $2bn (5.5 msf)
SEZ developments	25.0	13.8	0.0	0.0	Too early to ascribe value today. Reliance is developing the Haryana and Jamnagar SEZs
	100.0	**97.3**	**82.2**	**99.0**	
Timeframe	By May-11	By Mar-11	12 months	Oct-07	
Market cap on date	31.0	42.0			
Implied stock cagr	26.4	18.3			

Source: CLSA Asia-Pacific Markets. Note: Adjusted for fully diluted # shares and warrant conversion

Figure 8

This implies that Reliance needs to disclose an additional 147tcfe of discoveries



Source: CLSA Asia-Pacific Markets

Expectations for E&P, in particular, appear to have sky-rocketed

Figure 9

Reliance fair price scenarios under different P/CF multiples for E&P business

(Rs/share)	5x P/CF	6x P/CF	7x P/CF	8x P/CF	9x P/CF	10x P/CF
Core Business	**918**	**918**	**918**	**918**	**918**	**918**
Refining, Petrochem	769	769	769	769	769	769
Others	149	149	149	149	149	149
New upstream	**617**	**740**	**864**	**987**	**1,110**	**1,234**
Current development	530	530	530	530	530	530
Embedded upside	90	213	335	457	581	703
Investments	**308**	**308**	**308**	**308**	**308**	**308**
Reliance Petroleum	237	237	237	237	237	237
Reliance Retail	72	72	72	72	72	72
Enterprise Value	**1,843**	**1,966**	**2,090**	**2,213**	**2,337**	**2,460**
Net Debt	(218)	(218)	(218)	(218)	(218)	(218)
Fair Equity Value	**1,625**	**1,748**	**1,871**	**1,995**	**2,118**	**2,241**
Base value	1,538	1,538	1,538	1,538	1,538	1,538
Exploration upside	90	213	335	457	581	703
Exploration upside ($bn)	2.8	6.6	10.4	14.1	18.1	22.1
Recoverable gas (tcfe)	6	15	24	32	41	50
In place gas (tcfe)	15	36	56	78	100	120

Source: CLSA Asia-Pacific Markets

Current market price suggests an embedded exploration upside of $27bn

This means that Reliance has already established 147tcfe of additional resources over and above what it has disclosed

	#
$500+	01
$400-500	01
$300-400	03
$200-300	12
$100-200	57
Total	74

Exxon tops the list at $507bn

#74 stocks above $100bn; #17 stocks above $200bn

Appendix: The $100bn stocks globally

Figure 10

The global century club

Name	Domicile	Sector	Mkt Cap ($bn)	T12m profits ($bn)	PE (x)
Exxon Mobil Corp	USA	Energy	507	40.3	12.6
General Electric	USA	Industrial	428	21.5	19.9
Petrochina Co-H	China	Energy	345	18.3	18.8
China Mobile	China	Telecom	341	9.4	36.2
Ind & Comm Bk -H	China	Financials	310	6.2	50.1
Microsoft Corp	USA	Technology	281	14.1	19.9
At&T Inc	USA	Telecom	257	9.9	26.1
Royal Dutch Sh-A	Netherlands	Energy	255	27.2	9.4
Gazprom	Russia	Energy	254	22.6	11.3
Citigroup Inc	USA	Financials	240	21.9	11.0
China Life Insur	China	Financials	238	4.4	53.8
Bank Of America	USA	Financials	234	21.7	10.8
Hsbc Hldgs Plc	UK	Financials	231	18.0	12.9
Bp Plc	UK	Energy	222	21.2	10.5
China Const Ba-H	China	Financials	222	7.3	30.3
Procter & Gamble	USA	Consumer	221	10.3	21.3
Toyota Motor	Japan	Autos	211	14.1	15.0
China Petroleum	China	Energy	199	8.8	22.7
Cisco Systems	USA	Technology	199	7.3	27.1
Chevron Corp	USA	Energy	197	18.9	10.4
Johnson&Johnson	USA	Pharma	192	10.6	18.1
Bank Of China-H	China	Financials	192	6.8	28.3
Edf	France	Utilities	191	6.5	29.4
Berkshire Hath-A	USA	Financials	187	12.1	15.5
Total Sa	France	Energy	186	14.5	12.8
Wal-Mart Stores	USA	Retail	185	12.4	14.9
Google Inc-Cl A	USA	Technology	185	3.7	50.2
Vodafone Group	UK	Telecom	184	11.9	15.5
Amer Intl Group	USA	Financials	178	16.1	11.1
Pfizer Inc	USA	Pharma	177	17.5	10.1
Nestle Sa-Reg	Switzerland	Consumer	170	8.1	21.0
Petrobras	Brazil	Energy	164	11.0	14.8
Jpmorgan Chase	USA	Financials	161	16.8	9.6
Roche Hldg-Genus	Switzerland	Pharma	160	7.2	22.3
Ibm	USA	Technology	158	9.9	16.0
Vale R Doce	Brazil	Materials	156	8.7	17.9
Glaxosmithkline	UK	Pharma	152	10.5	14.5
Intel Corp	USA	Technology	149	5.7	26.1
Novartis Ag-Reg	Switzerland	Pharma	148	7.7	19.3
Eni Spa	Italy	Energy	147	11.5	12.8
Altria Group Inc	USA	Consumer	146	10.8	13.6
Nokia Oyj	Finland	Telecom	144	7.7	18.6
Apple	USA	Technology	140	3.1	44.8
Conocophillips	USA	Energy	137	10.9	12.5
Bhp Billiton Ltd	Australia	Materials	135	13.4	10.1
Telefonica	France	Telecom	134	7.0	19.2
Coca-Cola Co	USA	Consumer	134	5.3	25.6
Hewlett-Packard	USA	Technology	132	6.8	19.4
Verizon Communic	USA	Telecom	131	6.1	21.4
Ping An Insura-A	China	Financials	130	1.7	75.6
Siemens Ag-Reg	Germany	Industrial	128	5.3	24.0
E.On Ag	Germany	Utilities	127	8.1	15.7
Schlumberger Ltd	USA	Energy	125	4.6	27.4
Wells Fargo & Co	USA	Financials	125	8.9	14.1
Banco Santander	Spain	Financials	123	11.5	10.7
Ubs Ag-Reg	Switzerland	Financials	120	11.8	10.2
Unicredito Itali	Italy	Financials	120	7.8	15.2
Pepsico Inc	USA	Consumer	119	5.9	20.1
Sanofi-Aventis	France	Pharma	118	5.6	21.0
Merck & Co	USA	Pharma	116	4.8	24.2
Oracle Corp	USA	Technology	114	4.4	25.6
America Movil-A	Mexico	Telecom	114	4.8	23.8
Arcelormittal	Netherlands	Materials	111	8.7	12.7
Mitsubishi Ufj F	Japan	Financials	110	7.5	14.6
Royal Bk Scotlan	UK	Financials	110	13.1	8.4
Daimlerchrysler	Germany	Autos	109	6.4	17.1
Bnp Paribas	France	Financials	109	10.7	10.2
China Shenhua -H	China	Materials	109	2.5	44.5
Allianz Se-Reg	Germany	Financials	104	10.9	9.6
Statoilhydro Asa	Norway	Energy	103	6.2	16.5
Abn Amro Hldg	Netherlands	Financials	102	6.1	16.7
Wachovia Corp	USA	Financials	102	8.8	11.6
Intesa Sanpaolo	Italy	Financials	101	9.7	10.4
Goldman Sachs Gp	USA	Financials	100	11.5	8.7

Source: CLSA Asia-Pacific Markets

Recommendation history – Reliance Industries RIL IN

Date	Rec level	Closing price	Target
02 August 2007	O-PF	1,798.00	1,995.00
05 June 2007	O-PF	1,739.80	1,502.00
27 April 2007	O-PF	1,596.75	1,464.00
19 January 2007	O-PF	1,367.00	1,410.00
05 December 2006	O-PF	1,260.10	1,265.00
05 October 2006	O-PF	1,149.35	1,237.00
28 April 2006	O-PF	996.50	945.00
18 January 2006	BUY	702.90	750.00
04 January 2006	BUY	696.35	763.37
29 November 2005	BUY	641.67	704.30
26 November 2005	BUY	638.64	708.09

Source: CLSA Asia-Pacific Markets

Key to CLSA investment rankings: BUY = Expected to outperform the local market by > 10%; **O-PF** = Expected to outperform the local market by 0-10%; **U-PF** = Expected to underperform the local market by 0-10%; **SELL** = Expected to underperform the local market by >10. Performance is defined as 12-month total return (including dividends).

Chapter **16**

Technical Analysis

The Visual Clue

Learning Objectives

After studying this chapter, you should be able to:

- Distinguish technical analysis from fundamental analysis.
- Use charting techniques to identify buy and sell opportunities.
- Use breadth indicators and market sentiment indicators to assess the "technical condition" of the market.
- Evaluate the usefulness of technical analysis.

As an approach to investment analysis, technical analysis is radically different from fundamental analysis. While the fundamental analyst believes that the market is 90 percent logical and 10 percent psychological, the technical analyst assumes that it is 90 percent psychological and 10 percent logical. Technical analysts don't evaluate a large number of fundamental factors relating to the company, the industry, and the economy. Instead, they analyse internal market data with the help of charts and graphs. Subscribing to the 'castles-in-the-air' approach, they view the investment game as an exercise in anticipating the behaviour of market participants. They look at charts to understand what the market participants have been doing and believe that this provides a basis for predicting future behaviour.

The technical analysis is the oldest approach to equity investment, dating back to the late 19th century. It continues to flourish in modern times as well. As an investor, you will often encounter technical analysis because newspapers cover it, television programmes routinely call technical experts for their comments, and investment advisory services circulate technical reports. Thanks to its intuitive appeal, it is widely used. However, its validity has been severely challenged in recent decades.

Although technical analysis can be applied to commodities, currencies, bonds, and equity stocks, our discussion is restricted to equity stocks.

16.1 WHAT IS TECHNICAL ANALYSIS

Technical analysis involves a study of market generated data like prices and volumes to determine the future direction of price movement. In his book *Technical Analysis Explained*, Martin J. Pring explains:

> "The technical approach to investing is essentially a reflection of the idea that prices move in trends which are determined by the changing attitudes of investors toward a variety of economic, monetary, political and psychological forces. The art of technical analysis—for it is an art—is to identify trend changes at an early stage and to maintain an investment posture until the weight of the evidence indicates that the trend has been reversed."[1]

Basic Premises The basic premises underlying technical analysis, as articulated by Robert. A. Levy,[2] are as follows.

1. Market prices are determined by the interaction of supply and demand forces.
2. Supply and demand are influenced by a variety of factors, both rational and irrational. These include fundamental factors as well as psychological factors.
3. Barring minor deviations, stock prices tend to move in fairly persistent trends.
4. Shifts in demand and supply bring about changes in trends.
5. Irrespective of why they occur, shifts in demand and supply can be detected with the help of charts of market action.
6. Because of the persistence of trends and patterns, analysis of past market data can be used to predict future price behaviour.

Differences between Technical Analysis and Fundamental Analysis The key differences between technical analysis and fundamental analysis are as follows:

1. Technical analysis mainly seeks to predict short-term price movements, whereas fundamental analysis tries to establish long-term values.
2. The focus of technical analysis is mainly on internal market data, particularly price and volume data. The focus of fundamental analysis is on fundamental factors relating to the economy, the industry, and the firm.
3. Technical analysis appeals mostly to short-term traders, whereas fundamental analysis appeals primarily to long-term investors.

16.2 CHARTING TECHNIQUES

Technical analysts use a variety of charting techniques. The most popular ones seem to be the Dow theory, bar and line charts, the point and figure chart, the moving average line, and the relative strength line. We will examine these techniques in this section. However, as a prelude to that it is helpful to briefly explain the basic concepts underlying chart analysis.

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1 Martin J. Ping, *Technical Analysis Explained,* New York: McGraw-Hill, 1991.

2 Robert A. Levy, "Conceptual Foundations of Technical Analysis," *Financial Analysis Journal* (July-August, 1966).

Basic Concepts Underlying Chart Analysis The basic concepts underlying chart analysis are: (a) persistence of trends; (b) relationship between volume and trend; and (c) resistance and support levels.

Trends The key belief of the chartists is that stock prices tend to move in fairly persistent trends. Stock price behaviour is characterised by inertia: the price movement continues along a certain path (up, down, or sideways) until it meets an opposing force, arising out of an altered supply–demand relationship.

Relationship between Volume and Trends Chartists believe that generally volume and trend go hand in hand. When a major upturn begins, the volume of trading increases as the price advances and decreases as the price declines. In a major downturn, the opposite happens: the volume of trading increases as the price declines and decreases as the price rallies.

Support and Resistance Levels Chartists assume that it is difficult for the price of a share to rise above a certain level called the **resistance level** and fall below a certain level called a **support level**. Why? The explanation for the first claim goes as follows. If investors find that prices fall after their purchases, they continue to hang on to their shares in the hope of a recovery. And when the price rebounds to the level of their purchase price, they tend to sell and heave a sigh of relief as they break even. Such a behavioural tendency on the part of investors stimulates considerable supply when the price rebounds to the level at which substantial purchases were made by the investors. As a result, the share is not likely to rise above this level, the resistance level.

The level at which a declining share may evoke a substantial increase in demand is called the support level. This typically represents the level from which the share rose previously with large trading volumes. As the price falls to this level, there is a lot of demand from several quarters: those who 'missed the bus' on the previous occasion and have regrets for their failure to partake in the earlier advance; short-sellers who, having sold short, at higher levels, want to book profits by squaring their position; and value-oriented investors.

The Dow Theory Originally proposed in the late nineteenth century by Charles H. Dow, the editor of *The Wall Street Journal*, the Dow theory is perhaps the oldest and best known theory of technical analysis.

In the words of Charles Dow:

> "The market is always considered as having three movements, all going at the same time. The first is the narrow movement from day to day. The second is the short swing, running from two weeks to a month or more; the third is the main movement, covering at least four years in its duration."[3]

Proponents of the Dow theory refer to the three movements as: (a) **daily fluctuations** that are random day-to-day wiggles; (b) **secondary movements** or corrections that may last for a few weeks to some months; and (c) **primary trends** representing bull and bear phases of the market.

[3] *The Wall Street Journal*, December 19, 1900.

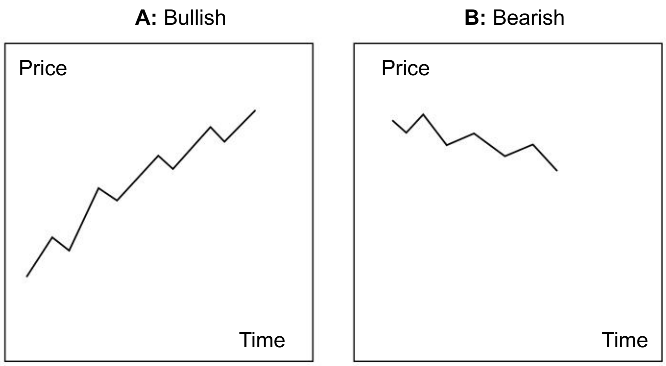
An upward primary trend represents a bull market, whereas a downward primary trend represents a bear market. A major upward move is said to occur when the high point of each rally is higher than the high point of the preceding rally and the low point of each decline is higher than the low point of the preceding decline. Likewise, a major downward move is said to occur when the high point of each rally is lower than the high point of the preceding rally and the low point of each decline is lower than the low point of the preceding decline.

The secondary movements represent technical correction. They represent adjustments to the excesses that may have occurred in the primary movements. These movements are considered quite significant in the application of the Dow Theory.

The daily fluctuations are considered to be minor significance. Even zealous technical analysts do not usually try to forecast day-to-day movements in the market.

Exhibit 16.1 illustrates the concept of Dow Theory.

Exhibit 16.1 ***The Concept of Dow Theory***



Bar and Line Charts The bar chart, one of the simplest and most commonly used tools of technical analysis, depicts the daily price range along with the closing price. In addition, it may show the daily volume of transactions.[4] Exhibit 16.2A shows an illustrative bar chart. The upper end of each bar represents the day's highest price and the lower end the day's lowest price. The small cross across the bar marks the day's closing price.

A line chart, a simplification over the bar chart, shows the line connecting successive closing prices. Exhibit 16.2B shows the line chart corresponding to the bar chart given in Exhibit 16.2A.

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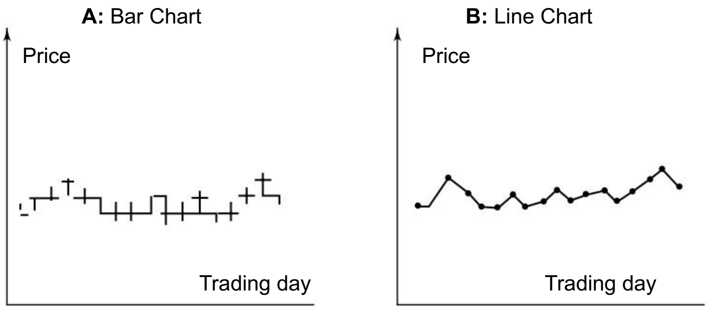
[4] The scope of the bar chart may be expanded further by showing on it: (a) a 50-day moving average; and (b) a relative strength line of the stock.

Exhibit 16.2 ***Bar and Line Charts***



Technical analysts believe that certain formations or patterns observed on the bar chart or line chart have predictive value. The more important formations and their indications are described below.

Head and Shoulders Top (HST) Pattern As the name suggests, the HST formation has a left shoulder, a head, and a right shoulder, as shown in Exhibit 16.3A. The HST formation represents a bearish development. If the price falls below the neckline (the line drawn tangentially to the left and right shoulders), a price decline is expected. Hence, it is a signal to sell.

Inverse Head and Shoulders Top (IHST) Pattern As the name indicates, the IHST formation is the inverse of the HST formation, as shown in Exhibit 16.3B. Hence, it reflects a bullish development. If the price rises above the neck line, a price rise is expected. Hence, it is a signal to buy.

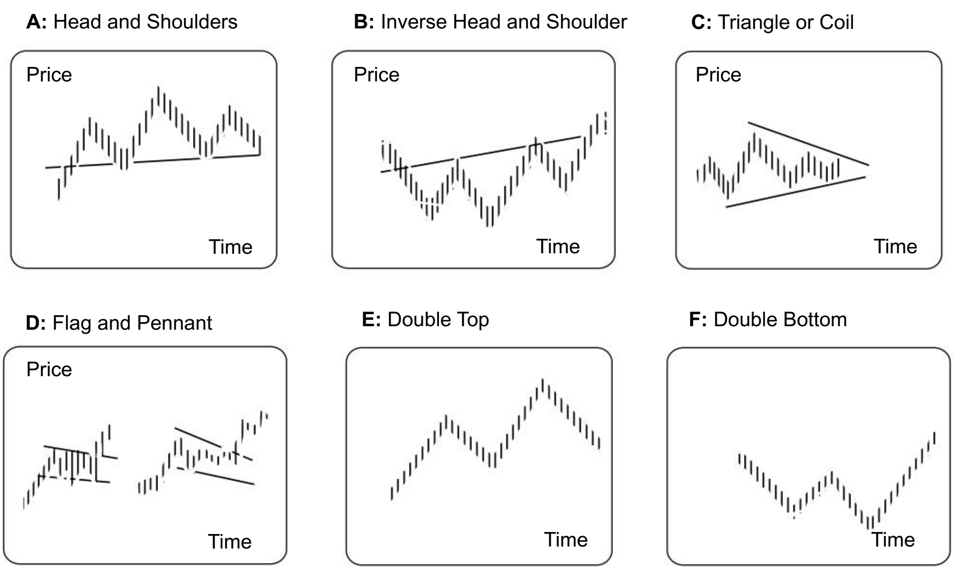
Triangle or Coil Formation This is shown in Exhibit 16.3C. This formation represents a pattern of uncertainty. Hence, it is difficult to predict which way the price will break out.

Flags and Pennants Formation This is shown in Exhibit 16.3D. It typically signifies a pause after which the previous price trend is likely to continue.

Double Top Formation This is shown in Exhibit 16.3E. It represents a bearish development, signalling that the price is expected to fall.

Double Bottom Formation This is shown in 16.3F. It reflects a bullish development, signalling that the price is expected to rise.

Exhibit 16.3 ***Important Chart Formations***



Point and Figure Chart More complex than a bar chart, a point and figure chart (PFC) has the following features.

1. On a PFC only significant price changes are recorded. For example, for a stock that has a price in the range of, say Rs 30 to Rs 50, price changes of one rupee or more only may be posted.
2. While the vertical scale on a PFC represents the price of the stock, the horizontal scale does not represent the time scale in the usual sense.
3. Each column on the horizontal scale of a PFC represents a significant reversal of price movement and not a trading day.

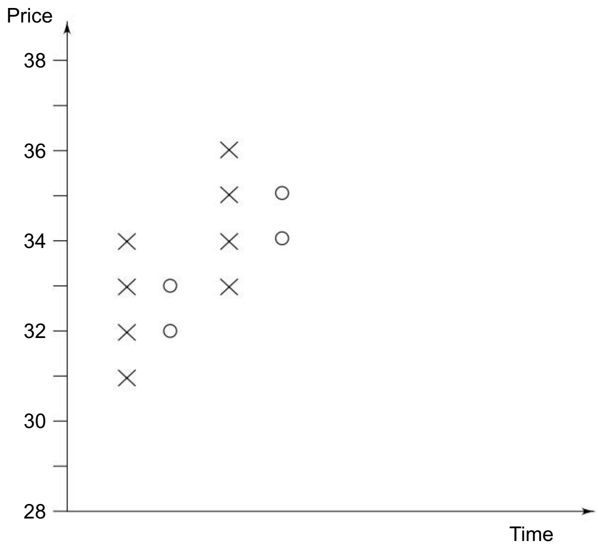
These features of the PFC may be illustrated with a hypothetical PFC. The daily closing price of ABC stock for the last 30 trading days have been as follows: Rs 31, 31.50, 32, 32.50, 33.00, 33.50, 33.75, 34, 33.50, 33.75, 34, 33, 32.5, 32.25, 32, 32.50,33, 33.50, 34, 34.25, 34.50, 35, 36, 35.50, 35, 34.5, 34.75, 34.5, 34, 33.5.

Using a one-point scale (this means that a price is recorded only when the change in price is one rupee), the PFC for ABC stock is constructed as shown in Exhibit 16.4. It may not be noted that:

1. When the price of ABC stock rises by one rupee over the previously recorded price, an *X* is recorded to reflect the increase.
2. When the price of ABC stock falls by one rupee over the previously recorded price, an *O* is recorded to reflect the decrease.
3. When the direction of price change reverses (a decline after previous increases or a rise after previous declines), the price is recorded in the next column to the right.

By eliminating the time scale and small changes, the PFC condenses the recording of price changes. This helps in identifying patterns and changes more easily. Technical analysts focus their attention on 'congestion areas' on a PFC. A 'congestion area' represents a horizontal band of *X*s and *O*s on a PFC which develops because of a series of reversals around a certain price level. A 'congestion area' arises when demand and supply are more or less equal. A *breakout* from the top of a congestion area heralds an upward price movement. On the other hand, a *penetration* through the bottom of a congestion area signals a downward price movement.

Exhibit 16.4 ***Point and Figure Chart***



Moving Average Analysis A moving average is calculated by taking into account the most recent *n* observations. To illustrate its calculation, consider the closing price of a stock on 10 successive trading days:

Trading Day	*Closing Price*
1	25.0
2	26.0
3	25.5
4	24.5
5	26.0
6	26.0
7	26.5
8	26.5
9	26.0
10	27.0

A 5-day moving average of daily closing prices is calculated as follows:

Trading day	*Closing price*	*Sum of five most recent closing prices*	*Moving average*
1	25.0		
2	26.0		
3	25.5		
4	24.5		
5	26.0	127.0	25.4
6	26.0	128.0	25.6
7	26.5	128.5	25.7
8	26.5	129.5	25.9
9	26.0	131.0	26.2
10	27.0	132.0	26.4

To identify trends, technical analysts use moving averages analysis: a 200-day moving average of daily prices (or alternatively, 30-week moving average of weekly prices) may be used to identify a long-term trend; a 60-day moving average of daily prices may be used to discern an intermediate term trend; a 10-day moving average of daily prices may be used to detect a short-term trend.

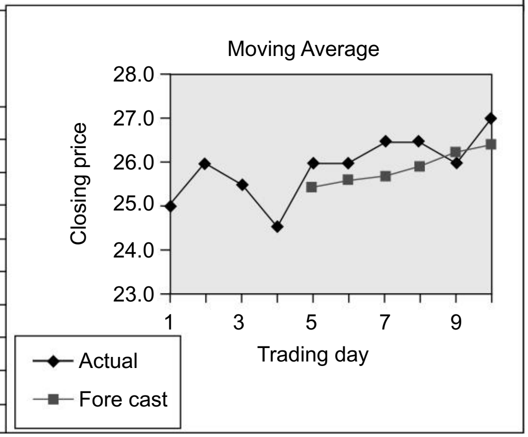
The *buy* and *sell* signals provided by the moving average analysis are as follows:

Buy signal	*Sell signal*
■ Stock price line rises through the moving average line when the graph of the moving average line is flattening out.	■ Stock price line falls through the moving average line when the graph of the moving average line is flattening out.
■ Stock price line falls below the moving average line which is rising.	■ Stock price line rises above the moving average line which is falling.
■ Stock price line, which is above the moving average line, falls but begins to rise again before reaching the moving average line.	■ Stock price line, which is below the moving average line, rises but begins to fall again before reaching the moving average line.

Spreadsheet Application Open the Excel spreadsheet and input the given data as shown below. Go to Tools, select Add-Ins and in the dialogue box that opens, check in Analytical Toolbar. (You will have to install this feature first, if not already installed). Next go back to Tools and this time select Data Analysis. In the dialogue box that opens select Moving Average and click on OK. This opens another dialogue box. There, in the Input Range, type B3:B12 or alternatively just select the range of values from B3 to B12 by moving the cursor across and Excel will automatically register the selection in the Input range. In the box for Interval type 5 and in the box for Output Range give the cell reference C3. In case you wish to have chart as well, check in on Chart Output and then click on OK. The 5 day moving average values will get filled in cells C7 to C12. Also the relative chart will appear alongside. You may format the chart by following the directions given in Excel.

If you want 10-day moving average values, just change the Interval in the last dialogue box to 10.

	A	B	C
1	Moving Average Analysis		
2	Trading day	Closing price	5 day moving average
3	1	25.0	
4	2	26.0	
5	3	25.5	
6	4	24.5	
7	5	26.0	25.4
8	6	26.0	25.6
9	7	26.5	25.7
10	8	26.5	25.9
11	9	26.0	26.2
12	10	27.0	26.4



MACD A variation of the moving average is the moving average convergence divergence, or MACD. It involves comparing a short-term moving average, say a 50-day moving average, with a long-term moving average, say a 200-day moving average. If the short-term moving average is consistently higher than the long-term moving average, it is a bullish signal; if the short-term moving average is consistently lower than the long-term moving average, it is a bearish signal.

Relative Strength Analysis The relative strength analysis is based on the assumption that prices of some securities rise rapidly during the bull phase but fall slowly during the bear phase in relation to the market as a whole. Put differently, such securities possess greater relative strength and hence outperform the market.

Technical analysts measure relative strength in different ways. A simple approach calculates rates of return and classifies securities that have earned superior historical returns as having relative strength. More commonly, technical analysts look at certain ratios to judge whether a security or, for that matter, an industry has relative strength. To illustrate how this is done, consider the price data of a hypothetical pharmaceutical company, Acme Limited, along with the price data for the pharmaceutical industry and the market as the whole, given in Exhibit 16.5.

From 20X1 through 20X4 Acme fared better than most of the firms in the pharmaceutical industry. This is clear from the fact the Acme's price grew faster than the pharmaceutical industry average: the ratio P_A / P_{PIA} increased from 1.33 to 1.78. How did the pharmaceutical industry perform *vis-à-vis* the market as a whole? The pharmaceutical industry more or less moved in tandem with the market as a whole; the ratio P_{PIA} / P_{MA} remained stationary between 20X1 and 20X2, perked up a bit between 20X2 and 20X3, and finally declined slightly in 20X4. Acme showed relative strength *vis-à-vis* the market a whole, as is evidenced by the fact that the ratio P_A / P_{MA} rose from 0.20 in 19X1 to 0.29 in 20X4.

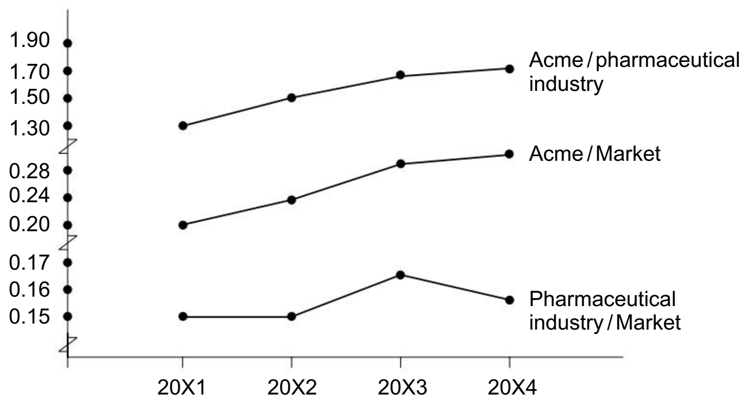
Exhibit 16.5 ***Relative Strength Data for Acme Limited***

Year	Average price of Acme P_A	Average price of pharma-ceutical industry P_{PIA}	Average price of the market P_{MA}	P_A / P_{PIA}	P_A / P_{MA}	P_{PIA} / P_{MA}
20X1	40	30	200	1.33	0.20	0.15
20X2	50	32	210	1.56	0.24	0.15
20X3	65	38	230	1.71	0.28	0.17
20X4	80	45	280	1.78	0.29	0.16

Generally, users of relative strength analysis plot the ratios of the security relative to its industry, of the industry relative to the market, and of the security relative to the market. Exhibit 16.6 shows such a graph for Acme. From this exhibit it is clear that while the pharmaceutical industry remained more or less constant relative to the market, Acme demonstrated strength relative to its industry as well as to the market as a whole.

Technical analysts prepare many charts like this to identify securities that have demonstrated relative strength. They believe that such industries and firms represent promising investment opportunities. Many empirical studies have been published supporting relative strength analysis.

Exhibit 16.6 ***Relative Strength Analysis***



16.3 TECHNICAL INDICATORS

In addition to the chart, which forms the mainstay of technical analysis, technicians also use certain indicators – breadth indicators and market sentiment indicators – to gauge the overall market situation.

Breadth Indicators

The Advance–Decline Line The advance–decline line is also referred to as the **breadth of the market**. Its measurement involves two steps:

1. Calculate the number of net advances/declines on a daily basis. (To do this, look at the number of shares that have advanced on that day and subtract from it the number of shares that have declined on the day.)
2. Obtain the breadth of the market by cumulating daily net advances/declines.

An illustrative calculation of the breadth of the market is shown in Exhibit 16.7.

Exhibit 16.7 ***Calculation of Breadth of Market***

Day	Advances	Declines	Net Advances or Declines	Breadth of Market
Tuesday	630	527	103	103
Wednesday	690	475	215	318(103 + 215)
Thursday	746	424	322	640(318 + 322)
Friday	492	630	– 138	502(640 – 138)
Monday	366	701	– 335	167(502 – 335)
Tuesday	404	698	– 294	– 127(167 – 294)

How is the breadth of market analysis used? Typically, the breadth of market is compared with one or two market averages. Ordinarily, the breadth of market is expected to move in tandem with a market average. However, if there is a divergence between the two, the technical analysts believe that it signals something. More specifically, if the market average is moving upwards, whereas the breadth of market is moving downwards, it indicates that the market is likely to turn bearish. Likewise, if the market average is moving downwards but the breadth of market is moving upwards it signals that the market may turn bullish.

New Highs and Low As part of stock market reporting, information is provided on the 52-week high and low prices for each stock. Technical analysts consider the market as bullish when a significant number of stocks hit the 52-week high each day. On the other hand, if market indices rise but few stocks hit new highs, technical analysts view this as a sign of trouble.

Volume Volume analysis is an important part of technical analysis. Other things being equal, a high trading volume is considered a bullish sign. If heavy volumes are accompanied by rising prices, it is considered even more bullish.

Sentiment Indicators

Short–Interest Ratio The **short interest** in a security is simply the number of shares that have been sold short but not yet bought back.

The short interest ratio is defined as follows:

$$\text{Short interest ratio} = \frac{\text{Total number of shares sold short}}{\text{Average daily trading volume}}$$

Investors sell short when they expect the prices to fall. So when the short interest ratio is high it means that most investors expect the price to fall. The technical analyst, however, interprets it differently. He considers a high short interest ratio as a sign of bullishness. His reasoning is as follows: "If the short-interest ratio is high, there will be a great demand for shares because those who have sold short would have to repurchase them, regardless of whether their expectations come out to be true or not, to close out their positions. This demand will have a buoying effect on the prices."

Mutual Fund Liquidity According to the theory of contrary opinion, it makes sense to go against the crowd because the crowd is generally wrong. Based on this theory, several indicators have been developed. One of them reflects mutual fund liquidity.

If mutual fund liquidity is low, it means that mutual funds are bullish. So contrarians argue that the market is at, or near, a peak and hence is likely to decline. Thus, low mutual fund liquidity is considered as a bearish indicator.

Conversely when the mutual fund liquidity is high, it means that mutual funds are bearish. So contrarians believe that the market is at, or near, a bottom and hence is poised to rise. Thus, high mutual fund liquidity is considered as a bullish indication.

Put/Call Ratio Another indicator monitored by contrarian technical analysts is the put/ call ratio.

Speculators buy calls when they are bullish and buy puts when they are bearish. Since speculators are often wrong, some technical analysts consider the put/call ratio as a useful indicator. The put/call ratio is defined as:

$$\frac{\text{Number of puts purchased}}{\text{Number of calls purchased}}$$

For example, a ratio of 0.70 means that only seven puts are purchased for every 10 calls purchased.

A rise in the put/call ratio means that speculators are pessimistic. For the contrarian technical analyst, however, this is a buy signal because he believes that the speculators are generally wrong.

Conversely when the put/call ratio falls, it means that the speculators are optimistic. The contrarian technical analyst, however, regards this as a sell signal.

Trin Statistic Market volume may be used to judge the strength of a market rise or fall. Technical analysts regard advances as more bullish if they are accompanied with increased trading volume. Likewise, they consider declines as more bearish when accompanied with increased trading volume.

The ratio of the number of advancing to declining issues divided by the ratio of volume in advancing to declining issues is called the *trin statistic*.

$$\text{Trin} = \frac{\text{Number advancing / Number declining}}{\text{Volume advancing / Volume declining}}$$

This expression can be rearranged as follows:

$$\text{Trin} = \frac{\text{Volume declining / Number declining}}{\text{Volume advancing / Number advancing}}$$

Thus, trin measures the ratio of average volume in declining issues to average volume in advancing issues. Generally, a trin ratio of more than 1 is deemed bearish as it means that the declining stocks have higher average volume compared to advancing stocks, suggesting a net selling pressure.

Open Interest in the Futures and Options Segment Open interest is the total number of outstanding, or yet-to-be settled, contracts at any given point of time. For example, if trader A buys 2 futures contracts from trader B, the open interest rises by 2. If another trader, trader C, buys 2 futures contracts from trader D, the open interest rises to 4. Now, if trader A unwinds his position and sells 2 futures contracts to trader D (who too unwinds his position), the open interest falls to 2. If trader A unwinds his position and sells 2 futures contracts to trader E then the open interest remains unchanged at 4.

The open interest in the derivatives segment is one of the widely tracked parameters in the market. The interpretation put on the changes in the open interest depends on whether the market is rising or falling:

- A rise in market along with an increase in open interest confirms an upward trend.
- A rise in market along with a decrease in open interest suggests that the market is weakening.
- A fall in market along with an increase in open interest confirms a downward trend.
- A fall in market along with a decrease in open interest implies that the market is strengthening.

Quants

Wall Street has attracted a lot of people—phycisists, computer scientists, engineers, mathematicians, statisticians, and so on—with highly developed quantitative skills, called as "quants" in the investment community. They employ sophisticated computer models based on chaos theory, neural networks, Kalman filters and "kitchen sink" models that include every conceivable variable to explain stock price movements.

The data-driven approach followed by quants often has no theoretical underpinning. Put differently, quants don't bother to explain why something has worked in the past. They try to figure out what has worked in the past and expect that the same will work in future. This approach sometimes generates profits in the market; more often, however, it does not.

A quantitative model should be evaluated in terms of its ability to produce superior long-term performance and not on its statistical complexity. In this respect, quants do not seem to have been very successful.

Financial Astrology

From early 1990s a new breed of astrologers, call them financial astrologers if you will, has emerged in India. They try to predict market sentiments, share price movements, and even government policy on the basis of the movement of stars.

Here is a sampling of what they say:

- The downtrend in share prices during the past fortnight is because of a "debilitated" Mercury under the influence of Saturn at a time when Jupiter is "retrograde."
- The market will stabilise by September 12 this year when jupiter enters the "Kanya rasi."

According to them, "nakshatras" that are good for buying or selling are as follows:

Buying

- Revathi
- Sathabisha
- Ashwini
- Shravan

Selling

- Purva phalguni
- Purvashada
- Kritika
- Ashlesha
- Bharani

16.4 TESTING TECHNICAL TRADING RULES

A number of technical trading rules are in vogue. To assess whether a technical trading rule is valid, you have to, at a minimum, ask the following questions:

- Does the trading rule produce excess returns after adjusting for risk? Other things being equal, one would expect a more risky strategy to produce higher returns than a less risky strategy. Hence, if two trading strategies have different degrees of risk associated with them, their returns must be compared on a risk-adjusted basis.
- Does the trading rule produce excess returns after adjusting for transaction and other costs (like taxes)? If transaction and other costs are ignored, several technical trading rules appear to produce excess returns. However, after such costs are deducted, the rules seem to be no better than a simple buy-and-hold strategy which entails very little transaction costs.
- How consistent is the performance of the trading rule? A trading rule may outperform an alternative for a short period. The real test is whether it holds up over a longer time frame.
- Is the trading rule valid outside the sample? If a number of trading rules are applied to a given sample it is quite possible to find some rule that works. As William Sharpe said in some other context: "If you torture the data long enough, it will confess to any crime." What is important is that the rule must work on data other than that used to discover it.

Empirical evidence seems to suggest that the popular technical trading rules do not measure up fully to these tests. Proponents of technical analysis, however, argue that they have more techniques in their repertoire that work. Perhaps there are some proprietary techniques which work. However, until they are tested one cannot comment on their validity.

16.5 EVALUATION OF TECHNICAL ANALYSIS

Technical analysis appears to be a highly controversial approach to security analysis. It has its ardent votaries; it has its severe critics. The advocates of technical analysis offer the following interrelated arguments in support of their position.

1. Under the influence of crowd psychology, trends persist for quite some time. Tools of technical analysis that help in identifying these trends early are helpful aids in investment decision making.
2. Shifts in demand and supply are gradual rather than instantaneous. Technical analysis helps in detecting these shifts rather early and hence provides clues to future price movements.
3. Fundamental information about a company is absorbed and assimilated by the market over a period of time. Hence, the price movement tends to continue in more or less the same direction till the information is fully assimilated in the stock price.
4. Charts provide a picture of what has happened in the past and hence give a sense of volatility that can be expected from the stock. Further, the information on trading volume which is ordinarily provided at the bottom of a bar chart gives a fair idea of the extent of public interest in the stock.

The detractors of technical analysis believe that technical analysis is a useless exercise. Their arguments run as follows:

1. Most technical analysts are not able to offer convincing explanations for the tools employed by them.
2. Empirical evidence in support of the random-walk hypothesis casts its shadow over the usefulness of technical analysis.
3. By the time an uptrend or downtrend may have been signalled by technical analysis, it may already have taken place.
4. Ultimately, technical analysis must be a self-defeating proposition. As more and more people employ it, the value of such analysis tends to decline.
5. The numerous claims that have been made for different chart patterns are simply untested assertions.
6. There is a great deal of ambiguity in the identification of configurations as well as trend lines and channels on the charts. The same chart can be interpreted differently. As an example, here is an extract from a commentary of a technical analyst:

> "To sum up, we are in a state where the market is either poised to recover, or go into a long-term decline (a change in the major trend). A failure of the head-and-shoulders formation in the National Index, which could occur if the index clambers over 1,400 would be a good signal to suggest a market recovery, while a breakdown below the support levels given for the leading Sensex stocks would mean harsher times ahead."

Despite these limitations charting is very popular. Why? It appears that charting appeals to a certain type of personality: the collector. It appears that the chartist is fascinated by his pattern which give him joy that transcends the possibility of making money. The chartist seems to be completely absorbed in his patterns, unmindful of a plant explosion or a profit explosion.

What is my position on the practical utility of technical analysis? I believe that in a rational, well-ordered, and efficient market, technical analysis is a worthless exercise. However, given the imperfections, inefficiencies, and irrationalities that characterise real world markets, technical analysis can be helpful. But I do not believe it can be of great value. Hence, it may be used, albeit to a limited extent, in conjunction with fundamental analysis to guide investment decision making.

For those who are enamoured of technical analysis here is a sobering finding.

In an extensive study, a computer was instructed to draw the charts of 540 NYSE stocks for a five-year period. It was programmed to scrutinise these charts and identify the 32 most commonly followed chart patterns like head and shoulders, triple tops and bottoms, channels, wedges, diamonds, and so on. Whenever the computer located a bearish formation (like the head and shoulders pattern followed by a downward move through the neckline) it registered a sell signal. Likewise, if it identified a bullish formation (like a triple bottom followed by an upside breakout) it recorded a buy signal. The computer compared the performance of stocks for which buy and sell signals were given with the performance of the market as a whole. The study concluded that: "There appears to be no relationship between technical indication and subsequent performance."

A Rationale for Technical Analysis While most academic scholars have dismissed technical analysis, Brown and Jennings in a 1989 article in the *Review of Financial Studies* provide a rigorous justification for technical analysis. Unlike the efficient markets hypothesis which assumes that information is available to all investors and the same gets quickly reflected in prices, the Brown and Jennings (BJ)[5] model argues that many investors get private information about the ultimate value of the stock. By observing the prices at which securities trade, each investor infers something about the information possessed by others. As Bodie, Kane, and Marcus put it: "As prices unfold,

[5] David Brown and Robert H. Jennings, "On Technical Analysis," *Review of Financial Studies* 2 (1989).

each trader infers the good-news or bad-news nature of the signals received by other traders and updates assessments of the firm accordingly. Prices *reveal* as well as *reflect* information and become useful data to traders."[6] Thus the sequence of prices is informative, making technical analysis useful.

Interestingly, some recent empirical works seem to support technical analysis. In a July 1990 *Journal of Finance* article, Jegadeesh found predictable pattern in monthly returns for the period 1934 to 1987. His study revealed that stocks with large losses in one month tend to show a significant reversal in the following month and vice versa. In a December 1992 *Journal of Finance* article, Block, LeBaron, and Lakonishok found support for two basic technical indicators, viz., moving averages and support and resistance. In an April 2000 *Journal of Finance* article, Chordia and Swaminathan found that trading volume has a bearing on leads and lags observed in stock prices. Returns on high-volume portfolios respond faster to market returns than do the returns on low-volume portfolios. In an August 2000 *Journal of Finance* article, Lo, Mamaysky, and Wang found that several technical indicators have some practical value as they provide incremental information.

Whether technical analysis works or not, it cannot be a quick road to riches. Even its ardent supporters generally admit that it works best in conjunction with fundamental analysis and helps in determining the entry and exit points.

Benjamin Graham on Technical Analysis

The one principle that applies to nearly all these "technical approaches" is that one should buy because a stock or the market has gone up and one should sell because it has declined. This is the exact opposite of sound business sense everywhere else, and it is most unlikely that it can lead to lasting success in Wall Street. In our own stock market experience and observation, extending over 50 years, we have not known a single person who has consistently or lastingly made money by "following the market". We do not hesitate to declare that this approach is as fallacious as it is popular.[7]

[6] Zvi Bodie, Alex Mane, and Alan J. Marcus, *Essentials of Investment 4/e*, New York. McGraw-Hill Irwin, 2001.

[7] Benjamin Graham, *The Intelligent Investor*, New York, Harper Collins Publishers, 1973.

SUMMARY

- Technical analysis involves a study of market data like prices and volumes to determine the future direction of price movement.
- Technical analysts use a variety of charting techniques, the most popular ones being the Dow theory, bar and line chart, the point and figure chart, the moving average line, and the relative strength line.
- The basic concepts underlying chart analysis are: (a) persistence of trends, (b) relationship between volume and trend, and (c) resistance and support levels.
- In addition to the chart, which forms the mainstay of technical analysis, technicians also use certain indicators – breadth indicators and market sentiment indicators – to guage the overall market situation. The popular breadth indicators are the advance – decline line, new highs and lows, and volume. The popular sentiment indicators are the short interest ratio, mutual fund liquidity, put/call ratio, and Trin statistic.
- Technical analysis appears to be a highly controversial approach to security analysis. It has its ardent votaries as well as severe critics.
- In a rational, well-ordered, and efficient market, technical analysis is a worthless exercise. However, given the imperfections, inefficiencies, and irrationalities that characterise real world markets, technical analysis can be helpful.

QUESTIONS

1. What are the basic premises of technical analysis?
2. What are the differences between technical analysis and fundamental analysis?
3. Discuss the basic concepts underlying chart analysis.
4. Explain the Dow theory.
5. What is a bar chart? What is a line chart?
6. Describe briefly the important technical formations on bar and line charts and the indications provided by them.
7. What are the features of a point and figure chart?
8. Explain the techniques of moving average analysis. What buy and sell signals are provided by it?
9. What is relative strength analysis? How do technical analysts use it?
10. What is breadth of market? How is it used?
11. Explain the following technical indicators: (a) new highs and lows, (b) volume, (c) short-interest ratio, (d) mutual fund liquidity, (e) put/call ratio and (f) Trin statistic.
12. What questions should you ask to assess the validity of a technical trading rule?
13. Evaluate technical analysis.

■ ■

PART

6

Derivatives

Chapter 17

Options

The Upside without the Downside

LEARNING OBJECTIVES

After studying this chapter, you should be able to:

- Compute the relationship between call and put prices.
- Calculate the profit function of various option strategies.
- Identify the variables that affect the value of a call option.
- Compute the value of a call option using the binomial model.
- Compute the value of a call option using the Black-Scholes model.

An option gives its owner the right to buy or sell an underlying asset on or before a given date at a fixed price. For example, you may enjoy the option to buy a certain apartment on or any time before December 31 of the current year at a price of Rs 5 million.

There can be as many different option contracts as the number of items to buy or sell. Stock options, commodity options, foreign exchange options, and interest rate options are traded on and off organised exchanges across the globe.

Options belong to a broader class of assets called contingent claims. A contingent claim is an asset whose payoff in future depends (or is contingent upon) on the outcome of some uncertain event.

The most popular model for pricing options is the Black-Scholes model which was published in 1973, the year in which the Chicago Board of Options Exchange (CBOE), the first organised options exchange in the world, was also set up - it was a rare occurrence in the field of finance when a seminal theoretical breakthrough coincided with a major institutional development. Black–Scholes formula is widely used by option traders. Such a rapid translation of theory to practice on such an extensive scale is perhaps without a precedent in the history of finance.

Since the option pricing model has played such an important role in advancing the frontiers of finance, a basic understanding of this model is essential for students of finance.

This chapter describes how options work, what are the payoffs of call and put options, what are the payoffs associated with popular option pricing strategies, what factors determine option values, how the value of options can be established using the simple binomial model, what is the Black–Scholes formula, and what are the features of index options and options on individual securities that have been introduced in India recently.

Read this chapter carefully because many believe that the option pricing theory represents the most important development of modern finance.

17.1 HOW OPTIONS WORK

An option is a special contract under which the option owner enjoys the right to buy or sell something without the obligation to do so. Options have a special terminology associated with them.

- The option to buy is a **call option** (or just call) and the option to sell is a **put option** (or just put).
- The **option holder** is the buyer of the option and the **option writer** is the seller of the option.
- The fixed price at which the option holder can buy and/or sell the underlying asset is called the **exercise price** or **strike price**.
- The date when the option expires or matures is referred to as the **expiration date** or **maturity date**. After the expiration date, the option is worthless.
- The act of buying or selling the underlying asset as per the option contract is called **exercising the option**.
- A **European option** can be exercised only on the expiration date whereas an **American option** can be exercised on or before the expiration date.
- Options traded on an exchange are called **exchange-traded options** and options not traded on an exchange are called **over-the-counter options**.
- Options are said to be **at the money** (ATM) or **in the money** (ITM) or **out of the money** (OTM) as shown below.

	Call option	*Put option*
ATM	Exercise price = Market price	Exercise price = Market price
ITM	Exercise price < Market price	Exercise price > Market price
OTM	Exercise price > Market price	Exercise price < Market price

- The value of an option, if it were to expire immediately, is called its **intrinsic value**. The excess of the market price of any option over its intrinsic value is called the **time value of the option**. To illustrate, suppose the market price of a share is Rs. 260, the exercise price of a call option on the share is Rs. 250, and the market price of the call option is Rs 15. In this case, the intrinsic value of the option is Rs 10 (Rs. 260 - Rs. 250) and the time value of the option is Rs. 5 (Rs. 15 – Rs. 10).

- Exchange-traded options are standardised in terms of quantity, trading cycle, expiration date, strike prices, type of option, and mode of settlement.

17.2 EQUITY OPTIONS IN INDIA

There are two popular types of equity options: index options and options on individual securities. Both the types of equity options have been introduced in India few years ago by the National Stock Exchange and the Bombay Stock Exchange.

Index Options Index options are options on stock market indices. Currently the most popular index option in India is the option on the S&P CNX Nifty which is traded on the National Stock Exchange. The salient features of this option contract are as follows:

- The contract size is 200 times (or multiples thereof) the underlying index, viz., S&P CNX Nifty.
- It is a European style option contract.
- The options contracts have a maximum of three month trading cycle – the near month (one), the next month (two), and the far month (three). A new contract will be introduced on the next trading day, following the expiry of near month contract.
- The expiry day is the last Thursday of the expiry month or the previous trading day if the last Thursday is a trading holiday.
- The contract is cash settled. The settlement is done a day after the expiry day based on the expiration price as may be decided by the exchange.

Options on Individual Securities Options on individual securities have been introduced by the National Stock Exchange and the Bombay Stock Exchange. The features of such option contracts on the National Stock Exchange are as follows:

- Option contracts on individual securities will have a maximum of three-month trading cycle. On expiry of the near month contract, a new contract shall be introduced at new strike prices for both call and put options, on the trading day following the expiry of the near month contract.
- The Exchange shall provide a minimum of five strike prices for every option type (i.e. call and put) during the trading month. There shall be two contracts in-the-money (ITM), two contracts out-of-the-money (OTM), and one contract at-the-money (ATM).

Exhibit 17.1 shows the quotations of Nifty options drawn from the October 9, 2007 issue of the *Economic Times*.

Exhibit 17.1 ***Quotations of NIFTY OPTIONS***

Contracts	Premium (Rs.)				Open Int	No. of
(Type. Stk. Price – Expiry)	Open	High	Low	Close	('000)	Cont
CE-5250.00 – Oct	130.00	130.00	60.00	65.90	313	3419
CE-5300.00 – Oct	110.00	110.00	45.00	53.55	907	15357
CE-5350.00 – Oct	85.00	90.00	32.05	42.65	15	214
CE-5400.00 – Oct	70.00	74.00	25.25	29.55	425	7989
CE-5450.00 – Oct	40.00	50.00	18.00	22.80	174	2897
CE-5150.00 – Nov	189.00	189.00	189.00	189.00	1	1
CE-5200.00 – Nov	218.20	218.20	169.00	187.60	208	306
CE-5300.00 – Nov	176.20	176.20	132.05	142.95	194	584
CE-5350.00 – Nov	121.00	139.95	121.00	139.95	0	3
CE-5400.00 – Nov	130.00	130.00	89.00	89.65	13	93
CE-5000.00 – Dec	400.00	400.00	300.00	310.15	0	3
CE-5200.00 – Dec	201.00	296.00	201.00	296.00	1	5
PE-4700.00 – Oct	33.00	54.00	33.00	46.85	1772	9551
PE-4750.00 – Oct	55.50	63.00	47.00	51.05	57	135
PE-4800.00 – Oct	40.05	74.95	40.05	62.00	1902	12647
PE-4850.00 – Oct	74.00	90.00	66.00	77.25	158	160
PE-4900.00 – Oct	65.00	109.90	63.00	92.40	1872	19661
PE-4300.00 – Nov	40.80	40.80	38.00	38.15	43	100
PE-4400.00 – Nov	59.95	72.00	59.95	69.00	17	46
PE-4500.00 – Nov	73.95	93.00	73.95	81.20	404	606
PE-4600.00 – Nov	85.00	117.90	85.00	100.00	121	241
PE-4700.00 – Nov	119.90	128.95	115.00	121.60	108	61
PE-4800.00 – Nov	98.00	162.00	98.00	150.00	106	309
PE-4900.00 – Dec	224.00	225.00	221.00	222.25	1	9
PE-5000.00 – Dec	289.00	299.00	245.00	245.00	0	4

- Option contracts on individual securities shall expire on the last Thursday of the expiry month. If the last Thursday is a trading holiday, the contract shall expire on the previous day.
- The value of an option contract on individual securities shall not be less than Rs 200,000 at the time of introduction. The permitted lot size for the option contracts on individual securities shall be in multiples of 100 and fractions, if any, shall be rounded off to the next higher multiple of 100.
- The price steps in respect of all option contracts admitted to dealings in the Exchange shall be Rs 0.05.
- Base price of the options contracts on introduction of new contracts shall be the theoretical value of the options contract arrived at using the Black-Scholes model. The base price of the contracts on subsequent trading days will be the daily close price of the option contracts.

- Options on individual securities are American style. In American style option contracts, the exercise type is automatic on the expiration day, and the exercise type is voluntary prior to the expiration date of the option contract. Automatic exercise means that all in-the-money options would be exercised by NSCCCL (the clearing corporation) on the expiration day of the contract. The buyer of such options need not give an exercise notice in such cases. Voluntary exercise means that the buyer of an in-the-money option is required to direct his broker to give exercise instructions to NSCCCL.
- Settlement of exercises of options on securities will be by payment in cash and not by delivery of securities, at least initially, in accordance with SEBI guidelines. The settlement is on T + 3 day.

Exhibit 17.2 shows the quotations for call options and put options on Reliance Energy Limited drawn from the October 9, 2007 issue of *The Economic Times*.

Exhibit 17.2 ***Options on Reliance Energy Limited***

Contracts	Premium (Rs.)				Open Int	No. of
(Type. Stk. Price – Expiry)	Open	High	Low	Close	('000)	Cont
CA-1040.00 – Oct	407.00	410.00	212.15	212.15	24	28
CA-1200.00 – Oct	151.00	199.95	150.00	185.00	113	8
CA-1290.00 – Oct	180.00	180.00	88.05	140.00	62	29
CA-1350.00 – Oct	100.00	100.00	62.00	90.00	18	38
CA-1380.00 – Oct	80.10	91.95	44.05	74.85	117	403
CA-1400.00 – Oct	77.05	77.90	38.10	62.20	86	232
CA-1440.00 – Oct	88.00	90.00	31.10	50.55	152	133
CA-1470.00 – Oct	72.00	72.00	30.00	40.00	13	29
CA-1500.00 – Oct	75.00	75.00	20.00	32.60	149	239
CA-1530.00 – Oct	47.00	47.00	16.00	26.30	111	80
CA-1560.00 – Oct	45.00	59.80	13.65	21.15	29	72
PA-1110.00 – Oct	9.55	9.75	6.00	6.00	32	6
PA-1200.00 – Oct	19.00	22.00	12.00	15.50	75	90
PA-1260.00 – Oct	32.00	40.00	27.00	27.90	9	8
PA-1290.00 – Oct	37.45	51.05	34.00	35.00	22	14
PA-1410.00 – Oct	85.00	124.00	66.50	90.00	12	10

17.3 OPTIONS AND THEIR PAYOFFS JUST BEFORE EXPIRATION

This section looks at the features of call and put options and their payoffs just before expiration, from the point of view of the option holder as well as the option writer. In addition, it discusses combination options.

Call option The most common type of option, the *call option*, gives the option holder the right to buy an asset at a fixed price during a certain period. While there is no restriction on the kind of asset, the most popular type of call option is the option on stocks. For example, investors can buy call options on Reliance Industries stock (and many other stocks) on the National Stock Exchange. A typical call option on Reliance Industries stock entitles the investor to buy 150 shares of Reliance Industries on or before say July 25, 200X at an exercise price of Rs. Y. Such an option is valuable if there is some likelihood that the price of the common (equity) stock of Reliance Industries will rise above Rs. Y on or before July 25, 200X.

To provide protection to the option holder, the option contract generally specifies that the exercise price and the number of shares will be adjusted for stock splits and stock dividends. For example, if the Reliance Industries stock splits 4 to 1, the option contract will be for 600 shares at an exercise price of Rs. Y/4. Of course, no adjustment is made for cash dividends. Remember that the holder of a call option is not entitled to receive cash dividends.

Payoff of a Call Option What is the payoff of a European call option? To answer this question let us look at the possible payoffs of the call option just before expiration[1]. The payoff of the call option (C) just before expiration depends on the relationship between the stock price (S_1) and the exercise price (E). Formally

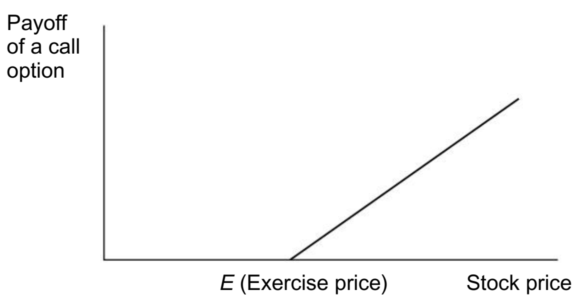
$$C = S_1 - E \text{ if } S_1 > E \tag{17.1}$$

$$C = 0 \text{ if } S_1 \leq E \tag{17.2}$$

This means $C = \text{Max}(S_1 - E, 0)$. Exhibit 17.1 shows graphically the value of call option. When $S_1 \leq E$, the call is said to be "out of money" and is worthless. When $S_1 > E$, the call is said to be "in the money" and its value is $S_1 - E$.

Put Option The opposite of a call option is a *put option*. While the call option gives the holder the right to buy a stock at a fixed price, the put option gives the holder the right to sell a stock at a fixed price. For example, a put option on the BHEL stock may give its holder the right to sell n shares of BHEL on or before July 25, 200X at a price of Rs. Y per share. Such an option is valuable if there is some possibility that the price of BHEL stock will fall below Rs. Y per share on or before July 25, 200X.

Exhibit 17.1 ***Payoff of a Call Option***



[1] Recall that such an option can be exercised only on the expiration date, not before.

Payoff of a Put Option The payoff of a put just before expiration depends on the relationship between the exercise price (E) and the price of the underlying stock (S_1). If $S_1 < E$, the put option has a value of $S_1 - E$, and is said to be "in the money". On the other hand if $S_1 \geq E$, the put option is worthless and is said to be "out of money". Thus the payoff of a put option just before expiration is:

	If $S_1 < E$	If $S_1 \geq E$
Value of the put option	$E - S_1$	0

Put differently, just before expiration the payoff of a put option is Max ($E - S_1$,0). Exhibit 17.2 plots the relationship between the value of the underlying stock and the payoff of the put option.

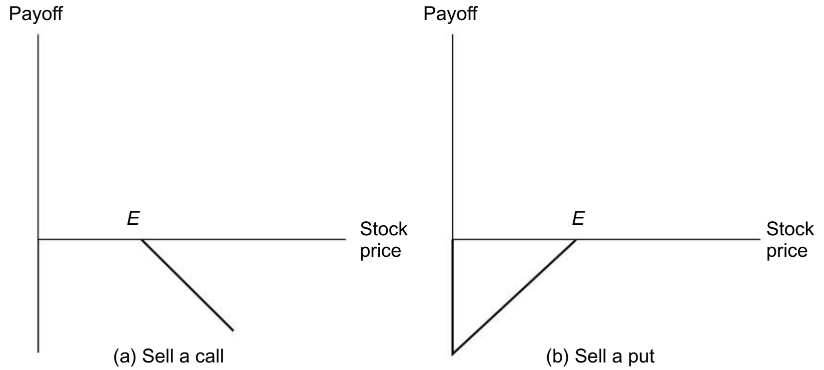
Exhibit 17.2 ***Payoff of a Put Option***

Seller's Position We discussed the payoff of call and put options from the point of view of the option buyer (or holder). Let us now look at the options from the point of view of the option writer (or seller).

A writer of a call option collects the option premium from the buyer (holder) of the option. In return, he is obliged to deliver the shares, should the option buyer exercise the option. If the stock price (S_1) is less than the exercise price (E) on the expiration date, the option holder will not exercise the option. In this case, the option writer's liability is nil. On the other hand, if the stock price (S_1) is more than the exercise price (E), the option holder will exercise the option. Hence the option writer loses $S_1 - E$.

What is the payoff from the point of view of the seller (or writer) of a put option? If the price of the stock (S_1) is equal to or more than the exercise price (E), the holder of the put option will not exercise the option. Hence the option writer's liability is nil. On the other hand, if $S_1 < E$, the holder of the put option will exercise the option. Hence the option writer loses $E - S_1$. The payoffs for "selling a call"and "selling a put" from the sellers' point of view are plotted in Exhibit 17.3.

Exhibit 17.3 ***Payoffs to the Seller of Options***

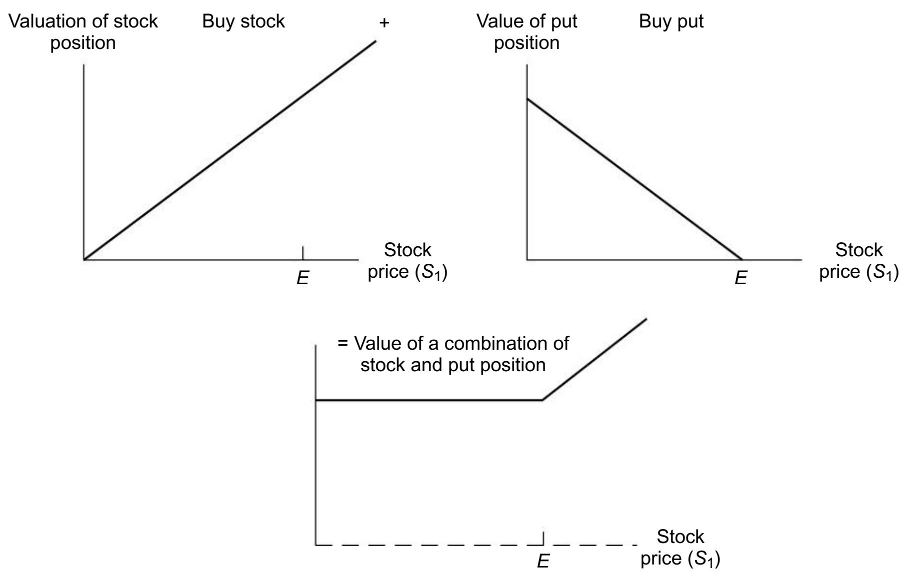


Combinations Puts and calls represent basic options. They serve as building blocks for developing more complex options. Exhibit 17.4 shows the payoff for a combination of (i) buying a stock, and (ii) buying a put option on the stock.

The algebra corresponding to this combination is as follows:

	Payoffs Just Before Expiration Date	
	If $S_1 < E$	*If $S_1 > E$*
(1) Put option	$E - S_1$	0
+		
(2) Equity stock	S_1	S_1
= Combination	E	S_1

Exhibit 17.4 ***Payoffs of a Combination of Buying Equity and Put Option***



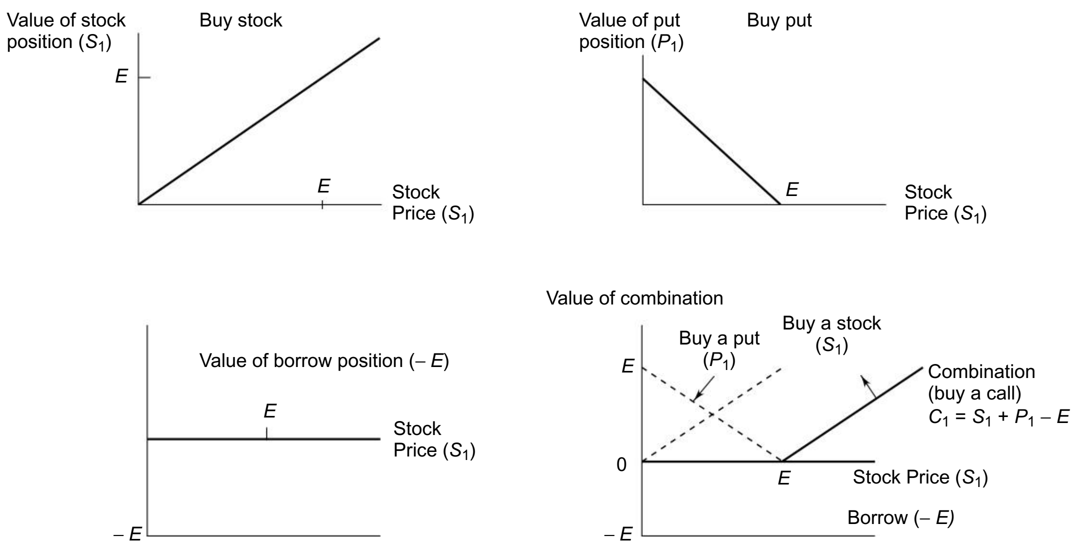
Thus, if you buy a stock along with a put option on that stock (exercisable at price E), your payoff will be E if the price of the stock is less than E; otherwise your payoff will be S_1.

Consider a more complex combination that consists of (i) buying a stock, (ii) buying a put option on that stock, and (iii) borrowing an amount equal to the exercise price. The payoff from this combination is identical to the payoff from buying a call option. The algebra of this equivalence is shown as follows:

	Payoffs Just Before Expiration Date	
	If $S_1 < E$	*If $S_1 > E$*
(1) Buy the equity stock	S_1	S_1
(2) Buy a put option	$E - S_1$	0
(3) Borrow an amount equal to the exercise price	$-E$	$-E$
(1) + (2) + (3) = Buy a call option	0	$S_1 - E$

The payoffs from the individual components and the combination are shown in Exhibit 17.5.

Exhibit 17.5 ***Graphical Representation of the Put Call Parity Theorem***



If C_1 is the terminal value of the call option (remember that $C_1 = \text{Max}\ (S_1 - E), 0)$, P_1 the terminal value of the put option (Remember that $P_1 = \text{Max}\ (E - S_1), 0)$, S_1 the terminal price of the stock, and E the amount borrowed, we know from the preceding analysis that:

$$C_1 = S_1 + P_1 - E \tag{17.3}$$

This is referred to as the **put-call parity** theorem.

Exotic Options

In recent years there has been a veritable explosion in the range of option instruments. Many of these options have unusual features, so they are called "exotic options." A sampling of them is given below:

Asian Options Asian options are options whose payoffs depend on the average price of the underlying asset during some portion of the life of the option. For example, the payoff of such an option may be either equal to the average stock price over the last three months minus the exercise price or zero, whichever is higher. Such options have appeal to firms that wish to hedge a profit stream which is dependent on the average price of some commodity over a period of time.

Barrier Options The payoff of a barrier option depends not only on what the price of the underlying asset is at the time of option expiration but also on whether the price of the underlying asset has crossed some "barrier." For example, a *down-and-out-option* is a barrier option that becomes worthless no sooner the stock price falls below some barrier price. Likewise, a *down-and-in-option* does not provide a payoff unless the price of the underlying asset falls below some barrier at least once during the life of the option.

Binary Options A binary option provides a fixed payoff, depending on the fulfillment of some condition. For example, a binary put option may pay off Rs. 100 if the stock price at maturity is less than the exercise price.

Lookback Options The payoff of a lookback option depends on the maximum or minimum price of the underlying asset during the life of the option. For example, the payoff of a lookback call option may be equal to the maximum stock price during the life of the option minus the exercise price.

17.4 OPTION STRATEGIES

You can achieve an innumerable variety of payoff patterns by combining puts and calls with various exercise prices. Some of the more popular strategies are discussed below.

Strategies with Individual Stock Options

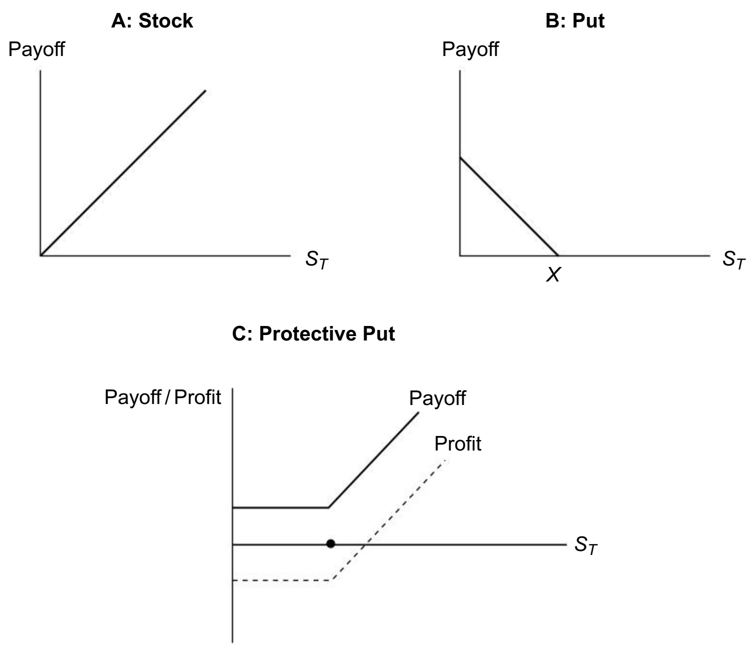
Protective Put Suppose you are interested in investing in a stock because its upside potential attracts you. However, you are concerned about the fall in its price. To protect yourself against potential losses beyond some given level, you can invest in the stock and simultaneously purchase a put option on it. Such a strategy is called a *protective put* strategy.

The payoff of a protective put is as follows:

	$S_T \le X$	$S_T \ge X$
Stock	S_T	S_T
+ Put	$X - S_T$	0
= Total	X	S_T

The payoff and profit of a protective put strategy are illustrated in Exhibit 17.6. *Note that the profit function is simply the payoff function less the premium paid to buy the put option.*

Exhibit 17.6 ***Payoff and Profit of a Protective Put at Expiration***



The solid line in this exhibit represents the payoff whereas the dashed line represents the profit. Note that the potential loss of a protective put is limited to the price of the put.

Let us see how the protective put compares with the stock investment. For the sake of simplicity we will consider an at-the-money protective put, so that $X = S_0$. Exhibit 17.7 shows the profit functions for the two strategies. From this exhibit it is clear that the protective put serves the purpose of limiting the downside risk. The premium paid to acquire the put represents the cost of insurance against stock price declines.

Covered Call A covered call strategy involves writing a call option on an asset along with buying the asset. It is called a "covered" position because the potential obligation to deliver the stock is covered by the underlying stock in the portfolio.

The payoff of a covered call is simply the stock value less the payoff of writing the call:

	$S_T \leq X$	$S_T > X$
Payoff of stock	S_T	S_T
– Payoff of writing a call	-0	$-(S_T - X)$
Total	S_T	X

Exhibit 17.7 ***Protective Put versus Stock Investment***

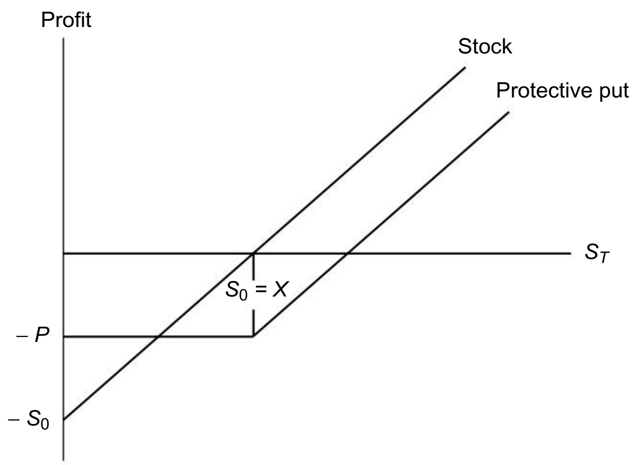


Exhibit 17.8 illustrates the payoff pattern associated with a covered call. From this exhibit we find that the payoff of a covered call is equal to S_T when the stock price at time T is below X and increases to a maximum of X when S_T exceeds X. This means that the call writer sells the claim to any stock value above X in return for the call price. Hence, at expiration his position is worth at most X. The profit of the covered call position is represented by the dashed line in Exhibit 17.8

Institutional investors find it appealing to write calls on stocks in their portfolio so that they can boost their earnings with the help of call premiums. True, by selling calls they forego potential gain arising from the increase in the stock price above the exercise price. So they normally do it when they plan to sell the stock anyway at a price of X. In such a case the call written by them imposes a certain self-discipline as it ensures that the stock is sold as planned.

Straddle A long straddle involves buying a call as well as a put on a stock at the same exercise price.

The payoff of a straddle is simply the payoff of a call plus the payoff of a put:

	$S_T < X$	$S_T \geq X$
Payoff of a call	0	$S_T - X$
+ Payoff of a put	$X - S_T$	0
Total	$X - S_T$	$S_T - X$

Exhibit 17.9 illustrates the payoff of a straddle. Note that the payoff of a straddle is always positive, except when $S_T = X$ (In this case the payoff is 0). The dashed line in this exhibit represents the profit of a straddle. The profit line is less than the payoff line by the cost of buying the straddle ($P + C$).

Exhibit 17.8 *Payoff and Profit of a Covered Call Position at Expiration*

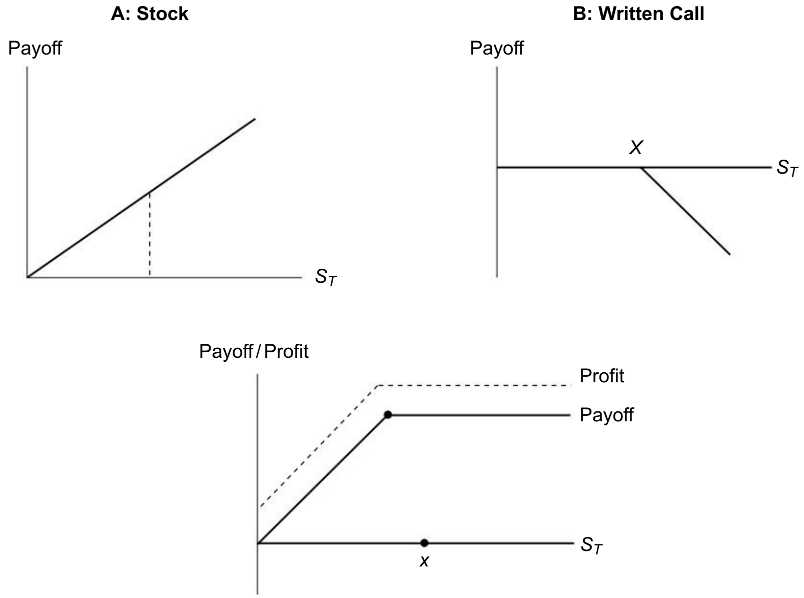
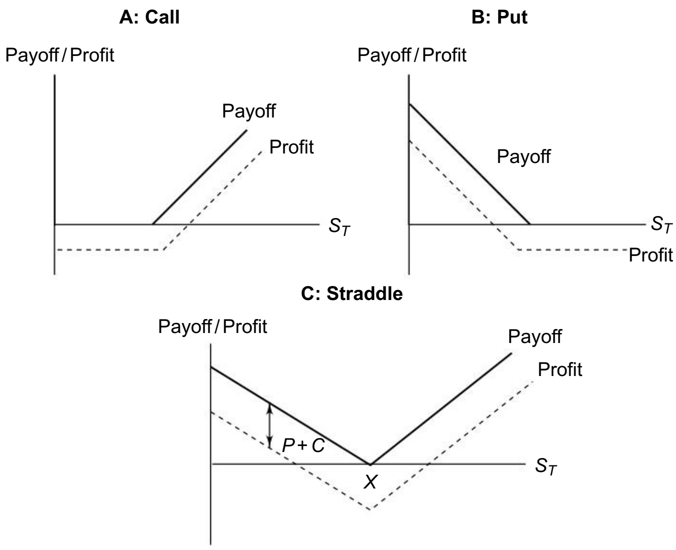


Exhibit 17.9 *Payoff and Profit of a Straddle at Expiration*



A straddle position makes sense for an investor who believes that the stock price is likely to move a lot but is not sure about the direction of the price movement. In essence, a straddle is a bet on price volatility. Note that the straddle is profitable only when the stock price deviates from the exercise price by an amount equal to the cost of buying the straddle ($P + C$).

The payoff and profit of a short straddle will be the inverse of that of a long straddle. A short straddle makes sense for an investor who believes that the stock price movement will be subdued.

A variant of a straddle is a **strangle**. A strangle is similar to a straddle, except that the strike prices of the call and put options are different.

Spread A spread involves combining two or more call options (or two or more puts) on the same stock with differing exercise prices or times to maturity. Some options are bought and some options are sold. A vertical or money spread involves purchase and sale of options at different exercise prices. A horizontal or time spread involves purchase and sale of options with differing expiration dates.

The payoffs of a vertical spread in which one call option is bought at an exercise price X_1 and another call option is written (sold) at a higher exercise price X_2 ($X_2 > X_1$) is as follows:

	$S_T < X_1$	$X_1 < S_T \leq X_2$	$S_T > X_2$
Payoff of call, exercise price = X_1	0	$S_T - X_1$	$S_T - X_1$
– Payoff of call, exercise price = X_2	– 0	– 0	$-(S_T - X_2)$
	0	$S_T - X_1$	$X_2 - X_1$

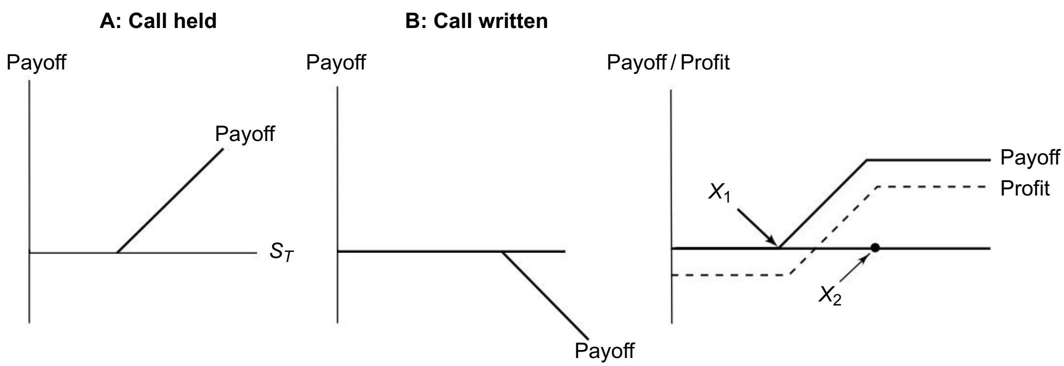
Thus, in a vertical spread there are three outcomes, instead of two:

- The low price region where $S_T \leq X_1$
- The middle price region where $X_1 < S_T \leq X_2$
- The high price region where $S_T > X_2$

Exhibit 17.10 illustrates the payoff and profit associated with a vertical spread.

Note that the payoff either increases or is not affected by stock price increases. Hence this strategy is also called a **bullish spread** strategy.

Exhibit 17.10 ***Payoff and Profit of a Vertical Spread at Expiration***



Collar A collar is an options strategy that limits the value of a portfolio within two bounds. Suppose that an investor has a large equity holding in Reliance Industries which is currently selling at Rs. 2500 per share. To ensure that the value of the portfolio does not fall below Rs 2400 per share, the investor can buy a protective put with an exercise price of Rs. 2400. To enjoy this protection the investor has to pay the put premium. To pay for the put, the investor may write a call option, say with an exercise price of Rs. 2600. The call and the put may sell at approximately the same price, implying that the net outlay for the two option positions is roughly zero. By writing the call, the investor limits the upside potential of his equity holding. Thus, by buying a put and writing a call, the investor obtains downside protection but also sacrifices the upside potential. Put differently, this strategy limits the value of his portfolio between two pre-determined bounds, irrespective of how the price of the underlying stock moves.

Strategies with Stock Index Options

You can use stock index options the way you use individual stock options:

- If you expect the market to rise, buy calls on the stock index. If the market does rise, the gain from your calls can be substantial, far greater than the premium paid for the calls.
- If you expect the market to fall, buy puts on the stock index. If the market does fall, the gain from your puts can be considerable, far greater than the premium paid for the puts.
- If you own a diversified portfolio of stocks, you can hedge your position by buying puts on the stock index. If the market falls, the erosion in your portfolio value will be offset by the gains on the stock index puts. In effect, you are buying a form of market insurance. Of course, if your portfolio is not perfectly correlated with the market index, you may not achieve complete protection against market decline. As long as your portfolio is adequately diversified as the market index, you will achieve substantial protection against market decline.

17.5 FACTORS DETERMINING OPTION VALUES

In the previous section, we looked at the payoffs of options just before the expiration date. Now we determine the present value of options.

Boundaries Before we identify the factors determining option values, it is helpful to specify the boundaries within which the value of an option falls.

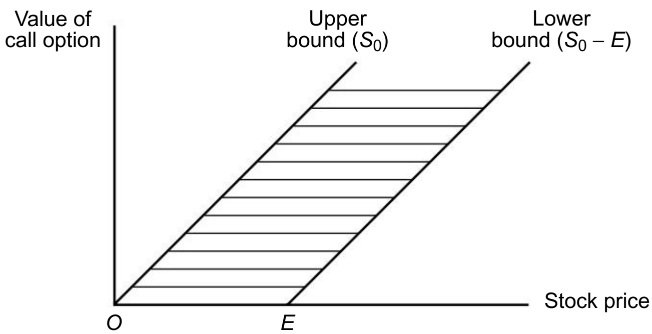
The minimum value at which a call option sells before the expiration date, say, at time zero, is Max $(0, S_0 - E)$. This means that C_0, the value of a call option, can never fall below zero (this happens when $S_0 < E$). Also, it means that the value of a call option cannot fall below $S_0 - E$ (this happens when $S_0 > E$). To see why this is so, consider a call option with $E = 150$, $S_0 = 250$, and $C_0 = 75$. In this case it pays an investor to buy the call option for 75, exercise it for 150, and finally sell the stock for 250. By doing so he earns a profit of:

$$S_0 - (C_0 + E) = 250 - (75 + 150) = 25$$

This profit, reflecting arbitrage profit, comes without incurring any risk or cost. Such a profit cannot occur in a well functioning financial market. Hence in such a market C_0 cannot sell for less than $S_0 - E$.

What is the upper limit for the option price? A call option entitles the holder to buy the underlying stock on payment of a certain exercise price. Hence its value cannot be greater than that of the underlying stock. If it were so, the investor would be better off by buying the stock directly. The upper and lower bounds for the value of a call option are shown in Exhibit 17.11.

Exhibit 17.11 ***Upper and Lower Bounds for the Value of Call Option***



Key Factors As indicated above, the price of a call option must fall in the shaded region of Exhibit 17.11. Put formally,

$$\text{Max}\,(S_0 - E,\, 0) \leq C_0 \leq S_0 \qquad (17.4)$$

Where exactly in the shaded region will the value of a call option be? The precise location of the option value depends on five key factors:

- Exercise price
- Expiration date
- Stock price
- Stock price variability
- Interest rate

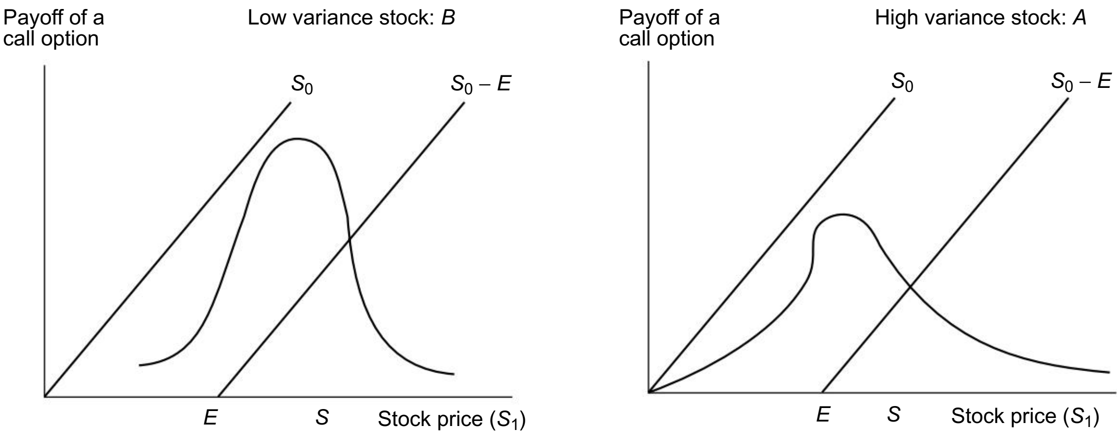
Exercise Price By now it is obvious that, other things being constant, the higher the exercise price the lower the value of the call option. Remember that the value of a call option can never be negative, regardless of how high the exercise price is set. Further it has a positive value if there is some possibility that the stock price will be higher than the exercise price before the expiration date.

Expiration Date Other things being equal, the longer the time to expiration date the more valuable the call option. Consider two American calls with maturities of one year and two years. The two-year call obviously is more valuable than the one year call because it gives its holder one more year within which it can be exercised.

Stock Price The value of a call option, other things being constant, increases with the stock price. This point is obvious from the figures showing the relationship between the stock price and the value of call option.

Variability of the Stock Price A call option has value when there is a possibility that the stock price exceeds the exercise price before the expiration date. Other things being equal, the higher the variability of the stock price, the greater the likelihood that the stock price will exceed the exercise price. This point is graphically illustrated in Exhibit 17.12.

Exhibit 17.12 ***Value of Call Options for Low Variability and High Variability Stocks***



In this figure the price distribution of two stocks, *A* and *B*, is given. While both *A* and *B* have the same expected value, *A* has a higher variance than *B*. Given an exercise price of *E*, a call option on *A* is more valuable than that on *B*. This is so because the holder of a call option gains when the stock price exceeds the exercise price and does not lose when the stock price is less than the exercise price.

So fundamental is this point that it calls for another illustration. Consider the probability distribution of the price of two stocks, *P* and *Q*, just before the call option (with an exercise price of 80) on them expires.

P		*Q*	
Price	*Probability*	*Price*	*Probability*
60	0.5	50	0.5
80	0.5	90	0.5

While the expected price of stock *Q* is same as that of stock *P*, the variance of *Q* is higher than that of *P*. The call option (exercise price: 80) on stock *P* is worthless as there is no likelihood that the price of stock *P* will exceed 80. However, the call option on stock *Q* is valuable because there is a distinct possibility that the stock price will exceed the exercise price.

Remember that there is a basic difference between holding a stock and holding a call option on the stock. If you are a risk-averse investor, you try to avoid buying a high variance stock, as it exposes you to the possibility of negative returns. However, you will like to buy a call option on that stock because you receive the profit from the right tail of the probability distribution, while avoiding the loss on the left tail. Thus, regardless of your risk disposition, you will find a high variance in the underlying stock desirable.

Interest Rate When you buy a call option you do not pay the exercise price until you decide to exercise the call option. Put differently, the payment, if any, is made in future. The higher the interest rate, the greater the benefit will be from delayed payment and vice versa. So the value of a call option is positively related to the interest rate.

Functional Relationship The manner in which the five variables discussed above influence the value of a call option is shown in the following relationship:

$$C_0 = f\,[\underset{+}{S_0},\ \underset{-}{E},\ \underset{+}{\sigma^2},\ \underset{+}{t},\ \underset{+}{r_f}] \tag{17.5}$$

where C_0 is the value of the call option, S_0 is the price of the underlying stock (or asset in general), E is the exercise price, σ^2 is the variance of the return on the underlying asset, t is the time left to expiration, and r_f is the risk-free interest rate.

The sign (+, –) put below a variable denotes the nature of its influence on the value of the call option. You must be eager to know the precise relationship between these variables and the value of call option. Black and Scholes developed their celebrated option pricing model which expresses this relationship. Before we look at their model, it is helpful to understand the two-state or binomial option valuation model.

17.6 BINOMIAL MODEL FOR OPTION VALUATION

The standard DCF (discounted cash flow) procedure involves two steps, viz. estimation of expected future cash flows and discounting of these cash flows using an appropriate cost of capital. There are problems in applying this procedure to option valuation. While it is difficult (though feasible) to estimate expected cash flows, it is impossible to determine the opportunity cost of capital because the risk of an option is virtually indeterminate as it changes every time the stock price varies.

Since options cannot be valued by the standard DCF method, financial economists struggled to develop a rigorous method for valuing options for many years. Finally, a real breakthrough occurred when Fisher Black and Myron Scholes[2] published their

[2] Fisher Black and Myron Scholes, "The Pricing of Options and Corporate Liabilities", *Journal of Political Economy*, vol. 81 (May-June 1973).

famous model in 1973. The basic idea underlying their model is to set up a portfolio which imitates the call option in its payoff. The cost of such a portfolio, which is readily observed, must represent the value of the call option.

The key insight underlying the Black and Scholes model may be illustrated through a single-period binomial (or two-state) model. The following assumptions may be employed to develop this model.

- The stock, currently selling for S, can take two possible values next year, uS or dS ($uS > dS$).
- An amount of B can be borrowed or lent at a rate of r the risk-free rate. The interest factor $(1 + r)$ may be represented, for the sake of simplicity, as R.
- The value of R is greater than d but smaller than $u (d < R < u)$. This condition ensures that there is no risk-free arbitrage opportunity.
- The exercise price is E.

The value of the call option, just before expiration, if the stock price goes up to uS, is

$$C_u = \text{Max}\ (uS - E, 0) \tag{17.6}$$

Likewise, the value of the call option, just before expiration, if the stock price goes down to dS is

$$C_d = \text{Max}\ (dS - E, 0) \tag{17.7}$$

Let us now set up a portfolio consisting of Δ shares of the stock and B rupees of borrowing. Since this portfolio is set up in such a way that it has a payoff identical to that of a call option at time 1, the following equations will be satisfied:

Stock price rises: $$\Delta uS - RB = C_u \tag{17.8}$$

Stock price falls: $$\Delta dS - RB = C_d \tag{17.9}$$

Solving Eqs (17.8) and (17.9) for Δ and B, we get

$$\Delta = \frac{C_u - C_d}{S(u-d)} = \frac{\text{Spread of possible option prices}}{\text{Spread of possible share prices}} \tag{17.10}$$

$$B = \frac{dC_u - uC_d}{(u-d)R} \tag{17.11}$$

Since the portfolio (consisting of Δ shares and B debt) has the same payoff as that of a call option, the value of the call option is

$$C = \Delta S - B \tag{17.12}$$

Note that the value of option is found out by looking at the value of a portfolio of shares and loan that imitates the option in its payoff. So this may be referred to as the option equivalent calculation.

To illustrate the application of the binomial model consider the following data for Pioneer's stock:

$$S = 200\ ,\ u = 1.4,\ d = 0.9$$

$$E = 220\ ,\ r = 0.10,\ R = 1.10$$

$$C_u = \text{Max}\ (uS - E, 0) = \text{Max}\ (280 - 220, 0) = 60$$

$$C_d = \text{Max}\ (dS - E, 0) = \text{Max}\ (180 - 220, 0) = 0$$

Given the above data, we can get the values of Δ and B by using Eqs (17.10) and (17.11).

$$\Delta = \frac{C_u - C_d}{(u-d)\,S} = \frac{60}{0.5\,(200)} = 0.6$$

$$B = \frac{d\,C_u - uC_d}{(u-d)\,R} = \frac{0.9\,(60)}{0.5\,(1.10)} = 98.18$$

Thus the portfolio consists of 0.6 of a share plus a borrowing of 98.18 (entailing a repayment of 98.18 (1.10) = 108 after one year). The identity of the payoffs of the portfolio and call option is shown below:

	Portfolio	*Call Option*
When *u* occurs	1.4 x 200 × 0.6 – 108 = 60	C_u = 60
When *d* occurs	0.9 x 200 × 0.6 – 108 = 0	C_d = 0

Given the equivalence of the call option and the portfolio, the value of the call option is:

$$C = \Delta\,S - B = 0.6 \times 200 - 98.18 = 21.82$$

Note that we could establish the value of the call option without any idea about the probability that the stock would go up or come down. An optimistic investor may think that the probability of an upward move is high whereas a pessimistic investor may think that it is low. Yet the two will agree that the value of the call option is 21.82. Why? The answer lies in the fact that the current stock price of 200 already incorporates the views of the optimists as well as the pessimists. And the option value, in turn, depends on the stock price.

Risk-Neutral Valuation Why should the call option on Pioneer stock sell for Rs. 21.82? If the option price exceeds Rs. 21.82, you can make a certain profit by borrowing Rs. 98.18, selling a call option, and buying 0.6 of a share of Pioneer's stock. Likewise, if the option price is less than Rs. 21.82, you can make a certain profit by selling 0.6 of a share of Alpha's stock, lending Rs. 98.18, and buying a call option. In either case you have an opportunity to make money without incurring any risk. Put differently, you have a money machine.

Since there cannot be a money machine, the equilibrium price of the call option is Rs. 21.82. Note that we established the equilibrium price of the call option without knowing anything about the attitude of investors toward risk. The price of the option does not depend on the investor attitude toward risk. It does not matter whether investors love risk or hate risk.

This suggests that there is an alternative method for valuing the option. In this alternative method, called the risk-neutral valuation method, we assume that investors are risk-neutral (indifferent to risk), calculate the expected future value of the option, and convert it into its present value by using the risk-free rate.

If investors are risk-neutral, the expected return on the equity stock of Pioneer must be equal to the risk-free rate.

$$\text{Expected return on Pioneer's stock} = 10 \text{ percent}$$

Since Pioneer's stock can either rise by 40 percent to 280 or fall by 10 percent to 180, we can calculate the probability of a price rise in the hypothetical risk-neutral world.

$$\begin{aligned}\text{Expected return} &= [\text{Probability of rise} \times 40\ \%] + [(1 - \text{Probability of rise}) \times -10\%]\\ &= 10\%\end{aligned}$$

Therefore the probability of rise is 0.40[3]. This is called the risk-neutral probability.

We know that if the stock price rises, the call option has a value of Rs. 60 and if the stock price falls the call option has a value of Rs 0.

Hence, if investors are risk-neutral, the call option has an expected future value of (Probability of rise × Rs 60) + (1 – Probability of rise × Rs 0)

$$= 0.40 \times \text{Rs } 60 + 0.60 \times \text{Rs } 0 = \text{Rs } 24.$$

The current value of the call option is the present value of the expected future value:

$$\frac{\text{Expected future value}}{1 + \text{Risk-free rate}} = \frac{\text{Rs } 24}{(1.10)} = \text{Rs } 21.82$$

Not surprisingly, this is exactly the answer we got by using the option equivalent method. Thus, we have two ways of calculating the value of an option in the binomial world.

Option Equivalent Method Find a portfolio of shares and loan that imitates the option in its payoff. Since the two alternatives have identical payoffs in the future, they must command the same price today.

Risk Neutral Method Assume that investors are risk-neutral, so that the expected return on the stock is the same as the interest rate. Calculate the expected future value of the option and discount it at the risk-free interest rate.

[3] Note that this is the probability of rise in our hypothetical risk-neutral world. Since real world investors are risk-adverse and not risk-neutral, they will require a higher expected return from a risky stock. Hence the true probability of rise will be greater than 0.40.

17.7 BLACK–SCHOLES MODEL

The above analysis was based on the assumption that there were two possible values for the stock price at the end of one year. If we assume that there are two possible stock prices at the end of each 6-month period, the number of possible end-of-year prices increases. As the period is further shortened (from 6-months to 3-months or 1 month), we get more frequent changes in stock price and a wider range of possible end-of-year prices. Eventually, we would reach a situation where prices change more or less continuously, leading to a continuum of possible prices at the end of the year. Theoretically, even for this situation we could set up a portfolio which has a payoff identical to that of a call option. However, the composition of this portfolio will have to be changed continuously as the year progresses.

Calculating the value of such a portfolio and through that the value of the call option in such a situation appears to be an unwieldy task, but Black and Scholes developed a formula that does precisely that. Their formula is:

$$C_0 = S_0\, N(d_1) - \frac{E}{e^{rt}}\, N(d_2) \tag{17.13}$$

where C_0 is the equilibrium value of a call option now, S_0 is the price of the stock now, E is the exercise price, e is the base of natural logarithm, r is the annualised continuously compounded risk-free interest rate, t is the length of time in years to the expiration date, and $N(d)$ is the value of the cumulative normal density function

$$d_1 = \frac{l_n\left(\frac{S_0}{E}\right) + \left(r + \frac{1}{2}\sigma^2\right)t}{\sigma\sqrt{t}} \tag{17.14}$$

$$d_2 = d_1 - \sigma\sqrt{t} \tag{17.15}$$

where l_n is the natural logarithm, and σ is the standard deviation of the annualised continuously compounded return on the stock.

Though one of the most complicated formulae in finance, it is one of the most practical. The formula has great appeal because four of the parameters, namely, S_0, E, r, and t are observable. Only one of the parameters, namely σ^2, has to be estimated. Note that the value of a call option is affected by neither the risk aversion of the investor nor the expected return on the stock.

Assumptions You may have guessed by now that the Black–Scholes model, like other important models in economics and finance, is based on a set of simplifying assumption. Yes, you are right. The assumptions underlying the Black–Scholes model are as follows:

- The call option is the European option.
- The stock price is continuous and is distributed normally.
- There are no transaction costs and taxes.

- There are no restrictions on or penalties for short selling.
- The stock pays no dividend.
- The risk-free interest rate is known and constant.

These assumptions may appear very severe. However when some of them do not hold, a variant of the Black–Scholes model applies. Further, empirical studies indicate that the Black–Scholes model applies to American options as well.

Applying the Black-Scholes Model Though the Black-Scholes model appears difficult it is fairly easy to apply. This may be illustrated with an example.

Consider the following data for a certain stock

- Price of stock now = S_0 = Rs 60
- Exercise price = E = Rs 56
- Standard deviation of continuously compounded annual returns = σ = 0.3
- Years to maturity = t = 0.5
- Risk-free interest rate per annum = 0.14

Applying the Black-Scholes formula involves four steps:

Step 1: Calculate d_1 and d_2

$$d_1 = \frac{l_n\left(\dfrac{S_0}{E}\right) + \left(r + \dfrac{\sigma^2}{2}\right)t}{\sigma\sqrt{t}}$$

$$= \frac{.068993 + 0.0925}{0.2121} = \frac{0.161493}{0.2121} = 0.7614$$

$$d_2 = d_1 - \sigma\sqrt{t}$$

$$= 0.7614 - 0.2121 = 0.5493$$

Step 2: Find $N(d_1)$ and $N(d_2)$. $N(d_1)$ and $N(d_2)$ represent the probabilities that a random variable that has a standardised normal distribution will assume values less than d_1 and d_2. The simplest way to find $N(d_1)$ and $N(d_2)$ is to use the Excel function NORMSDIST.

$$N(d_1) = N\,(0.7614) = 0.7768$$

$$N(d_2) = N\,(0.5493) = 0.7086$$

If you don't have easy access to the Excel function NORMSDIST, you can get a very close approximation by using the Normal Distribution given in Table A.5 in Appendix A at the end of the book. The procedure for doing that may be illustrated with respect to N (0.7614) as follows:

1. 0.7614 lies between 0.75 and 0.80.
2. According to the table N (0.75) = 1 – 0.2264

$$= 0.7736 \text{ and N } (0.80) = 1 - 0.2119 = 0.7881$$

3. For a difference of 0.05 (0.80 – 0.75) the cumulative probability increases by 0.0145 (0.7881 – 0.7736)
4. The difference between 0.7614 and 0.75 is 0.0114
5. So, $N\ (0.7614) = N\ (0.75) + \frac{0.0114}{0.05} \times 0.0145$

$$= 0.7736 + 0.0033 = 0.7769$$

This value is indeed a close approximation for the true value 0.7768.

Step 3: Estimate the present value of the exercise price, using the continuous discounting principle

$$\frac{E}{e^{rt}} = \frac{\text{Rs } 56}{e^{0.14 \times 0.5}} = \text{Rs } 52.21$$

Step 4: Plug the numbers obtained in the previous steps in the Black-Scholes formula

$$C_0 = \text{Rs } 60 \times 0.7768 - \text{Rs } 52.21 \times 0.7086$$
$$= \text{Rs } 46.61 - \text{Rs } 37.00 = \text{Rs } 9.61$$

Sources of Discrepancy Suppose the observed call price in the above example were Rs. 12 rather than Rs. 9.61 does it mean that the market has mispriced the option? Before jumping to such a conclusion, let us look at two possible sources of discrepancy.

First, the Black-Scholes model, like all models, is based on certain simplifying assumptions which may not be satisfied in the real world. That makes the formula only approximately valid.

Second, the parameters used in the formula may not be accurately measured. Recall that there are five parameters in the model: S_0, E, r, σ, and t. Out of these, S_0, E, r, and t – the stock price, the exercise price, the risk-free interest rate, and the time to expiration—are given accurately as they are directly observable. σ (the standard deviation), however, is not directly observable and must be estimated by relying on historical data, or scenario analysis, or some other method. An error in estimating the standard deviation can result in a discrepancy between the price of an option and its Black Scholes value.

Indeed, market participants often look at an option valuation from a different angle. Instead of calculating a Black-Scholes option value using a given standard deviation, they ask: "What standard deviation justifies the observed option price, according to the Black-Scholes formula? This is referred to as the **implied volatility** of the option as this is the volatility level implied by the prevailing option price. If investors believe that the actual standard deviation is more (less) than the implied volatility, then the option's fair price is deemed to be greater (lesser) than its observed price.

Another variant of this theme is to compare two options on the same stock with the same expiration date but different exercise prices. It makes sense to buy the option with the lower implied volatility and write the option with the higher implied volatility.

Spreadsheet Application You can easily calculate the Black-Scholes call-option value, as well as implied volatilities, by using the Excel spreadsheet given below:

	A		B	C
1	Price of stock now,	S_0		60
2	Exercise price,	E		56
3	Standard deviation of continuously compounded annual return	σ		0.3
4	Years to maturity	t		0.5
5	Interest rate per annum	r		0.14
6		d_1	=(LN(C1/C2)+(C5+(C3^A2)/(2*)C4)/(C3*(C4^A0.5))	0.7613
7		d_2	=C6-C3*(C4^0.5)	0.5492
8	Equilibrium value of call option now,	t	=C1*NORMSDIST(C6)-(C2/EXP(C5*C4))*NORMSDIST(C7)	9.61

The implied volatility can be computed by using the Solver command from the Tools menu in Excel. Solver calls for changing the value of one cell to make the value of another cell (the target cell) equal to a specific value. For example, if you find that a call option is selling for Rs. 12.00, you can use Solver to find the value for cell C3 (the standard deviation of the stock) that will equate the option value to Rs. 12.00.

Replicating Portfolio Note that the principle of replicating portfolio used in the binomial model also undergirds the Black-Scholes model. Exhibit 17.13 shows the replicating portfolios for calls and puts, in the binomial and the Black-Scholes models.

Exhibit 17.13 ***Replicating Portfolio for Calls and Puts***

Option Position	*Replicating Portfolio*	
	Binomial Model	*Black –Scholes Model*
Buy Call Option	Borrow B Buy Δ shares of stock	Borrow $Ee^{-rt} N(d_2)$ Buy $N(d_1)$ shares of stock
Sell Call Option	Lend B Sell short Δ shares	Lend $Ee^{-rt} N(d_2)$ Sell short $N(d_1)$ shares
Buy Put Option	Lend B' Sell short Δ' shares	Lend $Ee^{-rt}(1- N(d_2))$ Sell short $(1- N(d_1))$ shares
Sell Put Option	Borrow B' Buy Δ' shares	Borrow $Ee^{-rt}(1- N(d_2))$ Buy $(1- N(d_1))$ shares

Adjustment for Dividends The Black-Scholes model given in Eq. (17.13) assumes that the stock pays no dividend. When dividend is paid the stock price diminishes. Hence, call options become less valuable and put options become more valuable. To reflect dividend payments, two adjustments are commonly made, one for options that have a short life and the other for options that have a long life.

Short-term Options When options expire in less than one year, the present value of dividends expected during the life of the option is subtracted from the current value of the stock to obtain a 'dividend-adjusted value', which is then used as the input for S in the Black-Scholes model.

$$\text{Adjusted stock price} = S' = S - \sum \frac{\text{Div}_t}{(1+r)^t} \tag{17.16}$$

$$\text{Value of call} = S' N(d_1) - Ee^{-rt} N(d_2) \tag{17.17}$$

where

$$d_1 = \frac{l_n\left(\frac{S'}{E}\right) + \left(r + \frac{\sigma^2}{2}\right)t}{\sigma\sqrt{t}}$$

$$d_2 = d_1 - \sigma\sqrt{t}$$

Long-term Options Computing the present value of dividends and adjusting for the same is tedious and difficult in the case of long-term options. If the dividend yield (y = dividend / current stock price) is expected to remain fairly stable during the life of the option, the Black-Scholes model can be modified to reflect dividend payment.

$$C = Se^{-yt} N(d_1) - Ee^{-rt} N(d_2) \tag{17.18}$$

where

$$d_1 = \frac{l_n \frac{S}{E} + \left(r - y + \frac{\sigma^2}{2}\right)t}{\sigma\sqrt{t}}$$

$$d_2 = d_1 - \sigma\sqrt{t}$$

This adjustment essentially does two things: (i) It discounts the value of the stock to the present at the dividend yield to reflect the expected drop in value on account of dividend payments. (ii) It offsets the interest rate by the dividend yield to reflect the lower cost of carrying the stock (in the replicating portfolio).

Revisiting the Put-Call Parity We learnt earlier that just before the expiration the following holds:

$$C_1 = S_1 + P_1 - E \tag{17.3}$$

If there is some time before the expiration date, then Eq. (17.3) has to be restated as follows:

$$C_0 = S_0 + P_0 - E/e^{rt} \tag{17.19}$$

where C_0 is the value of the call option now, S_0 is the current stock price, P_0 is the value of the put option now, E is the exercise price, t is the time left for the expiration of option, and r is the risk-free interest rate.

Note that E/e^{rt} is the present value of the exercise price.

Inter alia, Eq. (17.19) can be used to establish the price of a put option and determine whether the put-call parity is working.

Value of a Put Option You can calculate the value of a put option by first calculating the value of a call option and using the put-call parity relationship. An example may be given to show how this is done. Let us assume the following:

$$\begin{aligned}\text{Stock price} &= \text{Rs. } 60\\ \text{Exercise price} &= \text{Rs. } 50\\ \text{Risk free rate} &= 8\%\\ \text{Time of expiration} &= 3 \text{ months } (t = 0.25)\\ \text{Standard deviation} &= \sigma = 0.4\end{aligned}$$

What is the value of the put using the same information?
The value of the call option is calculated as follows:

Step 1: Calculate d_1 and d_2

$$d_1 = \frac{l_n\left(\frac{S_0}{E}\right) + \left(r + \frac{\sigma^2}{2}\right)t}{\sigma\sqrt{t}}$$

$$d_1 = \frac{l_n\left(\frac{60}{50}\right) + \left(0.08 + \frac{0.16}{2}\right)0.25}{0.40\sqrt{0.25}}$$

$$= \frac{0.1823 + 0.04}{0.20} = 1.1115$$

$$d_2 = d_1 - \sigma\sqrt{t}$$

$$= 1.1115 - 0.20 = 0.9115$$

Step 2: Find $N(d_1)$ and $N(d_2)$. $N(d_1)$ and $N(d_2)$ represent the probabilities that a random variable that has a standardised normal distribution will assume values less than d_1 and d_2.

$$N(d_1) = N(1.1115) = 0.8668$$

$$N(d_2) = N(0.9115) = 0.8190$$

Step 3: Estimate the present value of the exercise price, using the continuous discounting principle.

$$\frac{E}{e^{rt}} = \frac{\text{Rs}\,50}{e^{0.08 \times 0.25}} = \frac{\text{Rs}\,50}{1.0202} = \text{Rs } 49.01$$

Step 4: Plug the numbers obtained above in the Black-Scholes formula.

$$\begin{aligned} C_0 &= S_0\,N(d_1) - \frac{E}{e^{rt}}\,N(d_2) \\ &= 60 \times 0.8668 - 49.01 \times 0.8190 \\ &= \text{Rs } 11.87 \end{aligned}$$

Step 5: Find the value of the put option as per the put-call parity relationship.

$$\begin{aligned} P_0 &= C_0 - S_0 + \frac{E}{e^{rt}} \\ &= 11.87 - 60 + 49.01 \\ &= \text{Rs } 0.88 \end{aligned}$$

Option Greeks As we have seen, the value of an option is a function of the following factors: the price of the underlying share, the volatility of the underlying share, the time to expiration, the risk-free interest rate, and the exercise price. Option Greeks (represented as they are by Greek alphabets) reflect the sensitivity of option price to changes in the value of the underlying factors. The commonly used option Greeks are Delta, Gamma, Vega, and Theta.

Delta (δ): Delta represents the change in the value an option for a given change in the value of the underlying share. For example, if the Delta of a call option is 0.50, it means that if the share price moves up by Re. 1.00, the value of the call option will rise by Rs. 0.50.

Gamma (γ): Gamma represents the change in delta for a given movement in the share price. Technically it is the second derivative of the option price with respect to the share price.

Vega (v): Vega stands for the change in option value with respect to the change in the volatility of the underlying price. For example a vega of 0.15 means that the option value increases by Rs. 0.15 for 1 percent increase in volatility.

Theta (θ): Theta stands for the change in option value with respect to time to expiration. For example, a theta of -0.20 means that the value of the option decreases by Rs. 0.20 at the end of one day.

Option Calculators Many websites have option calculators that compute option values and option Greeks. Exhibit 17.14 displays the option calculator downloaded from the website of the Bombay Stock Exchange.

Exhibit 17.14 ***Option Calculator****

Type		Exercise Style		Greeks		
Call	Put	American	European	Type: CALL Style: American		
				Delta	:	
Strike Price		Spot Price		Gamma	:	
Interest Rate		Dividend Yield		Theta	:	
No Of Days				Vega	:	
Volatility		Premium		Rho	:	
Note : All Calculations for European Style are done using BLACK-SCHOLES formula All Calculations for American Style are done using Binomial Method (255 Level)				Calculate		Reset

(*Source:* www.bseindia.com)

SUMMARY

- There are two basic types of options, call options and put options. A **call option** gives the option holder the right to buy a stock (or asset) at a fixed price on or before a certain date.
- The payoff of a European call option (this is a call option that can be exercised only on the expiration date) just before expiration is equal to:

$$\text{Max [Stock price – Exercise price, 0]}$$

- A **put option**—the opposite of a call option—gives the holder the right to sell stock (or some other asset) at a specified price on or before a certain date.
- The payoff of a European put option, just before expiration, is equal to:

$$\text{Max [Exercise price – Stock price, 0]}$$

- Puts and calls represent basic options. They serve as building blocks for developing more complex options.
- A call option is equivalent to a combination of the underlying stock, a put option on that stock, and a debt equal to the exercise price. This equivalence is referred to as the put-call parity.

- You can achieve an innumerable variety of payoff patterns by combining puts and calls with various exercise prices.
- A **protective put** strategy involves buying an asset along with a put on it.
- A **covered call** strategy involves writing a call position on an asset along with buying the asset.
- A **long straddle** involves buying a call as well as a put on a stock at the same exercise price.
- A **spread** involves combining two or more call options (or two or more puts) on the same stock with differing exercise prices or times to maturity.
- The price of a call option must lie between the following bounds:

$$\text{Max price } (S_0 - E, 0) \leq C_0 \leq S_0$$

- The location of the option value (C_0) between the two bounds depends on five key factors: price of the underlying stock (S_0), exercise price (E), variance of the return on the underlying stock (σ^2), time left to expiration (t), and risk-free interest rate (r_f). The manner in which these five variables influence the value of a call option is shown in the following relationship:

$$C_0 = \begin{pmatrix} S_0, & E, & \sigma^2, & t, & r_f \\ + & - & + & + & + \end{pmatrix}$$

- The sign (+, –) put below a variable denotes the nature of its influence on the value of the call option.
- The key insight underlying the Black–Scholes model may be illustrated through a single-period binomial (or two-state) model.
- There are two ways of calculating the value of an option in the binomial world: (i) **Option Equivalent Method:** Find a portfolio of shares and loan that imitates the option in its payoff. Since the two alternatives have identical payoffs in the future, they must command the same price today. (ii) **Risk Neutral Method:** Assume that investors are risk-neutral, so that the expected return on the stock is the same as the risk-free interest rate. Calculate the expected future value of the option and discount it at the risk-free interest rate.
- Black–Scholes developed the following formula showing how the value of a call option is related to the basic factors:

$$C_0 = S_0 N(d_1) - \frac{E}{e^{rt}} N(d_2)$$

- The Black-Scholes model assumes that the stock pays no dividend. To reflect dividend payments, two adjustments are commonly made, one for options that have a short life and the other for options that have a long life.
- Index options and options on individual securities have been introduced in India by the National Stock Exchange and Bombay Stock Exchange.

QUESTIONS

1. Define the following terms: option holder, option writer, exercise price, maturity date.
2. What is the payoff of a European call option and put option?
3. Define the payoffs of a call option and a put option from the point of view of the option writer (or seller).
4. What is *put-call parity* theorem? Demonstrate it.
5. Illustrate the payoff and profit function of a protective put.
6. What is a covered call strategy? Graphically show its payoff and profit function.
7. What is a long straddle? Show its payoff and profit function.
8. What is a vertical spread? Show its payoff and profit function.
9. Specify the boundaries within which the value of a call option falls.
10. Discuss the key factors that have a bearing on the value of a call option.
11. Show why a higher variability of the stock price has a positive effect on the value of call option.
12. Derive the value of call option in the binomial world using the option equivalent method.
13. What is the value of a call option as per Black-Scholes model?
14. State the assumptions underlying the Black-Scholes model.
15. Describe the risk-neutral valuation method.
16. Discuss the adjustments made for dividend payment in the Black-Scholes model.
17. Describe the salient features of the Nifty options.
18. Describe the salient features of options on individual securities at the National Stock Exchange.

■ ■

SOLVED PROBLEMS

1. A stock is currently selling for Rs 60. The call option on the stock exercisable a year from now at an exercise price of Rs 55 is currently selling for Rs 15. The risk-free interest rate is 12 percent. The stock can either rise or fall after a year. It can fall by 30 percent. By what percent can it rise?

Solution

According to the binomial model

$$C = \Delta S + B$$

$$\Delta = \frac{C_u - C_d}{S(u-d)}$$

$$B = \frac{dC_u - uC_d}{(u-d)R}$$

$$C_u = \text{Max}\ (uS - E, 0)$$

$$C_d = \text{Max}\ (dS - E, 0)$$

In the problem the following are given

$$S = \text{Rs } 60,\ E = \text{Rs } 55,\ C = \text{Rs } 15,\ R = 1.12,\ d = 0.7$$

$$C_d = \text{Max } (0.7 \times 60 - 55, 0) = 0$$

Since C = Rs 15, $uS - E$ has to be positive.

So $$C_u = uS - E = u \times 60 - 55$$

$$\Delta = \frac{60u - 55 - 0}{60(u - 0.7)}$$

$$B = \frac{u \times 0 - 0.7(60u - 55)}{1.12(u - 0.7)}$$

$$C = \Delta\, S + B$$

$$15 = \frac{(60u - 55)}{60(u - 0.7)} \times 60 + \frac{0 - 0.7(60u - 55)}{1.12(u - 0.7)}$$

Multiplying both the sides by $(u - 0.7)$ we get

$$15\ (u - 0.7) = 60u - 55 - \frac{0.7(60u - 55)}{1.12}$$

Solving this for u we get $u = 1.35$
So the stock can rise by 35 per cent.

2. Consider the following data:

$$S = 60,\ u = 1.4,\ d = 0.8$$

$$E = 50,\ r = 0.12,\ R = 1.12$$

What is the value of the call option?

Solution

The values of Δ (hedge ratio) and B (amount borrowed) can be obtained as follows:

$$\Delta = \frac{C_u - C_d}{(u - d)S}$$

$$B = \frac{dC_u - uC_d}{(u - d)R}$$

$$C_u = \text{Max } (60 \times 1.4 - 50{,}0) = 34$$

$$C_d = \text{Max } (60 \times 0.8 - 50{,}0) = 0$$

$$\Delta = \frac{34 - 0}{(1.4 - 0.8)60} = \frac{34}{36} = 0.9444$$

$$B = \frac{0.8 \times 34 - 1.4 \times 0}{(1.4 - 0.8)\,1.12} = 40.48$$

$$C = \Delta S - \text{B} = .944 \times 60 - 40.48 = 16.16$$

3. The following information is available for the equity stock of Prakash Limited.

$$S_0 = \text{Rs } 120,\ E = \text{Rs } 110,\ r = 0.12,\ \sigma = 0.40$$

Calculate the price of a 6 month call option as per the Black-Scholes model.

Solution

$$C_0 = S_0\, N(d_1) - \frac{E}{e^{rt}}\, N(d_2)$$

$$d_1 = \frac{l_n\left(\frac{S_0}{E}\right) + \left(r + \frac{1}{2}\sigma^2\right)t}{\sigma\sqrt{t}}$$

$$d_2 = d_1 - \sigma\sqrt{t}$$

$$d_1 = \frac{l_n\left(\frac{120}{110}\right) + \left(0.12 + \frac{1}{2} \times 0.16\right)0.5}{0.4\sqrt{0.5}}$$

$$= \frac{.0870 + 0.10}{0.2828} = 0.6612$$

$$d_2 = 0.6612 - 0.2828 = 0.3784$$

$$N(d_1) = N(0.6612) = 0.7457$$

$$N(d_1) = N(0.3784) = 0.6474$$

$$\frac{E}{e^{rt}} = \frac{110}{e^{0.12 \times 0.5}} = \frac{110}{1.0618} = 103.60$$

$$C_0 = \text{Rs } 120 \times 0.7457 - \text{Rs } 103.60 \times 0.6474 = \text{Rs } 22.41$$

4. The following information is available for the call and put options on the stock of Zenith Limited.

	Call	*Put*
Time to expiration (months)	3	3
Risk free rate	10%	10%
Exercise price	Rs 50	Rs 50
Stock price	Rs 60	Rs 60
Price	Rs 16	Rs 2

Determine if the put-call parity is working.

Solution

According to the put-call parity

$$C_0 = S_0 + P_0 - E/e^{rt}$$

In the problem S_0 = Rs 60, P_0 = Rs 2, E = Rs 50, r = 10% and t = 0.25

If the put-call parity were to work C_0 should be

$$60 + 2 - \frac{50}{e^{0.10 \times 0.25}} = \text{Rs } 13.23$$

The price of the call option is given to be Rs 16, which is different from Rs 13.23. So the put-call parity is not working.

5. The call option on Alpha's stock for March maturity with an exercise price of Rs 50 is selling for Rs 3. The put option for the same maturity and exercise price is selling for Rs 2.50. What would be the profit or loss per share of stock to an investor who buys the call option, if the stock price at the expiration of the option is Rs 55? What about a purchaser of the put option?

   Solution

   The payoff of the call option is Rs 5. The cost of the call option is Rs 3. So, the profit is Rs 2 per share. The put expires worthless since the stock price exceeds the exercise price.

6. The equity stock of Hitech Limited is currently selling for Rs 100. In a year's time it can rise by 60 percent or fall by 20 percent. The risk-free rate is 10 percent. The exercise price of a call option that can be exercised in a year from now is Rs 110. What is the value of the call option? Use the risk-neutral method.

   Solution

   Under the risk-neutral valuation method, the expected return on the equity stock is equal to the risk-free rate.

   The expected return on Hitech's stock = 10 percent.

   Since Hitech's stock can either rise by 60 percent or fall by 20 percent we can calculate the probability of a price rise in a hypothetical risk-neutral world.

$$\text{Expected return} = [\text{Probability of rise} \times 60\%] + [(1 - \text{Probability of rise}) \times -20\%]$$
$$= 10\%$$

   This leads to a probability of rise to be 3/8

   If the stock price rises by 60% to Rs 160, the call option has a value of Rs 50. If the stock prices falls by 20% to Rs 80, the call option has a value of 0.

   If investors are risk-neutral, the call option has an expected future value of:

$$\text{Probability of rise} \times \text{Rs } 50 + (1 - \text{Probability of rise}) \times \text{Rs } 0$$
$$3/8 \times \text{Rs } 50 + 0 = \text{Rs } 18.75$$

   The current value of the call option is:

$$\frac{\text{Rs } 18.75}{(1.10)} = \text{Rs } 17.05$$

PROBLEMS

1. Alpha Company's equity is currently selling for Rs 100 per share. In a year from now it can rise to Rs 150 or fall to Rs 90. The risk-free interest rate is 15 percent. What is the value of a call option on Alpha Company's equity as per the Binomial model if the exercise price is Rs 100?
2. Beta Company's equity is currently selling for Rs 60. In a year from now it can rise or fall. On the downside it may fall to Rs 45. The call option on Beta's equity has a value of Rs 5. If the risk-free interest rate is 16 percent, to what level would Beta's equity rise on the upside assuming that the exercise price is Rs 60?

3. The following information is available for Abhishek Industries:

$$S_0 = \text{Rs } 70,\ E = \text{Rs } 72,\ r = 0.12,\ \sigma = 0.30$$

Calculate the price for a six month call option as per the Black-Scholes model.
4. What is the value of a European call option (no dividends) with an exercise price of Rs 50 and an expiration date 3 months from now if the stock price is Rs 40, the standard deviation of the stock is 0.40, and the risk-free rate is 14 percent ? What is the value of the put using the same information ?
5. Consider the following data:

$$S = 100,\ u = 1.5,\ d = 0.8$$
$$E = 105,\ r = 0.12,\ R = 1.12$$

What is the value of the call option?
6. A stock is currently selling for Rs 40. The call option on the stock exercisable a year from now at a striking price of Rs 45 is currently selling for Rs 8. The risk-free interest rate is 10 percent. The stock can either rise or fall after a year. It can fall by 20 percent. By what percentage can it rise?
7. The following data is available for Thermal Plastics Limited, a company that is not expected to pay dividend for a year:

$$S_0 = 120$$
$$E = 110$$
$$r = 0.14$$
$$t = 1.0$$
$$\sigma = 0.4$$

What is the value of the call option as per the Black–Scholes model?
8. The standard deviation of the continuously compounded stock price change for Olympic Corporation is estimated to be 20 percent per year. The stock of Olympic Corporation currently sells for Rs 80 and the effective annual risk-free interest rate is 15.03 percent. What is the value of a one year call option on the stock of Olympic Corporation if the exercise price is Rs 82?
9. The following information is available for the call and put options on the stock of Amit Limited.

	Call	*Put*
Time to expiration (months)	3	3
Risk free rate	8%	8%
Exercise price	Rs 80	Rs 80
Stock price	Rs 75	Rs 75
Price	Rs 7	Rs 0.70

Determine if the put-call parity is working.
10. The equity stock of Bharat Limited is currently selling for Rs 60. In a year's time it can rise by 30 percent or fall by 5 percent. The risk-free rate is 8 percent. A call option on it can be exercised a year from now at a price of Rs 50. What is the value of the call option? Use the risk-neutral method.

MINICASE

Delphi Capital Management (DCM) is an investment management firm which, inter alia, offers portfolio management service to high networth individuals. Avinash Joshi, managing director of DCM, realised that many clients have interest in using options, but often do not understand the risks and rewards associated with these instruments.

You have joined DCM about six months ago. After majoring in finance you worked for a well known securities firm where you received good exposure to derivative instruments, before joining DCM. Appreciating your expertise, Avinash Joshi has asked you to educate and guide clients interested in using options

You have been approached by Pradeep Sharma, an eminent surgeon and long-time client of DCM, who wants to understand about options and the strategies based on options. You have decided to use the following data of Newage Hospitals Limited, a company in which Pradeep Sharma has equity shares, to guide him.

Newage Hospitals Option Quotes

Stock Price : 325						
	Calls			*Puts*		
Strike Price	*Jan*	*Feb*	*March*	*Jan*	*Feb*	*March*
280	48	53	– *	–	–	–
300	34	38	41	2	4	6
320	15	18	20	6	9	–
340	5	8	14	17	19	21
360	2	4	5	–	40	–

* A blank means that no quotation is available.

To educate your client you have to develop answers for the following questions:

a. What do the following terms mean : call option, put option, strike price (exercise price), and expiration date?
b. Which options are in - the - money and which options are out - of - the - money?
c. Assume that Pradeep Sharma owns 1000 shares of Newage Hospitals. What are the relative pros and cons of selling a call against this position using (i) January/340 versus (ii) March/300
d. What is the maximum profit, maximum loss, and break-even price associated with the strategy of simultaneously buying March/340 call while selling March/360 call ?
e. What are the implications for Pradeep Sharma if he simultaneously writes March/340 call and buys March/300 put ?
f. What is the profit at various stock prices of a March/340 straddle? Give the answer in the form of a graph.
g. What impact do the following have on the value of a call option ?
   - Current price
   - Exercise price
   - Option's term to maturity
   - Risk-free rate
   - Variance of the stock price

h. What assumptions underlie the Black–Scholes option pricing model?
i. What are the three equations that constitute the Black–Scholes model?
j. What should be value of the March/320 call as per the Black-Scholes model? Assume that t = 3 months, r_f = 6 percent, and σ = 0.30.
k. What is a collar?

▪ ▪

Chapter 18

Futures

Where the Hedgers and the Speculators Meet

LEARNING OBJECTIVES

After studying this chapter, you should be able to:

- Explain the key features of a futures contract.
- Calculate the theoretical price of various contracts.
- Discuss how futures contracts may be used by hedgers and speculators.
- Assess the economic functions performed by futures and options.

Forward and futures contracts are in a way like option contracts as they specify the terms of purchase or sale of some underlying security in future. However, there is one key difference. The holder of a call (put) option enjoys the right to buy (sell) without the obligation to do so. A forward or futures contract, however, imposes a firm obligation to go through the transaction.

In a strict sense, a forward or futures contract is not an investment because no cash is paid to buy an asset. It is just a commitment to do a transaction in future. Yet, we study them as part of investments as they are powerful tools to modify portfolio characteristics and hedge other investments.

While forward contracts have been in existence for thousands of years, organised futures markets started in the 19th century. Futures markets play an important role in the world of finance. Many kinds of futures contracts have been developed and the use of futures has received a great deal of attention. Futures, like options, are important derivative instruments and a major innovation in the field of finance.

18.1 FUTURES CONTRACTS

A futures contract is a standardised forward contract. So, let us first understand what a forward contract is. An agreement between two parties to exchange an asset for cash at a predetermined future date for a price that is specified today represents a forward contract. For example, if you agree on January 1 to buy 100 bales of cotton on July 1 at a price of Rs 800 per bale from a cotton dealer, you have **bought forward** cotton or you are long forward cotton, whereas the cotton dealer has **sold forward** cotton or is short forward cotton. No money or cotton changes hand when the deal is signed. The forward contract only specifies the terms of a transaction that will occur in the future.

Note that the terms buy and sell have a somewhat different meaning here. It is helpful to think in terms of:

- **Short position** which commits the seller to deliver an item at the contracted price on maturity; and
- **Long position** which commits the buyer to purchase an item at the contracted price on maturity.

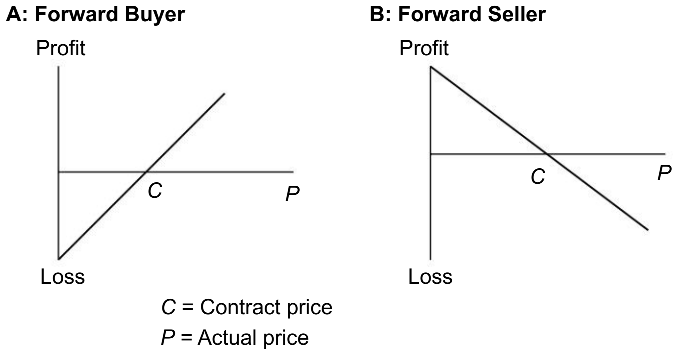
The forward buyer is obliged to purchase the underlying asset at the contract price or enter into an offsetting transaction. Likewise, the forward seller is obliged to deliver the underlying asset at the contract price or enter into an offsetting transaction.

What are the payoffs to the forward buyer and the forward seller? When the spot price in future exceeds the contract price, the forward buyer's gain is: spot price – contract price. If it is the other way round, the forward buyer's loss is: contract price – spot price. The payoff to the seller of a forward contract is the mirror image of the payoff to the buyer. The gain of the buyer is the loss of the seller, and vice versa. The payoffs to the forward buyer and the forward seller are shown in parts A and B of Exhibit 18.1.

Key Differences between Forwards and Futures A standardised forward contract is a futures contract. The key differences between forwards and futures are as follows:

- A forward contract is a tailor-made contract (the terms are negotiated between the buyer and seller), whereas a futures contract is a standardised contract (quantity, date, and delivery conditions are standardised).
- While there is no secondary market for forward contracts, the futures contracts are traded on organised exchanges.
- Forward contracts usually end with deliveries, whereas futures contracts are typically settled with the differences.
- Usually no collateral is required for a forward contract. In a futures contract, however, a margin is required.
- Forward contracts are settled on the maturity date, whereas futures contracts are 'marked to market' on a daily basis. This means that profits and losses on futures contracts are settled daily.
- In a forward contract, both the parties are exposed to credit risk, because irrespective of which way the price moves, one of the parties will have an incentive to default. A futures contract is virtually free from credit risk, as it comes with risk-eliminating measures.

Exhibit 18.1 ***Payoffs to the Forward Buyer and Forward Seller***



Futures Contracts: The Global Scene Broadly there are two types of futures, commodity futures and financial futures. A commodity futures is a futures contract in a commodity like cocoa or aluminium, while a financial futures is a futures contract in a financial instrument like Treasury bond, currency, or stock index. Exhibit 18.2 lists some illustrative commodity futures and financial futures and the exchanges where they are traded. Exhibit 18.3 describes the major types of futures contracts.

Exhibit 18.2 ***Commodity Futures and Financial Futures***

Commodity Futures	*Exchange*	*Financial Futures*	*Exchange*
Cocoa	CSCE, FOX	U.S Treasury bills	IMM, MCE
Cotton	CTN	Eurodollar deposits	IMM, LIFFE
Aluminium	COMEX, LME	Standard & Poor's	
Gold	LME	(S&P) Index	IMM
Crude oil	IPE, NYMEX	Sterling	IMM, LIFFE, MCE
Soyabean oil	CBT		Phil SE

CSCE	Coffee, Sugar and Cocoa Exchange, New York
FOX	London Futures and Options Exchange
CTN	New York Cotton Exchange
COMEX	Commodity Exchange, New York
LME	London Metal Exchange
IPE	International Petroleum Exchange of London
NYMEX	New York Mercantile Exchange
CBT	Chicago Board of Trade
IMM	International Monetary Market (at the Chicago Mercantile Exchange)
LIFFE	London International Financial Futures Exchange
MCE	Mid America Commodity Exchange
Phil SE	Philadelphia Stock Exchange

Exhibit 18.3 ***Major Types of Futures Contracts***

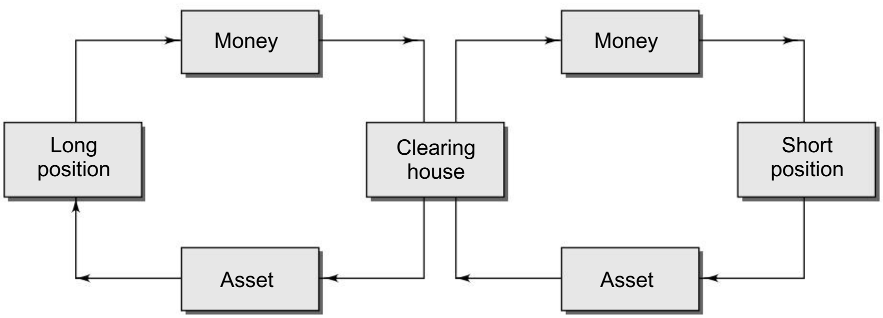
Type	*Example*
■ Futures contracts on debt instruments	■ *US Treasury bond futures contract:* This is a contract for delivery of US Treasury bonds with $100,000 face value and having a maturity of at least 15 years from the delivery date.
■ Futures contract on monetary metals	■ *Futures contract on gold:* This is a contract for delivery of 100 troy ounces of gold of 0.995 fineness.
■ Futures contract on foreign currencies	■ *Futures contract on British pound:* This is a contract for delivery of 25,000 British pounds, on the appropriate future date.
■ Futures contract on stock markets indices	■ *Futures contract on S&P 500:* The underlying value of the contract is $500 times the S & P 500 index. Unlike other futures contracts, the settlement of an index futures contract is by cash payment.

18.2 MECHANICS OF TRADING

Trading in futures is more complex than trading in stocks. Inter alia, it involves intermediation by a clearing house, margins, marking-to-market, and price limits.

Clearing House In a traded futures contract, the clearing house of the exchange interposes itself between the buyer (the long position) and the seller (the short position). This means that the clearing house becomes the seller to the buyer and the buyer to the seller as shown in Exhibit 18.4. Because the clearing house is obligated to perform on its side of each contract, it is the only party that can be hurt if any trader fails to fulfill his obligation. The clearing house protects its interest by imposing margin requirements on traders and by marking-to-market described below.

Exhibit 18.4 ***The Role of the Clearing House***



Thanks to the intermediation by the clearing house, traders can liquidate their positions easily. If you have a long position and you want to unwind it, simply instruct your broker to do the short side of the contract. Likewise, if you have a short position and you want to undo it, simply instruct your broker to do the long side of the contract. Such trades, meant to close out a position, are called **reverse trades**.

The **open interest** in a contract is simply the number of contracts outstanding. Because long and short positions are not counted separately, open interest is defined as either the number of long or short contracts outstanding. Since the position of the clearing house nets out to zero, it is not counted in computing the open interest. At the beginning of a trading cycle, open interest is zero. As time passes, open interest builds up. However, as most traders close out their positions before the contract maturity date, open interest declines sharply when the maturity date nears.

Margins When you execute a futures trade, you have to provide the **initial margin** which may be about 10 percent of the value of contract — it is fixed by the exchange. The margin, consisting of cash or cash equivalents, is to ensure that traders will honour the obligations arising out of the futures contract. The margin has to be posted by both the parties to the futures contract as both are exposed to losses.

If you incur sustained losses from daily marking-to-market, your margin amount may fall below a critical level called the maintenance, or variation, margin which may be around 5 percent — it too is fixed by the exchange. Should that happen, you will receive a margin call asking you to replenish the margin amount. If you do not replenish the margin amount, the broker will close out enough of your trading position, so that the amount in your margin account suffices for your balance trading position.

Marking to Market While forward contracts are settled on the maturity date, futures contracts are 'marked to market' on a periodic basis. This means that the profits and losses on futures contracts are settled on a periodic basis.

The marking-to-market feature of a futures contract may be illustrated with an example. Suppose on Monday morning you take a long position in a futures contract that matures on Friday afternoon, but is marked to market on a daily basis. The agreed upon price is, say, Rs 100. At the close of trading on Monday, the futures price rises to Rs 105. Now the marking-to-market feature means that three things would occur. First, you will receive a cash profit of Rs 5. Second, the existing futures contract with a price of Rs 100 would be cancelled. Third, you will receive a new futures contract at Rs 105. In essence, the making-to-market feature implies that the value of the futures contract is set to zero at the end of each trading day.

Note that although forward contracts and futures contracts are similar in their final outcomes, the settlement mechanisms are different. This may lead to different patterns of cash flow. This may be illustrated with an example.

Assume that the spot price of gold is \$950 and the four period futures contract in gold has a price of \$960. In the wake of changes in the price of the gold futures contract, the cash flow to the buyer and seller of this contract will be as shown in the last two columns of the following table.

Time Period	Gold Futures contract	Forward Buyer's cash flow	Forward Seller's cash cash flow	Futures Buyer's cash flow	Futures Seller's cash flow
1	965	$0	0	$5	$ – 5
2	955	0	0	– 10	10
3	960	0	0	5	– 5
4	965	5	– 5	5	– 5

Note that the net cash flow from the seller to the buyer is $5 in both the forward contract as well as the futures contract, but the timing of the cash flows is not the same.

Price Limits In general, futures exchanges impose limits on price movements of futures contracts. For example, the limit on the daily price movement on orange juice futures contracts on the Chicago Board of Trade is 5 cents per pound or $750 per contract of 15,000 pounds. If the price of the contract moves by $750, the trading is generally suspended for the day. The exchange, of course, has the discretion to reopen trading later in the day.

What is the rationale for price limits? Price limits are meant to prevent panic buying or selling, triggered by rumours, and to prevent overreaction to real information. It is based on the premise that if investors have more time to respond to extreme information, the price reaction is likely to be more rational.

18.3 FINANCIAL FUTURES

Although futures have their origins in commodities, financial futures, viz., equity futures, interest rate futures, and currency futures dominate the market today.

Equity Futures Equity futures are of two types : stock index futures and individual stock futures. Stock index futures are futures on stock market indices such as the Standard & Poor's 500 in the US or Nifty in India. Because it is very inconvenient to deliver the index, stock index futures contracts are settled by a cash amount which is equal to the difference between the contracted futures price and the final index value times a multiplier that scales the contract size.

Individual stock futures are futures on individual stocks. The list of stocks on which futures contracts are permitted may be specified by the exchange or the regulatory body. Individual stock futures may be settled by delivery or by cash.

Interest Rate Futures A futures contract on an asset whose price depends solely on the level of interest rates is called an interest rate futures contract. There are interest rate futures contracts on assets like Eurodollars, Treasury bills, Treasury notes, and Treasury bonds.

For example the Treasury bond futures traded on the Chicago Board of Trade (CBOT) require the delivery of any Treasury bond which has maturity of more than 15 years and which is not cancellable for at least the first 15 years. Since bonds of different maturities and coupons have different prices, the CBOT applies a conversion factor to adjust for these differences.

The conversion factor is based on the value of the bond on the first day of the delivery month on the assumption that the interest rate for all maturities is equal to 8 percent per annum (with semiannual coupon). To illustrate this procedure, let us consider a 10 percent coupon bond with a maturity of 18 years. Working with a standard of \$100 face value, the value of the bond can be calculated, using a discount rate of 8 percent.

$$\text{Present value of the bond} = \sum_{t=1}^{t=36} \frac{5}{(1.04)^t} + \frac{100}{(1.04)^{36}} = 118.92$$

$$\text{Thus the conversion factor of this bond is: } \frac{118.92}{100.00} = 1.1892$$

This means that this bond is deemed equivalent to 1.1892 units of a standard bond. The seller of a futures contract can deliver any one of a menu of Treasury bonds to fulfill the obligation. Naturally, the seller will deliver the cheapest bond on the menu, after adjusting for the conversion factor. Hence this delivery option is priced into the futures contract.

Foreign Exchange Futures Exchange rates between currencies fluctuate over time and often considerably. This variability bothers anyone engaged in international operations. To cope with the exchange rate risk, forward and futures contracts may be employed.

The forward market in foreign exchange is a somewhat informal network of banks and brokers that enables customers to enter into forward contracts to buy or sell currency in future at a price fixed today. Forward contracts in currencies are customised. There is no marking to market and execution takes place only at the maturity date.

Futures contracts in currencies take place in formal markets such as the Chicago Mercantile Exchange (International Monetary Market) and the London International Financial Futures Exchanges. On such markets, contracts are standardised by size and marking to market is done on a daily basis. Further, standard clearing arrangements allow traders to reverse positions. Recently trading in currency futures has been permitted in India, on a limited scale.

18.4 EQUITY FUTURES IN INDIA

Equity futures are of two types: stock index futures and futures on individual securities. Both the types of equity futures are available in India.

Stock Index Futures The National Stock Exchange and the Bombay Stock Exchange have introduced stock index futures. The National Stock Exchange has a stock index futures contract based on S&P CNX Nifty Index; the Bombay Stock Exchange has a stock index futures contract based on Sensex.

The features of the S&P CNX Nifty futures contracts are as follows:

- The Nifty Futures (FUTDIX) is traded on the NSE F&O segment.
- National Securities Clearing Corporation (NSCCL) is the clearing and settling agency for all deals done on NSE F&O segment. NSCCL guarantees all F&O settlements.

- S&P CNX Nifty futures contracts have a maximum of 3-month trading cycle – the near month (one), the next month (two), and the far month (three). A new contract will be introduced on the trading day following the expiry of the near month contract.
- S&P CNX Nifty futures contracts expire on the last Thursday of the expiry month. If the last Thursday is a trading holiday, the contracts shall expire on the previous trading day.
- The permitted lot size of S&P CNX NIFTY contracts is 200 and multiples thereof.

Exhibit 18.5 shows the quotations for the Nifty Futures drawn from the January 9, 2008 issue of The Economic Times.

Exhibit 18.5 ***Nifty Futures***

	Price					
	Open	*High*	*Low*	*Close*	*Open Int ('000)*	*No. of Contracts*
January 2008	5984.80	5993.80	5831.60	5947.65	41978	913007
February 2008	6017.70	6017.70	5834.60	5951.50	3559	33219
March 2008	6000.00	6000.00	5835.00	5947.95	424	1221

Futures on Individual Securities Futures on individual securities were introduced in India in 2001. The list of securities in which futures contracts are permitted is specified by Securities Exchange Board of India. The National Stock Exchange and the Bombay Stock Exchange have introduced futures on individual securities.

The salient features of futures on individual securities on the National Stock Exchange are as follows:

- The underlying for the futures on individual securities contracts shall be the underlying security available for trading in the capital market segment of the Exchange.
- Futures contracts on individual securities will have a maximum of three-month trading cycle. New contracts will be introduced on the trading day following the expiry of the near month contract.
- Futures contracts on individual securities shall expire on the last Thursday of the expiry month. If the last Thursday is a trading holiday, the contracts shall expire on the previous day.
- The permitted size of the futures contracts on individual securities shall be the same as the same lot size of options contract for a given underlying security or such lot size as may be stipulated by the Exchange from time to time.
- The price steps in respect of all futures contracts admitted to the dealings of the Exchange shall be Rs 0.05.
- The base price of the futures contracts on introduction of new contracts shall be the previous day's closing price of the underlying security. The base price of the contracts on subsequent trading days will be the daily settlement price of the futures contracts.

- Futures contracts on individual securities shall be initially cash settled and would be settled in the following manner: (i) Daily mark-to-market settlement and (ii) Final mark-to-market settlement on expiry of a futures contract.
- The pay-in and pay-out of the mark-to-market settlement is on T+1 day (T= Trade day).

Exhibit 18.6 shows the quotations for individual stock futures on NSE drawn from the Economic Times.

Exhibit 18.6 ***Individual Equity Futures on NSE: Reliance Industries***

	Price					
	Open	*High*	*Low*	*Close*	*Open Int ('000)*	*No. of Contracts*
January 2008	3132.40	3147.00	3052.35	3123.45	16854	146903
February 2008	3168.55	3178.00	3080.10	3146.15	575	4899
March 2008	3194.25	3250.00	3082.25	3191.00	5	27

Trading Mechanism The futures and options trading system of NSE is called NEAT-F&O. It is a nation-wide fully automated screen-based trading arrangement for Nifty futures and options and stock futures and options, with an online monitoring and surveillance mechanism. Similar to the trading of equities in the cash market system, NEAT-F&O trading system is an anonymous and transparent order-driven market that operates on a strict price-time priority basis. The NEAT-F&O trading system can be accessed by two types of users, the Trading Members (TMs) and the Clearing Members (CMs). Users have tremendous flexibility in terms of the kinds of orders that they can place on the system. They can impose various conditions like Good-till-Day, Good-till-Cancelled, Immediate or Cancel, Limit/Market Price, Stop Loss, and so on.

Clearing and Settlement The NSCCL (the National Stock Exchange Clearing Corporation Limited) clears and settles all the deals executed on the NSE's F&O segment. It acts as a legal counterparty to all deals on the F&O segment and guarantees settlement. It works out the open positions or obligations of members. A TM's open position is the sum of proprietary open position, client open long position, and client open short position. While F&O contracts on individual securities can be delivered as in the spot market, currently F&O contracts in India are cash-settled.

18.5 COMMODITY FUTURES IN INDIA[1]

Organised trading in commodity futures started in India in 1875 in Mumbai. By early 1970s most of the registered associations conducting such trading became inactive owing to government restrictions caused mainly by inflation concerns. A period of ban

[1] This section has been contributed by Mr. Venugopal Unni.

on commodity futures trading followed which lasted for nearly thirty years and was lifted only in 2003. Generally futures prices have strong influence on the spot commodity prices. Since a sharp rise or fall in spot prices affects consumers in general, the government retains summary intervention powers in commodity futures market. Forward/futures trading is now allowed in most commodities. Trading in commodity options is still prohibited.

Commodity Futures Exchanges The three national level multi commodity exchanges offering on-line futures trading in commodities are National Commodity & Derivatives Exchange Limited (NCDEX), Multi Commodities Exchange of India Limited (MCX), and National Multi Commodity Exchange (NMCE). Out of these NCDEX and MCX are the most popular ones. Both are Mumbai based public limited companies promoted by leading banks and other financial intermediaries in 2003.

Though many commodities are listed in both the exchanges, NCDEX mainly attracts trading in agricultural commodities and MCX in metals like gold and silver and crude. At present MCX is the largest commodity exchange in the country. It has already become the third largest bullion exchange and the fourth largest energy exchange in the world. The exchanges conduct settlement of trades and all related functions through a clearing house/clearing corporation, the members of which are called clearing members. A person allowed to trade in the exchange is called a trading member who could also happen to be a clearing member. For effecting physical delivery of commodities, the exchanges tie up with warehouses in different locations.

Regulation Forward trading in India is regulated under Forward Contracts (Regulation) Act 1952 (FCRA, hereafter). Commodities refer to goods which FCRA defines as every kind of movable property other than actionable claims, money and securities. According to FCRA, a forward contract providing for delivery of goods and payment of price after 11 days from the date of the contract are "forward" contracts. Forward contracts could be 'Specific Delivery Contracts' or 'Futures Contracts'. The former provides for the actual delivery of specific quantities and types of goods during a specified future period, and in which the names of both the buyer and the seller are mentioned.

Though 'Futures Contracts' is not explicitly defined in FCRA, it is implied to be a forward contract, which is not a specific delivery contract. As all forward contracts have to result in delivery of goods as per law, a futures contract (which is a form of forward contract) will be void if entered into without the intention of giving/taking delivery of the commodity at the end of the contract period. Of course a person to the contract can enter into a reverse position during the life of the contract and avoid delivery. However if he wishes to give delivery in the futures market, he has the right to do so. Thus an exchange has to necessarily allow an option to the seller of the futures to give physical delivery at the end of the contract period, if he so wishes. Because of such delivery option it can be fairly expected that the futures price will converge (or nearly converge) to the spot price on maturity of the contract. A similar right to the buyer to take delivery is of course contingent on the availability of a willing seller.

Forward Markets Commission is the regulatory authority for futures trading in commodities in India. It is overseen by the Ministry of Consumer Affairs and Public Distribution. At present there are twenty one regional or commodity specific exchanges and three nationwide exchanges trading multiple commodities online. Trading is allowed in over eighty commodities grouped under eight major categories, viz. vegetable oilseeds, oils and meals, pulses, spices, metals, energy products, vegetables, fibres and manufactures – cotton, other-guarseed, guar gum, sugar. Only a handful of commodities attract large trading volumes. Almost all trades in the exchanges get reversed before the expiry date with the participants taking up offsetting positions and only a miniscule of the trades result in actual delivery.

Differences between the Commodities Futures and Securities Futures Markets Unlike trading in securities futures market, trading in commodity futures is somewhat complicated, particularly when it comes to giving and taking of deliveries. Delivery is a cumbersome process, involving transportation, assaying, storage, quality specifications, grades etc. In commodity markets, each commodity often has several grades and subgrades. Conditions of storage, transportation and quality are of paramount concern in delivery of commodities while no such concern exist in the stock markets.

The demand – supply factors affecting commodity prices are far more complex and commodity specific unlike the position in securities market. For instance, a serious player in the agricultural commodities futures market has to have up-to-date knowledge of the carry over stocks, expected demand, crop acreage, production, imports and exports, government policies and procurement programmes, likely climatic conditions and so on. A player in crude futures has to closely monitor the global crude oil stock position, likely changes in OPEC production, strategic petroleum/reserve position in US, changes in refining capacities, dollar exchange rates and so on.

Features of Commodity Futures Trading In a commodity futures contract, the size, delivery months, last trading day, delivery location or locations, acceptable qualities or grades of the commodity, and so on are all standardised for each commodity. Prices quoted for the futures contracts would be ex-warehouse and exclusive of sales tax and other taxes. Like in other futures markets, the futures prices are marked to market on a daily basis. Initial margin typically ranges between two to ten percent of the contract value. The exchange imposes special additional margin in case of undue volatility. There will also be some upper limits to the open positions for clients and exchange members.

In all commodity exchanges, the parties to the contract are given a few days time before the expiry day of the contract, called tendering time, within which, they may tender documents stating their intention of settling the contract by giving/taking physical delivery. If they do not state any such intention, the exchanges will settle the contract on the expiry day on cash basis, based on the settlement price of the commodity. The settlement price could be the spot price prevailing on the contract expiry day as announced by the exchange or the average of the spot prices of a few days preceding the expiry day.

A few days time is allowed after the contract expiry date for effecting the delivery and during this period an enhanced margin is collected till the date of the delivery. If a seller or a buyer defaults in fulfilling delivery commitments, the exchange closes out the position in cash with penalty.

A party intending to give/take delivery of a commodity is required to open a commodity demat account with a depository, either NSDL or CDSL, through an accredited depository participant (DP). Whenever a commodity is deposited in or delivered from an accredited warehouse on behalf of the party, suitable credit or debit is given to the demat account electronically. A beneficiary can reconvert the commodity from demat to physical form if and when needed.

As commodities deteriorate in quality over time, there is a validity period for the demat credit. In the absence of demat credit, the seller will have to give physical delivery at the exchange approved warehouses/delivery centres in designated places using warehouse receipts/vault receipts. Dematerialisation of warehouse receipts is done only for convenience of settlement at the exchange level and there is no law under which this process is regulated.

A buyer intending to take delivery is selected from the open buy position holders for the offered quantity. Such matching for deliveries is done first on the basis of locations and then randomly subject to available storage capacity. Under certain circumstances, an exchange without taking any responsibility on itself, may also allow the parties to bilaterally settle delivery outside its purview.

Jim Rogers on Commodities

Jim Rogers is an internationally renowned expert on commodities. In a fascinating book titled *Hot Commodities: How Anyone Can Invest Profitably in the World's Best Market* published by Random House, he makes the following points.

- The monetary value of trading on various commodity exchanges in the US is several times that of stocks traded on the US stock exchanges.
- Most investors are well informed about stocks but know hardly anything about commodities. While they can recall P/E ratios of many companies, commodities trading remains a mysterious land populated by legendary dragons.
- There were three long bull markets in commodities in the 20th century (1906-1923, 1933-1953, 1968 – 1978). The current bull market in commodities began in 1999. As Jim Rogers put it: "The Next New Thing is – Things: A new bull market is under way, and it is in commodities – the 'raw materials,' 'natural resources,' 'hard assets,' and 'real things' that are essentials of not just your life but the lives of everyone in the world."
- The alternating long bear and bull markets in commodities (metals, hydrocarbons, livestock, and agricultural products) are caused by the basic economic principles of supply and demand.

The seller intending to give delivery is responsible for payment of sales tax and all other applicable taxes. The exchange members have to keep proper records of the tax registration particulars of both sellers and buyers seeking delivery and these have to be furnished to the exchange whenever required. Payment of taxes will be in addition to the settlement account wherever deliveries occur. The amount of sales tax on the deal would be notified on the settlement day and would be settled separately on a supplemental settlement day a few days later.

18.6 PRICING OF FUTURES CONTRACTS

You can obtain an asset at some date in the future in at least two ways. You can buy the asset now and hold it until the target date. Alternatively, you can buy a futures contract for that asset that matures on the target future date. Since both the strategies lead to the same result, the cost of pursuing these strategies must be the same. Thus, there should be a well-defined relationship between the current price of the asset, the cost of holding it, and its futures price. We will examine this relationship for equity futures, Treasury bond futures, and commodity futures.

Equity Futures Suppose you want to have 1 share of *ABC* stock at some future date *T*. You can choose from the following strategies.

Strategy A: Buy one share of *ABC* stock by paying the spot price (current price), S_o, and hold it until time *T*, when its spot price will be S_T.

Strategy B: Buy a futures contract for one share of *ABC* stock and invest enough money now in a risk-free security (that earns a return of r_f) to pay the futures price when the contract matures at time *T*.

The cash streams of the two strategies are shown below[2]:

		Initial cash flow	*Cash flow at time T*
Strategy A:	Buy one share in the spot market	$-S_0$	S_T
Strategy B:	Buy a futures contract for F_o	0	$S_T - F_o$
	Invest $F_o/(1+r_f)^T$ in risk free security	$-F_o/(1+r_f)^T$	F_o
	Total for strategy B	$-F_o/(1+r_f)^T$	S_T

Both the strategies result in an identical value of S_T rupees (the value of *ABC*'s share at time *T*). Therefore, the cost, or the initial outflow, associated with these strategies must be the same. This means that:

$$F_o/(1+r_f)^T = S_o$$

[2] For the sake of simplicity, we ignore the margin requirements on the futures contract and assume that there is no cash flow involved in establishing a futures position. There are two reasons for this simplification. First, the margin is small relative to the value of the contract. Second, and more importantly, the margin requirement may be met with interest-bearing securities and so there may be no time-value-of-money cost.

or $$F_o = S_o(1 + r_f)^T \tag{18.1}$$

The above result is called the **spot-futures parity relationship** or the **cost-of-carry relationship**. It gives the theoretically correct relationship between spot and future prices.

Example The share of *P* Company is currently selling for Rs 400. The risk-free interest rate is 1 percent per month. A 3 months futures contract should have a price of:

$$F_o = S_o(1 + r_f)^T = 400\ (1.01)^3 = \text{Rs } 412.12$$

If the contract has a 6-month maturity, the futures price should be:

$$F_o = 400\ (1.01)^6 = \text{Rs } 424.61$$

If the actual futures price deviates from its appropriate value, investors can earn arbitrage profits. For example, suppose the 3-months futures price in the above example were Rs 414 rather than the appropriate value of Rs 412.12. Since the futures price exceeds its appropriate value, it pays to buy the share in the spot market with borrowed money and sell the futures contract. Such an action produces a riskless profit of Rs 1.88 as shown below:

Action	*Initial cash flow*	*Cash flow at time T (3 months)*
■ Borrow Rs 400 now and repay with interest at time *T*	+ Rs 400	– Rs 400 $(1.01)^3$ = – Rs 412.12
■ Buy a share	– Rs 400	S_T
■ Sell a futures contract (F_o = Rs 414)	0	Rs 414 – S_T
Total	Rs 0	Rs 1.88

Note that the above strategy produces a riskless profit without any investment.

When a mispricing of the kind described in the above example occurs, market participants would rush to exploit it. As a result, the spot price would be bid up, and/or the futures price offered down, until the equilibrium relationship shown in Eq. (18.1) is satisfied.

There is a variant of Eq. (18.1) which is as follows:

$$F_o = S_o e^{r_f T} \tag{18.2}$$

This formula assumes continuous compounding and hence substitutes $e^{r_f T}$ for $(1 + r_f)^T$.

Note that the above formulae for establishing the price of futures contracts are applicable to individual stocks as well as stock indices.

When the underlying asset produces income to the owner, the parity relationship has to be modified. Suppose the underlying stock earns a dividend yield of *d*. This means that the net cost of carrying will be reduced to $r_f - d$ and the spot-futures parity relationship will be:

$$F_o = S_o(1 + r_f - d)^T \qquad (18.3)^3$$

[3] This an apporximate relationship as it assumes that divend is paid just before the maturity of the contract.

Example Suppose the stock index is currently 1200, the risk-free interest rate is 1% per month and the dividend yield on the stock index is 0.25% per month. The net cost of carry works out to 1% – 0.25% = 0.75. Given this, a three-month stock index futures contract will have a price of:

$$F_o = 1200\,(1 + 0.0075)^3 = 1227.2$$

Spreads Just as we determined the relationship between spot and futures prices, we can establish the relationship between futures prices for contracts of different maturity dates.

For a given stock, let $F(T_1)$ be the current futures price for delivery at T_1, $F(T_2)$ be the current futures price for delivery at T_2 ($T_2 > T_1$), and d be the dividend yield. According to the parity Eq. (18.3).

$$F(T_1) = S_O\,(1 + r_f - d)^{T_1}$$

$$F(T_2) = S_O\,(1 + r_f - d)^{T_2}$$

Dividing $F(T_2)$ by $F(T_1)$, we get

$$F(T_2)\ /\ F(T_1) = (1 + r_f - d)\ T_2 - T_1$$

Hence, the basic parity relationship for spreads is:

$$F(T_2) = F(T_1)\,(1 + r_f - d)^{T_2 - T_1} \tag{18.4}$$

To illustrate how Eq. (18.4) is used, consider the following data:

Contract Maturity Date	Futures Price
June 25	Rs. 1060
July 25	Rs. 1063

Suppose the risk-free interest rate is 6 percent and the dividend yield is 2 percent per year. According to Eq. (18.4), the "correct" July futures price in relation to the June futures price is:

$$1060\left[1 + \frac{(0.06 - 0.04)}{12}\right] = 1061.77$$

The "actual" July futures price is Rs. 1063, implying that the July futures is overpriced relative to the June futures. Ignoring transaction costs, there is an arbitrage opportunity. Arbitrageurs will sell July futures and buy June futures and their actions will quickly restore the parity relationship.

Treasury Bond Futures Treasury bond futures are valued the way stock index futures are valued, with one difference: For valuing stock index futures the dividend yield is subtracted from the riskfree interest, but for valuing a Treasury bond futures the present value of the coupons during the life of the futures contract is subtracted from the spot price of the Treasury bond. Thus, the theoretical price of a Treasury contract bond futures is:

$$F_o = (S_o - PVC)\,(1 + r_f)^T \tag{18.5}$$

where F_0 is the theoretical price of a Treasury bond futures contract, S_0 is the spot price of treasury bond, *PVC* is the present value of coupons during the life of the futures contract, r_f is the risk-free rate of interest, and *T* is the life of the futures contract.

Should the futures price deviate from the theoretical price, there will be an opportunity for arbitrage.

Commodity Futures (Storable Commodities) Futures contracts on various commodities, storable as well as perishable, like gold, oil, aluminium, cotton, rice, wheat, and orange juice have been in existence for nearly three centuries.

For a storable commodity, buying in the spot and storing it until the expiration of the futures contract is equivalent to buying a futures contract and taking delivery at the maturity date.

If you buy a commodity in the futures market, rather than the spot market, you gain on two counts: (i) You can earn interest on your money, as your payment is deferred. (i) You save on storage, insurance, and wastage costs as you don't have to store the commodity. As against these advantages, you have to forego the convenience of having the commodity readily on hand. For example, if you run out of your inventory of aluminum you can't replace it with aluminium futures.

Given the above advantages and disadvantages, one would expect the following relationship to hold for commodities:

$$\frac{\text{Futures price}}{(1+r_f)^T} = \text{Spot price} + \text{Present value of} - \text{ Present value of}$$

Commodity Futures (Perishable Commodities) For pricing futures contracts on the basis of arbitrage, the asset has to be storable. Hence perishable commodities have to be analysed differently.

The futures price of a perishable commodity is influenced by two factors mainly: (a) the expected spot price of the underlying commodity, and (b) the risk premium associated with the futures position.

- If the spot price of the underlying commodity is expected to rise before the expiration of the futures contract, the futures price will exceed the current spot price and vice versa.
- In a futures contract there is a buyer and a seller. Hence the magnitude and the direction of the risk premium depends on whether the buyer is providing service to the seller or vice versa.

In a futures contract where the buyer provides service to the seller, the buyer expects to be rewarded for bearing the risk. Thus the futures prices will be lower than the expected spot price.

$$\text{Futures price} = \text{Expected spot price} - \text{Expected risk premium}$$

This means that the price of the futures contract is expected to rise during its life as shown in part A of Exhibit 18.7. Such a relationship is called **normal backwardation**.

In a futures contract where the seller provides service to the buyer, the seller expects to be rewarded for bearing the risk. Hence the futures price will be greater than the expected spot price.

Futures price = Expected spot price + Expected risk premium

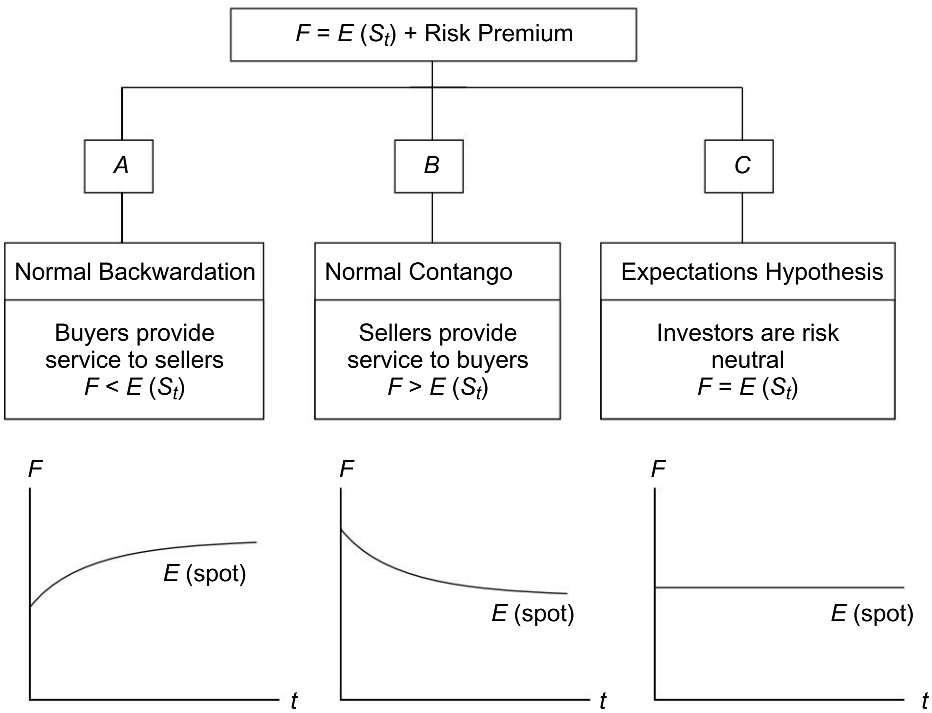
This means that the price of the futures contract is expected to fall during its life as shown in part B of Exhibit 15.8. Such a relationship is called **contango relationship**.

In a futures contract where buyers as well as sellers are investors (or speculators), no group is providing service or receiving service. This is true of most modern commodity futures contracts. In this case there will be no risk premium and hence the futures price would be equal to the expected spot price.

Futures price = Expected spot price

This means that the price of the futures contract is expected to remain stationary throughout its life. This is shown in part C of Exhibit 18.7.

Exhibit 18.7 ***Futures on Perishable Commodities***



18.7 USE OF FUTURES CONTRACTS

Who are the users of futures contracts? The participants in the futures market are hedgers or speculators or arbitragers. Since all the groups are important to the futures market we will discuss each in turn.

Hedgers Hedgers are parties who are exposed to risk because they have a prior position in the commodity or the financial instrument specified in the futures contract. For example, a farmer may be expecting a produce of n tonnes of wheat from his farm two months hence or an investor may be currently owning a broadly diversified portfolio of equity stocks worth Rs P million now. By taking an opposite position in the futures market, parties who are at risk with an asset can hedge their position. For example, the farmer may sell wheat futures and the investor may sell stock index futures. By doing so, they can shield themselves against the risk of unexpected price changes.

Since one can take either a long position or a short position in the futures contract, there are two basic hedge positions:

The short (sell) hedge A party who has a long cash position, current or potential, may sell (short) the futures. For example, a portfolio manager who wants to liquidate his equity portfolio six months from now but who is worried about the stock market level six months hence may sell stock index futures of six months maturity. Should the market fall in six months, the gains from squaring the stock index futures position would substantially offset the erosion in the value of the portfolio. Likewise, a bond portfolio manager who wants to protect his portfolio against interest rate increase may sell Treasury bond futures.

The long (buy) hedge A party who is not currently in cash but who expects to be in cash in the future may buy a futures contract to eliminate uncertainty about the price. For example, a miller who wants wheat three months hence may buy a three-months wheat futures contract to hedge against the risk of price change. Similarly, a portfolio manager who expects cash surpluses in future meant to be invested in bonds may buy treasury bond futures so that he can lock in the buying price and seek protection against a fall in interest rate.

Basis Risk The difference between the futures price and the spot price is called the *basis*. When a Nifty futures trades at 6120 and the spot Nifty is 6000, the "basis" is said to be 120 or 2 percent. The convergence property implies that on the contract maturity date, the basis must be zero. Thus $F_T - P_T = 0$.

Ideally, the basis should reflect interest rates, and nothing else. In reality, the basis fluctuates in a band around its ideal value. The unwanted fluctuations of the basis creates basis risk, which reduces the usefulness of the futures market for hedgers and speculators.

Of course, speculators attempt to profit from changes in the basis. Instead of taking a bet on the direction of the futures or spot prices per se, a speculator may bet on the changes in the difference between the two. If he has a long spot-short futures position he profits when the basis narrows.

To illustrate, consider a speculator who holds 100 shares of Reliance Industries and who is short one Reliance futures contract (for 100 shares). The spot price of Reliance is Rs. 2500 and the futures price is Rs. 2510. Hence, the basis is currently Rs. 10. Tomorrow, the spot price may rise to Rs. 2505, while the futures price increases to Rs. 2513, thereby narrowing the basis to Rs. 8. The speculator's gains and losses are as follows.

Gain on holding of 1 share of Reliance: Rs 2505 – Rs. 2500 = Rs.5

Loss on futures position on 1 share of Reliance: Rs. 2513 – Rs. 2510 = Rs. 2

Thus, the speculator gains Rs. 5 per share on his Reliance holding but loses Rs. 3 per share on his short futures position. His net gain is Rs. 2 (the decrease in basis) per share.

Speculators While hedgers buy or sell futures contracts to protect themselves against the risk of price changes, speculators buy or sell futures contracts in an attempt to earn a profit. Speculators do not have a prior position that they want to hedge against price fluctuation. Rather they are willing to assume the risk of price fluctuation in the hope of profiting from them.

Speculators play a very important role in the proper functioning of the futures market. They absorb the excess demand or supply generated by hedgers and assume the risk of price fluctuations that hedgers want to avoid. Speculators impart liquidity to the market and their actions, in general, dampen the variability in prices over time.

Why should someone speculate in the futures market? After all, he can do it in the market of the underlying instrument. For example, if someone believes that the interest rates will fall, he can buy Treasury bonds itself rather than the Treasury bond futures. The futures market offers the following attraction to the speculator:

- **Leverage** When you buy a futures contract you don't have to pay the entire value of the contract upfront. Instead, you have to pay just an initial margin which may be about 10 percent of the value of the contract. By contrast, a purchase in the underlying market calls for the entire payment.
- **Ease of transactions** If you think that interest rates will rise you will have difficulty in selling bonds short, but it is very easy for you to take a short position in a Treasury bond futures contract.
- **Lower transaction costs** The transaction costs in the futures market are significantly smaller than what they are in the underlying cash market.

Arbitragers An arbitrager uses futures contracts to exploit price differences between different markets. There are two main kinds of arbitrage transactions:

- A *futures-futures arbitrage* occurs when a dealer exploits the price differential between two futures markets. For example, if there is a difference between the LIFFE cocoa futures and the NYCSE cocoa futures, an arbitrageur may profit from it.
- A *cash-futures arbitrage* occurs when a dealer exploits a price misalignment between the cash market and the futures market. To illustrate, suppose the spot Nifty is 6000 and a one-month Nifty futures is 6090 when the risk-free interest rate is 1 percent per month. This means that futures is trading above its theoretical value of 6060. There is pricing error of 30. An arbitrager can exploit this mispricing by buying the spot Nifty, selling Nifty futures, and holding till expiration. This strategy will enable the arbitrager to lend money to the market

at 1.5 percent per month. As long as he can borrow at1.0 percent per month, he will earn 0.5 percent per month, without assuming any risk.

Program Trading

Stock index futures enable investors to offset security risk through complicated strategies such as index arbitrage. Index arbitrage seeks to exploit discrepancies between actual and futures prices. For example, if the stock index futures are trading at a higher price compared to their theoretical price, it may be profitable to buy a basket of stocks underlying the index in the cash market and sell the stock index futures and vice versa. Trading of baskets of stocks tied to expiring futures contracts is called program trading. On New York Stock Exchange, simultaneous purchase or sale of at least 15 different stocks with a total value of at least $1 million is referred to as program trading. Some criticise program trading for causing market turmoil; others claim that it makes the market more efficient and liquid.

18.8 ASSESSMENT

Economic Functions Futures and options perform three very useful economic functions: risk transfer, price discovery, and market completion.

Risk Transfer By themselves, derivatives do not create additional risk. They merely reallocate the existing risk among various participants in the financial markets. In this sense, they are like insurance products. As Merton H. Miller said:

> "The combined set of futures and options contracts and the markets, formal and informal, in which they are transferred has thus been likened to a gigantic insurance company - and rightly so. Efficient risk-sharing is what much of the futures and options revolution has been all about."[4]

Price Discovery Individuals possessing superior information and judgment are motivated to participate in the futures markets as well as the options market. These markets are a way to distill and convey information about what is likely to happen. They improve price discovery (as prices reflect more information). This leads to a better allocation of resources.

In general, empirical studies abroad have shown that the stock index futures market plays an important role in information assimilation and price discovery. A study by Suchismita Bose, published in the February 2007 issue of *Money & Finance,* found that there is a two-way information flow between the Nifty futures market and the spot market. As the author put it: "The contributions of the two markets to the price discovery process are almost equal with the futures showing a marginal edge over the spot market as the information flow into the stock prices from the futures is slightly

[4] Merton H. Miller, " Financial Innovation: Achievements and Prospects" , *Japan and the World Economy*, vol. 4, no. 2 (June 1992).

higher than the price information flows to the futures market from the spot market. The futures market also readjusts faster to market-wide information and thus absorbs much of the volatility induced by flow of new information."

Market Completion In a complete market, the number of independent securities (or financial instruments) equals the number of alternative future states of nature. This means that it is possible to draw up financial contracts which cover all possible contingencies.

A complete market is a theoretical ideal that is not attainable in practice. It is not possible to design enforceable financial contracts that cover an endless range of contingencies. While a complete market is an impractical proposition, it is possible to increase the degree of market completeness by adding more instruments. Futures and options certainly represent useful instruments that expand the opportunities available to the investors at fairly low transaction costs.

Thanks to the valuable economic functions performed by the derivatives, they have come to play an important role in the financial markets all over the world. This is evident from the global explosion in the volume of derivative trading.

Critique and Response Notwithstanding the endorsement of derivatives by financial economists and business persons, there is a widespread belief among regulators, bureaucrats, and politicians that derivatives are employed mainly for gambling or speculation purposes, and they accentuate the volatility in the underlying cash markets. As John Shad, former Chairman, Securities Exchange Commission, US, said:

> "Futures and options are the tail wagging the dog. They have escalated the leverage and volatility of the markets to precipitous, unacceptable levels."

In support of their contention, the critics cite cases of organisations which have suffered grievously from the use derivatives. Some such examples are the German conglomerate giant Metallgesellschaft, Orange County, and Barings Plc.

The Barings Episode

While derivatives are mostly used for risk hedging, they may be used for speculation as well. A conspicuous example is the reckless purchase of futures contracts on Japan's Nikkei index by Nicholas Leeson, which led to the collapse of Barings Plc., a reputed bank with a hoary history. Leeson took a bet that the Nikkei index would rise. Contrary to his expectations, the Nikkei index fell precipitously, entailing a huge loss. While the truth in the Barings case is not fully known, it appears that the debacle was caused by a combination of several factors, namely, recklessness of a rogue trader (Nicholas Leeson), camouflaging of transactions, inability of the auditor to raise the right questions, inadequate controls, and connivance on the part of the top management.

It is important to note that the Barings episode did not cause any systemic failure. The moral of the Barings story is that the costs of abusing derivatives are highly concentrated. They are borne by those who violate laws (Nicholas Leeson), those who are derelict in their duties (managers of Barings), and those who fail to choose the right board of directors (shareholders of Barings).

Many in the profession, however, disagree vehemently with the view that derivatives accentuate volatility in the underlying cash markets. On the contrary, they argue, volatility in the underlying cash market declines with the introduction of derivatives. Since hedging opportunities prove valuable only if the underlying cash markets are volatile, derivatives are introduced only when the underlying asset's prices become more volatile. Hence, volatility in the underlying cash market is the *impetus* for introducing derivatives and not the *consequence* thereof.

Indeed, there is extensive empirical evidence to support the hypothesis that the volatility in the underlying cash markets diminishes with the introduction of derivatives.

The economic underpinnings of this evidence appear to be as follows: (a) transaction costs in futures markets are very low - usually about one-fifth of what they are in the cash markets (transaction costs include commissions, fees, and market impact cost); and (b) futures and options markets have a very high degree of liquidity. Thanks to these characteristics, trading in derivative markets is profitable on much smaller economy-wide information events.

On this issue, it is instructive to listen to Merton H. Miller, Nobel Laureate in Economics. He makes the following observations on derivatives and volatility:

- The frequently made charge that stock index futures have increased the volatility of the US stock market is not true.
- Volatility itself is volatile - goes up and down. The upward bulges occur typically after the crashes. That's one of the few things we really know about the volatility of stock prices.
- Volatility, looked at over a longer period of time, is pretty much constant, except for those occasional bulges like in the 1930s. We certainly shouldn't credit regulation with any dramatic improvement in volatility.

Derivatives: Myths and Realities

Myths	*Realities*
■ Derivatives add to risk	■ Derivatives are devices for managing risk
■ The best platform for derivatives trading is an organised exchange	■ Many successful derivatives trade over-the-counter
■ Since the derivatives on individual assets are the oldest exchange derivatives, they must be the most useful	■ Derivatives on baskets of assets have gained pre-eminence because of their usefulness

SUMMARY

- An agreement between two parties to exchange an asset in future for cash at a price that is specified today represents a **forward contract**.
- A standardised forward contract is a **futures contract**. While there is no secondary market for forward contracts, the futures contracts are traded on organised exchanges. Forward contracts usually end with deliveries, whereas futures contracts are settled with the differences. Forward contracts do not require a margin, whereas futures contracts require a margin. Forward contracts are settled on the maturity date, whereas futures contracts are 'marked to market' on a daily basis.
- Broadly, there are two types of futures, **commodity futures** and **financial futures.**
- Equity futures are of two types: **stock index futures** and **futures on individual securities.**
- A stock index futures contract is a futures contract on a stock index.
- Futures contracts can be priced using the principle of **arbitrage.**
- The theoretical price of the stock index futures, as well as the futures on an individual stock, is

$$F_0 = S_0 \,(1 + r_f - d)^{T}$$

- A Treasury bond futures contract is a contract for delivery in future of Treasury bonds (government bonds) having certain features.
- The theoretical price of a Treasury bond futures contract is

$$F_0 = (S_0 - PVC)\,(1 + r_f)^T$$

- The futures price of a perishable commodity is influenced by two factors mainly: (a) the expected spot price of the underlying commodity, and (b) the risk premium associated with the futures position.
- The participants in the futures market are either hedgers or speculators.
- The futures market offers the following attraction to the speculator: leverage, ease of transactions, and lower transaction costs.
- Futures and options perform three very useful economic functions: **risk transfer**, **price discovery**, and **market completion**.
- Many believe that derivatives accentuate the volatility of the cash market. Financial economists, however, argue that the volatility in the underlying cash market is the **impetus** for introducing derivatives and not the **consequence** thereof.
- Empirical evidence suggests that the volatility in the underlying cash markets diminishes with the introduction of derivatives.

QUESTIONS

1. What are the key differences between forwards and futures?
2. Explain the 'marking-to-market' feature with an example.
3. Give examples of major types of futures contracts.
4. Describe the features of the Nifty futures contract.
5. Describe the salient features of futures on individual securities on the National Stock Exchange.
6. What is the theoretical price of a stock index futures contract?
7. What is the theoretical price of a Treasury bond futures contract?
8. What is the theoretical price of a futures contract in a storable commodity?
9. What will be the futures price of a perishable commodity under the following situations: normal backwardation, normal contango, and expectations hypothesis?
10. Describe the short hedge and the long hedge.
11. What is the appeal of the futures market to the speculator?
12. Discuss the economic functions served by derivatives.
13. What do the critics of derivatives say? How do the proponents of derivatives defend?
14. What are Merton H. Miller's views on derivatives and volatility?

SOLVED PROBLEMS

1. A non-dividend paying stock has a current price of Rs 16. What will be the futures price if the risk free rate is 9 percent and the maturity of the futures contract is 1 month?

Solution

$$F_0 = S_0 (1 + r_f)^t$$

$$= \text{Rs } 16 (1.09)^{1/12} = \text{Rs } 16.115$$

2. Suppose a stock index has a current value of 3500. If the risk-free rate is 8 percent and the expected yield on the index is 2 percent, what should be the price of a six months maturity futures contract ?

Solution

$$F_0 = S_0 (1+r_f - d)^t$$

$$= 3500 (1 + .08 - .02)^{0.5} = 3603.5$$

3. The share of Omega Company which is not expected to pay dividend in the near future is currently selling for Rs 150. The risk-free interest rate is 0.8% per month. A 3-month futures contract is selling for Rs 152. Develop an arbitrage strategy and show what your profit will be 3 months hence.

Solution

The appropriate value of the 3-months futures contract is

$$F_0 = 150\ (1.008)^3 = \text{Rs } 153.63$$

Since the futures price (Rs 152) is less than its appropriate value (Rs 153.63), it pays to do the following :

Action	*Initial cash flow*	*Cash flow at time T (3 months)*
Sell the share short and return it after 3 months	150	$-S_T$
Lend 150 now and collect the loan with interest 3 months from now	–150	$150\ (1.008)^3 = 153.63$
Buy a futures contract ($F_0 = 152$)	0	$S_T - 152$
	0	1.63

PROBLEMS

1. Assume that an investor buys a stock index futures contract on March 1 at 1125 which was that day's closing price. The position is closed out on March 5 at that day's settlement price. The stock index prices at the closing of trade on March 2 to March 5 are 1128, 1127, 1126, 1128. Calculate the cash flow to the investor on a daily basis. Ignore the margin requirements.
2. A nondividend-paying stock has a current price of Rs 40. What will be the futures price if the risk-free rate is 8 percent and the maturity of the futures contract is 3 months?
3. Suppose a stock index has a current value of 1200. If the risk-free rate is 10 percent and the expected dividend yield on the index is 3 percent, what should be the price of the one year maturity futures contract?
4. The six-months futures contract for gold is \$432.8 while the one year futures contract for gold is \$453. The risk-free interest rate is 8%. Do you see an arbitrage opportunity? If so, what will you do to exploit it? Ignore storage cost and convenience benefit.
5. The share of Ram Limited is currently selling for Rs 1,000. The risk-free interest is 1 percent per month. Suppose the 3-months futures price is Rs 1035. What will you do? Assume that Ram Limited will not pay any dividend in the next six months.

PART

7

Other Investment Options

Chapter **19**

Mutual Funds

Indirect Investing

LEARNING OBJECTIVES

After studying this chapter, you should be able to:

- Describe the role played by various entities in a mutual fund operation.
- Discuss the investment-orientation of different categories of mutual fund schemes.
- Understand the key financial numbers relating to a mutual fund scheme.
- Appreciate the pros and cons of mutual fund investing.

A mutual fund represents a vehicle for collective investment. When you participate in the scheme of a mutual fund, you become part-owner of the investments held under that scheme.

Till 1986, the Unit Trust of India was the only mutual fund in India. Since then public sector banks and insurance companies have been allowed to set up subsidiaries to undertake mutual fund business. So, State Bank of India, Canara Bank, LIC, GIC, and a few other public sector banks entered the mutual fund industry. In 1992, the mutual fund industry was opened to the private sector and a number of private sector mutual funds such as Birla Mutual Fund, DSP Merrill Lynch Mutual Fund, HDFC Mutual Fund, IDBI-Principal Mutual Fund, JM Mutual Fund, Kotak Mahindra Mutual Fund, Morgan Stanley Mutual Fund, Prudential ICICI Mutual Fund, Reliance Mutual Fund, Standard Chartered Mutual Fund, Tata Mutual Fund, and Templeton India Mutual Fund have been set up. The process of consolidation began in recent years. For example, Templeton Mutual Fund has taken over Kothari Pioneer Mutual Fund and HDFC Mutual Fund has taken over Zurich India Mutual Fund. At present, there are about 30 mutual funds managing nearly 1000 schemes.

While the mutual fund industry in India has registered a healthy growth over the last 15 years, it is still very small in relation to other intermediaries like banks and insurance companies.

19.1 ENTITIES IN A MUTUAL FUND OPERATION

In India, the following entities are involved in a mutual fund operation: the sponsor, the mutual fund, the trustees, the asset management company, the custodian, and the registrars and transfer agents.

Sponsor The sponsor of a mutual fund is like the promoter of a company. The sponsor may be a bank, a financial institution, or a financial services company. It may be Indian or foreign. For example, the sponsor of Templeton Mutual Fund is Templeton International Inc. The sponsor has to obtain a license from SEBI for which it has to satisfy several conditions relating to capital, profits, track record, default free dealings, and so on.

The sponsor is responsible for setting up and establishing the mutual fund. The sponsor is the settlor of the mutual fund trust. The sponsor delegates the trustee function to the trustees.

Mutual Fund The mutual fund is constituted as a trust under the Indian Trust Act, 1881, and registered with SEBI. The beneficiaries of the trust are the investors who invest in various schemes of the mutual fund.

Trustees A trust is a notional entity that cannot contract in its own name. So, the trust enters into contracts in the name of the trustees. Appointed by the sponsor, the trustees can be either individuals or a corporate body (a trustee company). Typically it is the latter. For example, the trustee of the Templeton Mutual Fund is the Templeton Trust Services Private Ltd, a company incorporated with limited liability under the Companies Act, 1956. To ensure that the trustees are fair and impartial, SEBI rules mandate that at least two-thirds of the trustees are independent - this means that they have no association with the sponsor.

The trustees appoint the asset management company (AMC), secure necessary approvals, periodically monitor how the AMC functions, and hold the properties of the various schemes in trust for the benefit of investors. Trustees can be held accountable for the financial irregularities of the mutual fund.

Asset Management Company The Asset Management Company (AMC), also referred to as the Investment Manager, is a separate company appointed by the trustees to run the mutual fund. For example, Templeton Asset Management (India) Private Ltd. is the AMC of the Templeton Mutual Fund. The AMC should have a certificate from SEBI to act as Portfolio Manager under SEBI (Portfolio Managers) Rules and Regulations, 1993. The AMC handles all operational matters such as designing the schemes, launching the schemes, managing investments, and interacting with investors.

In return for its services, the AMC is compensated in the form of investment management and advisory fees. Each scheme of the mutual fund pays the AMC an annual investment management and advisory fees which is linked to the size of the scheme. Currently this fees is subject to the following limits: 1.25 percent on the first Rs.100 crores of the weekly average net assets and 1.00 percent on the balance of net assets.

The head of the AMC is generally referred to as the chief executive officer (CEO). Next to him is the chief investment officer (CIO) who shapes the fund's investment philosophy and who is supported by fund managers responsible for managing various schemes. The fund managers are assisted by a team of analysts who track markets, sectors, and companies.

Custodian The custodian handles the investment back office operations of a mutual fund. Inter alia, it looks after the receipt and delivery of securities, collection of income, distribution of dividends, and segregation of assets between schemes. The sponsor of a mutual fund cannot act as its custodian. This condition is meant to ensure that the assets of the mutual fund are not in the hands of its sponsor.

Registrars and Transfer Agents The registrars and transfer agents handle investor-related services such as issuing units, redeeming units, sending fact sheets and annual reports, and so on. Some funds handle such functions in-house, while others outsource it to SEBI -approved registrars and transfer agents like Karvy and CAMS.

19.2 INVESTMENT-ORIENTATION OF MUTUAL FUND SCHEMES

Mutual funds invest in three broad classes of financial assets:

Stocks: Equity and equity-related instruments.

Bonds: Debt instruments that have a maturity of more than one year (treasury bonds, quasi-government bonds, corporate debentures, and asset-based securities).

Cash: Debt instruments that have a maturity of less than one year (Treasury bills, commercial paper, certificates of deposit, reverse repos, and call money) and bank deposits.

Depending on the asset-mix, mutual fund schemes are classified into three broad categories: equity schemes, hybrid schemes, and debt schemes. Within each of these broad categories, there are several variants.

Equity Schemes

Equity schemes invest the bulk of their corpus - 85 percent to 95 percent or even more - in equity shares or equity-linked instruments and the balance in cash. Equity schemes offered by mutual funds in India may be classified broadly into the following sub-types.

Diversified Equity Schemes As the name suggests, these schemes invest in a broadly diversified portfolio of equity stocks. Typically, such schemes have 20 to 50 or even more equity stocks from a wide range of industries. Examples of such schemes are HDFC Equity scheme, UTI Mastershare scheme, and Reliance Vision Fund.

Index Schemes An index scheme is an equity scheme that invests its corpus in a basket of equity stocks that comprise a given stock market index such as the S&P Nifty Index or the Sensex, with each stock being assigned a weightage equal to what it has in the index. Thus an index scheme appreciates or depreciates (subject to tracking error) the same way as the index. The principal objective of an index scheme is to give a return in line with the index. Examples of such index schemes are UTI Master Index and Franklin India Index NSE Nifty.

Sectoral Schemes A sectoral scheme invests its corpus in the equity stocks of a given sector such as pharmaceuticals, information technology, telecommunications, power, and so on. These schemes appeal to investors interested in taking a bet on specific sectors. Examples of such schemes are UTI Petro, Franklin Infotech, and Reliance Pharma Fund.

Tax Planning Schemes Tax planning schemes or equity linked savings schemes (ELSS) are open to only individuals and HUFs. Subject to such conditions and limitations, as prescribed under Section 80 C of the Income Tax Act, subscriptions to such schemes can be deducted before computing the taxable income. Franklin India Taxshield and Reliance Tax Saver (ELSS) Fund are examples of such schemes.

Arbitrage Schemes Typically, the price of a stock in the cash (spot) market is less than its price in the futures market. The difference between the two represents the 'interest' element of equity markets. An arbitrage scheme seeks to capture this element by buying stocks in the cash market and selling stocks in the futures markets. On or before the expiry date of the futures contract (the last Thursday of every month), the spread between the cash (spot) and futures price disappears. At that time, the position is unwound to book the profit. Given the timing of unwinding, arbitrage schemes typically are interval schemes that allow for redemption only on specific dates around the future rollover dates.

Arbitrage schemes, as they have a market-neutral stance, are not exposed to the volatility of normal equity schemes. Essentially they are quasi-debt schemes (as they capture the 'interest' element of equity markets), that enjoy the tax efficiency of equity schemes.

Index Funds

Index funds offer the following advantages: (a) Recurring expenses are low because no equity research is required, (b) Transaction costs are negligible because portfolio turnover is very low, and (c) Unsystematic risk is more or less eliminated.

Thanks to these advantages, index funds have grown in importance in developed capital markets like the US. However, they have not been very popular in India for the following reasons: (a) The actively managed funds in general have done well *vis-à-vis* popular indices like Nifty and Sensex. (b) The index composition may not be changed sufficiently rapidly to reflect market realities and emerging opportunities for profitable investing. (c) Most index funds in India mimic Nifty or Sensex and not broad based indices.

However, things are likely to change in future for two reasons. (a) As the Indian capital market becomes more efficient, actively managed funds are less likely to outperform the index – indeed, we find that the proportion of actively managed funds outperforming the Nifty or Sensex has fallen considerably in the last two years. (b) More broad-based index funds would be offered. These two developments are likely to increase the popularity of index funds in India in future.

Hybrid Schemes

Hybrid schemes, also referred to as balanced schemes, invest in a mix of equity and debt instruments. A hybrid scheme may be equity-oriented or debt-oriented or have a variable asset allocation.

Equity-oriented Schemes An equity-oriented hybrid scheme is tilted in favour of equities which may account for about 60 percent of the portfolio, the balance being invested in debt instruments (bonds and cash). Examples of equity-oriented schemes are HDFC Prudence and Unit Scheme 95.

Debt-oriented Schemes A debt-oriented hybrid scheme is tilted in favour of debt instruments. The most popular debt-oriented schemes in India are Monthly Income Plans which typically have a debt component of 85–90 percent (dominated by bonds) and an equity component of 10–15 percent. Examples of such schemes are Birla MIP and FT India MIP.

Variable Asset Allocation Schemes A variable asset allocation scheme is one wherein the proportions of equity and debt are varied, often on the basis of some objective criterion. For example, in November 2002 UTI introduced an Indexed Linked Plan (ILP), a plan under UTI Variable Investment Scheme. It is an open-ended scheme that dynamically allocates assets between debt and equity under different market conditions. The allocation to equity (debt) increases (decreases) when the market falls but decreases (increases) when the market rises.

Debt Schemes

Debt schemes invest in debt instruments viz., bonds and cash. The wide range of debt schemes currently offered by mutual funds in India may be divided into the following sub-categories: gilt schemes, mixed debt schemes, floating rate schemes, cash schemes (money market schemes),and fixed maturity plans.

Gilt Schemes A gilt scheme or a government securities scheme invests only in government bonds (which may typically account for 80-85 percent of the corpus) and cash (which may typically account for 10-15 percent of the corpus). Gilt schemes may be dedicated to gilts of varying maturities: long-term, medium-term, and short-term. Examples of gilt schemes are Tata GSF and UTI G-Sec.

Mixed Debt Schemes Mixed debt schemes invest in government bonds, corporate bonds, and cash. Typically, 30–40 percent of the corpus is invested in government bonds, 40–55 percent of the corpus is invested in corporate bonds, and the balance is invested in cash. Examples of mixed debt schemes are HDFC Income and UTI Bond.

Floating Rate Debt Schemes Floating rate debt schemes invest in a portfolio comprising substantially of floating rate debt bonds, fixed rate bonds swapped for floating rate returns, and cash. Examples of floating rate debt schemes are Grindlays Floating Rate Scheme and Prudential ICICI Floating Rate Scheme.

Cash Schemes Cash schemes, also called liquid schemes, invest primarily in money market instruments (Treasury bills, commercial paper, certificates of deposit, call money and reverse repos) and deposits with bank. They also have an allocation of about

25 percent to short-term bonds. Typically, the average portfolio maturity of such schemes is less than 150 days. Examples of such schemes are HDFC Liquid and Reliance Liquidity Fund. Presently, cash schemes account for the largest share of the mutual fund industry in India because corporates use these schemes extensively for parking short-term surplus funds.

Fixed Maturity Plans An important recent innovation in the area of debt schemes, a fixed maturity plan (FMP) is a closed-ended debt scheme that has a fixed maturity. Presently, FMPs come with tenures ranging from three months to three years and have an indicative, but not a guaranteed, return. The corpus of an FMP is invested primarily in corporate bonds.

FMPs offer a higher post-tax return compared to competing instruments like bank fixed deposits and various kinds of bonds because of their tax advantage.

Investors in FMPs can choose the dividend option or the growth option. Under the dividend option, the mutual fund pays the dividend distribution tax (DDT) and the dividend income is tax-free in the hands of the investors. Under the growth option, the profits are taxed as capital gains in the hands of the investors. Capital gains on FMPs held for less than 12 months are taxed at the rate of income tax applicable to the investors. Capital gains on FMPs held for more than 12 months are taxed at a rate of 10 percent without indexation benefit or at a rate of 20 percent with indexation benefit at the option of the assessee.

Fund of Fund Schemes

A fund of fund scheme takes the idea of investing in a diversified portfolio through a mutual fund scheme a step further. A fund of fund scheme, instead of investing in stocks or bonds, invests in mutual fund schemes. For example, Pru ICICI Advisor Series, the first Indian fund of fund scheme, offers five plans: very cautious (no-equity, 100 percent debt), cautious (up to 35 percent equity), moderate (40–60 percent in equity), aggressive (50–80 percent in equity), and very aggressive (90–100 percent in equity).

The advantages of a fund-of-fund scheme are: (a) It reduces risk further, by providing a higher degree of diversification. (b) It is more tax-efficient than investing directly in mutual fund schemes. If you invest directly in mutual fund schemes and want to rebalance, you will have to sell units of one scheme and buy units of another. On your sale, you may have to pay capital gains taxes. But if you invest in a fund-of-fund scheme, you don't bear any tax burden on account of rebalancing because mutual funds are tax-exempt.

The disadvantages of a fund-of-fund scheme are: (a) The cost of investing increases because you incur the expenses of the fund-of-fund schemes which may be up to 0.75 percentage points, in addition to the expenses of the schemes in which the fund-of-fund scheme invests. (b) Most of the current fund-of-fund schemes invest solely in the schemes of the same mutual fund. This may not be in the interests of the investors, if the sister schemes are not the best of their kind.

19.3 OPEN-ENDED SCHEMES VERSUS CLOSED-ENDED SCHEMES

A mutual fund scheme may be a closed-ended or an open-ended scheme. What are the salient differences between these schemes?

The key differences between the closed-ended and open-ended schemes are as follows:

- The subscription to a closed-ended scheme is kept open only for a limited period (usually one month to three months), whereas an open-ended scheme accepts funds from investors by offering its units or shares on a continuing basis.
- A closed-ended scheme does not allow investors to withdraw funds as and when they like, whereas on open-ended scheme permits investors to withdraw funds on a continuing basis under a re-purchase arrangement.
- A closed-ended scheme has a fixed maturity period (usually 5 to 15 years) whereas an open-ended scheme has no maturity period.
- The closed-ended schemes are listed on the secondary market, whereas the open-ended schemes are ordinarily not listed.

In general, the pros and cons of the closed-ended and open-ended schemes are as follows:

1. In the secondary market, the shares of closed-ended schemes sell at a discount (often varying between 5 and 20 percent) over their net asset value. Hence, a subscriber to such a scheme does not realise a fair value. As against this, the subscriber to an open-ended scheme gets a value close to the net asset value (typically, it is 0 to 2 percent less than the net asset value).
2. At the time of redemption, the entire investment in a closed-ended scheme is liquidated and the proceeds are distributed among the subscribers. This has two, somewhat unfavourable, implications: (a) the full value of the investment may not be realised because of an adverse market impact, and (b) the tax liability of the subscribers tends to be greater as the entire capital appreciation is realised in one go. The open-ended schemes, on the other hand, do not suffer from these drawbacks.
3. The fund manager of a closed-ended scheme can manage the investments better because the corpus fund is available for the entire duration of the scheme and he is not required to maintain liquidity to take care of redemption demands during its life. As against this, the fund manager of an open-ended scheme has to wrestle with a volatile fund corpus. He may have to cope with a sharp outflow in a declining market or with a speculative inflow in a buoyant market and also maintain some liquidity to meet the redemption demands. All this can mar the over-all performance of an open-ended scheme *vis-à-vis* a closed-ended scheme.

Real Estate Investment Trusts

Several developed countries have Real Estate Investment Trusts (REITs) which are mutual funds that invest in real estate. REITs are of three types: equity REITs, mortgage REITs, and hybrid REITs. Equity REITs own and operate real estate. Mortgage REITS lend money directly or indirectly to real estate owners. Hybrid REITs both own properties and lend to real estate owners.

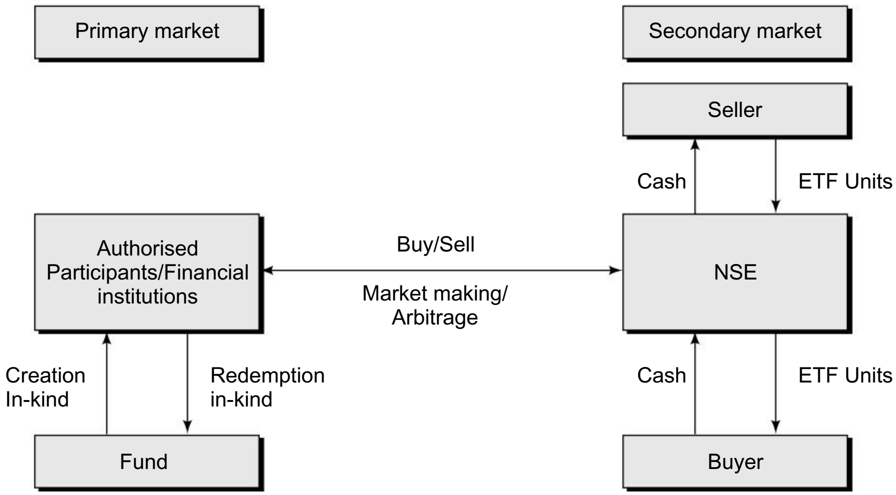
So far REITs have not been set up in India. However, the Association of Mutual Funds of India (AMFI) and SEBI are working on a proposal for introducing REITs in India. Once the regulator gives its nod, investors in India will hopefully have an avenue of investing in real estate through a mutual fund.

Exchange Traded Funds As exchange traded fund (ETF) is a hybrid of a closed-ended index fund and an open-ended index fund. Like a closed-ended index fund, it is listed on the stock exchange and like an open-ended fund it creates and redeems units in line with the rise and fall in demand. Benchmark Mutual Fund's Nifty Benchmark Exchange Traded Scheme (BeES) which tracks the S&P CNX Nifty and Prudential ICICI Mutual Fund's SPICE (Sensex Prudential ICICI ETF) which tracks the BSE Sensex are examples of exchange traded funds.

Exhibit 19.1 shows the manner in which an exchange traded fund is structured. The key features of an ETF are as follows:

- The open-end side of an ETF is restricted to a limited set of participants called Authorised Participants and a certain minimum size is prescribed for the creation/redemption of units.
- The creation/redemption of units happens in kind. Authorised Participants who want new ETF units have to pay in the form of a basket of stocks that mirrors the underlying index. Likewise, when Authorised Participants want the ETF units to be redeemed they are paid in the form of a basket of stocks mirroring the underlying index.
- As ETF units are listed on the secondary market (like NSE) investors can buy and sell ETF units in cash.
- In the secondary market, ETF units tend to trade very near to their fair value (NAV). If the market price of ETF units exceeds its NAV, Authorised Participants would sell ETF units from their inventory, buy the underlying basket of stocks from the exchange, and deliver the basket of stocks to the ETF to replenish their inventory of ETF units and make an arbitrage profit. Likewise, if the market price of ETF units is less than its NAV, Authorised Participants would buy ETF units from the market, redeem the units with its ETF, get the underlying basket of stocks, and sell the same in the market to make an arbitrage profit.

Exhibit 19.1 ***Structuring of an Exchange Traded Fund***



What is the advantage of an ETF over an index fund, closed-ended or open-ended? An ETF offers the following advantages over an index fund, closed-ended or open-ended:

- An ETF is better than a closed-ended index fund because ETF units trade near their fair value (NAV), whereas the units of a close-ended index fund typically trade at a discount.
- An ETF is better than an open-ended index fund in two ways. First, an ETF requires minimal cash balance, thanks to in-kind creation and redemption of units. This reduces the tracking error. (The tracking error is the difference between the performance of an index scheme and the benchmark index). Second, ETFs have lower expense ratios. For example, the offer document of Benchmark Nifty BeEs (BEES) caps its expense ratio at 0.80 percent, whereas index funds charged on average 1.16 percent in 2006-2007. Third, you can buy and sell ETFs throughout the day at the prevailing market price, whereas the index fund can be traded only at the closing NAV of the day.

Hedge Funds

Hedge funds, like mutual funds, are vehicles of collective investment. However, there are some important differences between the two: (a) While mutual funds are open to the general investing public, hedge funds are typically open only to wealthy individuals and institutional investors. (b) Mutual funds are heavily regulated entities, whereas hedge funds are only lightly regulated. (c) Hedge fund managers can engage in leverage, short sales, and heavy use of derivatives across various markets, whereas mutual fund managers cannot.

Typically, hedge funds seek to exploit transient misalignments in security valuations. They buy securities that appear to be relatively underpriced and sell securities that appear to be relatively overpriced. For example, if the yield on corporate bonds seems abnormally high compared to the yield on Treasury bonds, the hedge fund would buy corporate bonds and short sell Treasury bonds. Note that by being long on corporate bonds and short on Treasury bonds, the fund maintains a 'hedged' position with respect to interest rate exposure, while taking a bet on relative valuations. It expects to earn a profit when the yield spread (corporate bond yield – Treasury bond yield) returns to its normal level, irrespective of what happens to the general level of interest rates. Thus, the fund strives to be market-neutral– that is why it is called a hedge fund.

A market-neutral position does not necessarily mean low risk. If the valuation difference across the two sectors persists or even accentuates, the hedge fund can lose money. Since hedge funds typically take highly leveraged positions, their returns tend to be highly volatile.

19.4 REGULATION ON THE INVESTMENTS OF A MUTUAL FUND

The investments of a mutual fund are subject to a set of regulations prescribed by SEBI. Presently the following restrictions apply:

- No term loan shall be granted by a mutual fund scheme.
- A mutual fund, under all its schemes taken together, will not own more than 10 percent of any company's paid up capital carrying voting rights.
- A scheme may invest in another scheme under the same asset management company or any other mutual fund without charging any fees, provided that the aggregate inter- scheme investments made by all the schemes under the same management or in schemes under the management of any other asset management company shall not exceed 5 percent of the net asset value of the mutual fund.
- Transfers of investments from one scheme to another scheme of a mutual fund are permitted provided that:
  (a) Such transfers are done at the prevailing market price for quoted instruments on spot basis.

(b) The securities so transferred shall be in conformity with the investment objective of the scheme to which such transfer has been made.
(c) The registration and accounting of the transaction is completed and ratified in the next meeting of the Board of Trustees, if the regulations so require.

- A mutual fund may borrow to meet liquidity needs, for the purpose of repurchase, redemption of units, or payment of interest or dividend to the unitholders. Such borrowings shall not exceed 20 percent of the net assets of the scheme and the duration of the borrowing shall not exceed 6 months. The fund may borrow from permissible entities at prevailing market rates and may offer the assets of the scheme as collateral for such borrowing.
- A scheme shall not invest more than 15 percent of its NAV in debt instruments issued by a single issuer which are rated not below investment grade by an authorised credit rating agency. Such investment limit may be extended to 20 percent of the NAV of the scheme with the prior approval of the Board of Trustees and the Board of Asset Management Company. This limit, however, is not applicable for investments in government securities and money market instruments.
- A scheme shall not invest more than 10 percent of its NAV in unrated debt instruments issued by a single issuer and the total investment in such instruments shall not exceed 25 percent of the NAV of the scheme. All such investments shall be made with the prior approval of the Board of Trustees and the Board of Asset Management Company.
- A mutual fund will buy and sell securities on the basis of deliveries. It cannot make short sales or engage in carry forward transactions.
- A mutual fund can enter into derivatives transactions on a recognised stock exchange for purposes of hedging and portfolio balancing in accordance with SEBI guidelines.
- A scheme shall not make any investment in (a) any unlisted security of an associate or group company of the sponsor or (b) any security issued by way of private placement by an associate or group company of the sponsor or (c) the listed securities of group companies of the sponsor in excess of 25 percent of the net assets.
- The investment manager may invest in a scheme from time to time. The percentage of such investments to the total net assets may vary from time to time and can be up to 100 percent of the net assets of the scheme. However, the investment manager shall not charge any fees on its investments in the scheme.
- A scheme shall not invest more than 10 percent of its NAV in the equity shares or equity related instruments of any one company. In sector specific funds, the investment in a single scrip shall not exceed the weightage of the scrip in the representative sectoral index/sub-index if any, or 10 percent of the NAV of the scheme whichever is higher. This limit, however, will not apply to index funds because in that case the exposure to a company's stock would depend on the weightage of the stock in the benchmark index.

- A scheme may invest in ADRs/GDRs of Indian companies listed on overseas stock exchanges to the extent and in a manner approved by RBI. The fund will employ necessary measures to manage foreign exchange movements arising out of such investments.
- A scheme shall not invest more than 5 percent of its NAV in unlisted equity shares or equity related instruments in case of an open–ended scheme and 10 percent of its NAV in case of a close–ended scheme.
- A fund of fund scheme shall be subject to the following restrictions:
  (a) It shall not invest in the schemes of any other fund.
  (b) It shall not invest in assets other than in the schemes of the mutual funds except to the extent of funds required for meeting the liquidity requirements for the purpose of repurchase or redemption.
- Traded securities have to be valued at the last quoted closing price on the exchange where the security is principally traded. Non-traded securities shall be valued "in good faith" by the AMC on the basis of appropriate valuation methods. Equity instruments may be valued on the basis of capitalisation of earnings and NAV, with an appropriate discount for lower liquidity. Debt instruments may be valued on the basis of yield to maturity with an appropriate discount for lower liquidity.
- For the purpose of financial statements, mutual funds shall mark all investments to market and carry investments in the balance sheet at market value. However, since the unrealised gain arising out of appreciation in investments cannot be distributed, provision has to be made for the exclusion of this item when arriving at distributable income.

Offer Document and Key Information Memorandum

The offer document (OD) is the most important source of information for investors. Close-ended funds have to issue the OD at the time of the IPO whereas open-ended funds have to update the OD at least once in two years. The Key Information Memorandum (KIM), which is an abridged version of the OD, has to be compulsorily made available along with the application form.

SEBI has prescribed the format and contents of the OD. The OD contains preliminary information on the fund and the scheme, information on fund structure and constitution, fundamental attributes of the scheme, details of the offer, investor rights, and information on income and expenses of existing schemes.

The fundamental attributes of a scheme include the scheme type, objectives, investment pattern, fees and expenses, liquidity conditions, accounting and valuation, and investment restrictions.

The AMC prepares the OD and KIM and is responsible for the information contained in it and the trustees approve the contents of the OD and KIM. SEBI does not approve or certify the contents of the OD or KIM.

19.5 TAX ASPECTS OF MUTUAL FUND INVESTMENT

Tax Treatment at the Fund Level The key tax aspects at the fund level are as follows:

- The entire income of a mutual fund registered with SEBI is exempt from income tax in accordance with the provision of Section 10 (23D) of the Income-tax Act, 1961.
- A mutual fund is liable to pay securities transaction tax on its purchases and sales of equity shares, units of equity-oriented funds, and derivatives.
- A mutual fund is liable to pay dividend distribution tax as follows. (a) Zero percent in the case of equity-oriented schemes (An equity-oriented scheme is one that has more than 65 percent of its corpus invested in equity shares of domestic companies. The percentage of equity share holding shall be computed with reference to the annual average of the monthly averages of the opening and closing figures.). (b) 25 percent plus surcharge plus cess in the case of money market or liquid schemes. (c) 15.0 percent (20.0 percent) plus surcharge plus cess for individuals and HUFs (other types of assessees) in the case of other schemes.

Tax Treatment at the Level of Unitholders The key provisions of taxation for unitholders are as follows:

- The dividend received from mutual funds is tax-exempt in the hands of the unitholders.
- Capital gains from the sale of the units of mutual fund scheme are treated as long-term capital gains if the units are held for a period of more than 12 months; otherwise they are treated as short-term capital gains.
- Long term capital gains arising from the sale of units of equity-oriented funds are exempt from income tax in the hands of unit holders provided the securities transaction tax (STT) is charged on such sale by the mutual fund.
- Short-term capital gains from the transfer of units of an equity-oriented scheme are taxed at a rate of 15 percent plus applicable surcharge and cess, provided STT is charged on such sale by the mutual fund.
- Long-term capital gains from the sale of units of mutual fund schemes, other than equity-oriented schemes, are taxed in the hands of unitholders. Individuals, HUFs, partnership firms, Indian companies, and foreign companies are liable to pay a tax rate of 20 percent plus applicable surcharge and cess when the long-term capital gains are computed after taking into account the benefit of indexation, or a tax rate of 5 percent plus applicable surcharge and cess when the long-term capital gains are computed without taking into account the benefit of indexation.
- Short-term capital gains from the sale of units of mutual fund schemes other than equity-oriented schemes are added to the total income of the unitholder and are chargeable to tax as per the relevant slab rates.
- Units held under mutual fund schemes are not liable to wealth tax.

19.6 MUTUAL FUND EVALUATION

Key Financial Numbers

As a participant in a mutual fund scheme, you should understand the following numbers:

- Asset mix
- Net asset value
- Market price, repurchase price, and reissue price
- Discount
- Rate of return
- Standard deviation
- Ex-Mark (or R^2)
- Beta
- Gross yield
- Portfolio turnover ratio
- Expense ratio
- Alpha

Asset Mix The asset-mix of a scheme refers to the allocation of the corpus of a scheme across three broad asset categories, viz., stocks, bonds, and cash. An asset mix of 60:30:10 means that 60 percent of the corpus is invested in stocks, 30 percent in bonds, and 10 percent in cash.

Net Asset Value The net asset value (NAV) is the actual value of a share/unit on any business day. It is computed as follows:

$$\text{NAV} = \frac{\text{Market value of the fund's investments + Receivables + Accrued income – Liabilities – Accrued expenses}}{\text{Number of shares or units outstanding}}$$

The calculation of NAV may be illustrated with the help of a simple example, as follows:

Name of the scheme	: ABC
Size of the scheme	: Rs 100 crore
Face value of the share	: Rs 10
Number of outstanding shares	: 10 crore
Market value of the fund's investments	: Rs 180 crore
Receivables	: Rs 1 crore
Accrued income	: Rs 1 crore
Liabilities	: Rs 0.5 crore
Accrued expenses	: Rs 0.5 crore
NAV	: (180 + 1 + 1 – 0.5 – 0.5)/10 = Rs.18.1

Entry and Exit Loads Entry load is the load imposed when the investor purchases the units and exit load is the load imposed when the investor redeems the units.

Market Price, Repurchase Price, and Reissue Price A closed-ended scheme has to be necessarily listed on a recognised stock exchange to ensure that its participants enjoy liquidity. Generally, the market price of a closed-ended scheme tends to be lower than its NAV. If the market price is lower than the NAV, the scheme is said to be selling at a discount; if it is higher, the scheme is said to be selling at a premium. In addition to listing, the mutual fund may also offer the facility of repurchase. The repurchase price is usually linked to the NAV.

Unlike a closed-ended scheme, an open-ended scheme is not ordinarily listed on the stock exchange. Hence, the mutual fund has to stand ready to repurchase and issue its units or shares on a continuing basis. The repurchase and reissue prices are, of course, closely linked to the NAV.

Discount Closed-ended schemes typically sell at a discount,[1] which may sometimes be very steep, over their NAV. Why? According to Benjamin Graham, the reason lies in the structure, not the performance, of such schemes. They are perhaps not well-suited for any important group of investors. The small and naïve investors are allured towards the open-ended schemes as they are sold more aggressively; the large and sophisticated investors may find mutual funds, in general, not very appealing; the speculators also have little interest in the ordinary closed-ended scheme as it lacks the excitement of a specific scrip.

Rate of Return The periodic (the period may be one month, one quarter, one year, or any other) rate of return on a mutual fund scheme is calculated as follows:

To illustrate the calculation of rate of return, consider the following data:

NAV (beginning)	= Rs 16
NAV (ending)	= Rs 17
Dividend paid	= Re 1
Rate of return	$= \dfrac{(17-16)+1}{16}$ = 12.5 percent

The compounded annual total return (expressed as percent per annum) on a mutual fund scheme represents the return to investors from a scheme, since the date of issue. It includes reinvestment of dividends and makes adjustments for bonus and rights. It is calculated on NAV basis or price basis. On NAV basis, it reflects the return generated by the fund manager on NAV. In this calculation, it is assumed that the dividend is reinvested at the NAV prevailing on the day it is paid. On price basis, it reflects the return to investors by way of market or repurchase price. In this calculation, it is assumed that the dividend is reinvested at the prevailing market or reissue price.

[1] Occasionally, however, they sell at premium as well.

Standard Deviation The standard deviation of returns, a measure of dispersion, is the square root of the mean of the square of deviations around the arithmetic average. Generally, standard deviation, Ex-Mark, and beta are computed taking monthly returns into account for a period of three to five years.

Ex-Mark This is a term coined by John C. Bogle to define the extent to which a return of a mutual fund is *Ex*plained by a particular financial *Mark*et. This concept is designated in statistics as R-squared. The Ex-Mark of a typical mainstream equity fund is 80–90 percent.

Beta Beta of a fund measures its past price volatility relative to a particular stock market index. It is a measure of risk that provides useful statistical information particularly when applied to portfolios (as distinct from individual stocks). Most mainstream equity funds have betas in the range of 0.85 to 1.05.

Alpha Alpha measures the extra return earned on a scheme on a risk-adjusted basis.

Gross Dividend Yield The gross dividend yield is an important indicator of the investment characteristics of a mutual fund. Among equity funds, value-oriented funds tend to have a higher gross dividend yield and growth-oriented funds tend to have a lower gross dividend yield. The gross dividend yield is a reliable differentiator of a fund's investment philosophy.

Portfolio Turnover Ratio Portfolio turnover represents the churn in the portfolio. It is measured as follows:

$$\text{Portfolio turnover ratio} = \frac{\text{Lower of purchase or sales during a given period}}{\text{Average daily net assets}}$$

Expense Ratio Expense ratio refers to the annual recurring costs as a percentage of the net assets of the scheme. These are discussed fully in the next section.

Rating of Mutual Fund Schemes

Mutual fund schemes are periodically evaluated by independent institutions. CRISIL, Value Research India, and Economic Times are three such institutions whose rankings or evaluations are currently very popular.

CRISIL Credit Rating and Information Services of India Limited (CRISIL) carries out Composite Performance Rankings that cover all open-ended schemes that disclose their entire portfolio composition and have NAV information for at least two years. It currently ranks schemes in five categories, viz., Equity Schemes, Debt Schemes, Gilt Schemes, Balanced Schemes, and Liquid Schemes. Its ranking is based on four criteria, viz., risk-adjusted return of the scheme's NAV, diversification of the portfolio, liquidity, and asset size. The weights assigned to these criteria vary from category to category. Within each category, the top 10 percent are considered very good, the next 20 percent good, the next 40 percent average, the next 20 percent below average, and the last 10 percent poor.

Value Research India Like CRISIL, Value Research India rates schemes in different categories. Each scheme is assigned a risk grade and a return grade and a composite measure of performance is calculated by subtracting the risk grade from the return grade. Within each category, the top 10 percent are considered *five star*, the next 22.5 percent *four star*, the next 35 percent *three star*, the next 22.5 percent *two star*, and the last 10 percent *one star*.

Economic Times The Economic Times (ET) evaluates mutual fund (MF) schemes on a quarterly basis. The ET MF Tracker uses a risk-adjusted measure called the Sortino ratio to assess fund performance in five categories: Equity Diversified, ELSS (Equity-Linked Savings Schemes), Balanced, MIP (Monthly Income Plan), and Debt. The top 10 percent of funds in each category are classified as 'Platinum Funds,' the next 20 percent as 'Gold Funds,' and the next 70 percent as 'Silver Funds.'

Style Boxes It is difficult to compare the performance of equity schemes that pursue different strategies and have different levels of risk. So, it is common to compare equity schemes with similar characteristics. A **style box** is a simple tool for characterising portfolio risk according to value-growth orientation and market capitalisation. Exhibit 19.2 shows the style box developed by Morningstar of US. Instead of going by each fund's stated investment objective, Morningstar classifies fund portfolios into 9 categories based on market capitalisation and value-growth orientation. (Value Research India too has developed style boxes for classifying mutual fund schemes in India.)

To place funds along the vertical axis of the box, Morningstar considers the top 250 companies by market capitalisation to be "large cap", next 750 companies to be "mid-cap", and the remaining 4000 companies to be "small cap". (In the US, the 5000 largest companies virtually represent the entire market capitalisation.)

Exhibit 19.2 ***Morningstar's Nine-Part Style Box***

	Value Strategy (score < 1.75)	Blended Strategy (1.75 ≤ score ≤ 2.25)	Growth Strategy (score > 2.25)
Large Cap (top 5%)			
Mid Cap (next 15%)			
Small Cap (bottom 80%)			

To place funds along the horizontal axis (value–growth dimension), Morningstar considers P/E (price-earnings) ratio and P/B (price-book) ratio. Each portfolio is given a relative P/E and a relative P/B score. If the P/E of a portfolio is equal to the P/E of the market group norm it gets a relative score of 1.00 as far as the P/E is concerned, if the P/E of a portfolio is 0.8 times the P/E of the market group norm it gets a relative score of 0.80 as far as the P/E is concerned; so on and so forth. The relative P/B is also calculated in the same manner. Morningstar then adds the relative P/E and the relative P/B score of the fund. If the sum of these scores is less than 1.75, the fund is considered a value fund; if the sum is between 1.75 and 2.25, the fund is considered a blend fund; finally, if the sum is above 2.25, the fund is regarded as a growth fund.

Benchmarking

In April 2002, SEBI made benchmarking compulsory for mutual funds. In every half-yearly results, the performance of mutual fund schemes has to be disclosed along with the performance of a benchmark index. Here is an illustration.
Morgan Stanley Growth Fund (MSGF) Performance versus Benchmark Indices (as of March 31, 2005)

Period	MSGF NAV*	BSE Sensex	BSE 100
Returns during the year [(+) (-)]	22.76%	16.14%	17.38%
Returns during the half year [(+) (-)]	20.52%	16.28%	16.14%
Compound annualised growth rate			
(i) Last 3 years	30.67%	23.23%	26.59%
(ii) Last 5 years	9.63%	5.36%	3.71%
(iii) Since the launch of the scheme (6th January 1994)	11.26%	5.22%	6.29%

* Performance of the fund has been calculated based on the assumption that all dividends during the period have been reinvested in the scheme at the then prevailing NAV.

19.7 COSTS OF INVESTING IN A MUTUAL FUND

There are four types of costs associated with mutual fund investing: initial issue expenses, entry load, exit load, and annual recurring expenses.

Initial issue expenses include items such as brokerage fees and commission, marketing and advertising expenses, printing and distribution costs, and so on which are incurred when the scheme is launched. Earlier initial expenses upto 6 percent of the amount mobilised could be charged to the scheme. In April 2006, SEBI banned open-ended schemes from charging initial expenses, but allowed close-ended schemes to do so. There is now a proposal to disallow even close-ended schemes to do so.

Entry load or sales load is the load imposed when the units are purchased. It may be upto 2.5 percent - of course for many schemes it is nil. If the entry load is 2 percent, it means that when you buy the units of a mutual fund scheme which has a net asset value per unit of say Rs. 12 you have to pay Rs 12.24. From early 2008, the entry load has been waived for applications received directly by the mutual fund. Schemes that have an entry load are called *load schemes* and schemes that have no entry load are called *no-load schemes*.

Exit load or redemption load is the load imposed when the units are sold back to the mutual fund. In practice it varies from 0 percent to 3 percent. This load is imposed to deter investors from withdrawing from the scheme. In some cases a *contingent deferred sales charge* of 0.5 percent to 1.0 percent is levied when the investor redeems the units before a certain holding period (say 6 months). Normally *exit load* or *contingent deferred sales charge* is not applicable when there is an *entry load.*

Annual recurring expenses refer to the investment management and advisory fees charged by the AMC and operating expenses like marketing and selling expenses, brokerage costs, trustee fees, custodian fees, audit fees, costs of investor communication, costs of providing account statements and dividend/redemption cheques and warrants, and costs of statutory advertisements.

The investment management and advisory fees chargeable by the AMC is subject to the following restrictions: 1.25 percent of net assets upto Rs 100 crore and 1.00 percent of net assets above Rs.100 crore. For schemes launched on a *no load basis*, the AMC shall be entitled to collect an additional management fees not exceeding 1 percent of weekly average net assets outstanding in each financial year.

The annual recurring expenses shall be subject to the following limits:

- On the first Rs 100 crore of the average weekly net assets : 2.50 percent
- On the next Rs 300 crore of the average weekly net assets : 2.25 percent
- On the next Rs 300 crore of the average weekly net assets : 2.00 percent
- On the balance of net assets: 1.75 percent

In respect of a debt scheme, the ceiling mentioned above has to be lowered by 0.25 percent.

In case of a fund of funds scheme, the total recurring expenses of the scheme shall not exceed 0.75 percent of the daily or weekly average net assets, depending on whether the NAV of the scheme is calculated on daily or weekly basis.

So far we looked at the visible costs of mutual fund investing. There is one large cost which is invisible and hence is often overlooked. It is the cost incurred in executing portfolio transactions. When a mutual fund buys and sells securities it incurs commissions as well as market impact costs. Transaction costs depend on the rate of portfolio turnover and the degree of liquidity and marketability of the securities included in the portfolio. For example, if the portfolio turnover of a mutual fund scheme is 80 percent and the scheme incurs a cost of 0.6 percent (this consists of the transaction cost plus the market impact cost) on each leg (buy as well as sell leg) of the transaction, the total cost of executing the transactions will be 0.96 percent [0.8 (0.6 + 0.6)].

When the costs (visible and invisible) of mutual fund investing are high, they impose a significant drag on fund returns. The drag will be quite burdensome if the gross returns are low. For example, when the costs are 3 percent and the gross returns are 12 percent, the costs will absorb 25 percent of the returns. The lesson is simple: costs matter. So, you should be aware of their potential impact on your investment returns.

19.8 OPTIONS AND VALUE-ADDED SERVICES

Thanks to the heightened competition in the mutual fund industry, mutual funds now offer various options and value-added services to attract and retain customers.

Options With respect to a number of schemes, mutual funds offer the following: dividend, reinvestment and growth options; systematic investment plan; systematic transfer plan; and systematic withdrawal plan.

Scheme Options Within a scheme, the investor can choose any of the three options: the dividend payout option, the dividend reinvestment option, and the growth option.

Under the *dividend payout option,* the dividend declared by the scheme is paid in cash to the investor. Under the *dividend reinvestment option* the dividend declared by the scheme is ploughed back into the scheme at the applicable NAV. In effect, the investor first receives the dividend on paper and then the same is converted into additional units. Under the *growth option,* no dividend is paid and hence the gains of the scheme get reflected in the NAV of the scheme.

Systematic Investment Plan Under the Systematic Investment Plan (SIP), the investor can invest regular sums of money every month to buy units of a mutual fund scheme. As the investment is made regularly, the investor buys more units when the price is low and fewer units when the price is high. Essentially it means he resorts to **rupee cost averaging.**

Systematic Transfer Plan If you have a certain corpus that you want to invest gradually in an equity scheme, you can, to begin with, put your money in a liquid scheme and opt for the Systematic Transfer Plan (STP). This will ensure that every month a predetermined amount of money will be transferred from the liquid scheme to the equity scheme of your choice. The advantage of investing through an STP is that your money, till it is transferred to the equity scheme, earns a post-tax rate comparable to a deposit in a bank account.

Systematic Withdrawal Plan A Systematic Withdrawal Plan (SWP) works like a Systematic Investment Plan in the opposite direction. The SWP allows the investor to withdraw a fixed amount every month. The mutual fund sends the redemption proceeds to the investor every month automatically, thereby relieving the investor of the chore of sending redemption request. The investor can opt for a fixed sum every month or a certain percentage of the capital appreciation in the NAV of the scheme.

Value-Added Services Mutual funds offer value-added services like redemption over phone, triggers and alerts, cheque book facility, and new points of purchase.

Redemption Over Phone Prudential ICICI for example offers investors the facility of making a redemption request or switch between schemes over the phone.

Triggers and Alerts A trigger is an actionable facility that lets the investor pre-specify exit targets for his mutual fund investments. Generally, triggers are based on value (for example, a 60 percent rise in NAV) or a fall of NAV to a certain level or time (a specific day like March 30th or after a specified period). When the target is reached, the fund house will automatically redeem the units of the investor.

Under an alert service, the fund house intimates to the investor -by phone, post, or e-mail - when a certain trigger point has been reached. It is then upto the investor to decide whether he wants to redeem his units or remain invested. UTI, for example, offers the trigger and alert services on some of the schemes.

Cheque Book Facility Fund houses take few days to process a redemption request and then further time is lost when the redemption cheque is in transit. To cut down this delay, some fund houses give investors in certain schemes (typically debt schemes), the option to take a redemption cheque worth 75 percent of the investment value subject to some limit, at the time of investment itself. Encashment of the cheque is deemed as withdrawal, at the scheme's NAV on the day the cheque is deposited. The investor, of course, has to contact the fund house to get the balance amount. HDFC Mutual Fund and Templeton Mutual Fund, for example, offer this facility with respect to their liquid schemes.

New Points of Purchase For the convenience of their investors, fund houses are supplementing traditional channels of distribution with more points-of-purchase. For example:

- HDFC Mutual Fund allows investors to buy and sell units through ATMs.
- Prudential ICICI and Templeton Mutual Fund sell units of their schemes on line to investors who have a Net banking account with any of the banks these mutual funds have tied up with.

19.9 PROS, CONS, AND THE CHOICE

Pros Mutual funds offer the following benefits to their participants.

Diversification The pool of funds collected in a mutual fund scheme is invested in scores of securities. Individual investors can scarcely achieve such diversification on their own. Remember that a diversified portfolio reduces risk.

Professional Management When you invest in a mutual fund scheme, you are relieved of the chores and tensions associated with managing investments on your own. Mutual funds are managed by professionals who decide what to buy and sell, and when. Their decisions are supposedly guided by investment research and analysis. Individual investors may lack such expertise and/or cannot devote similar time and attention to their portfolio.

Liquidity Investment in mutual funds is generally fairly liquid. Units or shares of mutual funds can be traded in the secondary market or sold back at the notified repurchase prices.

Assured Allotment Investors are assured of firm allotment (typically it is total, sometimes it is partial) when they apply for the units or shares of mutual funds. Of course, under the tax-saving schemes, there are limits on investment.

Small Investments You can participate in a mutual fund scheme even if you want to make a small investment. Most schemes keep the minimum investment between Rs 1000 and Rs 5000. No other avenue of investment offers such a wide range of choice for such an affordable sum.

Tax Advantages Mutual funds offer two major tax advantages. First, mutual funds *per se* are tax-exempt entities. This means that they do not pay taxes on their interest and dividend income as well as capital gains (both short-term and long-term). Second, dividends distributed by mutual funds are tax-exempt in the hands of the recipients.

As against these significant tax advantages, mutual fund schemes, other than open-ended equity schemes, are required to pay a dividend distribution tax. On the whole, from a tax point of view

(a) debt mutual fund schemes are more advantageous than direct investment in debt instruments if the investor pays more than 12.5 percent in taxes on his income from direct debt instruments and
(b) equity mutual fund schemes are more advantageous than direct equity investment if the equity holding period of the investor is less than one year.

Transparency Mutual funds are perhaps the most transparent financial intermediary. When you invest in a mutual fund scheme you know its investment objective, its asset allocation pattern, its portfolio composition, its net asset value, its expenses, and so on. You can track its performance periodically. Which other financial intermediary offers this degree of transparency?

Cons The major disadvantage of investing in a mutual fund is that you have to, in effect, bear the entry/exit load and the expenses of running the mutual fund. To understand the implications of these, let us assume that the entry load is 2 percent and the recurring expenses are 2 percent. This means that if you contribute Rs 100 to a mutual fund scheme, the net amount available for investment is only Rs 98. Further, on this net investment there is a recurring expense of 2 percent. Hence, if you can earn a rate of return of, say, 15 percent by investing on your own, the mutual fund must earn a rate of return of 17.31 percent to provide the same return to you.[2] The following calculation bears this out:

$$\text{Invest on your own} = \frac{100}{\text{Amount invested}} \times \frac{0.15}{\text{Rate of return earned}} = \frac{15.0}{\text{Annual income}}$$

$$\begin{array}{c}\text{Invest through}\\ \text{the mutual fund}\end{array} = \frac{98}{\text{Amount invested}} \times \frac{0.1731}{\begin{array}{c}\text{Rate of return}\\ \text{earned}\end{array}} - \frac{0.020}{\text{Recurring expenses}}$$

$$= \frac{15.0}{\text{Annual income}}$$

[2] More generally, if r_1, is the rate of return that you can earn on your own, then r_2, the rate of return the mutual fund should earn, is:

$$r_2 = \frac{1}{\begin{array}{c}\text{1 - Entry load in}\\ \text{decimal terms}\end{array}}\ r_1 + \text{Recurring expense in percentage terms}$$

This equation is based on the assumption that the entry load is 2 percent and the annual recurring expenses are 2 percent.

Another disadvantage of investing in a mutual fund is that you will miss the thrill and joy of managing your portfolio.

Direct versus Indirect Investing When should you invest on your own? And when should you invest through a mutual fund?

Invest on your own if you:

- have fairly strong speculative instincts,
- find the game of investing enjoyable,
- have the time to manage your investments, and
- believe that you can earn superior returns.

Invest through a mutual fund if you:

- have a small amount to invest,
- hold fewer than five stocks,
- think that you need better advice on investing,
- have difficulty in deciding when to sell, and
- find the chores relating to investments cumbersome.

Choosing Equity Mutual Fund Schemes Today investors have a profusion of choices. There are about 500 mutual fund schemes of various kinds – gold ETFs, ethical funds, and capital guaranteed funds are the more recent arrivals on the scene. Perhaps the Indian mutual fund industry is heading the US way, although it is still far behind its US counterpart. Do you know that there are more mutual fund schemes than listed stocks in the US? Choosing equity mutual fund schemes may be difficult. Yet you have to decide. You will find the following suggestions, offered by the legendary John C. Bogle,[3] helpful in this task.

- Invest mainly in broadbased mainstream schemes.
- Give important consideration to three technical factors: Ex-Mark, Beta, and Gross Dividend Yield.
- Carefully consider the cost of acquiring (the sales load) and the cost of holding (the expense ratio) of the mutual fund scheme.
- Look at the returns of the mutual fund scheme over the previous ten years or its life time (if it is a new fund).
- Avoid schemes that are at the top of the performance deck because hot funds tend to cool of. Likewise, avoid schemes that are persistently at the bottom of the performance deck, because while success does not persist there is some evidence that failure does.
- Limit narrowly based schemes to a small proportion of your equity assets and do not attempt to beat the market by engaging in short-term switching among sectoral schemes.
- If the above rules seem overly analytical and tedious, simply invest in index schemes.

[3] John C. Bogle, *Bogle on Mutual Funds*, Dell Publishing, 1994.

It is a puzzle that index funds, despite their conceptual superiority, remain a marginal force. Why? John C. Bogle offers the following explanations.

1. Indexing is decidedly counterintuitive.
2. Indexing is far less profitable to investment advisers than their actively managed accounts.
3. Hope springs eternal.

Choosing Debt Mutual Fund Schemes There are several types of debt schemes: gilt schemes, mixed debt schemes, floating rate debt schemes, fixed maturity plans, and cash schemes. The key factors to be considered in choosing a debt scheme are: credit risk, interest rate risk, and expense ratio.

Credit risk depends on the rating profile of the debt securities. If government securities and 'AAA' rated debt instruments account for say 80-85 percent of the portfolio and 'AA' rated debt instruments account for the balance portfolio, credit risk is negligible.

Interest rate risk depends on the average duration of the scheme. While most gilt schemes and mixed debt schemes are exposed to interest rate risk (as they have a duration of 4 to 7 years), floating rate debt schemes, cash schemes, and fixed maturity plans are relatively immune to interest rate risk.

Expense ratio tends to be low for cash schemes, fixed maturity plans, and floating rate schemes, moderate for gilt schemes, and high for mixed debt schemes.

Socially Responsible Investing

In the last few years, a number of institutional investors in developed countries have taken interest in socially responsible investing (SRI). For example, the Government Pension Fund of Norway recently decided to exclude Wal-Mart from its portfolio citing that the company has committed "serious and systematic violations of human rights and labour rights." Climate change, environment, bio-diversity, human rights, social development, and governance (ESG) matter in SRI. While the evidence is not conclusive, it appears that ESG-compliant companies are better managed, have lesser risk, and achieve higher long-term growth.

ABN Amro Sustainable Development Fund, launched in March 2007, is the first SRI fund in India. Though the fund received lukewarm response it is hoped that SRI investing will catch up in India. As Sunil K. Sinha put it: "In a globalised economy, Indian companies will have to be ESG compliant to meet global standards. Global Reporting Initiative, ILO labour and employment convention, and Kyoto protocol would further raise ESG compliance levels in Indian companies. This will popularise ethical investing in India."

SUMMARY

- A mutual fund represents a vehicle for collective investment.
- In India the following entities are involved in a mutual fund operation: the sponsor, the mutual fund, the trustees, the asset management company, the custodian, and the registrars and transfer agents.
- A mutual fund scheme may be a **closed-ended** or an **open-ended** scheme.
- Mutual funds invest in three broad categories of financial assets, viz., stocks (equities), bonds, and cash.
- Depending on the asset mix, mutual fund schemes are classified into three broad categories, viz., **equity schemes**, **hybrid schemes**, and **debt schemes**. Within each of these categories there are several variants.
- A **fund-of-fund scheme**, instead of investing in equity and debt instruments, invests in mutual fund schemes.
- An **exchange traded fund** (ETF) is a hybrid of a closed-ended index fund and an open-ended index fund.
- The investments of a mutual fund are subject to a set of regulations prescribed by SEBI.
- Mutual fund investments enjoy tax benefits.
- As a participant in a mutual fund scheme, you should understand the following numbers: asset mix, net asset value, entry and exit loads, market price, repurchase price, reissue price, discount, rate of return, standard deviation, Ex-Mark (or R^2), beta, alpha, gross yield, portfolio turnover ratio, and expense ratio.
- Mutual fund schemes are periodically evaluated by independent institutions. CRISIL, Value Research India, and ET are institutions whose rankings or evaluations are currently very popular.
- SEBI has made **benchmarking** compulsory for mutual funds.
- There are four types of costs associated with mutual fund investing: initial issue expenses, entry load, exit load, and annual recurring expenses.
- Thanks to heightened competition, mutual funds offer various options and value-added services.
- Mutual funds offer the advantages of diversification, professional management, liquidity, assured allotment, tax savings, and transparency. The major disadvantage of investing in a mutual fund relates to the expenses of running the mutual fund.

QUESTIONS

1. Discuss the role of the various entities in a mutual fund operation.
2. What are the key differences between closed-ended and open-ended schemes?
3. Describe the characteristics of the following broad categories of mutual fund schemes: equity schemes, hybrid schemes, and debt schemes.

4. What is an exchange traded fund? How is it structured?
5. What is a fund-of-fund scheme?
6. Describe the key regulations applicable to investments of a mutual fund.
7. Discuss the tax aspects of mutual fund investment.
8. Explain the following terms: asset mix, net asset value, discount, rate of return, Ex-Mark (or R^2), gross yield, portfolio turnover ratio, and expense ratio.
9. What are the costs of investing in a mutual fund?
10. What are the options and value-added services offered by mutual funds?
11. Discuss the pros and cons of investing in a mutual fund.

■ ■

SOLVED PROBLEMS

1. You can earn a return of 15 percent by investing in equity shares on your own. You are considering a recently announced equity mutual fund scheme where the entry load is 1 percent and the recurring annual expenses are expected to be 2 percent. How much should the mutual fund scheme earn to provide a return of 15 percent to you?

Solution:

$$r_2 = \frac{1}{\text{1 - Entry load in percentage}}\, r_1 + \text{Recurring expense in percentage terms}$$

$$= \frac{1}{1 - 0.01} \times 15\% + 2\%$$

$$= 17.15\%$$

PROBLEMS

1. You can earn a return of 13 percent by investing in equity shares on your own. You are considering a recently announced equity mutual fund scheme where the entry load is 2 percent and the recurring annual expenses are expected to be 1.8 percent. How much should the mutual fund scheme earn to provide a return of 13 percent for you?
2. You can earn a return of 14 percent by investing in equity shares on your own. You are considering a recently announced equity mutual fund scheme where the entry load is 1.5 percent. You believe that the mutual fund scheme will earn 16.5 percent. At what recurring expense (in percentage terms) will you be indifferent between investing on your own and investing through the mutual fund.

Chapter **20**

Investment in Real Assets

The Tangible Thing

LEARNING OBJECTIVES

After studying this chapter, you should be able to:

- Identify the pros and cons of investing in real assets.
- Understand the nature of investment in various forms of real estate.
- Evaluate financially investment in real estate meant for renting.
- Appreciate the investment characteristics of precious metals, precious stones, and art objects.

The bulk of this book focuses on financial assets like bank deposits, equity shares, bonds, and mutual fund schemes. The distinguishing feature of financial assets is that they are legal claims that are denominated in rupees.

This chapter turns the spotlight on real assets – assets which are tangible or physical in nature. Residential house, land, gold, silver, diamonds, paintings, and so on are examples of real assets. Real assets are denominated in physical units and not rupees. This is an important difference between financial (or monetary) assets and real assets.

While real assets loom large in the wealth of people all over the world, they form a disproportionately large share of the wealth of Indians. Hence a basic understanding of the features of various forms of real assets is required by all investors.

20.1 PROS AND CONS OF INVESTING IN REAL ASSETS

Real assets (real estate, precious metals, commodities, and other physical items) offer several advantages:

- **Inflation Hedge** Real assets often provide an inflation hedge because inflation means a higher replacement cost for real estate, precious metals, and other physical items.

- **Efficient Diversification** Empirical evidence suggests that the returns from various types of real and financial assets are less positively correlated compared to those from financial assets alone. This means that a portfolio which is diversified across financial and real assets is more efficient in reducing risk.
- **Psychic Pleasure** Investment in real assets provides psychic pleasure. You can easily relate to an attractive house, a beautiful painting, or an exquisite piece of jewellery.
- **Safe Haven** People perceive gold and other precious objects as a safe haven in times of trouble.

As against the above advantages, investment in real assets suffers from the following disadvantages.

- **Illiquid Markets** You can sell stocks or bonds in a few moments at a price close to the latest quotation. But this is often not possible for real assets like real estate, diamonds, and paintings. It may take months to get the desired price. Further, there will be an air of uncertainty, until the transaction is consummated.
- **High Spreads and Commissions** The dealer's spread or the broker's commission in stock and bond trades are very small. However, for most real assets (gold and silver are exceptions) the spreads or commissions are high.
- **No Current Income** Real assets (with the possible exception of real estate) provide no current income. Further, investment in such assets entails storage and insurance costs.

Features of the Real Estate Market

The real estate market is characterised by several imperfections like the following:

High degree of government control A high degree of government control exists with respect to real estate. Further, the nature of control or regulation changes over time.

Stratified local markets Within a given area, several levels of real estate markets may coexist. Such diversity gives an edge to those who can accurately assess demand for various submarkets in a given area.

Poor information flow Most real estate transactions are private and hence information about them is not readily available. If you can develop a good database through local contacts and research, you can have a competitive edge in the real estate market.

Slow adjustments of supply and demand Given its somewhat disorganised nature, real estate market is characterised by periodic demand – supply imbalances. This tends to give rise to real estate cycles. Those who can anticipate these cycles can take advantage of them.

Attraction of Real Estate Real estate (represented by residential house, commercial property, agricultural land, farm house, and so on) often represents the largest component of the wealth of individual investors. Investment in real estate is attractive for various reasons.

Capital Appreciation Capital appreciation in real estate is fairly high. In India, historically, real estate has appreciated at a higher rate compared to other asset classes.

Rental Income Real estate fetches a good rental income. Rental yield on real estate is typically higher than the dividend yield on equity shares.

Leverage A substantial portion of investment in real estate can be financed with bank loan.

Tax Shelter Real estate investment offers several tax advantages.

20.2 RESIDENTIAL HOUSE

A residential house represents an attractive investment proposition for the following reasons.

- The total return (rental savings plus capital appreciation) from a residential house is attractive.
- Loans are available from various quarters for buying/constructing residential property.
- For wealth tax purposes, the value of a residential property is reckoned at its historical cost and not at its present market price.
- Interest on loans taken for buying/constructing a residential house is tax-deductible within certain limits.
- Ownership of a residential property provides psychological satisfaction.

Sources of Housing Finance A major deterrent for investing in property is the huge investment required. Hence, you may have to explore for sources of loan finance. The organisations that offer housing loan in India are as follows.

Employers Many employers offer housing finance at subsidised interest rates. If your employer has such a scheme, avail of it at the earliest.

Life Insurance Corporation Traditionally, the most important formal source of housing finance, the Life Insurance Corporation has been offering housing finance as a bait to sell insurance policies. It has three main schemes for housing finance: (i) Own Your Home (OYH) scheme, (ii) Own Your Apartment scheme, and (iii) Property Mortgage scheme.

Housing Finance Companies In the last decade, a number of housing finance companies (HFCs) have come into being. There are presently about 280 HFCs, big and small. Leading the pack is the Housing Development Finance Corporation (HDFC). Other well known HFCs are Canfin Homes, SBI Homes, Dewan Housing, LIC Housing Finance (this is subsidiary of LIC set up to provide housing finance only).

Commercial Banks In recent years commercial banks have become active players in the field of housing finance.

Features of Housing Loan The housing loans fall into three broad categories:

- Straight loans for purchase of house or for undertaking extensions/repairs.
- Loans linked to saving made by the customer over a period of time.
- Preferential sanction of loans to depositors.

The typical features of housing loans are as follows:

- Loans are sanctioned against the mortgage of the house property bought with the loan proceeds.
- The interest rate generally rises with the quantum of loan.
- The repayment is typically in the form of equated monthly installments (EMIs) over the period of loan. However, most lenders are willing to structure the pattern of repayment to suit the convenience of the borrower. For example, HDFC offers a 'step up repayment facility', under which the installments increase progressively.

Guidelines for Buying a Flat While buying a flat remember the following guidelines:

- *Assess the track record of the builder* Collect information about the projects undertaken by the builder. Meet his previous customers and find out whether the quality of construction has been good, whether schedules have been maintained, and whether commitments have been honoured.
- *Consult a lawyer* Get the title deeds as well as proposed sale (and/or construction) deed examined by a lawyer.
- *Link payment with progress* Make payments in installments that are linked to well-defined milestones in construction.
- *Demand an allotment letter* Insist on getting the allotment letter at the time of booking the flat. Ensure that the allotment letter clearly states the price which includes the land cost as well as the construction cost, specifies the payment schedule, and contains the plan for the flat.
- *Get a copy of the approved plan* Ask for a copy of the plan as approved by the appropriate authority (corporation or development authority). Ensure that the building is in conformity with the approved plan.

20.3 OTHER FORMS OF REAL ESTATE

The more affluent investors may be interested in other forms of real estate such as commercial property, agricultural land, suburban land, and time share in a holiday resort.

Commercial Property The investment in commercial property may take the form of constructing a commercial complex or buying office or shop space in a commercial complex.

The appeal of such an investment lies mainly in the form of regular rental income which can be revised upward periodically. Further, the commercial property enjoys capital appreciation over a period of time. The disadvantage of such an investment is that it requires a large outlay and may require time and effort in managing it.

Agricultural Land The appreciation in the value of agricultural land makes it an attractive investment proposition. Its appeal is further enhanced by the following factors.

- Agricultural income per se is not taxable. However, it is included in the total income for determining the tax rate applicable to the non-agricultural income of the assessee.
- Agricultural land is exempt from wealth tax.
- Loans are available for agricultural operations at a concessional rate.
- There is a charm in living in a farmhouse.
- Capital gains arising from the sale of agricultural land may be tax-exempt in some cases (as certain types of agricultural land are not regarded as capital assets) or may be taxed at a concessional rate.

As against the above attractions, investment in agricultural land has some problems associated with it. The principal ones are.

- In many states, land ceiling laws are quite restrictive. Moreover, in some states the law precludes non-agriculturists from acquiring agricultural land.
- Many states have laws that confer ownership to the cultivating tenant.
- Farmhouses, in general, may not be very safe.
- Agricultural activity is often uneconomical or unprofitable, particularly if it is done on a part-time basis.

Suburban Land Land within city limits is often very costly. However, you can buy residential land (converted land) in private layouts in suburban areas at affordable prices. Such an investment offers good scope for capital appreciation. Further, it gives you an opportunity to move to a quieter location that may not be very far from the city as the city expands.

If you are considering buying suburban land, make sure that the developer satisfies all zonal requirements and has a clear title. Many people have been cheated by fly-by-night land developers.

Time Share in a Holiday Resort In the last 20 years or so, a number of time-sharing holiday resorts have come up. You can buy one or two weeks in a holiday resort of your choice. Such an investment offers several advantages.

- The outlay is modest and affordable.
- Often you get a choice of two or more locations.
- If you don't use a certain week, you can rent it or accumulate it.
- The value of your time share appreciates like any other property does.
- You don't have to bother about security or safety.

20.4 FINANCIAL EVALUATION OF INVESTMENT IN REAL ESTATE FOR PURPOSE OF RENTING

While evaluating a real estate investment meant for renting bear in mind the following tax considerations.

- A substantial portion of investment in real estate can be financed with a bank loan. Interest on loan taken and utilised for buying a property from which rental income is derived is deductible from the rental income of the assessee.
- From the annual value of the rented property (annual value is equal to the gross amount of rent less actual property tax paid) a standard deduction equal to 30 percent of the annual value is available for various expenses like repairs, collection charges, etc. For rented property, depreciation cannot be claimed.
- In case a person owns more than one residential house property, subsequent residential house properties would not be subjected to wealth tax, provided they are rented out for more than 300 days in a year.
- All commercial properties are fully exempt from wealth tax, irrespective of whether they are rented, self-occupied, or kept vacant.
- For a rented property, the entire property tax payment is deductible from the rental income of the tax payer, provided the actual payment of tax is made by the assesse.

Procedure for Financial Evaluation The steps involved in evaluating a real estate investment which is meant to be rented out are as follows:

1. Define how the total cost (TC) of the real estate will be supported by a mix of equity (E) and debt (D).
2. Determine the loan amortisation schedule along with a break up of the periodic installment payment between interest (INT) and principal repayment (PR).
3. Forecast the post-tax rental income (PTRI). The PTRI for a given year is:
   0.7 Rental income (1 – Investor's marginal tax rate) + 0.3 Rental income.
4. Estimate the net cash flow (NCF) over the loan repayment period. The NCF is equal to:
   PTRI - INT (1 – Investor's marginal tax rate) – PR
5. Estimate the net salvage value (NSV) of the real estate at the end of the loan repayment period. The NSV will be equal to:
   Salvage value – Tax payable on capital gains
6. Calculate the internal rate of return (IRR) of the real estate investment as follows:

$$E = \sum_{t=1}^{n} \frac{NCF_t}{(1+IRR)^t} + \frac{NSV_n}{(1+IRR)^n}$$

7. Compare the IRR with the investor's hurdle rate (HR). If the IRR>HR accept the project. If the IRR<HR reject the project.

Illustration The above procedure may be illustrated with an example. Ravi is considering an investment in a commercial property, costing Rs. 16 million. Ravi can get a bank loan at the rate of 12 percent upto 50 percent of the cost of the loan property. The loan will be repaid in 10 equal annual installments; the first installment will fall due one year from now. (For the sake of simplicity, we have assumed that the loan will be repaid in equal annual installments. In real life, the loan is typically repaid in equal monthly installment. However, the procedure for analysis remains the same). Ravi expects that the property will fetch a rental income of Rs. 1.6 million per year. Thereafter, the rental income will increase by 5 percent per year. For the sake of simplicity, assume that the rental income is receivable at the end of the year. After 10 years, the property is expected to fetch a net salvage value of Rs. 32 million. Ravi's required hurdle rate from this investment is 14 percent. Is this a worthwhile proposal?

To ascertain whether the investment proposal is worthwhile, let us follow the steps described below:

1. The total cost of Rs. 16 million will be supported by an equity (E) of Rs. 8 million and a debt (D) of Rs. 8 million.
2. The loan amortisation along with a break-up of the periodic installment payment between interest (INT) and principal repayment (PR) is shown in Exhibit 20.1.
3. The expected post-tax rental income (PTRI) over the ten year period is shown in column B of Exhibit 20.2. For calculating PTRI, the investor's marginal tax rate has been assumed to be 30 percent. So, PTRI=0.7 Rental income (1-0.3) + 0.3 Rental income = 0.79 Rental income.
4. The net cash flow (NCF) over the ten year period is shown in the last column of Exhibit 20.2.
5. The net salvage value (NSV) of the real estate at the end of the ten year period is expected to be Rs. 32 million.
6. The internal rate of return (IRR) of the real estate investment is calculated from the following question:

$$\begin{aligned}8{,}000{,}000 = {} & \frac{136{,}126}{(1+\text{IRR})^1} + \frac{182{,}914}{(1+\text{IRR})^2} + \frac{230{,}894}{(1+\text{IRR})^3} \\ & + \frac{279{,}985}{(1+\text{IRR})^4} + \frac{330{,}090}{(1+\text{IRR})^5} + \frac{381{,}086}{(1+\text{IRR})^6} + \frac{432{,}825}{(1+\text{IRR})^7} \\ & + \frac{485{,}126}{(1+\text{IRR})^8} + \frac{537{,}774}{(1+\text{IRR})^9} + \frac{32{,}590{,}515}{(1+\text{IRR})^{10}}\end{aligned}$$

7. The IRR (17.06 percent) is higher than the hurdle rate (14.00 percent). So, it is a worthwhile investment proposal.

Exhibit 20.1 ***Loan Amortisation Schedule***

Year	Amount Outstanding in the Beginning	Interest	Installment	Principal Rapayment	Amount Outstanding at the End
1	8,000,000	960,000	1,415,874	455,874	7,544,126
2	7,544,126	905,295	1,415,874	510,579	7,033,547
3	7,033,547	844,026	1,415,874	571,848	6,461,699
4	6,461,699	775,404	1,415,874	640,470	5,821,229
5	5,821,229	698,547	1,415,874	717,327	5,103,902
6	5,103,902	612,468	1,415,874	803,406	4,300,496
7	4,300,496	516,060	1,415,874	899,814	3,400,682
8	3,400,682	408,082	1,415,874	1,007,792	2,392,890
9	2,392,890	287,147	1,415,874	1,128,727	1,264,163
10	1,264,163	151,699	1,415,874	1,264,175	(12)

Exhibit 20.2 ***Net Cash Flow***

Year	Rantal Income A	Post-tax Rental Income B = (0.79A)	Interest Payment C	Post-tax Interest D = (0.7C)	Principal Repayment E	Net Cash Flow F = (B-D-E)
1	1,600,000	1,264,000	960,000	672,000	455,874	136,126
2	1,680,000	1,327,200	905,295	633,707	510,579	182,914
3	1,764,000	1,393,560,	844,026	590,818	571,848	230,894
4	1,852,000	1,463,238	775,404	542,783	640,470	279,985
5	1,944,810	1,536,400	698,547	488,983	717,327	330,090
6	2,042,051	1,613,220	612,468	428,728	803,406	381,086
7	2,144,153	1,693,881	516,060	361,242	899,814	432,825
8	2,251,361	1,778,575	408,082	285,657	1,007,792	485,126
9	2.363,929	1,867,504	287,147	201,003	1,128,727	537,774
10	2,482,125	1,960,879	151,699	106,189	1,264,175	590,515

20.5 PRECIOUS METALS

Gold and silver, the two most widely held precious metals, appeal to almost all kinds of investors for the following reasons.

- Historically, they have been good hedges against inflation.
- They are highly liquid with very low trading commissions.
- They are aesthetically attractive.
- Returns on gold, in general, have been negatively correlated with the returns on stocks. So, gold provides a good diversification opportunity.
- They possess a high degree of 'moneyness'. According to Jack Clarke Francis: "A

substance possesses moneyness when it is (1) a store of value, (2) durable, (3) easy to own anonymously, (4) easy to subdivide into small pieces that are also valuable, (5) easy to authenticate, and (6) interchangeable, that is, homogeneous or fungible."[1]

As against these advantages, investment in gold and silver have the following disadvantages.

- They do not provide regular current income.
- There is no tax advantage associated with them.
- There may be a possibility of being cheated.

The Mystery of Gold We are all intrigued by gold to some extent or other. "Throughout history, humans have been influenced by this heraldic metal. We have envied those who have it, pitied those who do not, moved to where it could be mined, and fought or robbed one another to obtain more of it." *Source:* Gold Information Centre, World Gold Council, New York.

Investing in Gold and Silver Investment in gold and silver can be in physical or nonphysical forms. The physical form includes bullion, coins, and jewellery. Gold or silver bars, called bullion or ingots, come in a wide range of sizes. Gold or silver coins may or may not have numismatic (or collector's) value. Jewellery made of gold or silver may provide aesthetic satisfaction but is not a good form of investment because of high making charges which may not be recovered.

The nonphysical form includes futures contracts, units of gold exchange-traded funds, and shares of gold mining companies. Investors can buy futures contracts in gold and silver—such contracts tend to be highly leveraged investments. The units of gold exchange—traded funds (ETFs) are listed on a secondary market and investors can buy such units easily. Gold ETFs have been permitted in India since March 2007. Benchmark Mutual Fund and UTI were the first two funds to launch gold ETFs. Each share of a gold ETF represents one-tenth of an ounce of physical gold. This may be the best way to invest in gold as it spares you the hassles involved in ascertaining the purity of gold and storing it safely. Finally, investors can buy shares of common stock of a company that mines gold or silver as an indirect way of investing in these metals.

20.6 PRECIOUS STONES

Diamonds, rubies, emeralds, and sapphires, have appealed to investors since time immemorial because of their aesthetic appeal and rarity.

Diamonds De Beers Consolidated Mines Limited, a South African Company, owns about a third of the diamond mines in the world and has contracts to buy the output of a number of diamond mines. Hence, it substantially controls most of the supply of new diamonds. This control along with its enormous financial resources enables De Beers to exercise a certain degree of control over the price of diamonds. If diamond prices

[1] Jack Clarke Francis, *Investments: Analysis and Management*, New York: McGraw-Hill, 1986.

stagnate, De Beers curtails its supply and even buys diamond to prop up the prices. Similarly, if diamond prices rise sharply, De Beers expands its supply to moderate the price hike.

The quality of a diamond is basically judged in terms of the 4 Cs, viz., carat weight (one carat is 1/142 of 1 ounce), cut, clarity, and colour. Depending on the quality of the diamond, the price per carat may vary considerably. A perfect diamond may cost 5 times per carat compared to an imperfect diamond. Some institutions like the Gemological Institute of America (GIA) inspect diamonds for a fee and issue a certificate describing them in terms of the four Cs.

Coloured Stones Rubies, sapphires, and emeralds are referred to as coloured stones. A high quality ruby is "pigeon-blood red" in colour and clear; a high quality sapphire is pure blue in colour and clear; and a high quality emerald is deep, translucent green.

Investing in Precious Stones While coloured stones are much scarcer than diamonds, the latter command a higher price per carat for the following reasons: (a) Jewellery lovers prefer diamonds to coloured stones. (b) De Beers Consolidated Mines Limited supports diamond prices. (c) It is difficult to differentiate genuine small coloured stones from industrially manufactured coloured stones.

Precious stones make sense for the affluent people who have skills in buying them for the following reasons:

- Diamonds have a gratificational and emotional attraction. They have great appeal as objects of adornment.
- According to trade sources, diamond prices have been appreciating at an average rate of about 10 percent per year.
- They can be held anonymously. As one diamond trader put it: "Most of my customers prefer to invest in diamonds as there is complete anonymity for the buyer with no registration and no government interferences. Moreover, diamonds are portable."[2]

If you wish to buy diamonds primarily for investment purposes, you should buy larger diamonds (one carat and above) which are certified.[3] A diamond certificate provides details about the quality and authenticity of the diamond. It helps in establishing the value of the diamond.

While precious stones may have appeal for the affluent investors and those who have skill in buying them, they are not suitable for the bulk of the investors for the following reasons:

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[2] Quoted in "Beyond the Glitter Lies an Investment Rationale," by Aarti Shelly, an article that appeared in *The Economic Times.*

[3] Global certifiers like the Gemological Institute of America (GIA), the Hoge Raadvoor Diamant (HRD), and the International Gemological Institute (IGI) have their presence in India. In addition, there are local certifiers.

- Precious stones can be very illiquid. It may not be easy to sell them quickly without giving major price concessions.
- The grading process by which the quality and value of precious stones is determined can be quite subjective.
- For investment purposes, larger precious stones are suitable. Most investment grade precious stones, diamonds in particular, require huge investments.
- Precious stones do not earn a regular return during the period they are held. On the contrary, the investor has to incur the costs of insurance and storage.

20.7 ART OBJECTS

Objects which possess aesthetic appeal because their production requires skill, taste, creativity, talent, and imagination may be referred to as art objects. According to this definition, paintings, sculptures, etchings, and so on, may be regarded as art objects (some of these objects, thanks to their historical importance, are classified as antiques). The value of an art object is a function of its aesthetic appeal, rarity, reputation of the creator, physical condition, and fashion. A brief description of the more commonly bought art objects, viz., paintings and antiques, follows.

Paintings Paintings appear to be the most popular among objects of arts. In the last decade or so, interest in paintings has grown considerably, thanks to the substantial appreciation in the market value of paintings of Hussain, Raza, Menon, and others.

If you have an inclination to buy paintings, bear in mind the following guidelines:

- *Put your bet more on fledgling painters* Works of established painters may be too expensive and beyond your reach. More important, the expected appreciation in their value may not be considerable. Hence, it makes more sense to buy good quality paintings done by fledgling painters – the potential Hussains of tomorrow. True, when you bet on an 'emerging painter, you are taking more risk. Often, the potential rewards justify such risk.
- *Develop a sense for the quality of painting* Even if you don't have the skill of a connoisseur, you can judge the basic qualities of a painting by looking at attributes like spontaneity, maturity of strokes, balance of colour, and originality. Over a period of time you can refine your sensibility, provided of course you have a basic aesthetic sense (as someone said humorously "Art is a matter of taste. However, there is no point in talking about it to people who have no taste".)
- *Buy a painting that you really like* A painting should be viewed as an object of art as well as an investment medium. While you cannot predict how the value of painting will appreciate over time, you can certainly ensure that as long as the painting adorns your drawing room it remains a source of aesthetic pleasure.
- *Buy at an auction* The art market is made up of (a) creative artists, (b) agents, auctioneers, and dealers, (c) private investors and collectors, and (d) museums and other institutions. If you want to invest in an art object but lack inside connections, buy at an auction and not from a dealer. When you buy at an auction you buy at the wholesale price and when you buy from a dealer you buy at the retail price.

Antiques An object of historical interest may be regarded as an antique. It could be a coin, a manuscript, a sculpture, a painting, or any other object. If you are interested in investing in an antique, bear in mind the following:

- The owner of an antique is required to register it with the Archaeological Society of India. If the registering authority is satisfied about the authenticity of the antique, it issues a "Certificate of Registration".
- Whenever an antique is sold, the registering authority has to be informed and the ownership must be transferred.
- Export of antiques, in general, is banned. In exceptional cases it is allowed only at the instance of the Director General of the Archaeological Society of India.
- The government has the right to acquire an antique if it is felt that the same must be kept in a museum for the general good.
- Antiques are available in places like Chor Bazar (Bombay), Mullick Market (Calcutta) and Burma Bazar (Madras). However, it may not be easy to get good bargains at these places. To buy antiques at bargain prices, you have to actively look for them in smaller towns and villages.
- There is a flourishing market for 'fake' antiques. These are objects, which are chemically treated to give them an 'antique' look, though they are not genuine antiques.
- Unless you are looking for objects like old coins, the investment per antique may be quite high.
- Antiques tend to appreciate in value over time, but in a very unpredictable manner.
- Antiques seem to make sense only for those who have patience to wait and who derive psychological satisfaction from owning objects of historical interest. One may even argue that, since very few investors have the ability to assess the value of antiques, investments in these may largely be left to connoisseurs.

SUMMARY

- Real assets offer advantages like inflation hedge, efficient diversification, psychic pleasure, and safe haven but suffer from disadvantages like illiquid markets, high spreads and commissions, and no current income.
- The most important asset for individual investors generally is a residential house, which is an attractive investment proposition for various reasons.
- A variety of organisations now provide finance on attractive terms for housing finance.
- The affluent investors may be interested in investing in commercial property, agricultural land, and semi-urban land.
- Investment in real estate meant for being rented out offers several tax shelters like standard deduction, tax-deductibility of interest on loans, and wealth tax exemption.
- Gold and silver appeal to investors because of their aesthetic appeal, liquidity, and inflation-protection.

- Diamonds, rubies, emeralds, and sapphires, have appealed to investors from time immemorial because of their aesthetic appeal and rarity.
- Objects which possess aesthetic appeal because their production requires skill, taste, creativity, talent, and imagination may be referred to as art objects.

QUESTIONS

1. What are the pros and cons of investing in real assets?
2. Evaluate the following types of real estate investment: residential house, agricultural land, semi-urban land, and time share in a holiday resort.
3. What are the sources of housing finance and the features of housing loans?
4. Discuss the guidelines that should be borne in mind while buying a flat.
5. What are the important tax considerations relevant for a real estate investment meant to be rented out?
6. Discuss the procedure for evaluating a real estate investment meant to be rented out.
7. What are the pros and cons of investing in gold and silver? In what form can you invest in them?
8. Discuss the characteristics and investment features of precious stones.
9. What should you bear in mind while investing in paintings and antiques?

PROBLEMS

1. Mahesh is considering an investment in a commercial property costing Rs. 20 million. Mahesh can get a bank loan of Rs. 8 million at the rate of 12 percent per year, for purchasing the property. The loan will be repaid in 10 equal installments; the first installment will fall due one year from now. Mahesh expects that the property will fetch a rental income of Rs. 1.8 million for the first year; thereafter the rental income will increase at the rate of 5 percent per year. For the sake of simplicity assume that the rental income is receivable at the end of the year. After 10 years, the property is expected to fetch a net salvage value of Rs. 40 million. Mahesh's required hurdle rate for this project is 13 percent. Is this a worthwhile proposal? Assume that the tax rate is 30 percent.
2. In problem 1, assume that Mahesh collects a deposit equal to 2 years for rent, but the rental income increases by 25 percent every five years. What will the IRR of the proposal?

PART

8

Portfolio Management

Chapter **21**

Portfolio Management Framework

The Grand Design

LEARNING OBJECTIVES

After studying this chapter, you should be able to:

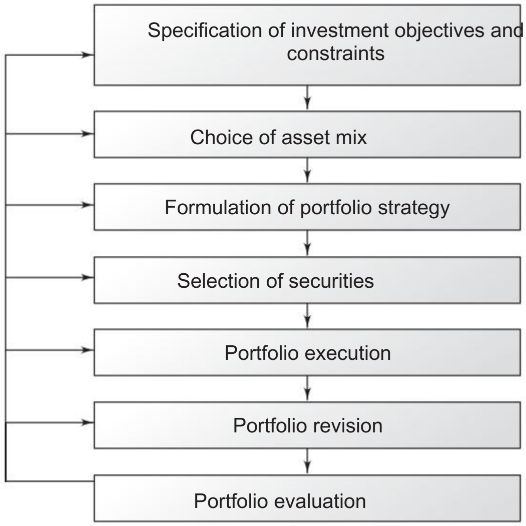
- Make a preliminary assessment of your risk tolerance.
- Select an appropriate asset allocation mix based on time horizon and risk tolerance.
- Explain the vectors of an active portfolio strategy.
- Understand the nature of the trading game.
- Calculate different measures of portfolio performance.

Investment management, also referred to as portfolio management, is a complex process or activity that may be divided into seven broad phases:

- Specification of investment objectives and constraints
- Choice of asset mix
- Formulation of portfolio strategy
- Selection of securities
- Portfolio execution
- Portfolio revision
- Performance evaluation

This chapter discusses the process of portfolio management in terms of these phases. For pedagogic convenience, they are treated sequentially. However, it must be emphasised that they are interrelated as shown in Exhibit 21.1.

Exhibit 21.1 ***Interrelationship Among Various Phases of Portfolio Management***



21.1 SPECIFICATION OF INVESTMENT OBJECTIVES AND CONSTRAINTS

The first step in the portfolio management process is to specify the investment policy which summarises the objectives, constraints, and preferences of the investor. The investment policy may be expressed as follows:

- Objectives
  - Return requirements
  - Risk tolerance
- Constraints and Preferences
  - Liquidity
  - Investment horizon
  - Taxes
  - Regulations
  - Unique circumstances

Objectives The commonly stated investment goals are:

- *Income* To provide a steady stream of income through regular interest/dividend payment.
- *Growth* To increase the value of the principal amount through capital appreciation.
- *Stability* To protect the principal amount invested from the risk of loss.

Since income and growth represent two ways by which return is generated and stability implies containment or even elimination of risk, investment objectives may be expressed more succinctly in terms of return and risk. As an investor, you would primarily be interested in a higher return (in the form of income and/or capital appreciation) and a lower level of risk. However, return and risk typically go hand in hand. So you have to ordinarily bear a higher level of risk in order to earn a higher return. How much risk you would be willing to bear to seek a higher return depends on your risk disposition. Your investment objective should state your preference for return relative to your distaste for risk.

You can specify your investment objectives in one of the following ways:

- Maximise the expected rate of return, subject to the risk exposure being held within a certain limit (the risk tolerance level).
- Minimise the risk exposure, without sacrificing a certain expected rate of return (the target rate of return).

Which of these two should you adopt? My recommendation is for you to start by defining how much risk you can bear or how much you can afford to lose, rather than specifying how much money you want to make. The risk you can bear depends on two key factors: (a) your financial situation, and (b) your temperament. To assess your financial situation, answer the following questions: What is the position of your wealth? What major expenses (house construction, marriage, education, medical treatment, etc.) can be anticipated in the near future? What is your earning capacity? How much money can you lose without seriously hurting your standard of living? A careful and realistic appraisal of your assets, expenses, and earnings is basic to defining your risk tolerance.

After appraising your financial situation, assess your temperamental tolerance for risk. Even though your financial situation may permit you to absorb losses easily, you may become extremely upset over small losses. On the other hand, despite a not-so-strong financial position, you may not be easily ruffled by losses. Understand your financial temperament as objectively as you can.

Your risk tolerance level is set by either your financial situation or your financial temperament, whichever is lower. Of course, you must realise that your risk tolerance cannot be or should not be defined too precisely and rigorously. For practical purposes, it suffices if you define it as low, medium, or high. Once you have articulated your risk tolerance realistically in this fashion, it will serve as a valuable guide in your investment selection. It will provide you with a useful perspective and prevent you from being a victim of the waves and manias that tend to sweep the market from time to time.

Risk Assessment Financial advisers, mutual funds, and brokerage firms have developed risk questionnaires to help investors determine whether they are conservative, moderate, or aggressive. Typically, such risk questionaires have 7 to 10 questions to guage a person's tendency to make risky or conservative choices in certain hypothetical situations. Although risk questionnaires are not precise, they are helpful in getting a rough idea of an investor's risk tolerance. A specimen risk tolerance questionnaire is given in Exhibit 21.2.

While risk tolerance is helpful, the real risk tolerance is often lower than expected. Most investors do not have the risk tolerance that even they think they have because it is one thing to look at disappointment on paper and another thing to endure it in reality. When you look at the historical evidence for a particular investment strategy, you may see an alluring history of profit, interspersed with short periods of losses and say 'I can tolerate the disappointment'. However, enduring such disappointment is very different from just seeing it on paper.

Constraints In pursuing your investment objective, which is specified in terms of return requirement and risk tolerance, you should bear in mind the constraints arising out of or relating to the following factors:

Liquidity Liquidity refers to the speed with which an asset can be sold, without suffering any significant discount to its fair market price. For example, money market instruments are the most liquid assets, whereas antiques are among the least liquid.

Taking into account your cash requirements in the foreseeable future, you must establish the minimum level of 'cash' you want in your investment portfolio.

Investment Horizon The investment horizon is the time till the investment or part thereof is planned to be liquidated to meet a specific need. For example, the investment horizon may be ten years to fund a child's college education or thirty years to meet retirement needs. The investment horizon has an important bearing on the choice of assets.

Taxes What matters finally is the post-tax return from an investment. Tax considerations therefore have an important bearing on investment decisions. So, carefully review the tax shelters available to you and incorporate the same in your investment decisions.

Regulations While individual investors are generally not constrained much by law, institutional investors have to conform to various regulations. For example, mutual funds in India are not allowed to hold more than 10 percent of the equity shares of a public company.

Unique Circumstances Almost every investor faces unique circumstances. For example, an individual may have the responsibility of looking after ageing parents. Or, an endowment fund may be precluded from investing in the securities of companies making alcoholic products and tobacco products.

Exhibit 21.2 ***A Risk Tolerance Questionnaire***

Here is an example of a short quiz used by financial institutions to help estimate risk tolerance.

	Question	1 Point	2 Points	3 Points	4 Points
1.	I plan on using the money I am investing:	Within 6 months	Within the next 3 years	Between 3 and 6 years.	No sooner than 7 years from now.
2.	My investments make up this share of assets (excluding home):	More than 75%	50% or more but less than 75%	25% or more but less than 50%.	Less than 25%
3.	I expect my future income to:	Decrease.	Remain the same or grow slowly.	Grow faster than the rate of *inflation*.	Grow quickly.
4.	I have emergency savings.	No.	—	Yes, but less than I'd like to have.	Yes.
5.	I would risk this share in exchange for the same probability of doubling my money.	Zero.	10%	25%	50%
6.	I have invested in stocks and stock mutual funds:	—	Yes, but I was uneasy about it.	No, but I look forward to it.	Yes, and I was comfortable with it.
7.	My most important investment goal is to.	Preserve my original investment.	Receive some growth and provide income.	Grow faster than inflation but still provide some income.	Grow as fast as possible. Income is not important today.

Add the number of points for all seven questions. Add one point if you choose the first answer, two if you choose the second answer, and so on. If you score between 25 and 28 points, consider yourself an *aggressive investor*. If you score between 20 and 24 points, your risk tolerance is above average. If you score between 15 and 19 points, consider yourself a *moderate investor*. This means you are willing to accept some risk in exchange for a potential higher rate of return. If you score fewer than 15 points, consider yourself a *conservative investor*. I you have fewer than 10 points, you may consider yourself a very conservative investor.

Source: Securities Industry Association, downloaded from **partners.financecenter.com/businessweek/learn/guides/investbasic/invprofile.fcs.**

Differences between Individual Investors and Institutional Investors

According to Kaiser,[1] the key differences between individual investors and institutional investors are as follows:

1. Individuals define risk as "losing money", whereas institutions define risk in terms of "standard deviation of return".
2. Individuals can be categorised by their personalities (or psychographics) whereas institutions can be categorised by the investment characteristics of their beneficiaries.
3. Individuals enjoy great freedom to invest the way they want, whereas institutions are subject to various legal constraints.
4. Taxes often matter a great deal for individual investors, whereas many institutions such as mutual funds, pension funds, and insurance companies are tax-exempt entities.

21.2 SELECTION OF ASSET MIX

Based on your objectives and constraints, you have to specify your asset allocation, that is, you have to decide how much of your portfolio has to be invested in each of the following asset categories:

- Cash
- Bonds
- Stocks
- Real estate
- Precious metals
- Others

The thrust of our discussion will be on determining the appropriate mix of 'bonds' and 'stocks' in the portfolio. Before we examine this issue, note the following:

- The first important investment decision for most individuals is concerned with their education meant to build their human capital.
- The most significant asset that people generally have during their early working years is their earning power that stems from their human capital. Purchase of life and disability insurance becomes a pressing need to hedge against loss of income on account of death or disability.
- The first major economic asset that individuals plan to invest in is their own house. Before they are ready to buy the house, their savings are likely to be in the form of bank deposits and money market mutual fund schemes. Referred to broadly as 'cash', these instruments have appeal because they are safe and liquid.
- Once the investment in house is made and reasonable liquidity in the form of 'cash' is maintained to meet expected and unexpected expenses in the short run, the focus shifts to planning for the education of children, providing financial

[1] Ronald W. Kaiser, "Individual Investors" in *Managing Investment Portfolios*: *A Dynamic Process* 2/e, (eds.) John L. Maginn and Donald L. Tuttle, New York: Warren, Gosham, and Lamont, 1990.

security to the family, saving for retirement, bequeathing wealth to heirs, and contributing to charitable activities. In this context 'stocks' and 'bonds' become important. Very broadly, we define them as follows:

'*Stocks*' include equity shares (which in turn may be classified into income shares, growth shares, bluechip shares, cyclical shares, speculative shares, and so on) and units/shares of equity schemes of mutual funds (like Mastershares, Birla Advantage, and so on).

'*Bonds*', defined very broadly, consist of non-convertible debentures of private sector companies, public sector bonds, gilt-edged securities, RBI Savings Bonds, units/shares of debt-oriented schemes of mutual funds, National Savings Certificates, Kisan Vikas Patras, bank deposits, post office savings deposits, fixed deposits with companies, deposits in provident fund and public provident fund schemes, deposits in the Senior Citizen's Savings Scheme, and so on.[2] The basic feature of these investments is that they earn a fixed or near-fixed return.

Stocks versus Bonds

Studies of long-term returns on stocks (or equities) and bonds over 200 years provide some interesting insights.

- Equities tend to regress to the mean over time, but no such tendency is found in bonds. Thus, long-term returns from equities are more predictable than long-term returns on bonds.
- Even with 200 years of bond market history, it is hard to make a statement about the basic return from bonds. It is hard to say what the real long-term rate of interest should be, or has been, or will be in the future over the long pull.

Should the long-term stock-bond mix be 50:50 or 75:25 or 25:75 or any other? Referred to as the strategic asset-mix decision (or policy asset-mix decision), this is by far the most important decision to be made by the investor. Empirical studies have shown that nearly 90 percent of a fund's returns over time is explained by its target asset allocation policy and only about 10 percent of its returns are explained by elements like 'market timing' and 'security selection'. Given the significance of the asset-mix decision, spend enough time and effort in articulating it. Preferably put it down on paper. Writing it down will raise the "ante" and deepen your commitment. It will

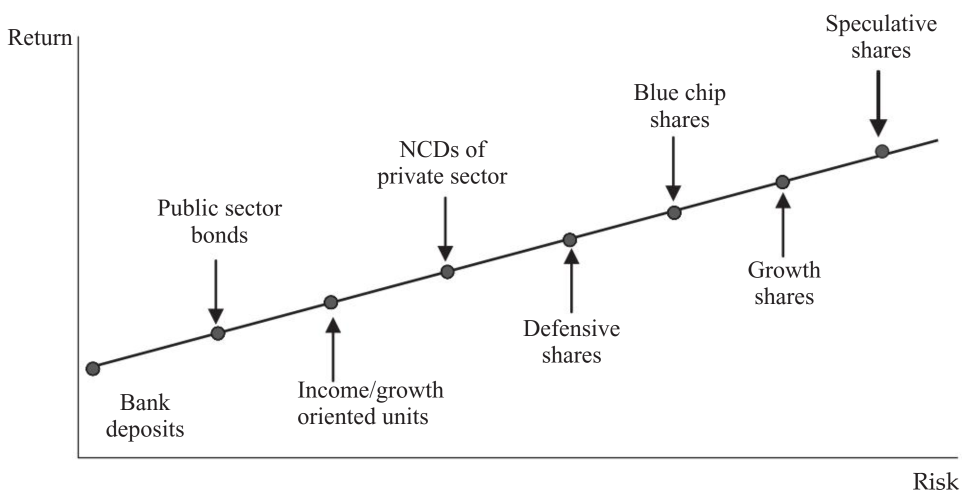
[2] The fixed income instruments available for individual investors have been mentioned here. The list of fixed income instruments (referred to here by the generic term 'bonds') applicable to institutional investors, however, would be somewhat different. It will consist mainly of gilt-edged securities, public sector bonds, non-convertible debentures of private sectors, loans and deposits, certificates of deposits, and money market instruments (bills, call deposits, and commercial paper).

increase the likelihood that you will adhere to your asset mix decision and react less impulsively to the ups and downs of the markets.

Conventional Wisdom on Asset Mix The conventional wisdom on the asset mix is embodied in two propositions:

1. Other things being equal, an investor with greater tolerance for risk should tilt the portfolio in favour of stocks, whereas an investor with lesser tolerance for risk should tilt the portfolio in favour of bonds. This is because, in general, stocks are riskier than bonds and hence earn higher returns than bonds. Exhibit 21.3 portrays the risk-return relationship for various types of stock and bond investments. James H. Lorie/*et.al*[3] summed up the long view well when he stated: "The most enduring relation in all finance perhaps is the relationship between returns on equities (or stocks) and returns on bonds. In all periods of American history, British history, French history, and German history, equities (stocks) have provided higher returns than bonds." A similar observation can be made when we look at the returns on stocks and bonds in India for the last few decades.

Exhibit 21.3 ***Risk-Return Relationship for Various Types of Bonds and Stocks***



2. Other things being equal, an investor with a longer investment horizon should tilt his portfolio in favour of stocks whereas an investor with a shorter investment horizon should tilt his portfolio in favour of bonds. This is because while the expected return from stocks is not very sensitive to the length of the investment period, the risk from stocks diminishes as the investment period lengthens.

[3] James H. Lorie, Peter Dodd, and Mary Hamilton Kimpton, *The Stock Market Theories and Evidence*, New York: Richard D. Irwin, 1984.

As the investment period lengthens, the average yearly return over the period is subject to lesser volatility because low returns in some years may be offset by high returns in other years and vice versa. Put differently there is the benefit of 'time diversification' which is distinct from 'portfolio diversification'.

The implications of the above propositions are captured in Exhibit 21.4 which shows how the appropriate percentage allocation to the stock component of the portfolio is influenced by the two basic factors, viz. risk tolerance and investment horizon.[4] To obtain the corresponding percentage allocation for the bond component of the portfolio, simply subtract the number given in the exhibit from 100. You will find this matrix helpful in resolving your asset-mix decision. (Of course, before using this matrix, you should define your risk tolerance and investment horizon as realistically as possible). In applying this matrix, the zero percent, given for the cell low risk tolerance/ short time horizon, may be raised to 10 percent or so. In a similar manner, the 100 percent, given for the cell high risk tolerance/long time horizon, may be lowered to 90 percent. These modifications will help the investor in realising the benefit of diversification across stocks and bonds.

Exhibit 21.4 ***Appropriate Percentage Allocation to the Stock Component of the Portfolio***

Time Horizon	*Risk Tolerance*		
	Low	*Moderate*	*High*
Short	0	25	50
Medium	25	50	75
Long	50	75	100

For the sake of simplicity, we assumed that there is a single investment horizon. In reality, an investor may have multiple investment horizons corresponding to varied needs. For example, the investment horizons corresponding to various goals sought by an investor may be as follows:

Investment goal	**Investment horizon**
■ Buying a car	■ One year
■ Constructing a house	■ Five years
■ Achieving financial independence	■ Twenty years
■ Establishing a charitable institution	■ Thirty years

Obviously, the appropriate asset mix corresponding to these investment goals would be different.

The Fallacy of Time Diversification It can be shown mathematically that if returns follow a random walk, that is, future returns are independent of past returns, then the

[4] A popular rule of thumb for asset allocation says that the percentage allocation to debt must be equal to the age of the individual.

notion of time diversification is fallacious. Even though the uncertainty about the average rate of return diminishes over a long time period, it also compounds over a longer time period. Unfortunately the latter effect dominates. Hence the total return becomes more uncertain as the investment horizon lengthens.

An example will illustrate this point. Suppose the expected one-year return on a stock is 15 percent with a standard deviation of 30 percent. If you hold the stock for 5 years, the expected annual return over 5 years remains at 15 percent, but the standard deviation of the average return over 5 years declines from 30 percent to 13.42 percent $(30/\sqrt{5})$[5]. Even though the standard deviation of the 5-year return is now significantly lower at 0.1342 (or 13.42 percent), a disappointment of one standard deviation will affect the terminal wealth by a factor of $(1 - 0.1342)^5 = 0.487$. This certainly has a larger impact than a swing of 30 percent in one year. As Bodie et al. put it: "While the confidence band around the expected rate of return narrows with investment life, the dollar confidence band widens."[6]

This point has been demonstrated very vividly by Peter Bernstein. Citing Ibbotson Associates data he says that the expected return for a one-year holding period is about 12.5 percent but the range is between – 8.0 percent and 32.0 percent. If the holding period is stretched from one year to ten years, the expected returns remains more or less unchanged but the range of the expected return becomes 5 percent to 15 percent. The narrower range for the longer period may be deceptive. What really matters is the final liquidating value at the end of ten years, not the annual rate of return. A dollar invested for ten years at 5 percent will compound to $1.63; at 15 percent, it will compound to $4.05. A dollar invested for one year will end up between $0.92 and $1.32. Thus, the spread in liquidating value over a ten-year holding period is far wider than the spread in liquidating value over a one-year holding period.

The above result has an important implication: although an investor is less likely to lose money over a longer horizon, as compared to a shorter horizon, the magnitude of his potential loss clearly increases with the length of his investment horizon. Hence the critics of time diversification argue that if you prefer a riskless investment over a shorter investment horizon, you should prefer a riskless investment for over a longer investment horizon as well. Put differently, your risk exposure should not depend on your investment horizon.

Resurrection of Time Diversification Although the above critique of time diversification is mathematically correct, all is not lost for those who believe in the principle of time diversification. There remain some valid reasons why you should still condition your risk posture on your investment horizon. Two of them deserve a particular mention.

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5 In general, if returns are independent over time (which means that they behave like a random walk) the standard deviation of the average return over n years is $\sigma/\sqrt{n}$, where σ is the standard deviation of one-year return and n is length of investment horizon.

6 Zvi Bodie, Alex Mane, and Alan J Marcus, *Investments* 6/e, New York: McGraw-Hill, 2006.

1. Empirically, risk (defined as the standard deviation of average annual returns) of equities falls nearly twice as fast compare to the theoretical risk (which is predicated by the random walk theory) as the holding period increases. This is clear evidence that stock returns are not serially independent but tend to mean–revert over long intervals. This means that it is more likely that a below-average return may be followed by an above-average return than another below-average return. Given this tendency of stock returns to mean-revert, the dispersion of terminal wealth increases at a slower rate than what is implied by serially independent returns. (Remember that the critics of time diversification assume a perfectly efficient market in which stock returns are serially independent.)

   In his classic work *Irrational Exuberance,* Robert Shiller[7] examined the aftermath of major 5-year stock price movements (upwards or downwards) in various countries. He found that out of 25 winning countries which experienced large five-year real price increases, 17 experienced a decline in real stock prices in the following 5-year periods. Likewise, out of 25 losing countries which experienced 5-year price decreases, 20 experienced a healthy increase in real stock prices in the following 5-year periods. Based on this evidence, Robert Shiller noted: "We thus see quite a substantial, though imperfect, tendency for major 5-year stock price movement to be reversed in another five years, for both up movements and down movements."
2. You may be inclined to accept more risk over a longer horizon as you have greater scope to adjust your consumption and work habits. If you have a short investment horizon and if the risky investment performs poorly at the beginning you can do very little to overcome the loss of wealth. However, over a long investment horizon, you can adjust consumption and work harder to realise your financial goals.

Mean Aversion of Bonds

As the holding period increases, the actual risk of stocks declines faster than the theoretical risk, thanks to mean reversion of real stock returns. In sharp contrast, the actual risk of bonds *declines more slowly* than the theoretical risk, as the holding period increases. This means that real bond returns display a *mean aversion* tendency – they wander from the mean value rather than be drawn to it. This is because bond real returns are critically influenced by inflation which cumulates over time.

The implication of this has been stated well by Jeremy J. Siegel, "Finance theory is thus presented with a conundrum. Stocks are riskier than bonds in the short-run but are actually less risky in the long-run. The optimal allocation of one's portfolio cannot be divorced from the holding period of the investor."[8]

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[7] Robert J. Shiller, *Irrational Exuberance*, 2/e, New York: Currency Doubeday, 2005.
[8] Jeremy J. Siegel, *Stocks for the Long Run*, New York: McGraw-Hill, 2002.

Benjamin Graham on Asset Allocation Benjamin Graham, the most revered investment guru, suggested that the investor should never have less than 25 percent or more than 75 percent of his funds in common stocks, with a consequent inverse range of between 75 percent and 25 percent in bonds. According to him the standard distribution should be 50:50 between the two major investment mediums. As he put it, "We are convinced that our 50:50 version of this approach makes good sense for the defensive investor. It is extremely simple; it aims unquestionably in the right direction; it gives the follower the feeling that he is at least making some moves in response to market developments; more important of all, it will restrain him from being drawn more and more heavily into common stocks as the market rises to more and more dizzy heights!"

John Bogle on Asset Allocation John Bogle,[9] the founder of the Vanguard group of mutual funds, has offered guidelines on asset allocation, taking into account the age and the specific phase (accumulation or distribution) of the investment life cycle. His recommended asset allocation model is given below.

Balanced Asset Allocation Model

Age	Accumulation	Distribution
Older	70.:30	50:50
Younger	80:20	60:40

Investment Goal

The key points of his asset allocation model are mere common sense: (a) During the accumulation phase when the investor is building assets the investor can afford to take more risks whereas during the distribution phase when the investor has ceased adding assets the investor cannot afford to take more risks. (b) Younger investors who have more time for the magic of compounding to work for them can afford to be more aggressive whereas older investors have to be more conservative.

21.3 FORMULATION OF PORTFOLIO STRATEGY

After you have chosen a certain asset mix, you have to formulate an appropriate portfolio strategy. Two broad choices are available in this respect, an active portfolio strategy or a passive portfolio strategy.

[9] John C. Bogle, *Bogle on Mutual Funds*, Burr Ridge II: Richard D. Irwin, Inc, 1994.

Active Portfolio Strategy

An active portfolio strategy is followed by most investment professionals and aggressive investors who strive to earn superior returns, after adjustment for risk. The four principal vectors of an active strategy, as shown in Exhibit 21.5, are:

- Market timing
- Sector rotation
- Security selection
- Use of a specialised concept

Exhibit 21.5 ***Vectors of Active Portfolio Management***

	Highly Active	Highly Passive
Market Timing	|	|
Sector Rotation	|	|
Security Selection	|	|
Use of a Specialised Concept	|	|

Market Timing This involves departing from the normal (or strategic or long run) asset mix to reflect one's assessment of the prospects of various assets in the near future. Suppose your investible resources for financial assets are 100 and your normal (or strategic) stock-bond mix is 50:50. In the short and intermediate run, however, you may be inclined to deviate from your long-term asset mix. If you expect stocks to outperform bonds, on a risk-adjusted basis, in the near future, you may perhaps step up the stock component of your portfolio to say 60 or 70 percent. Such an action, of course, would raise the beta of your portfolio. On the other hand, if you expect bonds to outperform stocks, on a risk-adjusted basis, in the near future, you may step up the bond component of your portfolio to 60 percent or 70 percent. This will naturally lower the beta of your portfolio.

Market timing is based on an explicit or implicit forecast of general market movements. The advocates of market timing employ a variety of tools like business cycle analysis, moving average analysis, advance-decline analysis, and econometric models. The forecast of the general market movement derived with the help of one or more of these tools is tempered by the subjective judgment of the investor. Often, of course, the investor may go largely by his market sense.

Anyone who reviews the fluctuations in the market may be tempted to play the game of market timing. Yet very few seem to succeed in this game. A careful study on market timing argues that an investment manager must forecast the market correctly 75 percent of the time just to break-even, after taking into account the costs of errors and the costs of transactions. As Fischer Black said: "The market does just as well, on average, when the investor is *out* of the market as it does when he is *in*. So he loses money, relative to a simple buy-and-hold strategy, by being out of the market part of the time." Echoing a similar view John Bogle, founder of the Vanguard Group of investment companies, said: "In 30 years in this business, I do not know anyone who has done it successfully and consistently, nor anybody who knows anybody who has done it successfully and consistently. Indeed, my impression is that trying to do market timing is likely to be counterproductive."[10] John Maynard Keynes rendered a similar verdict decades ago: "We have not proved able to take much advantage of a general systematic movement out of and into ordinary shares as a whole at different phases of the trade cycle. As a result of these experiences I am clear that the idea of wholesale shifts is for various reasons impracticable and indeed undesirable."[11] William Sherdeen, in his insightful book *The Fortune Sellers* put it more bluntly, "Avoid market timers, for they promise something they cannot deliver. Cancel your subscription to market-timing newsletters… Stop asking yourself, and everyone you know, What's the market going to do? It is an irrelevant question, because it cannot be answered."[12]

Sector Rotation The concept of sector rotation can be applied to stocks as well as bonds. It is, however, used more commonly with respect to the stock component of the portfolio where it essentially involves shifting the weightings for various sectors based on their assessed outlook. For example, if you believe that cement and banking sectors would do well compared to other sectors in the forthcoming period (one year, two years, or whatever), you may overweight these sectors, relative to their position in the market portfolio. Put differently, your stock portfolio will be tilted more towards these sectors in comparison to the market portfolio.

With respect to bonds, sector rotation implies a shift in the composition of the bond portfolio in terms of quality (as reflected in credit rating), coupon rate, term to maturity, and so on. For example, if you anticipate a rise in interest rates you may shift from long-term bonds to medium-term or even short-term bonds. Remember that a long-term bond is more sensitive to interest rate variation compared to a short-term bond.

Security Selection Perhaps the most commonly used vector by those who follow an active portfolio strategy, security selection involves a search for under-priced securities. If you resort to active stock selection, you may employ fundamental and/or technical analysis to identify stocks which seem to promise superior returns and concentrate the stock component of your portfolio on them. Put differently, in your portfolio such stocks will be overweighted relative to their position in the market portfolio. Likewise, stocks which are perceived to be unattractive will be underweighted relative to their position in the market portfolio.

As far as bonds are concerned, security selection calls for choosing bonds which offer the highest yield to maturity at a given level of risk.

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[10] John C. Bogle, *op.cit*.
[11] J.M. Keynes, *op. cit*.
[12] William J. Sherdeen, *The Fortune Sellers*, New York: John Wiley & Sons Inc., 1999.

Use of a Specialised Investment Concept A fourth possible approach to achieve superior returns is to employ a specialised concept or philosophy, particularly with respect to investment in stocks. As Charles D. Ellis put it, a possible way to enhance returns "is to develop a profound and valid insight into the forces that drive a particular sector of the market or a particular group of companies or industries and systematically exploit that investment insight or concept."[13] Some of the concepts that have been exploited successfully by investment practitioners are:

- Growth stocks
- Value stocks
- Asset-rich stocks
- Technology stocks
- Cyclical stocks
- Momentum stocks

The advantage of cultivating a specialised investment concept or philosophy is that it will help you to: (a) focus your efforts on a certain kind of investment that reflects your abilities and talents, (b) avoid the distractions of pursuing other alternatives, and (c) master an approach or style through sustained practice and continual self-critique. As against these merits, the great disadvantage of focusing exclusively on a specialised concept or philosophy is that it may become obsolete. The changes in market place may cast a shadow over the validity of the basic premise underlying the investment philosophy. Given your profound conviction and long-term commitment to your specialised investment concept or philosophy, you may not detect the need for change till it becomes rather late.

Two Popular Management Styles Two management styles popularly used by active portfolio managers are **value management** and **growth management**. Value managers typically buy stocks that have low price-earnings ratios, low price-to-book value ratios, below average earnings growth, and high dividend yields. Such stocks are referred to as value stocks. Value managers are sometimes called contrarian managers as they often buy "out-of-favour" stocks.

Growth managers buy stocks that currently enjoy high rates of earnings growth and are expected to experience high rates of earnings growth in future as well. These stocks, called "growth stocks" or "glamour stocks", typically have high price-earnings ratios, high price-to-book value ratios, above average earnings growth, and low dividend yields.

The characteristics of value and growth stocks are summarised below:

[13] Charles D. Ellis, *Investment Policy: How to Win Loser's Game*, Homewood, Illinois: Irwin Professional Publication, 1993.

Value Stocks	*Growth Stocks*
Low earnings per share growth	High earnings per share growth
Low price-earnings ratio	High price-earnings ratio
Low price-book ratio	High price-book ratio
High dividend yield	Low dividend yield
Betas tend to be less than one	Betas tend to be more than one
Out of favour	Popular

Empirical evidence suggests that, in general, value stocks have outperformed growth stocks, in terms of both raw and risk-adjusted returns. The value managers seem to have performed better in several different countries and over extended periods of time.

Case for Active Strategy

How can one reconcile active portfolio strategy with the notion of market efficiency? While most managers are not likely to outperform the passive strategy on a risk-adjusted basis, economic logic and some empirical evidence suggest that exceptional managers might realise superior risk-adjusted returns.

Consider the economic logic first. If all investors pursue the less expensive passive strategy, funds will not be available for pursuing active strategies. Hence, prices will no longer reflect sophisticated analysis. This will then generate profit opportunities that will attract active managers who are likely to earn superior returns.

Now, look at the following empirical evidence: (a) Some portfolio managers have produced superior returns on a sustained basis and it is hard to regard them as just lucky strokes. (b) Given the noise in realised returns, it is not possible to dismiss the hypothesis that some portfolio managers have outperformed the passive strategy by a statistically small, but economically significant, margin. (c) The persistence of some anomalies in realised returns suggests that those who detected them early may have outperformed the passive strategy over extended periods.

Passive Strategy

The active strategy is based on the premise that the capital market is characterised by inefficiencies which can be exploited by resorting to market timing or sector rotation or security selection or use of a specialised concept or some combination of these vectors. The passive strategy, on the other hand, rests on the tenet that the capital market is fairly efficient with respect to the available information. Hence, the search for superior returns through an active strategy is considered futile.

Operationally, how is the passive strategy implemented? Basically, it involves adhering to the following two guidelines:

1. Create a well-diversified portfolio at a pre-determined level of risk.
2. Hold the portfolio relatively unchanged over time, unless it becomes inadequately diversified or inconsistent with the investor's risk-return preferences.

Choice of Strategy

The active approach takes a lot of time and consumes a great deal of energy, whereas the passive approach takes little time or effort but calls for an ascetic aloofness from the tempting hullabaloo of the market. As Charles Ellis explained, the active approach tends to be intellectually and physically taxing, while the passive approach is emotionally burdensome.

Which approach should you choose? In his commentary in the book *The Inteligent Investor* by Benjamin Graham, Jason Zweig, a renowned investment commentator, offers helpful advice: "If you have time to spare, are highly competitive, think like a sports fan, and relish a complicated challenge, then the active approach is up your alley. If you always feel rushed, crave simplicity, and don't relish thinking about money, then the passive approach is for you." He continues further: "Both approaches are equally intelligent, and you can be successful with either – but only if you know yourself well enough to pick the right one, stick with it over the course of your investing lifetime, and keep your costs and emotions under control."

Samuelson's Defence of Indexing

Paul Samuelson, a Nobel Laureate and a leading economist of 20th century, defends indexing, a passive approach to investing, in the following words:

"A thousand to ten thousand money managers all look about equally good or bad. ... After the fact, hardly ten out of ten thousand perform in a way that convinces an experienced student of inductive evidence that a long-term edge over indexing is likely."[1]

[1] Paul Samuelson, "The Judgment of Economic Science on Rational Portfolio Management: Indexing, Timing, and Long-Horizon Effects," *Journal of Portfolio Management,* Fall 1989.

Portfolio Strategy

Your portfolio strategy should reflect your ability to select undervalued securities and your ability to forecast overall market level. Exhibit 21.6 provides a useful guide for developing your portfolio strategy.

Exhibit 21.6 ***Portfolio Strategy***

	Good	*Poor*
Good	1. Resort to market timing 2. Concentrate holdings in few undervalued securities	1. Avoid market timing 2. Concentrate holdings in few undervalued securities
Poor	1. Resort to market timing 2. Diversify broadly	1. Avoid market timing 2. Diversify broadly

21.4 SELECTION OF SECURITIES

Selection of Bonds (Fixed Income Avenues) You should carefully evaluate the following factors in selecting fixed income avenues.

- *Yield to maturity* As discussed previously, the yield to maturity for a fixed income avenue represents the rate of return earned by the investor if he invests in the fixed income avenue and holds it till its maturity.
- *Risk of default* To assess the risk of default on a bond, you may look at the credit rating of the bond. If no credit rating is available, examine relevant financial ratios (like debt-to-equity ratio, times interest earned ratio, and earning power) of the firm and assess the general prospects of the industry to which the firm belongs.
- *Tax shield* In yesteryears, several fixed income avenues offered tax shield; now very few do so.
- *Liquidity* If the fixed income avenue can be converted wholly or substantially into cash at a fairly short notice, it possesses liquidity of a high order.

Selection of Stocks (Equity Shares) Three broad approaches are employed for the selection of equity shares: technical analysis, fundamental analysis, and random selection. Technical analysis looks at price behaviour and volume data to determine whether the share will move up or down or remain trendless. Fundamental analysis focuses on fundamental factors like the earnings level, growth prospects, and risk exposure to establish the intrinsic value of a share. The recommendation to buy, hold, or sell is based on a comparison of the intrinsic value and the prevailing market price. The random selection approach is based on the premise that the market is efficient and securities are properly priced.

Exhibit 21.7 shows how the three approaches perform at different levels of market efficiency.[14]

[14] Anthony J. Curley and Robert M. Bear, *Investment Analysis and Management*, New York: Harper & Row Publishers, 1979.

21.5 PORTFOLIO EXECUTION[15]

By the time this phase of portfolio management is reached, several keys issues have been sorted out. Investment objectives and constraints have been specified, asset mix has been chosen, portfolio strategy has been developed, and specific securities to be included in the portfolio have been identified. The next step is to implement the portfolio plan by buying and/or selling specified securities in given amounts. This is the phase of portfolio execution which is often glossed over in portfolio management literature. However, it is an important practical step that has a significant bearing on investment results. Further, it is neither simple nor costless as is sometimes naively felt.

For effectively handling the portfolio execution phase, you should understand what the trading game is like, what motivates trades, what is the nature of key players (transactors) in this game, who are the likely winners and losers in this game, and what guidelines should be borne in mind while trading.

Exhibit 21.7 ***Levels of Market Efficiency and Approaches to Security Selection***

Level of efficiency \ *Approach*	*Technical analysis*	*Fundamental analysis*	*Random selection*
Inefficiency	Best	Poor	Poor
Weak-form efficiency	Poor	Best	Poor
Semi-strong-form efficiency	Poor	Good	Fair
Strong-form efficiency	Poor	Fair	Best

Trading Game Security transactions tend to differ from normal business transactions in two fundamental ways:

1. A businessman entering into a transaction does so with a reasonable understanding of the motives of the party on the other side of the transaction. For example, when you are buying a piece of used machinery, you are well aware of the motives of the seller. In contrast, in a typical securities transaction, the motive, and even the identity, of the other party is not known.
2. While both parties generally gain from a business transaction, a security transaction tends to be a zero sum game. A security offers the same future cash flow stream to the buyer as well as the seller. So, apart from considerations of taxes and differential risk-bearing abilities, the value of security is the same to the buyer as well as the seller. Hence, constructive motives which guide business transactions are not present in most security transactions. This means that if a security transaction benefits one party, it hurts the other. Put differently, if one wins the other loses.

[15] This section is largely adapted from Jack L. Treynor and Wayne H. Wagner, "Implementation of Portfolio Building: Execution,"in *Managing Investment Portfolios: A Dynamic Process*, 2/e, edited by John L. Maginn and Donald L. Tuttle, New York: Warren, Gorham & Lamont 1990.

Motives for Trade Why do people trade? One motivation is **cognitive.** People trade because they think they have superior information or better methods of analysing information. However, most traders tend to confuse noise or randomness for information. People often see patterns in stock prices that are random; they rely on fallible intuitive judgment even when systematic analysis would have proved that their judgment is erroneous.

Another motivation is **emotional**. A trading decision that produces profit is also a source of pride. People love to crow about their investment success, even though it may be purely fortuitous. Of course, if the trading decision turns out to be wrong it can inflict losses and cause embarrassment.

Key Players Securities market appears to be thronged by four types of players or transactors: value-based transactors, information-based transactors, liquidity-based transactors, and pseudo-information based transactors. Generally, the dealer or the market maker intermediates between these transactors.

Value Based Transactors A value based transactor (VBT, hereafter) carries out extensive analysis of publicly available information to establish values. He trades when the difference between the value assessed by him and the prevailing market price so warrants. Typically, he places limit orders to buy and sell with a spread that is large enough to provide a cushion against errors of judgment and informational lacunae. For example, a VBT who establishes an intrinsic value of Rs. 50 for some equity share may place an order to buy if the net price is Rs 40 or less. VBTs generally serve as the anchor for the trading system and establish the framework for the operations of dealers. VBTs typically don't place much importance on time.

Information Based Transactors An information based transactor (IBT hereafter) transacts on the basis of information which is not in public domain and, therefore, not reflected in security prices. Since he expects this information to have a significant impact on prices, he is keen to transact soon. To him, time is a great value. While the VBT is concerned about how much the market will move towards the justified price (the price established by him based on fundamental analysis), the IBT is bothered about how soon the market price will move up or down in response to new information.

The IBT generally employs 'incremental' fundamental analysis (as he is concerned about price movements in response to new information). In addition, he uses technical analysis because timing is crucial to his operations. Unlike the VBT, he rarely tries to establish the absolute value of a security. Instead, he tries to assess the likely impact of 'marginal' fundamental and technical developments.

Liquidity Based Transactors A VBT, like an IBT, trades to reap investment advantage. A liquidity based transactor (LBT, hereafter), however, trades primarily due to liquidity considerations. He trades to deploy surplus funds or to obtain funds or to rebalance the portfolio. His trades are not based on a detailed valuation exercise (as is the case of a VBT) or access to some information that is not already reflected in market price (as is the case of an IBT). Hence, he may be regarded as an informationless trader who is driven mainly by liquidity considerations.

Pseudo-information Based Transactors A pseudo-information based transactor (PIBT, hereafter) believes that he possesses information that can be a source of gain, even though that information is already captured or impounded in the price of the security. Or, he exaggerates the value of new information that he may come across and forms unrealistic expectations. Essentially, the PIBT, like the LBT, is an informationless trader. Yet, he mistakenly believes that he posseses information which will generate investment advantage to him.

Dealers A dealer intermediates between buyers and sellers eager to transact. The dealer is ready to buy or sell with a spread which is fairly small for actively traded securities. For example, the bid and ask prices of a dealer for a certain security may be 80–82. This means that the dealer is willing to buy at 80 and sell at 82. The dealer's quotations may move swiftly in response to changes in the demand and supply forces in the market.

Typically, the dealer's bid-ask price band lies well within the bid-ask price band set by the VBT. This means that the bid price of the dealer is higher than the bid price of the VBT and the ask price of the dealer is lower than the ask price of the VBT. The dealer's function is such that he is not required to take a view on whether a security is worth buying or worth selling. He simply plays the role of an intermediary and he does not plan to hold the position he acquires in accommodating a transaction. Hence, the dealer is a remarkably innocuous person. Lurking behind the dealer, of course, is the transactor's real trading adversary, whose identity and motive are often unknown.

Exhibit 21.8 summarises the trading motivations, time horizons, and time versus price preferences of different transactors.

Who Wins, Who Loses Who wins and who loses in the trading game, which is essentially a zero sum game. It appears that the IBT's odds of winning are the highest, assuming that his information is substantiated by the market. He is followed by the VBT, LBT, and PIBT in that order. Put differently, the above question may be answered as follows:

- The IBT seems to have a distinct edge over others.
- The VBT tends to lose against the IBT but gains against the LBT and PIBT.
- The LBT may have some advantage over the PIBT.

Exhibit 21.8[16] ***Summary of Trading Motivations, Time Horizons, and Time vs Price Preferences***

Transactor	*Motivation*	*Time Horizon*	*Time vs Price Preference*
VBT	Discrepancy between value and price	Weeks to months	Price
IBT	New information	Hours to days	Time
LBT	Release or absorb cash	Hours to days	Time
PIBT	Apparently new information	Hours to days	Time
Dealer	Accommodation	Minutes to hours	Indifferent

[16] Based on Chapter 12 of the book *Managing Investment Portfolios: A Dynamic process* (Eds) John L. Maginn and Donald L. Tuttle, 2nd edition, New York 1990, Warren Gorham & Lamont, 1990.

Trading Cost Management

When you do a trade, you have to look at the tradeoff between the "immediacy cost" of doing the trade quickly and the "opportunity cost" associated with missing the opportunity that may have motivated the trade. Immediacy cost tends to decline with time when the trade can be done patiently. Opportunity cost, on the other hand, tends to rise with time as the market recognises the information that forms the basis of the trade. Investors who rely on fast-breaking news or momentum strategy face a rapidly rising opportunity cost curve. Hence, they must resort to rapid and aggressive execution. On the other hand, investors, who focus on out-of-favour stocks face a slowly rising opportunity cost. Hence they must not show undue haste. Since the tradeoff between "immediacy cost" and "opportunity cost" is important it is important that as an investor you should know the nature of your investment process. If you do not know yourself, you may transact too soon or too late. This can impair your long-term investment performance.

Guidelines The following guidelines must be borne in mind while executing transactions.

- *Maintain a dialogue with the broker* When a trade is seriously contemplated, check with the broker about the sensitivity of the stock to buying or selling pressure, the volume that can be traded without pushing the price out of the desirable range, the manipulative games, if any, being played by operators, and the degree of market resilience.
- *Place an order which serves your interest best* Different kinds of orders can be placed with your broker. The more common ones are: the market order, the best efforts order, the market-on-open order, and the limit order. The **market order** instructs the broker to execute the transaction promptly at the best available price. This order leaves very little discretion to the broker. The **best efforts order** gives the broker a certain measure of discretion to execute the transaction when he considers market condition more favourable. The **market-on-open order** instructs the broker to execute the transaction no sooner the market opens. The **limit order** instructs the broker to execute the transaction only within the price limits specified in the order. The timing of the trade is left to the ebb and flow of market conditions. For the IBT the most appropriate order is the market order or the market-on-open order. For the VBT the most appropriate order is the limit order. And for the LBT and PIBT the most appropriate order may be the best efforts order.
- *Avoid serious trading errors* The worst trading errors appear to be the following: (a) a VBT sells time too cheaply, (b) an IBT buys time too expensively, and (c) an LBT, by appearing motivated by information, evokes very defensive responses from dealers and other market participants. Guard yourself against these errors.

Trading Pitfalls

Hyperactive Trading Active trading is alluring. People who think that they have superior investment skills or information trade frequently to derive benefit from their advantage. However, empirical studies show that psychological biases are exacerbated by active trading because of the constant focus on the market. On average, active trading induces investors to sell a good stock and buy a poor one. Apart from impairing the quality of investment decisions, active trading entails costs like brokerage costs, market impact costs, and taxes.

Online Brokerage and Trading Activity Trading in an online brokerage account enables investors to place trades without talking to a stockbroker. This may induce them to trade more actively and commit more mistakes. A study by Brad Barber and Terrance Odean published in the March 2002 issue of *Review of Financial Studies* considered the trading behaviour and investment performance of 1607 investors who switched from a phone-based trading system to an Internet-based trading system. The study found, that after the switch, the investors traded more but significantly underperformed the market.

The Illusion of Knowledge People tend to believe that more information increases their forecasting performance. Put differently, additional information gives them the illusion of knowledge.

The vast amount of information available on the Internet and through other sources, however, may be noise or irrelevant or even misleading. Further, most people lack the ability to interpret such information.

Illusion of Control People tend to believe that they have influence over the outcome of uncontrollable events. Such illusion of control is greater when they are actively involved in decision making, as in the case of online trading. Hence, in general, online investors trade more, make more biased decisions, and finally earn lower investment returns.

21.6 PORTFOLIO REVISION

Irrespective of how well you have constructed your portfolio, it soon tends to become inefficient and hence needs to be monitored and revised periodically. However carefully crafted it may be, a portfolio does not manage itself. With the passage of time things change and the portfolio tends to become sub-optimal, if left unaltered.

Over time several things are likely to happen. The asset allocation in the portfolio may have drifted away from its target; the risk and return characteristics of various securities may have altered; finally, the objectives and preferences of the investor may have changed.

Given the dynamic developments in the capital market and changes in your circumstances, you have to periodically monitor and revise your portfolio. This usually entails two things, viz. **portfolio rebalancing** and **portfolio upgrading**.

Portfolio Rebalancing Portfolio rebalancing involves reviewing and revising the portfolio composition (i.e. the stock-bond mix). There are three basic policies with respect to portfolio rebalancing: buy and hold policy, constant mix policy, and portfolio insurance policy.

Under the **buy and hold policy**, the initial portfolio is left undisturbed. It is essentially a 'buy and hold' policy. Irrespective of what happens to relative values, no rebalancing is done. For example, if the initial portfolio has a stock-bond mix of 50:50 and after six months the stock-bond mix happens to be, say, 60:40 because the stock component has appreciated and the bond component has stagnated, the portfolio mix is allowed to drift. Put differently, no changes are effected.

The **constant mix policy** calls for maintaining the proportions of stocks and bonds in line with their target value. For example, if the desired mix of stocks and bonds is say 50:50, the constant mix policy calls for rebalancing the portfolio when relative values of its components change, so that the target proportions are maintained. This is perhaps the most sensible portfolio rebalancing policy.

The **portfolio insurance policy** calls for increasing the exposure to stocks when the portfolio appreciates in value and decreasing the exposure to stocks when the portfolio depreciates in value. The basic idea is to ensure that the portfolio value does not fall below a floor level.

Portfolio Upgrading While portfolio rebalancing involves shifting from stocks to bonds or vice versa, portfolio upgrading calls for re-assessing the risk-return characteristics of various securities (stocks as well as bonds), selling over-priced securities, and buying under-priced securities. It may also entail other changes the investor may consider necessary to enhance the performance of the portfolio.

You may hesitate to revise your portfolio or be too slow in doing so. You may not like to incur the costs of trading like commission costs, taxes, and adverse market impacts. These costs often look very obvious. However, remember that there are costs of non-trading which, though subtle, may be significant. Your portfolio may drift into an asset mix that may no longer be appropriate to your needs; you may hold over-priced investments, offering inferior returns; you may forego opportunities of making promising investments. You should learn how to weigh the opportunity cost of non-trading against the explicit costs of trading. In essence, portfolio revision calls for developing an appropriate response to the tension between the 'apparent' cost of trading and the 'subtle' cost of inaction.

Restoring the Target Proportions

Since the strategic asset-mix decision (or policy asset-mix decision) is the most important decision in portfolio management, it is normally assumed that the investor will periodically (say, once a year) rebalance the portfolio to restore the target proportion. Suppose your strategic asset mix of 50:50 and you start with an investment of Rs. 100,000 in stocks and Rs. 100,000 in bonds. After one year the

(*Contd.*)

values of the and bonds are say Rs. 150,000 and Rs. 110,000 respectively. To restore the target proportions, you must sell Rs. 20,000 of stocks and buy Rs. 20,000 of bonds. Doing so may seem easy, but in real life you require a lot of discipline and patience because it involves doing exactly the opposite of what most others in the investment world are doing. A disciplined restoration of target proportions is indeed an effective way of becoming a "contrarian."

If you have stronger "contrarian" instincts, you can go a step further. You can resort to dynamic asset allocation. This calls for increasing your target allocation in favour of the asset class that has underperformed. To illustrate, suppose your target allocation for stocks and bonds is 50:50 and you, to begin with, invest Rs. 100,000 each in stocks and bonds. After one year you find that the values of the stock and the bond components are Rs. 80,000 and Rs. 110,000. Since stocks have underperformed bonds, you increase your target allocation to stocks from 50 percent to say 55 percent and diminish the target allocation to bonds from 50 percent to 45 percent. Your portfolio after rebalancing will be as follows:

	Before Rebalancing	After Rebalancing
Stocks	80,000	104,500
Bonds	110,000	85,500
	190,000	190,000

Note that under dynamic asset allocation, changes in target allocation are driven purely by market valuation. For example, you may follow a simple rule like increasing (decreasing) the target allocation to stocks by 0.5 percent for every 1 percent fall (rise) in its value.

Dynamic asset allocation is in essence a more rigorous form of rebalancing – indeed, it is "overbalancing" and it requires greater courage and determination. As William Bernstein put in his insightful book *The Intelligent Asset Allocator* published by McGraw Hill in 2001: "Rebalancing requires nerve and discipline; overbalancing requires even more of both of these scarce commodities; Very few investors, small or institutional can carry it off." He adds "You cannot pilot a modern jet fighter before mastering the trainer; likewise, you should not attempt dynamic asset allocation before mastering fixed asset allocation."

21.7 PERFORMANCE EVALUATION

The key dimensions of portfolio performance evaluation are rate of return and risk. This section looks at the measures of rate of return, risk, and performance.

Rate of Return

The rate of return from a portfolio for a given period (which may be defined as a period of one year) is measured as follows:

$$\frac{\text{Dividend income} + \text{Terminal value} - \text{Initial value}}{\text{Initial value}}$$

To illustrate the calculation of the rate of return, let us look at the following data:

- Initial market value of the portfolio : Rs 100,000
- Dividend and interest income received toward the end of the year : Rs 10,000
- Terminal market value of the portfolio : Rs 105,000

The rate of return on this portfolio is simply:

$$\frac{10{,}000 + (105{,}000 - 100{,}000)}{100{,}000} = 0.15 \text{ or } 15 \text{ percent}$$

To calculate the average rate of return, over a period of several years, the following measures may be employed: (a) arithmetic average of annual rates of return, (b) internal rate of return (also referred to as the money-weighted rate of return), and (c) geometric average of annual rates of return (also referred to as the time-weighted rate of return). The calculation of these measures may be illustrated with the help of the data given in Exhibit 21.9.

The **arithmetic average** of annual rates of return in the above case is:

$$(15.0 + 0.0 + 36.8 + 26.7 + 15.7)\ /\ 5 = 18.8 \text{ percent}$$

The **internal rate of return** is defined as the discount rate which brings about an equality between the initial investment and the present value of future benefits associated with the investment. The internal rate of return in the above case is the value of r (which works out to 17.65) in the following equation:

$$100{,}000 = \frac{10{,}000}{(1+r)} + \frac{10{,}000}{(1+r)^2} + \frac{10{,}000}{(1+r)^3} + \frac{12{,}000}{(1+r)^4} + \frac{12{,}000 + 150{,}000}{(1+r)^5}$$

Exhibit 21.9 ***Rate of Return Data***

Year	*Market value of the portfolio (Rs.)*	*Dividend and interest income (Rs.)*	*Rate of return*
0	100,000		
1	105,000	10,000	$\frac{10{,}000 + (105{,}000 - 100{,}000)}{100{,}000} = 15\%$
2	95,000	10,000	$\frac{10{,}000 + (95{,}000 - 105{,}000)}{105{,}000} = 0.0\%$
3	120,000	10,000	$\frac{10{,}000 + (120{,}000 - 95{,}000)}{95{,}000} = 36.8\%$
4	140,000	12,000	$\frac{12{,}000 + (140{,}000 - 120{,}000)}{120{,}000} = 26.7\%$
5	150,000	12,000	$\frac{12{,}000 + (150{,}000 - 140{,}000)}{140{,}000} = 15.7\%$

The **geometric mean** of annual rates of return is the *n*th root of the product of *n* annual wealth ratios (wealth ratio is simply 1 + annual rate of return) minus 1. The geometric mean of annual rates of return in the above case is:

$$[(1 + 0.15)\ (1 + 0.00)\ (1 + 0.368)\ (1 + 0.267)\ (1 + 0.157)]^{1/5} - 1$$

$$= \text{about } 0.182 \text{ or } 18.2 \text{ percent}$$

How useful or appropriate are the above measures of rate of return? Let us examine them one by one. The arithmetic average of annual rates of return is appealing because it is simple in concept and application. However, it suffers from a serious limitation. To understand this, consider a case where the market value of an investment of 100 made at the end of year 0 declines to 80 at the end of year 1 and recovers to 100 at the end of year 2. Assuming that there is no dividend payment during the two year period, the annual returns and their arithmetic average are as follows:

$$\text{Return for year 1: } \frac{80 - 100}{100} = -20 \text{ percent}$$

$$\text{Return for year 2: } \frac{100 - 80}{80} = 25 \text{ percent}$$

$$\text{Arithmetic average of annual returns: } \frac{-20 + 25}{2} = 2.5 \text{ percent}$$

Thus we find that although the return over the two year period is nil, the arithmetic average of annual returns works out to 2.5 percent. So this measure of return can be misleading. Despite this limitation, thanks to its simplicity, it is the most commonly used measure of return.

How useful is the internal rate of return, also referred to as the **money-weighted rate of return**? To answer this question let us look at the internal rate of return of two portfolios, *A* and *B* that experience different cash flows as shown in Exhibit 21.10.

Exhibit 21.10 ***Cash Flows of Portfolios A and B***

	Period			
	1	**2**	**3**	**4**
Rate of return earned	10%	30%	20%	–
Portfolio A				
1. Beginning value before inflow or outflow	10,000	11,000	14,300	17,160
2. Inflow (outflow)	–	–	–	(17,160)
3. Amount invested	10,000	11,000	14,300	–
4. Ending value	11,000	14,300	17,160	–
Portfolio B				
1. Beginning value before inflow or outflow	10,000	11,000	3,900	4,680
2. Inflow (outflow)	–	(8,000)	–	(4,680)
3. Amount invested	10,000	3,000	3,900	–
4. Ending value	11,000	3,900	4,680	–

In Portfolio *A*, an initial investment of 10,000 grows to 17,160 at the end of year 3, with no intermediate cash flows. Hence, its internal rate of return is the value of *r* that satisfies the equation

$$10{,}000 = \frac{17{,}160}{(1+r)^3}$$

Solving this equation, we get the value of *r* to be 19.72 percent.

In Portfolio *B*, an initial investment of 10,000 results in cash out flows of 8,000 and 4,680 at the end of years 1 and 3 respectively. Hence, its internal rate of return is the value of *r* that satisfies the equation

$$10{,}000 = \frac{8{,}000}{(1+r)} + \frac{0}{(1+r)^2} + \frac{4{,}680}{(1+r)^3}$$

Solving this equation, we get the value of *r* to be 15.27 percent.

Thus we find that though the period-by-period returns of both the portfolios are identical, the internal rate of return (or the money-weighted rate of return) for Portfolio *A* is greater than that for Portfolio *B*. This is because the internal rate of return suffers from a limitation in that it is sensitive to the pattern of cash flows over which portfolio managers often have no control. Note that the internal rate of return reflects investment performance as well as the effect of contributions and withdrawals. Hence it is not correct so say that investment performance alone accounted for 15.27 percent. Indeed, you cannot judge the **quality of investment performance** from the internal rate of return figure. The internal rate of return, however, is useful in measuring the **total experience** of a fund, reflecting investment performance as well as cash flows.

The geometric mean rate of return (or the **time-weighted rate of return**) assigns equal weight to the results achieved in each time period and is independent of the pattern of cash flows. Hence it is a superior measure. The geometric mean rate of return for both the portfolios shown in Exhibit 21.11 is:

$$[(1.10)\,(1.30)\,(1.20)]^{1/3} - 1 = 0.1972 \text{ or } 19.72 \text{ percent}$$

Risk

The risk of a portfolio can be measured in various ways. The two most commonly used measures of risk are: variability and beta.

Variability The Bank Administration Institute of the US recommended the use of variability (as measured by the mean absolute deviation[17]) of the quarterly rates of return of the portfolio. Sharpe and others have also advocated the use of variability. However, their preferred measure of variability is standard deviation.

Beta A measure of risk commonly advocated is beta. The beta of a portfolio is computed the way the beta of an individual security is computed. To calculate the beta

[17] The mean absolute deviation of a set of returns of simply: $\Sigma\ |d|/n$
where $|d|$ is the absolute deviation of a particular return from the arithmetic mean and n is the number of return observations.

of a portfolio, regress the rate of return of the portfolio on the rate of return of a market index. The slope of this regression line is the portfolio beta. Remember that is reflects the systematic risk of the portfolio.

Performance Measures

For evaluating the performance of a portfolio it is necessary to consider both risk and return. This is what the Treynor measure, the Sharpe measure, the Jensen measure, and the M^2 measure—the four popularly employed portfolio performance measures—precisely do.

Treynor Measure According to Jack Treynor, systematic risk or beta is the appropriate measure of risk, as suggested by the capital asset pricing model. The Treynor measure of portfolio performance relates the excess return on a portfolio to the portfolio beta.

$$\text{Treynor's measure} = \frac{\text{Excess return on portfolio } p}{\text{Beta of portfolio } p}$$

$$= \frac{\begin{array}{c}\text{Average rate of return} \\ \text{on portfolio } p\end{array} - \begin{array}{c}\text{Average rate of return} \\ \text{on a risk-free investment}\end{array}}{\text{Beta of portfolio } p}$$

The numerator of the Treynor measure is the risk premium earned by the portfolio; the denominator, the systematic risk (beta). Hence, the Treynor measure reflects the excess return earned per unit of risk. As systematic risk is the measure of risk, the Treynor measure implicitly assumes that the portfolio is well diversified.

Sharpe Measure The Sharpe measure is similar to the Treynor measure except that it employs standard deviation, not beta, as the measure of risk. Thus,

$$\text{Sharpe measure} = \frac{\begin{array}{c}\text{Average rate of return} \\ \text{on portfolio } p\end{array} - \begin{array}{c}\text{Average rate of return} \\ \text{on a risk-free investment}\end{array}}{\text{Standard deviation of return of portfolio } p}$$

Hence, the Sharpe measure reflects the excess return earned on a portfolio per unit of its total risk (standard deviation).

Note the following: (i) Both the measures, the Treynor measure as well as the Sharpe measure, postulate a linear relationship between risk and return though they employ different measures of risk. (ii) For a perfectly diversified portfolio both the measures give identical rankings because in such cases the total risk and systematic risk are the same.

Jensen Measure Like the Treynor measure, the Jensen measure or Jensen's Alpha is based on the capital asset pricing model. It reflects the difference between the return actually earned on a portfolio and the return the portfolio was supposed to earn, given its beta as per the capital asset pricing model. Thus, the Jensen measure is:

$$\begin{matrix}\text{Average}\\ \text{return on}\\ \text{portfolio } p\end{matrix} - \left(\begin{matrix}\text{Risk-free}\\ \text{return}\end{matrix} + \begin{matrix}\text{Portfolio}\\ \text{beta}\end{matrix}\left(\begin{matrix}\text{Average return}\\ \text{on market}\\ \text{portfolio}\end{matrix} - \begin{matrix}\text{Risk}\\ \text{free}\\ \text{return}\end{matrix}\right)\right)$$

Fund evaluation services often place heavy reliance on Alpha because it is a risk-adjusted measure. A positive Alpha is considered good and a negative Alpha bad. John C. Bogle, however, is critical of such emphasis on Alpha. He argues: "But Alphas are volatile and can swiftly move from + to –. In my view, Alpha because of its unpredictable and backward-looking nature is a counterproductive measure. I believe Alpha is a flawed measure of what to expect from a fund and should generally be ignored."[18] The essence of his argument is that the past performance of an equity mutual fund cannot predict its future performance.

The M^2 Measure Leah Modigliani and Franco Modigliani,[19] Nobel Laureate in Economics, proposed a variant of Sharpe measure which has been dubbed as the M^2 measure (for Modigliani-squared).

The M^2 measure is defined as

$$M^2 = r_p{}^* - r_M$$

where $r_p{}^*$ is the return on an "adjusted" portfolio whose volatility matches the volatility of the market index and r_M is the return on the market index.

The "adjusted" portfolio (P*) is a "managed" portfolio (P) mixed with a position in T-bills in such a way that it (P*) has the volatility (defined as standard deviation) of the market index. To illustrate how the "adjusted" portfolio is constructed, let us consider the following data for a certain sample period during which the return on T-bills was 6%.

	Portfolio P (A managed portfolio)	Market Index
Average return	30%	22%
Beta	1.2	1.0
Standard deviation	50%	30%

Since the managed portfolio has 1.667 times the standard deviation of the market index, the "adjusted" portfolio would be invested 60 percent in the managed portfolio and 40 percent in T-bills. Hence $r_p{}^*$, the return on the "adjusted" portfolio, is 20.4% [0.6 (30%) + 0.4 (6%)] and the M^2 measure is: 20.4% – 22.00% = -1.6%

The M^2 measure, compared to the Sharpe measure, is easier to interpret as it is expressed as a rate of return. Hence, it has gained in popularity.

Illustration To illustrate the four measures of portfolio performance, let us look at the returns on the portfolios of three mutual funds, A, B, and C over a 9 year period, along with the return on a market index and the risk-free return, given in Exhibit 21.11.

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[18] John C. Bogle, *op. cit.*

[19] Franco Modigliani and Leah Modigliani, "Risk-Adjusted Performance," *Journal of Portfolio Management* , Winter 1997.

Exhibit 21.11 ***Annual Returns for Three Mutual Funds and a Market Index***

Period	*Fund A*	*Fund B*	*Fund C*	*Return on market*	*Risk-free return*
1	– 38.7	–16	–33	–26	7.9
2	39.6	39.4	30	36.9	5.8
3	11.1	34.3	18.2	23.6	5.0
4	12.7	–6.9	–7.3	–7.2	5.3
5	20.9	3.2	4.9	6.4	7.2
6	35.5	28.9	30.9	18.2	10.0
7	57.6	24.1	34.7	31.5	11.5
8	–7.8	0.0	6.0	–4.8	14.1
9	22.8	23.4	33.0	20.4	10.7
Mean: $\bar{R}_p$	17.1	14.5	13.0	11	8.6
Standard deviation: σ_p	28.1	19.7	22.8	20.5	_
Beta: β_p	1.20	0.92	1.04	1.00	_

Given the data in Exhibit 21.11 the performance of the three funds *A*, *B*, and *C* is as shown in Exhibit 21.12.

Performance Attribution Apart from calculating risk-adjusted returns, practitioners also want to ascertain the causes for superior or inferior investment performance.

A commonly followed method of performance attribution decomposes portfolio performance into three components: (i) asset allocation choice across three broad asset classes, viz., stocks, bonds, and money market instruments; (ii) sector choice within each asset class; and (iii) security selection within each sector.

Exhibit 21.12 ***Performance Evaluation of the Three Funds***

		Treynor Measure: $\dfrac{\bar{R}_p - R_f}{\beta_p}$
Fund *A*	:	$\dfrac{17.1 - 8.6}{1.20} = 7.1$
Fund *B*	:	$\dfrac{14.5 - 8.6}{0.92} = 6.41$
Fund *C*	:	$\dfrac{13.0 - 8.6}{1.04} = 4.23$
Market Index	:	$\dfrac{11.0 - 8.6}{1.0} = 2.4$

(*Contd.*)

		Sharpe Measure: $\frac{\bar{R}_p - R_f}{\sigma_p}$
Fund *A*	:	$\frac{17.1 - 8.6}{28.1} = 0.302$
Fund *B*	:	$\frac{14.5 - 8.6}{19.7} = 0.299$
Fund *C*	:	$\frac{13.0 - 8.6}{22.8} = 0.193$
Market Index	:	$\frac{11.0 - 8.6}{20.5} = 0.117$

		Jensen Measure: $\bar{R}_p - [R_f + \beta_p (\bar{R}_M - R_f)]$
Fund *A*	:	17.1 – [8.6 + 1.20 (2.4)] = 5.62
Fund *B*	:	14.5 – [8.6 + 0.92 (2.4)] = 3.69
Fund *C*	:	13.0 – [8.6 + 1.04 (2.4)] = 1.90
Market Index	:	0 (By definition)

		M^2 Measure : $M^2 = r_p^* - r_M$
Fund *A*	:	(0.730 × 17.1 + 0.270 × 8.6) – 11.000 = 3.805
Fund *B*	:	(1.041 × 14.5 – 0.041 × 8.6) – 11.000 = 3.742
Fund *C*	:	(0.899 × 13.0 – 0.101 × 8.6) – 11.000 = – 0.182
Market Index	:	(1.000 × 11.0 – 0) – 11.000 = 0

The first step in performance attribution is to establish a benchmark level of performance called the bogey; it reflects the returns the portfolio manager would earn by following a completely passive strategy. This means allocating funds across broad asset classes in accordance with a "neutral" allocation reflecting the risk tolerance of the investor and holding an "index" portfolio within each asset class.

The second step in portfolio attribution is to determine the contribution made by the decisions in the areas of asset allocation, sector choice, and security selection.

Problem with Performance Measurement

Performance measurement is basically a good idea. In practice, however, it is often not applied properly. Performance is measured too frequently and judgments are formed on the basis of very short-time frames. Such an approach has certain negative or dysfunctional consequences:

- It has attempted to quantify a function that is only partly amenable to quantification.
- It has led to 'short-termism' in investment decisions.
- It has promoted the cult of market timing.

It must be recognised that it is not feasible to evaluate the ability of a money manager over a short period of one to three years when it should be appraised over a period of five to seven years. As Peter O. Dietz and Jeannette R Kirschman wrote: "For accuracy of computations, performance should be computed as often as practical, but results should not be taken as significant by the investor or the investment manager until a reasonable period of time, such as a market cycle for equities or an interest rate cycle for fixed income securities, has elapsed."[20]

SUMMARY

- Investment management, also referred to as portfolio management, is a complex process or activity that may be divided into seven broad phases: (i) specification of investment objectives and constraints, (ii) choice of asset mix, (iii) formulation of portfolio strategy, (iv) selection of securities, (v) portfolio execution, (vi) portfolio revision, and (vii) portfolio evaluation.
- Investment objectives are expressed in terms of return and risk.
- After providing for a residential house, suitable insurance cover, and cash reserve, the asset mix decision is concerned mainly with the stock-bond mix.
- The conventional wisdom on the stock-bond mix says that higher tolerance for risk and longer investment horizon imply a greater allocation to stocks compared to bonds and vice versa.
- Two broad choices are available with respect to portfolio strategy, viz., an active strategy or a passive strategy. An active strategy is followed by most investment professionals and aggressive investors who strive to earn superior returns, after adjustment for risk. The four principal vectors of an active strategy are: market timing, sector rotation, security selection, and use of a specialised concept.
- A passive portfolio strategy calls for creating a well-diversified portfolio at a pre-determined level of risk and holding it relatively unchanged over time, unless it becomes inadequately diversified or inconsistent with the investor's risk-return preferences.
- The factors that are commonly considered in selecting fixed income avenues are: yield to maturity, risk of default, tax shield, and liquidity.
- Three broad approaches are employed for the selection of equity shares: technical analysis, fundamental analysis, and random selection.
- People trade for **cognitive** and **emotional** reasons.

[20] Peter O. Dietz and Jannette R. Kirschman, " Evaluating Portfolio Performance" in *Managing Investment Portfolios:* A *Dynamic Process*, 2/e edited by John L. Maginn and Donald L. Tuttle, New York: Warren, Gorham & Lamont, 1990.

- The securities market appears to be thronged by four types of players or transactors: value-based transactors (VBTs), information-based transactors (IBTs), liquidity-based transactors (LBTs), and pseudo-information based transactors (PIBTs). Generally, the dealer or the market maker intermediates between these transactors.
- You have to periodically monitor and revise your portfolio. This usually entails two things, viz., **portfolio rebalancing** and **portfolio upgrading**.
- The key dimensions of portfolio performance evaluation are rate of return and risk.
- The following measures may be employed to measure the average rate of return: arithmetic average, internal rate of return, and geometric average.
- The two commonly used measures of risk are standard deviation and beta.
- The popularly employed measures of portfolio performance are: Treynor measure, Sharpe measure, Jensen measure and M^2 measure.

QUESTIONS

1. Spell out the key steps involved in portfolio management.
2. Describe the dimensions of investment policy.
3. Discuss the conventional wisdom on asset mix.
4. Explain the fallacy of time diversification and show why it still makes sense.
5. Discuss the key vectors of active portfolio strategy.
6. What is passive strategy?
7. Describe the key players in security markets.
8. What guidelines should you bear in mind while executing transactions?
9. Briefly describe the three basic policies with respect to portfolio rebalancing.
10. How would you carry out portfolio performance evaluation?

SOLVED PROBLEMS

1. A fund begins with Rs 100 million and reports the following results for three periods:

	Period		
	1	*2*	*3*
Rate of return	7%	16%	10%
Net inflow (end of period) Rs in million	10	2	0

Compute the arithmetic, time-weighted, and rupee-weighted average returns.

Solution

(a) The arithmetic average return is:
$(7 + 16 + 10)/3 = 11\%$ per period

(b) The time-weighted (geometric average) return is:
$[(1 + .07) \times (1 + .16) \times (1 + .10]^{1/3} - 1 = .109$ or 10.9% per period.

(c) The rupee-weighted average (IRR) return is computed below:

	Period		
	1	*2*	*3*
Rate of return earned	7%	16%	10%
Beginning value of assets	100	117	137.72
Investment profit during the period (Rate of return × Assets)	7	18.72	13.772
Net inflow at the end	10	2	–
Ending value of assets	117	137.72	151.492

	Time			
	0	*1*	*2*	*3*
Net cash flow	– 100	– 10	– 2	151.492

The IRR of this sequence is

$$100 + \frac{10}{(1+r)} + \frac{2}{(1+r)^2} = \frac{151.492}{(1+r)^3}$$

$$r = 11.05 \text{ percent}$$

2. Consider the following information for three mutual funds, *A*, *B*, and *C*, and the market.

	Mean return (%)	*Standard deviation (%)*	*Beta*
A	12	18	1.1
B	10	15	0.9
C	13	20	1.2
Market index	11	17	1.00

The mean risk-free rate was 6 percent. Calculate the Treynor measure, Sharpe measure, and Jensen measure for the three mutual funds and the market index.

Solution

Treynor Measure : $\dfrac{\bar{R}_p - R_f}{\beta_p}$

Fund *A* : $\dfrac{12-6}{1.1} = 5.45$

Fund *B* : $\dfrac{10-6}{0.9} = 4.44$

Fund *C* : $\dfrac{13-6}{1.2} = 5.83$

Market index : $\dfrac{11-6}{1.0} = 5.00$

Sharpe Measure : $\dfrac{\bar{R}_p - R_f}{\sigma_p}$

Fund *A* : $\dfrac{12-6}{18} = 0.333$

Fund *B* : $\dfrac{10-6}{15} = 0.267$

Fund *C* : $\dfrac{13-6}{20} = 0.350$

Market index : $\dfrac{11-6}{17} = 0.294$

Jensen Measure: $\bar{R}_p - [R_f + \beta_p(\bar{R}_p - R_f)]$

Fund *A*: $12 - [6 + 1.1\,(5)] = 0.5$

Fund *B*: $10 - [6 + 0.9\,(5)] = -0.5$

Fund *C*: $13 - [6 + 1.2\,(5)] = 1.0$

Market Index: 0 (By definition)

PROBLEMS

1. Consider the following information for three mutual funds, *P*, *Q*, and *R*, and the market.

	Mean return	*Standard deviation*	*Beta*
P	15%	20%	0.90
Q	17	24	1.10
R	19	27	1.20
Market Index	16	20	1.00

The mean risk-free rate was 10 percent.
Calculate the Treynor measure, Sharpe measure, Jensen measure, and M^2 for the three mutual funds and the market index.

2. A fund begins with Rs 200 million and reports the following results for four periods:

	Period			
	1	*2*	*3*	*4*
Rate of return	5%	12%	16%	3%
Net inflow (End of period, Rs in million)	10	50	30	0

Compute the arithmetic, time-weighted and rupee weighted average returns.

■ ■

MINICASE

You have been employed as a financial planner by Acme Investments, which, inter alia, advises clients on their investments.

You have been assigned the task of developing an appropriate asset mix for three clients, Mahesh, Praveen, and Deepika.

Mahesh : A Retiree with Modest Means Mahesh retired recently from government service. He owns an apartment where he lives with his wife who is a homemaker. Ramesh received a sum of Rs 14 lakh from provident fund, gratuity, and so on from his employer at the time of retirement. In addition he has other savings of Rs 2 lakh. Ramesh is entitled to a pension income of about Rs 75,000 per year which will probably move in line with inflation over time. Ramesh's primary investment goal is to generate an additional income of at least Rs 75,000 per year to meet his living expenses. In addition, he would like to prevent erosion of his capital as he and his wife do not have the ability to earn income outside their portfolio. Finally, he wants to increase his wealth to some extent.

Praveen : A Young Executive with a Promising Future Praveen is an ambitious twenty-five-year old who graduated recently from a prestigious business school. He is working as a credit officer in a multinational bank drawing a handsome salary. Praveen expects his earnings to rise substantially over time as his career advances. Praveen recently inherited a legacy of Rs 1,000,000 from his grandfather's estate. Praveen wants to build a sizeable portfolio in the next twenty years or so to achieve financial freedom to retire early and pursue other interests in life or even start a venture of his own.

Deepika : A Handicapped Millionaire Deepika is an unmarried 19-year old girl who recently met with a crippling accident that has created a life-long disability—it also forced her to abandon her studies mid-way. Deepika inherited Rs 6,000,000 from her father's estate—this is her only financial asset. Deepika plans to stay alone in an owned or rented apartment with a live-in maid and work as a volunteer for the 'Home for the Disabled' to spend her time gainfully. Apart from rent, Deepika expects her living expenses to be about Rs 120,000 a year. Of course, they are expected to increase over time in the wake of inflation If Deepika buys an apartment for her use it will cost her Rs 1,800,000. Otherwise, she will have to pay a rent of about Rs 90,000 per year which will be periodically revised upwards. Deepika attaches almost equal importance to current income as well as growth in income to protect her from the ravages of inflation (which may be 6 percent per year).

APPENDIX 21 A
ASSET ALLOCATION

The term 'asset allocation' means different things to different people in different contexts. We will look at the following versions of asset allocation:

- Strategic asset allocation
- Tactical asset allocation
- Drifting asset allocation
- Balanced asset allocation
- Dynamic (insured) asset allocation

While strategic asset allocation is concerned with establishing the long-term asset mix of a portfolio, the other types of asset allocation refer to what the portfolio manager does in response to evolving market conditions.

Strategic Asset Allocation The strategic asset allocation refers to the long-term 'normal' asset mix sought by the investor (or portfolio manager) to achieve an ideal blend of risk and return. It may be established with the help of either an informal or a formal approach.

Informal Approach In Chapter 21 we discussed the informal approach to strategic asset allocation. Essentially, it involves three broad steps:

1. Subjectively assess the risk tolerance as 'low', 'medium', or 'high'.
2. Define the investment horizon as 'short', 'intermediate', or 'long'.
3. Establish the optimal strategic asset allocation using some 'rule of thumb'.

Formal Approach The formal approach to strategic asset allocation involves the following steps:

1. Develop quantitative forecasts of expected returns, standard deviations, and correlations of the two asset categories, viz. stocks and bonds. Exhibit 21A.1A shows illustrative forecasts.
2. Define the efficient frontier which contains all the efficient portfolio options available to the investor. Remember that a portfolio is efficient if (and only if) there is no alternative with (i) the same $E(R_p)$ and a lower $\sigma_{p,}$ (ii) the same σ_p and a higher $E(R_p)$, or (iii) a higher $E(R_p)$ and a lower σ_p. Exhibit 21A.1B shows the efficient frontier which represents the best possible combinations of stocks and bonds.
3. Specify the utility indifference curves reflecting the risk disposition of the investor. Illustrative utility indifference curves are shown in Exhibit 21A.1C. Note that all points lying on a utility indifference curve provide the same level of satisfaction. For example, points X and Y which lie on the utility indifference curve I_1 offer the same level of satisfaction. The level of satisfaction increases as one moves leftward. The utility indifference curve I_2 offers a higher level of satisfaction as compared to the utility indifference curve I_1; and so on.

4. Choose the optimal portfolio (asset allocation). The optimal portfolio is found at the point of tangency between the efficient frontier and a utility indifference curve. This point represents the highest level of utility the investor can reach. Exhibit 21A.1D shows that the optimal portfolio (strategic asset allocation) for the investor is represented by point *O*.

Tactical Asset Allocation Tactical asset allocation involves a conscious departure from the strategic or normal asset mix based on rigorous and objective measurement of value. The objective of tactical asset allocation is to enhance the performance of the portfolio through an opportunistic shift in the asset mix in response to changing patterns of reward in the capital market. The distinctive features of tactical asset allocation are as follows:

- It is guided by objective measures of prospective values like earnings yield and yield to maturity. Hence it is essentially a value-oriented approach.
- It is inherently contrarian in nature as it involves buying on a market decline and selling on a market rise.

Note that tactical asset allocation entails market timing. The only difference between the traditional market timing and tactical asset allocation (a modern version for market timing) is that the latter is supposed to be analytically disciplined and based on objective measures of value.

Drifting Asset Allocation This policy advocates that the initial portfolio be left undisturbed. It is essentially a 'buy and hold' policy. Irrespective of what happens to relative values, no rebalancing is done.

Exhibit 21A.2 shows the payoff diagram for a 'buy-and-hold' policy if the initial stock: bond mix is 50:50. This exhibit illustrates the following features of the 'buy-and-hold' policy.

Exhibit 21A.1 ***Strategic Asset Allocation***

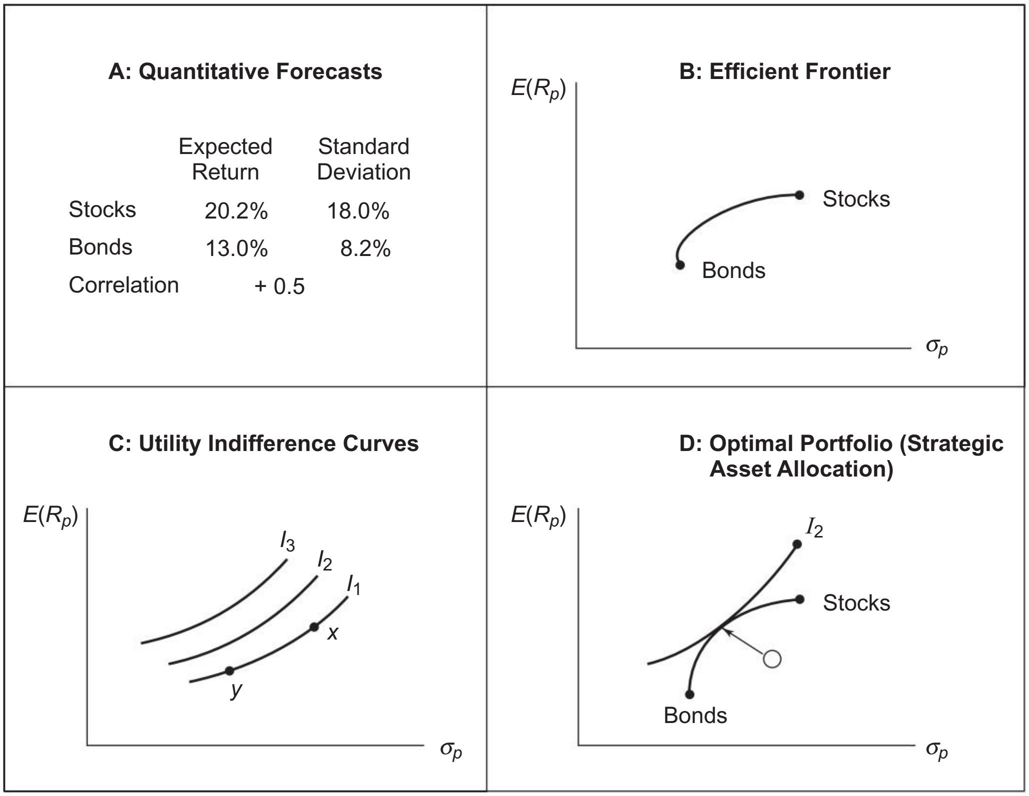
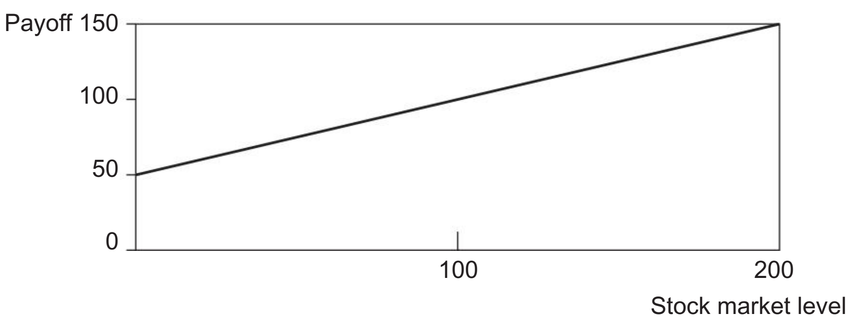


Exhibit 21A.2 ***Payoff Diagram for a Buy and Hold Policy***



- The value of portfolio is linearly related to that of the stock market.
- While the portfolio value cannot fall below the value of the initial investment in bonds, its upside potential is unlimited.
- When stocks outperform bonds, the higher the initial percentage in stocks, the better the performance of the 'buy-and-hold' policy. On the other hand, when stocks under-perform bonds, the higher the initial percentage in stocks, the worse the performance of the 'buy-and-hold' policy.

Balanced Asset Allocation A balanced asset allocation policy calls for a periodical rebalancing of the portfolio to ensure that the stock-bond mix is in line with the long-term 'normal' mix. Put differently, this policy calls for maintaining an exposure to stocks that is a constant proportion of portfolio value. If the desired constant mix of stocks and bonds is say 50:50, this policy calls for rebalancing the portfolio when relative values of its components change, so that the target proportions are maintained. Thus, this policy, unlike the 'buy-and-hold' policy is a 'do something' policy. The kind of rebalancing that is done under this policy is shown in Exhibit 21A.3. The payoff associated with the constant mix policy is shown graphically in Exhibit 21A.4.

Dynamic (or Insured) Asset Allocation Dynamic (or insured) asset allocation involves shifting the asset mix mechanistically in response to changing market conditions. For example, the fund manager may follow a constant proportion portfolio insurance (CPPI) policy. A CPPI policy takes the following form:

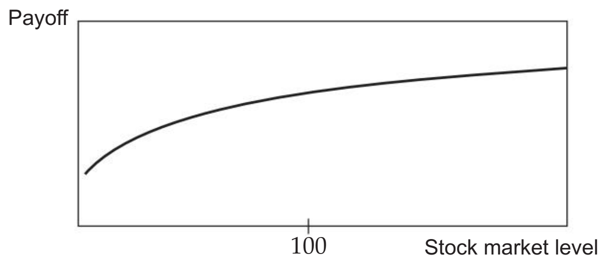
$$\text{Investment in stocks} = m\ (\text{Portfolio value} - \text{Floor})$$

where m is greater than 1.

Exhibit 21A.3 ***Portfolio Rebalancing Under a Constant Mix Policy When the Stock-Bond Ratio is 50:50***

Stock Market Level		Stocks	Bonds	Total	Stocks to Bonds Switch	Bonds to Stocks Switch
	After rebalancing	39.4	39.4	78.8		
60	Before rebalancing	33.8	45	78.8		5.6
	After rebalancing	45	45	90		
80	Before rebalancing	40	50	90		5.0
100	**Starting Level**		50	50	100	
150	Before rebalancing	75	50	125	12.5	
	After rebalancing	62.5	62.5	125		
200	Before rebalancing	83.3	62.5	145.8	10.4	
	After rebalancing	72.9	72.9	145.8		
250	Before rebalancing	91	72.8	163.8	9.1	
	After rebalancing	81.9	81.9	163.8		

Exhibit 21A.4 ***Payoff Diagram for a Constant Mix Policy***



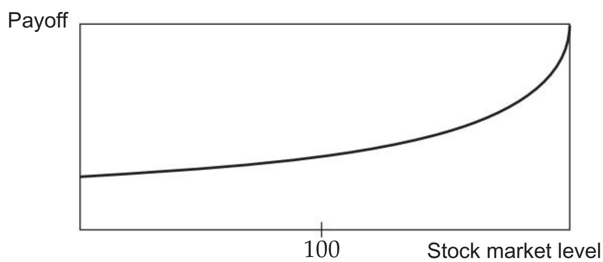
To illustrate the pattern of investment associated with such a policy, let us assume a wealth of 100,000, a floor of 75,000, and a multiplier of 2. As the initial cushion (the difference between the portfolio value and the floor) is 25,000, the initial investment in stocks is 50,000 (twice the initial cushion). So the initial portfolio mix is 50,000 in stocks and 50,000 in bonds.

Now, suppose that the stock market falls from 100 to 80. As a result, the value of the stocks in the portfolio falls from 50,000 to 40,000. This means that the value of portfolio declines to 90,000 thereby reducing the cushion of 15,000. As per the CPPI policy, the stock component should be 30,000 ($2 \times 15{,}000$). So, 10,000 of stocks should be sold and the proceeds invested in bonds. If stocks decline further, more should be sold, and so on.

What happens if the stock market rises from 100 to 150? The value of stocks in the portfolio rises from 50,000 to 75,000. This means that the value of portfolio jumps to 125,000, thereby raising the cushion to 50,000. As per the CPPI policy, the stock component should go up to 100,000. This necessitates selling bonds worth 25,000 and re-investing the proceeds in stocks. If stocks rise further in value, more stocks should be bought, and so on.

From the above analysis, we find that the CPPI policy calls for 'selling stocks as they fall and buying stocks as they rise'. This implies that this policy is the opposite of the constant mix policy which calls for 'buying stocks as they fall and selling stocks as they rise.' Hence, this policy has a convex payoff curve (that increases at an increasing rate as one moves from left to right). This is shown in Exhibit 21A.5.

Exhibit 21A.5 ***Payoff Diagram for a Constant Proportion Portfolio Insurance Policy***

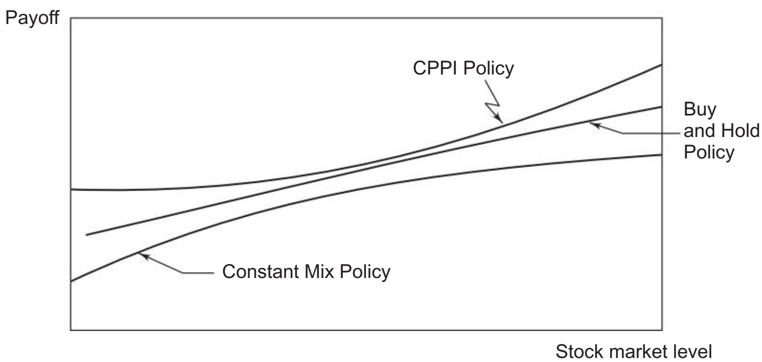


Comparative Evaluation While tactical asset allocation calls for discretionary shifts, the remaining three kinds of asset allocation, viz. the drifting asset allocation, the balanced asset allocation, and the dynamic (or insured) asset allocation involve asset-mix changes in accordance with a fixed rule. It may be instructive to compare them.

As discussed earlier, the payoffs associated with the drifting asset allocation policy (or buy and hold policy), the balanced asset allocation policy (or constant mix policy), and the dynamic asset allocation policy (typified by the CPPI policy) are represented by a straight line, a concave curve, and a convex curve respectively. Exhibit 21A.6 shows these payoffs. A look at this exhibit suggests that if the stock market moves in only one direction, either up or down, the best policy is the CPPI policy and the worst policy is the balanced asset allocation policy. In between lies the drifting asset allocation policy.

However, if the stock market reverses itself frequently, rather than moving in the same direction, the balanced asset allocation policy tends to be superior to other policies. To illustrate this point, let us look at the payoff from an initial investment of 100,000 when the market moves from 100 to 80 and back to 100 under the following three policies.

Exhibit 21A.6 ***Payoffs Associated with Various Portfolio Rebalancing Policies***



- A drifting asset allocation policy under which the initial stock-bond mix is 50:50
- A balanced asset allocation policy under which the stock-bond mix is 50:50
- A CPPI policy which takes the form:
  Investment in stocks = 2 (Portfolio value – 75,000)

The portfolio compositions and their values for the three policies are calculated in Exhibit 21A.7.

The performance features of the three policies are summarised below:

Drifting Asset Allocation Policy

- Gives rise to a straight line payoff
- Provides a definite downside protection

- Performs between the constant mix policy and the constant proportion portfolio insurance policy.

Balanced Asset Allocation Policy

- Gives rise to a concave payoff
- Does not provide much downward protection and tends to do relatively poorly in up market
- Tends to do very well in flat, but fluctuating, markets.

CPPI Policy

- Gives rise to a convex payoff curve
- Provides good downside protection and performs well in up market.
- Tends to do very poorly in flat, but fluctuating, markets.

Exhibit 21A.7 ***Portfolio Composition and Payoffs for the Three Policies***

Market Level is 100						
	Portfolio					
	Stocks	Bonds	Total			
Buy and Hold Policy	50,000	50,000	100,000			
Constant Mix Policy	50,000	50,000	100,000			
Constant Proportion Portfolio Insurance Policy	50,000	50,000	100,000			
Market Level Falls to 80						
	Portfolio (before rebalancing)			Portfolio (after rebalancing)		
	Stocks	Bonds	Total	Stocks	Bonds	Total
Buy and Hold Policy	40,000	50,000	90,000	40,000	50,000	90,000
Constant Mix Policy	40,000	50,000	90,000	45,000	45,000	90,000
Constant Proportion Portfolio Insurance Policy	40,000	50,000	90,000	30,000	60,000	90,000
Market Level Rises to 100						
	Portfolio (before rebalancing)			Portfoilo (after rebalancing)		
	Stocks	Bonds	Total	Stocks	Bonds	Total
Buy and Hold Policy	50,000	50,000	100,000	50,000	50,000	100,000
Constant Mix Policy	56,250	45,000	101,250	50,625	50,625	101,250
Constant Proportion Portfolio Insurance Policy	37,500	60,000	97,500	45,000	52,500	97,500

Why Various Policies Coexist Tactical asset allocation seems to offer a higher long-term reward without the corresponding increase in risk. Does it mean that the basic axiom of finance which says "risk and return go hand in hand" is violated.

The puzzle may be resolved by the utility theory. The connection between risk and return is not inviolate if a higher return strategy provides lower utility than a lower return strategy that offers greater comfort. Let us see how this may happen.

As the market advances, investors' wealth increases but prospective returns diminish; likewise, as the market declines, investors' wealth decreases but prospective returns improve. Investors broadly display four kinds of response to these changes:

A. Some investors are unaffected by fluctuations in wealth and their risk tolerance remains the same. They are the true long-term investors. When the market advances and prospective stock returns diminish, these investors increase their exposure to bonds. On the other hand, when the market declines and prospective returns increase, these investors increase their exposure to stocks. These investors naturally resort to **tactical asset allocation**.

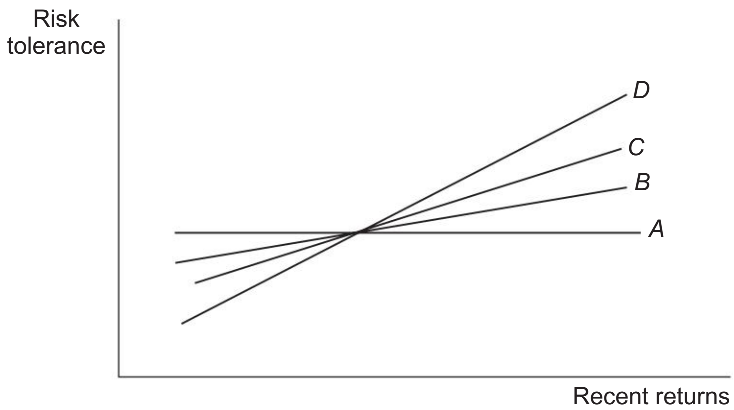
B. Other investors are mildly affected by changes in wealth. If their wealth increases, in the wake of a market advance, their risk tolerance too increases, albeit slightly. Similarly, a market decline diminishes their risk to tolerance, though slightly. These investors naturally prefer **balanced asset allocation**.

C. Still another class of investors displays a somewhat greater sensitivity to recent changes in wealth. As the market rises, their risk tolerance increases and they feel no need to decrease their exposure to stocks, despite diminished prospective returns. Likewise, when the market falls, their risk tolerance diminishes and they feel no need to increase their exposure to stocks. These investors are the natural candidates for the policy of **drifting asset allocation**.

D. Finally, there is a class of investors which reacts very sharply to recent market movements. If the market rises, their risk tolerance increases sharply and they want to increase their exposure to stocks, notwithstanding the diminished prospects. If the market falls, their risk tolerance falls sharply and they want to diminish their exposure to stocks. These investors are natural candidates for a policy of **dynamic (or insured) asset allocation** which says "Buy after a market rise and sell after a market fall".

Exhibit 21A.8 displays graphically how the risk tolerance of these different classes of investors varies in response to recent returns. Thus we find that there are natural candidates for tactical asset allocation, balanced asset allocation, drifting asset allocation, and dynamic (or insured) asset allocation. Just as tactical asset allocation is right for some investors, dynamic asset allocation is right for others. The reason for this is that an improvement in long-term return does not necessarily imply an improvement in the 'utility' of all investors. Remember that utility reflects both *return* as well as *comfort*.

Exhibit 21A.8 ***Risk Tolerance in Response to Recent Returns***



QUESTIONS

1. What is strategic asset allocation?
2. List the three steps involved in the informal approach to strategic asset allocation.
3. Discuss the steps involved in the formal approach to strategic asset allocation.
4. What is tactical asset allocation? What are its distinctive features?
5. What are the key features of a 'buy-and-hold' policy?
6. What does a constant mix policy entail?
7. Illustrate the nature of Constant Proportion Portfolio Insurance (CPPI) policy.
8. Evaluate comparatively the drifting asset allocation policy, the balanced asset allocation policy, and the CPPI policy?
9. Show how different kinds of investors are natural candidates for different asset allocation policies?

PROBLEM

1. Show the pay off from an initial investment of 100,000 when the market moves from 100 to 80 and back to 100 under the following policies:
   - A drifting asset allocation policy under which the initial stock-bond mix is 60:40.
   - A balanced asset allocation policy under which the stock-bond mix is 60:40
   - A CPPI policy which takes the form: Investment in stocks = 3 (portfolio value – 80,000).

APPENDIX 21 B
FAMA'S MEASURE OF NET SELECTIVITY[1]

The Jensen measure of portfolio performance was defined as:

$$R_p - [R_f + \beta_p (R_M - R_f)] \tag{21B.1}$$

where R_p is the return earned on the portfolio, R_f is the risk-free return, β_p is the portfolio beta, and R_M is the return earned on the market portfolio

The Jensen measure reflects the difference between the return earned on the portfolio $[R_p]$ and the return posited by the security market line $[R_f + \beta_p (R_M - R_f)]$. Put differently the Jensen measure is based on the systematic risk (β) and hence looks at the security market line. Graphically the Jensen measure looks at the vertical distance of the portfolio from the SML (security market line), shown in Exhibit 21B.1. For the purpose of illustrating the Jensen measure in this exhibit, we have assumed that R_f = 10%, R_M = 16%, R_p = 19%, and β_p = 1.3.

Fama proposed a measure of net selectivity based on the total risk of the portfolio. His measure is:

$$R_p - \left(R_f + \frac{\sigma_p}{\sigma_M} (R_M - R_f) \right) \tag{21B.2}$$

The Fama measure of net selectivity reflects the difference between the return earned on the portfolio $[R_p]$ and the return posited by the capital market line. Graphically, the Fama measure looks at the vertical distance of the portfolio from the CML (capital market line) as shown in Exhibit 21B.2. For the purpose of illustrating the Fama measure in this exhibit, we have assumed that R_f = 10%, R_M = 16%, σ_M = 20%, and σ_p = 35%.

Fama's measure is based on a decomposition of the observed return of a portfolio (R_p) into four components as follows:

1. The risk-free return: R_f
2. The impact of systematic risk: $\beta_p (R_M - R_f)$
3. The impact of imperfect diversification: $(\sigma_p/\sigma_M - \beta_p)(R_M - R_f)$
4. The net superior returns due to selectivity: $R_p - \left(R_f + \frac{\sigma_p}{\sigma_M} (R_M - R_f) \right)$

Note that 1, 2, 3, and 4 add up to R_p. A word of explanation about 3, the impact of imperfect diversification, may be in order.

[1] Eugene F. Fama, "Components of Investment Performance,'' *Journal of Finance* (June 1972).

Exhibit 21B.1 ***Security Market Line***

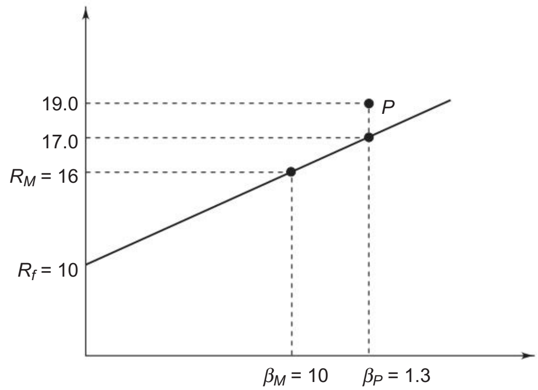
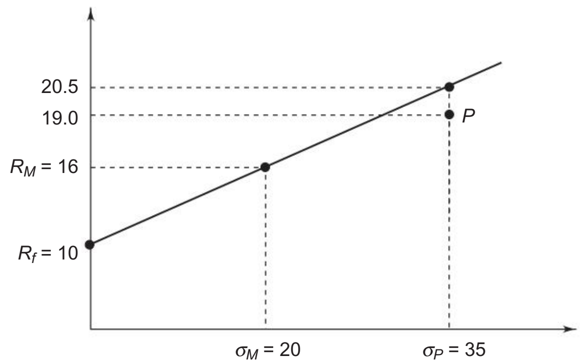


Exhibit 21B.2 ***Capital Market Line***



A portfolio is said to be perfectly diversified if its returns are perfectly correlated with the returns on the market portfolio. This means that ρ_{pM}, the coefficient of correlation between the return on portfolio P and the return on the market portfolio M, is 1. Since,

$$\beta_p = \frac{\rho_{pM}\sigma_p\sigma_M}{\sigma_M^2} = \rho_{pM}\frac{\sigma_p}{\sigma_M}$$

$\rho_{pM} = 1$ implies that

$$\beta_p = \frac{\sigma_p}{\sigma_M}$$

Hence when the portfolio is perfectly diversified, the impact of imperfect diversification is, as expected, nil

$$(\beta_p - \beta_p)\,(R_M - R_f) = 0$$

Illustration The return on a mutual fund portfolio during the last few years was 18%, when the return on the market portfolio was 15%. The standard deviation of the portfolio return was 28% whereas the standard deviation of the market portfolio return was 20%. The portfolio beta was 1.2. The risk-free rate was 9%.

The portfolio return may be decomposed into its four components as follows:

1. Risk–free return, R_f: 9%
2. The impact of systematic return, $b_p\ (R_M - R_f)$: 1.2 (15 – 9) = 7.2%
3. The impact of imperfect diversification,

$$\left(\frac{\sigma_p}{\sigma_M} - \beta_p\right) (R_M - R_f)\text{: } \left(\frac{28}{20} - 1.2\right) (15 - 9) = 1.2\%$$

4. The net superior returns due to selectivity,

$$R_p - \left(R_f + \frac{\sigma_p}{\sigma_M}(R_M - R_f)\right)\text{: } 18 - \left(9 + \frac{28}{20}(15 - 9)\right) = 0.6\%$$

PROBLEM

1. The return on a mutual fund portfolio during the last few years was 16%, when the return on the market portfolio was 18%. The standard deviation of the portfolio return was 14% whereas the standard deviation of the market portfolio return was 16%. The portfolio beta was 1.2. The risk-free rate was 10%. Decompose the portfolio return into four components as suggested by Fama.

Chapter **22**

Guidelines for Investment Decisions

What It All Comes To

LEARNING OBJECTIVES

After studying this chapter, you should be able to:

- Explain the basic guidelines that all investors should follow.
- Discuss the guidelines that are specially relevant for aggressive equity investors.
- Discuss the guidelines that are specially relevant for conservative equity investors.

You have covered a vast terrain in your journey through this book. You have learnt about the operations of the securities market, the characteristics of various investment avenues available to you, the concept of time value of money, the basic models of security evaluation, the approach of fundamental analysis, the tools of technical analysis, the insights provided by modern investment research, and the ways of resolving the key issues relating to the process of portfolio management. It is time now to translate the knowledge, insights, and perspectives gained so far into specific guidelines for investment decision making.

22.1 BASIC GUIDELINES: THE TEN COMMANDMENTS

There are ten commandments of investing which should serve as basic guidelines for all investors. They are as follows.

1. Start saving early and save regularly.
2. Maintain an adequate cash reserve and an appropriate insurance cover.
3. Accord top priority to a residential house.
4. Match your stock-bond mix to your investment situation.
5. Select stocks and bonds (fixed income instruments) judiciously.
6. Avail of tax shelters.
7. Diversify adequately.

8. Periodically review and revise your portfolio.
9. Check your irrationality.
10. Maximise your lifetime financial success.

• Start Saving Early and Save Regularly

Many young people, despite earning well, do not seem to pay much attention to savings and investments. They perhaps believe that they have a long productive career ahead of them and they need not worry about building a nest egg at an early age. They probably do not fully realise the benefit of growth over time. To tap this benefit you should start investing early and invest regularly over a long period. The magic of compounding works wonders over time. Exhibit 22.1 shows the payoffs from long-term investing.

Exhibit 22.1 ***Payoffs from Long-Term Investing***

Amount Invested per Year	*Number of Years*	*8%*	*10%*	*12%*	*15%*	*18%*
10000	10	144,870	159,370	175,490	203,040	235,210
10000	20	457,620	572,750	720,520	1,024,400	1,466,300
10000	30	1,132,830	1,644,940	2,413,300	4, 347,500	7,909,500
10000	40	2.590,560	4,425,900	7,670,900	17,791,000	41,632,000

The importance of starting the saving programme early can be conveyed emphatically by looking at the following table which shows the amount that a person has to save on a monthly basis to accumulate Rs.10,000,000 assuming that the annual rate of return is 10 percent and the investments are made over periods that range from 5 to 30 years.

No. of years	Monthly savings required
30	4400
20	13100
10	48400
5	128100

As John C. Bogle put it: "The slope of the financial mountain you have to climb gets steeper and steeper as time goes on, from a gradual and manageable slope if you have 30 years to invest to a near – insurmountable precipice if the summit must be reached in just five years.[1]

Retirement Planning A financially secure and comfortable retirement is a top priority for every investor. To achieve this goal, the investor must save enough during the pre-retirement period so that he enjoys a certain level of real income during the retirement period and bequeath a certain wealth for his heirs. How much should that savings be? The manner in which it is determined may be illustrated with an example.

[1] John C. Bogle, *op. cit.*

Aman Sharma is 45 years old and his annual income for the just concluded year was Rs. 500,000. He expects his income to increase by 12 percent per year till he retires at the age of 60.

In his post-retirement period, which he expects to be 15 years, Aman Sharma would like his annual income from his financial investments to be 40 percent of his salary income in his last working year. Further, he would like the same to be protected in real terms.

Aman Sharma owns a house and has Rs. 1,000,000 of financial assets. He wants to bequeath the house and Rs. 12,000,000 to his son when he dies.

The current financial assets and the future savings of Aman Sharma would earn a nominal rate of return of 10 percent. The expected inflation rate for the next 30 years is likely to be 5 percent.

What proportion of his salary income should Aman Sharma save till he retires so that he can meet his post-retirement financial goals? This question may be answered in three steps as follows:

Step 1: *Estimate the annual income required in the post-retirement period*

The present annual income of Rs. 500,000 will grow to Rs. 500,000 $(1.12)^{15}$ = Rs. 2,736,783. Forty percent of the same works out to Rs. 1,094,713.

Step 2: *Figure out the corpus required at the time of retirement*

The corpus required at the time of retirement will be:
Present value of the income required in the post-retirement period
+
Present value of financial assets to be bequeathed.
The present value of the income required in the post-retirement period is:
$PVIFA_{r,n}$ x Annual income required
$PVIFA_{4.76\%,\ 15}$ x 1,094,713

$$\left[\frac{1-\dfrac{1}{(1.0476)^{15}}}{.0476}\right] \times 1{,}094{,}713$$

= Rs. 11,549,346

Note that for calculating the PVIFA we have used the real rate of interest (1.10/1.05 – 1 = 0.0476 or 4.76 percent) because the annual income required has to be protected in real terms.

The present value of the financial assets of Rs. 12 million to be bequeathed, evaluated at the time of retirement is:
$PVIF_{10\%,\ 15}$ x Rs. 12,000,000
0.239 x Rs. 12,000,000
= Rs. 2,868,000

So, the total corpus required on retirement is:
Rs. 11,549,346 + Rs. 2,868,000

= Rs. 14,417,346

Step 3: *Estimate the proportion of salary to be saved*

The current financial assets of Rs. 1,000,000 will grow to Rs. 1,000,000 $(1.10)^{15}$ = Rs. 1,000,000 x 4.177 = Rs. 4,177,000

So, the savings during the next 15 years should cumulate to

Rs. 14,417,346 – 4,177,000 = Rs. 10,240,346

Since Aman Sharma will save a fixed proportion (p) of his salary, which in turn will grow at the rate of 12 percent per year for the next 15 years from the current level of Rs. 500,000, the savings stream will be a growing annuity. The value of this growing annuity at the end of 15 years will be:

$$p \times 500{,}000\ (1.12) \left[\frac{1 - \dfrac{(1.12)^{15}}{(1.10)^{15}}}{0.10 - 0.12} \right] (1.10)^{15}$$

$$= p \times 36{,}294{,}736$$

This should be equal to Rs. 10,240,346

So,

$$p = \frac{10{,}240{,}346}{36{,}294{,}736} = 0.282 \text{ or } 28.2 \text{ percent}$$

- **Maintain an Adequate Cash Reserve and an Appropriate Insurance Cover**

Life is uncertain and almost everyone experiences unexpected financial needs. You may lose your job just when your son has met with an accident. To cope with the catastrophes of life, you need an adequate cash reserve and an appropriate insurance cover.

Cash Reserve Some people believe that cash is an idle asset and sitting on a cash balance means foregoing attractive investments. Yet everyone needs a reserve of safe and liquid assets to meet an unexpected medical expense or tide over a period of unemployment. The amount of this reserve may be 3 to 6 months of your monthly expenses.

In what form should you maintain this reserve? The most convenient forms are fixed deposits (which can be prematurely encashed) with banks and money market mutual fund schemes.

Insurance Cover As a protection against various risks, most people need insurance. Inter alia, you need auto insurance, home insurance, health insurance, disability insurance, and life insurance to financially protect yourself (or your family) against the consequences of accidents, illness, disability, and death.

You can take a third party auto insurance cover (which is minimally required by law) or a comprehensive auto insurance cover, depending on the level of protection you want. You can insure your home and its valuables upto a desired limit. You can buy health insurance of the kind that gives you comfort. You can take an appropriate life insurance cover for protecting your dependents.

The Need and Type of Life Insurance The primary purpose of life insurance is to provide financial protection to the dependents, should the insured die without accumulating wealth. Hence, the need for life insurance is a function of (a) the financial requirements of the dependents, and (b) available resources elsewhere. Ignoring inherited wealth, the need for life insurance varies over one's life cycle as follows:

Phase	*Financial requirement of dependents*	*Available resources elsewhere*	*Need for insurance*
Young adulthood (0–25)	None	Negligible	Absent
Family formation and development (25–50)	High	Meagre to modest	High
Pre-retirement (50–60)	Modest	Substantial	Diminished
Retirement	Small	Substantial	Absent

From the foregoing, it is clear that the need for insurance is high in the age bracket of 25 to 50 years. When your need for insurance diminishes, you should considering surrendering your policy.

The primary purpose of insurance is protection, not accumulation of wealth. So choose an insurance policy which provides only insurance and not insurance along with a savings plan. If the insurance policy carries 'living benefits', i.e., it provides monetary benefits to the assured while he is alive, it implies that it combines insurance with savings. Such a policy earns a modest tax-free return on the savings portion. You can perhaps earn a higher return if you invest on your own. Hence, you may be better off with a term assurance policy rather than the more popular endowment assurance policy. However, if you find that the latter policy disciplines you to save more, enables you to get the kind of insurance cover you are looking for, simplifies your investment decision making, saves you from the chores of investment management, and prevents you from squandering your savings, you may consider it favourably.

Term policies have not been very popular in India for various reasons. First, most individuals cannot reconcile to the idea of not getting anything back when the policy matures for all the premiums they pay. Second, insurance agents do not have much incentive to sell such policies because they carry lower premia and consequently generate lower commissions. For example, a person who is about 30 years old can get a coverage of Rs. 1 million for 20 to 25 years by paying a premium of Rs. 3300 to Rs. 3500 per year.

Accord Priority to a Residential House

A residential house represents an attractive investment proposition for the following reasons:

- The rate of return, consisting of rental income (or rental saving) and capital appreciation, is attractive (capital appreciation often dominates the rental income).
- The risk exposure is limited. Barring a few bad years, property values in India have been moving upwards. Hence, investment in a residential house does not have much downside risk associated with it.
- A residential house provides significant tax shelter in the long run. For wealth tax purposes, the value of a residential house is reckoned at its historical cost and not the current market value.
- Loans are available from various quarters for buying/constructing a residential house. Further, interest on loans taken for buying/constructing a residential house is tax-deductible within certain limits.
- Even though there may be initial hassles when a residential house is bought/constructed, in the long run it requires very little monitoring.
- Ownership of a residential house provides psychic satisfaction which other forms of investment may not offer.

Given the above advantages, your first priority as an investor should be to buy a residential site in an area where you plan to settle down and, thereafter, construct a house as soon as your resources position permits you to do so. If you are not likely to live in that place in the foreseeable future, the construction of the house can be deferred. It may be noted that the rate of return earned on a wisely chosen portfolio of financial investments can cover the escalation in construction cost, but not perhaps the escalation in land cost. Hence, you should acquire the land as early as possible, preferably through some housing cooperative society, and undertake construction at an appropriate time. If the cost of an independent house is beyond your means, choose the alternative of buying a flat. In metropolitan areas, given the exorbitant land prices, this may be the only option available to you.

Additional Real Estate As people become more affluent they have resources to buy additional real estate like a second house or commercial property or urban land or farmland.

If your resources permit, you should look at buying additional real estate. Real estate earns excellent returns over time and is perceived to be less risky than stocks – to some extent this may be because you don't see a daily quotation for real estate as you see for stocks.

• Match Your Stock-bond Mix to Your Investment Situation

After you have provided for your priority needs (cash reserve, insurance cover, and residential house), your most important decision is concerned with the stock-bond mix. What proportion of your assets should you allocate to stocks? to bonds?

Your stock-bond mix depend on three factors, in the main:

- *Investment Horizon*: This is the period over which you will build up and hold your investments.
- *Risk Capacity*: This is your financial capacity to withstand investment losses.
- *Risk Tolerance*: This is your willingness or emotional ability to accept volatile returns

The key guidelines relevant for the stock-bond mix are as follows:

1. Other things being equal, if your investment horizon is longer, your portfolio should be tilted in favour of stocks rather than bonds and if your investment horizon is shorter, your portfolio should be tilted in favour of bonds rather than stocks.
2. Other things being equal, if you have a greater capacity for risk, your portfolio should be tilted in favour of stocks rather than bonds and if you have a lesser capacity for risk your portfolio should be tilted in favour of bonds rather than stocks.
3. Other things being equal, if you have a greater tolerance for risk, your portfolio should be tilted in favour of stocks rather than bonds and if you have a lesser tolerance for risk, your portfolio should be tilted in favour of bonds rather than stocks.

Risk-Return Preference Over Investor Life Cycle The investor life cycle is typically divided into four stages as follows:

Stage I: Early Career At the beginning of his career, an individual's net worth is small - it may even be negative if he has taken educational loans which have not been repaid. However, his income exceeds his expenses. More important, he expects a larger future income over an extended period of time as his career advances. Given his long-term investment horizon, he is willing to accept higher risk in anticipation of higher returns.

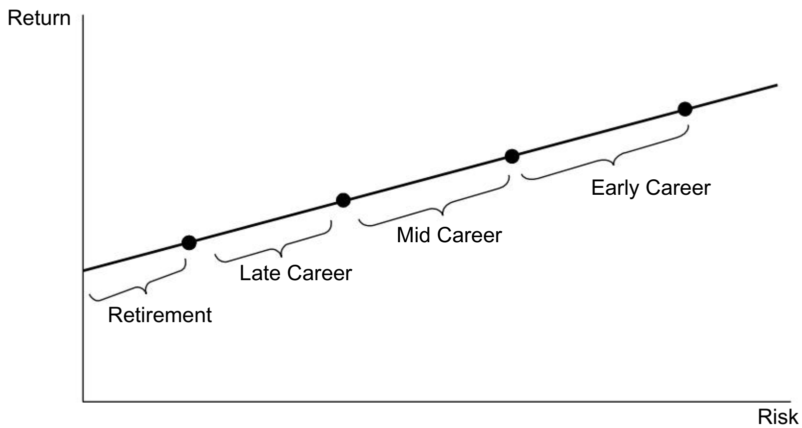
Stage II: Mid Career By the time the individual reaches this stage he would have accumulated some wealth. A well prepared individual would have a satisfactory insurance cover, a tangible investment in a home, and a reasonable base of financial assets. The investment horizon is still long (one is 15 to 20 years away from retirement) and hence high-return—high-risk investments still make sense. Yet, during this stage, preservation of capital acquires some importance and the individual may want to moderate his risk exposure in some ways.

Stage III: Late Career The individual has virtually no debt or mortgage on his home and has a reasonably solid base of other assets as well. Further, his savings level is high, thanks to an expanded income and a diminution of expenses. Nevertheless, a significantly reduced investment horizon (5–10 years) induces conservatism. Preservation of capital becomes an important concern and, hence, risk exposure is reduced.

Stage IV: Retirement At this stage, investment becomes the principal source of sustenance. Even though his investment income may be comfortable, the vagaries of inflation and the unpredictable medical expenses induce a great deal of conservatism. This means that preservation of capital may become the over-riding concern and, hence, risk is mitigated further.

Exhibit 22.2 shows graphically the risk-return preferences of a typical individual over his life cycle.

Exhibit 22.2 ***Risk-Return Preferences Over Investor Life Cycle***



The diminishing risk appetite of an individual as he advances in age has an important implication for his investment policy (asset allocation policy): As one grows older, the proportion of bonds must increase and the proportion of stocks must decrease. A conventional rule of thumb says that the percentage invested in bonds must correspond to the age of the individual. Thus, a 30 year old person must invest 30 percent of his portfolio in bonds and a 70 year old must invest 70 percent.

Investment Horizon Versus Living Horizon The general recommendation that a person should gradually tilt his portfolio in favour of bonds as he advances in age implicitly assumes that a person's **investment horizon** is more or less the same as his **living horizon**. This may often not be true because for most people the investment horizon may be longer, indeed much longer, than their living horizon.

For example, if you are 45 years old and have a 10-year-old son, your investment horizon is not just another 30 years (your future life expectancy), but close to 70 years that your son may live. Even if you are 70 years old, your investment horizon may be 70 years if you have young grandchildren that you care for or a charitable cause that you want to contribute to.

As Charles Ellis put it, "Most investors' actual time horizons for investments are quite *long*—20 years, 30 years, and often 50 years or more—because the investments they pass on to others will continue to be active well past the period of their own lives".[2]

So Ellis argues that you should not change your investments just because you have retired or reached a certain age. As he says, "Maintain the strategy you have set for yourself if you can afford to do it".

Select Stocks and Bonds (Fixed Income Instruments) Judiciously

After you have chosen the stock-bond mix appropriate to your investment situation, you have to select stocks and bonds.

Stock Selection Investors display widely different approaches to equity selection. At one end of the spectrum, you have aggressive investors constantly searching for undervalued stocks and at the other end of the spectrum you have very conservative investors who participate in index schemes.

In general, you would do well if you go largely by fundamentals, without losing sight of technicals. This guideline along with the guidelines specifically applicable to aggressive and conservative investors will be discussed at some length in the following sections.

Bond Selection The most popular forms of fixed income avenues (referred to very broadly as 'bonds' for our discussion) are:

1. Provident fund deposits
2. Fixed deposits with banks and post offices
3. Fixed deposits with companies
4. Income-oriented and growth-oriented debt schemes
5. Corporate bonds
6. RBI savings bonds
7. National Savings Certificates
8. Convertible debentures[3]
9. Kisan Vikas Patras
10. Debt-oriented Unit Linked Pension Plans

The relative attractiveness of various fixed income avenues depends mainly on two factors: (a) need for tax shelter; and (b) preference for current income versus capital appreciation. The following matrix will broadly guide you in selecting fixed income avenues based on these two considerations.

While the matrix provides broad guidelines, here are some specific suggestions:

[2] Charles Ellis, *op. cit*

[3] Since the investor has the option of retaining the convertible debenture as a straight debt instrument, it is viewed here as a fixed income instrument.

Tax Shelter sought	Preferred Form of Return: Current income	Preferred Form of Return: Capital appreciation
Yes	■ Post office savings bank account ■ Tax-free bonds ■ Income-oriented debt schemes	■ Provident fund schemes ■ Growth-oriented debt schemes
No	■ Fixed deposits with banks and companies ■ Non convertible debentures	■ Kisan Vikas Patras ■ Convertible debentures

1. If you are seeking to reduce your tax liability in the long run, deposit as liberally as you can in a recognised provident fund scheme and /or public provident fund scheme. Investment in provident fund schemes offer several advantages: (a) initial tax advantage; (b) continuing tax advantage; (c) facility for partial withdrawals; (d) satisfactory rate of return; and (e) immunity from attachment of a court decree. Given these advantages, it is a boon to the bulk of the investors. Hardly any other form of investment offers such attraction. Hence, it should be accorded a very high priority in your scheme of investments.
2. Give preference to income-oriented debt schemes and tax-free bonds if you are looking for a tax-sheltered current income. They offer attractive post-tax rates of return compared to other fixed income avenues.
3. Invest in good convertible debentures. Due to some peculiar reasons, convertible debentures, in general, sell for a price lower than the market value of the underlying equity. Yet, till the conversion takes place, the interest income on them is higher than the dividend income provided by the underlying equity. Given this anomaly of the Indian stock market, it makes sense to buy convertible debentures.
4. Consider investment in non-convertible debentures, Kisan Vikas Patras, and corporate fixed deposit schemes under two broad circumstances:
   - When your taxable income is less than Rs. 150,000; and
   - When you have exhausted the limits for various tax-sheltered investments.
5. While evaluating non-convertible debentures look at the following factors:
   - Yield to maturity
   - Credit rating
   - Maturity period
   - Buy-back facility

6. Look at the following factors before making a fixed deposit with a company.
   - Reserves and surplus in relation to paid up share capital
   - Track record of earnings and dividends
   - Reputation of management
   - Credit rating

Avail of Tax Shelters

While planning your investments bear in mind the following:

- Under Section 80C the following investments, *inter alia,* can be deducted before computing the taxable income: contributions to statutory or recognised provident fund, contribution to public provident fund, life insurance premiums, subscription to National Savings Certificates, contribution to unit-linked insurance plan, and contribution to any notified equity-linked savings scheme of a mutual fund. Under Section 80 CCC, contributions to certain pension funds can be deducted before computing the taxable income. The maximum permissible deduction under Sections 80C and 80CCC is Rs. 100,000.
- Capital gains (losses) are divided into two categories: (i) long-term capital gains (losses), and (ii) short-term capital gains (losses). Long-term capital gains (losses) arise from the sale of equity shares and other securities that are held for more than 12 months (for all other capital assets the period of holding is 36 months); short-term capital gains (losses) arise from the sale of equity shares and other securities that are held for less than 12 months (for all other capital assets the period of holding is 36 months).
- Long-term capital gains (losses) are calculated as follows:

  Sale consideration – Indexed cost of acquisition – Indexed cost of improvement – Expenditure incurred in connection with transfer

- Long-term capital gains from equity shares are tax-exempt, whereas short-term capital gains are taxable at the rate of 15 percent.
- If the taxable income excluding the capital gains is less than Rs. 150,000, then no tax is payable on so much of the long-term capital gains as is equal to the aforesaid shortfall.

You must plan to avail of the tax shelters available to you. Some suggestions in this regard are offered below:

- Deposit liberally or invest in (a) a recognised provident fund scheme and/or the PPF scheme, and (b) life insurance policy to reduce your tax liability.
- Augment your tax-exempt current income by investing in equity shares, mutual fund schemes, and so on.
- Ordinarily, plan to hold your equity shares and other securities for at least one year to get the benefit of tax exemption.

- Avoid/reduce long-term capital gains by investing in specified securities, specified assets, and residential house as stipulated under Sections 54EC, 54ED, and 54F of the Income Tax Act.

Diversify Adequately

Your investment strategy should be to diversify your holdings within an investment class and to hold different classes of assets (cash, bonds, stocks, and real estate) in your portfolio.

Often individual investor portfolios are not diversified properly. They are either under-diversified or over-diversified. I have seen a number of individual portfolios dominated by just 1 or 2 stocks which may account for 60 to 80 percent of portfolio value. Clearly such portfolios are under-diversified and exposed to unnecessary unsystematic risk.

I have also seen individual portfolios which are over-diversified, having 30 to 60 different shares. This may be mainly due to the following reasons: (a) The number of shares received at the time of public issue is often small. As a result, investors tend to have a large number of different shares in small quantities. (b) Investors perhaps feel psychologically secure with a large number of different shares in their portfolio. (c) There is reluctance on the part of investors to sell shares.

You must, however, realise that diversification beyond a certain point does not bring any appreciable gain in terms of risk reduction, which is usually the principal motivation for diversification. Empirical studies have provided reasonably conclusive evidence in support of the hypothesis that the bulk of the benefit from diversification, in the form of risk reduction, can be achieved by forming a portfolio of about 10 stocks; thereafter, the gains from diversification tend to be negligible.

In view of this relationship, you should normally plan to have 10-12 stocks in your portfolio. If you have fewer stocks in your portfolio, you may be unnecessarily exposed to risk which can be easily diversified away. The 10 to 12 stocks held by you should span at least 4 different industries with no single industry accounting for more than, say, 40 percent of your equity investment.

If you have more stocks in your portfolio, transaction and monitoring costs tend to increase, without any worthwhile reduction in risk. More important, an overly diversified portfolio dilutes focus which in turn is likely to impair the quality of investment management. If you have 10 stocks in your portfolio, you are likely to be circumspect in your decision making and attentive in your monitoring, because each stock accounts for, on average, 10 percent of your portfolio value. On the other hand, if you have 50 stocks in your portfolio, you are likely to be cursory in your decision making and negligent in your monitoring, because each stock accounts for, on average, just 2 percent of your portfolio value.

You have to track company actions (dividend, rights, and bonus announcements), company news, share prices, periodic results, industry trends, and so on, so that you can time your decisions well. Even a full time investor cannot track more than 50 stocks. Unfortunately, investors forget what they already have and yearn for new investment opportunities. This happens more so in a bull market, when they don't want to miss the next 'hot' thing and keep adding to their problems.

You should diversify your bond portfolio along with your equity portfolio. Note that the diversification of bond portfolio serves a different purpose than the diversification of equity portfolio. In the case of bonds we do not refer to systematic or unsystematic risk. Instead, we are concerned with two other types of risk viz., default risk and interest rate risk. In a bond portfolio, we try to diversify these two types of risk.

Periodically Review and Revise the Portfolio

Often investors do not review and revise their portfolios regularly. This may be due to a variety of reasons:

- Lack of time and inclination to undertake periodic review and revision.
- Sticky portfolio habits (many investors have a reluctance to sell securities because they are likened to gold or real estate to be liquidated only during a time of financial distress).
- An inadequate appreciation of the benefits of periodic review and revision.

Since the world of investments is highly dynamic and rapidly changing, it behooves upon every investor to periodically review his portfolio and revise it in the light of changed circumstances. Over time, several changes are likely to take place:

- Relative market values of various securities in the portfolio tend to change.
- New information may alter the risk-return prospects of various securities.
- Funds may be made available for portfolio investment; or funds may be required from the portfolio.
- Investor disposition toward risk may itself change, albeit very gradually.

In order to cope with these changes, periodic review and revision is required to:

- Maintain adequate diversification when relative values of various securities in the portfolio change.
- Incorporate new information relevant for risk-return assessment.
- Expand or contract the size of portfolio to absorb funds or withdraw funds.
- Reflect changes in investor risk disposition.
- Ensure that the target asset-mix is maintained.

How often should the exercise of portfolio review and revision be undertaken? As this exercise entails monitoring costs, transaction costs, and taxes, its periodicity should be so fixed that its benefits are maximised in relation to its costs. This means that (a) if the investment environment is volatile, review should be more frequent, (b) if an active approach is followed, review should be more frequent, and (c) if the size of the portfolio is large, review should be more frequent.

If you are a typical individual investor who is relatively passive in his approach and who does not have a large portfolio, you will find a review period of six months alright. It you do it more often you may succumb to the temptation of frequently switching your commitments in a somewhat aimless fashion. Guard yourself against this danger.

A major purpose of periodic review is to identify securities for disinvestment. If a security is overpriced in relation to its intrinsic value (the purchase price is irrelevant), it should be sold so that the proceeds can be invested elsewhere. Disinvestment, of course, is often abhorred by investors who find it easy to invest but difficult to disinvest. Yet, to succeed in the investment game you must not only know when to invest but also when to disinvest. There is a time to buy as well as a time to sell. So shuffle your portfolio, if necessary, on the basis of your reviews.

Most investors review their portfolios superficially. They scan their portfolio and merely take note of paper profits and losses. To do well in the game of investing, you should, however, go further and re-evaluate each commitment in a detached fashion. Though it is difficult psychologically, you must make a determined effort to do this.

Suppose you have 500 shares of Alpha Company stock which is selling currently at Rs 120. Ask yourself a simple question: "If I have Rs 60,000 of cash today and I want to buy some stock, would I choose the shares of Alpha Company in preference to other options available to me?" If the answer is strongly in the negative, you should sell your holding of Alpha Company. Remember that your purchase price, whether it was Rs 50 or Rs 150, should not matter. Your original cost is irrelevant.

One should take a cue from many outstanding investors who keep a systematic record of their investment decisions. Maintain a notebook with a page for every security in your portfolio. Write down why you have bought and later why you have sold. Periodically review your completed transactions to understand the psychological reasons, if any, for your mistakes.

In a bull market book profits, even if you believe that the bull run has some steam left in it. Offload your holdings in installments. Be contented with the profits you realise. Don't wait greedily to sell when the market reaches its peak. It is like chasing a chimera. If you don't contain your avarice, your paper profits may evaporate as the market declines.

Investors often have more difficulty in deciding when to sell than when to buy. A disciplined approach to selling may help them to overcome this difficulty. They should religiously follow rules like the following.

- Sell when the price falls below ay 10 percent of their purchase price (this means that they follow a stop loss order rule of 10 percent).
- Sell when a certain profit target, say 50 percent or 100 percent has been achieved.
- Sell when the review suggests that the price exceeds the intrinsic value determined by whatever approach the investor follows.

A practical problem in switching from one security (whether it is a stock or a bond) to another (whether it is a stock or a bond) is related to taxes. Let us look at an example to understand the issues involved. Suppose Suneel Shah has bought 1,000 equity shares of A Limited for Rs 25,000 six months ago. The current market price of these shares is Rs 50,000. Suneel Shah believes that these shares are somewhat overpriced and considers the scope for appreciation over the next one year to be somewhat modest. He expects the price per share to be Rs 55 a year hence. He is considering the possibility of selling these shares now and investing the post-tax sales proceeds in the shares of company B, which he expects to appreciate by 20 percent over a one year period. What will be the expected post-tax amount in Suneel Shah's hands a year hence under the following options?

Option 1: Hold the shares of A and sell them for Rs 55,000 a year hence.

Option 2: Sell the shares of A now, invest the post-tax proceeds in the shares of B, and sell the shares of B a year hence.

For evaluating the two options, we will ignore dividends for the sake of simplicity:

Option 1: Hold the shares of A

1. Expected market value of shares one year hence	: Rs 55,000
2. Post-tax realisation	: Rs 55,000

Option 2: Switch from the shares of A to the shares of B

1. Current sales realisation	: Rs 50,000
2. Purchase cost (six months ago)	: Rs 25,000
3. Short-term capital gains	: Rs 25,000
4. Tax on short-term capital gains	: Rs 3,750
5. Post tax realisation	: Rs 46,250
6. Current investment in the shares of B	: Rs 46,250
7. Expected market value of shares of B one year hence (Rs 46,250 x 1.20)	: Rs 55,500
8. Post-tax realisation	: Rs 55,500

Formula Plan as a Tool for Revision Emotion and poor judgment play a significant role in the lack of investment success. Formula plans have been developed to help investors overcome such human failings. A formula plan essentially prescribes the proportions of your wealth you should hold in stock and bond components. A commonly used and recommended formula plan is the constant ratio formula plan. If you use such a plan you will:

(a) Decide in advance the proportions of your wealth you will keep in stocks and bonds respectively;

(b) Periodically evaluate what the actual proportions are (it may be noted that changes in market values tend to change the proportions); and

(c) Effect whatever switches are necessary to restore the predetermined proportions.

To illustrate, suppose you have Rs 100,000 to invest as on 1.1.20X0 and you decide to invest equally in stocks and bonds. You review the market values of stocks and bonds in your portfolio every six months and effect whatever switch is required to ensure that the stock and bond components remain equal in value. Exhibit 22.3 shows the market values of these components at three review dates, viz. 1.7.20X0, 1.1.20X1, and 1.7.20X1 and the switches to be made in conformity with your constant ratio formula plan.

Exhibit 22.3 ***Illustration of a Constant Ratio Formula Plan***

	Market value of stocks	Market value of bonds	Switch from stocks bonds	Switch from bonds to stocks
1.1.20X0	50,000	50,000		
1.7.20X0	70,000	52,000	9,000	
1.7.20X0 (After revision)	61,000	61,000		
1.1.20X1	50,000	62,000		6,000
1.1.20X1 (After revision)	56,000	56,000		
1.7.20X1	65,000	55,000	5,000	
1.7.20X1 (After revision)	60,000	60,000		

In the above illustration, the proportions of stocks and bonds were kept constant at 0.5 each. Hence, it was referred to as a **constant ratio formula plan**. If you feel that you may like to vary these proportions to reflect your judgment about market prospects, you may follow a **variable ratio formula plan**. Such a plan provides scope for changing the proportions of stocks and bonds in your portfolio. For example, if you assess that the outlook for stocks is bright, you may raise the proportion of stocks to 0.75. On the other hand, if you think that the outlook for stocks is dismal, you may lower the proportion of stocks to 0.25. Clearly, a variable ratio formula plan is superior to a constant ratio formula plan if your judgment about market outlook is sound; otherwise it is inferior. Hence, the practical guideline is: "Should you possess superior forecasting ability follow a variable ratio formula plan; otherwise follow a constant ratio formula plan."

Formula plans induce caution in bullish markets and instill courage during bearish markets. If you adhere to a formula plan religiously, you will protect yourself from being swayed by the waves of optimism and pessimism which sweep the market periodically. Hence, you may, in general, outperform the market. However, remember that they are more helpful when prices fluctuate widely and generally trendless conditions prevail.

Check Your Irrationality

As human beings we are endowed with certain characteristics of mind and behaviour that lead to imperfect decisions and even dreadfully serious mistakes.

Often we are not rational and we do not act in our own best interests. For example:

- We ignore the "base rate" in preference to the "case rate."
- We overreact to good news as well as bad news.
- We are impatient.

- We tend to be overoptimistic and not realistic.
- We are proud and unwilling to admit our mistakes.
- We are susceptible to hot tip investing.
- We naively believe in foolproof schemes.
- We easily succumb to herd mentality.

That is why to succeed as an investor, you must first know yourself. Your intellectual capabilities and your emotional capabilities will largely determine your investment success.

Your intellectual capabilities include your ability to analyse financial statements, your memory and recall power, your capacity to master and manage knowledge, your flair for developing insights and understanding from amorphous data and information, and so on.

Your emotional capabilities include your ability to maintain composure in a chaotic environment and your capacity to deal rationally with volatility and disruptions that you face everyday.

Maximise Your Lifetime Financial Success

There are five stages or dimensions of your lifetime financial success:

- Earning
- Saving
- Investing
- Contributing
- Estate planning

You should strive to maximise achievement in each of these areas, within the set of opportunities available to you, while enjoying a full and balanced life.

If you have resources in excess of what you wish to transfer to your family and others you care about, you have rewarding opportunities to contribute to worthwhile causes.

You may find great fulfillment in converting your financial resources (which represent the stored values of your hardwork, skills, and good fortune) into actions that advance causes that you truly care about. Here are some possibilities:

- Provide scholarship to young children who are economically deprived.
- Support hospitals and shelter homes that help the needy and indigent.
- Contribute to organisations engaged in scientific or medical research.
- Espouse institutions that work for environmental protection.

In addition to contributing money, you should also commit your time, talents, and energy to initiatives and endeavours that you believe in. It can be profoundly rewarding to see how real, living people and institutions benefit from your active participation and involvement. As Charles Ellis put it: "As with other areas of investing, it's wise to plan ahead, to be conservative (within limits), and to make productive use of time by beginning early and sustaining your commitments over as long a period as you can provide yourself."[4]

[4] Charles Ellis *op. cit*.

Write a Will You must write a will so that your wealth is distributed according to your wishes after you are gone. In the absence of a will, your heirs may squabble among themselves, incur unnecessary litigation expenses, strain their relationships, and suffer a lot of avoidable bitterness.

Bear in mind the following things about a will.

- Although a will can be oral (wherein a person speaks one's intention in front of witnesses) or written, it is advisable to have a written will, preferably hand-written.
- A will can be written on plain paper and it requires two witnesses.
- A will can always be re-freshed or altered.
- A will can be registered with the state authorities for a nominal fee. If there are several registered wills the last one prevails.
- Every will needs an executor who probates the will – a probate is a court-supervised procedure for distributing the decedent's estate. Nominated by the maker of will, the executor may be a beneficiary of the will or a neutral person.
- It may take five to six months of probation period before the will is finally accepted by the court. If immovable property is involved, a court fees is payable for its valuation and it is usually 3 percent of the total value.
- If all the inheritors amicably accept the will, a family settlement can be arrived at out of the court to save on the court expenses. However, nobody can subvert a will and arrive at a family settlement.

22.2 GUIDELINES FOR EQUITY INVESTING

While selecting fixed instruments is relatively straightforward, selecting stocks (equities) is somewhat confusing, difficult, and frustrating. Most investors have difficulty in identifying individual stocks or equity-oriented mutual fund schemes. This section discusses a general guideline for all investors and some specific guidelines for aggressive and conservative investors.

A General Guideline

In choosing equity shares go largely by fundamentals but do not lose sight of technicals. This broad guideline may be implemented in terms of three sub-guidelines: (a) establish value anchors, (b) assess market psychology, and (c) combine fundamental and technical analysis.

Establish Value Anchors The intrinsic value of a share is determined by three fundamental factors: earnings (and dividend) level, growth prospects, and risk exposure. With the help of the analysis discussed earlier, you can get a handle over these factors and estimate the intrinsic value by employing the dividend capitalisation model or the earnings capitalisation approach. However, as valuation is essentially an uncertain and imprecise exercise, it would be naïve to put great faith in a single point intrinsic value estimate. Practical wisdom calls for defining an intrinsic value range around the single point estimate. For example, if you arrive at an intrinsic value estimate of, say, Rs. 50 for some share, it may be more sensible to talk of an intrinsic value range of, say, Rs. 45 to Rs. 55. When you define a range like this, you are essentially saying: "While my single point value estimate is Rs. 50, I am aware that there may be bias and errors in my estimate. To take care of these, it makes greater sense to talk of an intrinsic value range of Rs. 45 to Rs. 55". Using this range as the value anchor, your decision rules may be as follows:

Market price	*Decision*
Less than Rs. 45	Buy
Between Rs. 45 and Rs. 55	Hold
More than Rs. 55	Sell

In establishing the value anchor, you may have to use a price-earnings ratio. Remember that it is theoretically equal to:

$$\frac{\text{Payout ratio}}{\text{Discount rate} - \text{Growth rate}}$$

For example, if you expect the payout ratio to be 0.5, the discount rate to be 0.16, and the growth rate to be 0.10, you establish the price-earnings ratio as follows:

$$\frac{0.5}{0.16 - 0.10} = 8.33$$

In practice, the actual price-earnings ratio may differ from the price-earnings ratio established by you. This discrepancy may be caused mainly by two factors: (a) the assessment of the market (about growth and risk, growth in particular) may differ from your assessment, and (b) there may be certain imperfections in the market (artificial support provided by the management, negligible floating stocks, etc.) which may persist over time.

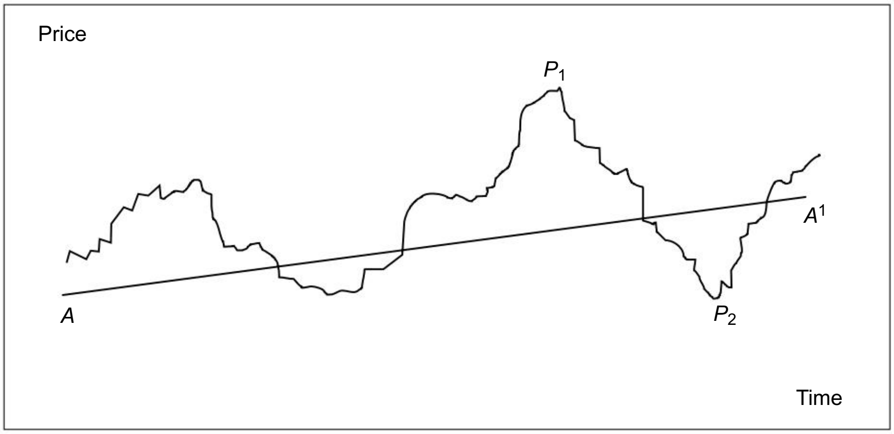
When the discrepancy arises you should examine the following:

- The average price-earnings ratio of the share in the last 3 to 5 years; and
- The average price-earnings ratio of the industry to which the share belongs.

The above evidence provides useful clues to certain factors that you may have overlooked but the market considers relevant. Based on this information, you may modify your initial assessment. For example, if your initial assessment suggests that a reasonable price-earnings ratio for a certain share is 8.33 but you find that the 5-year average price-earnings ratio for the share has been 15.0 and the current average price-earnings ratio for the industry to which this share belongs is 12.0, you may revise your assessment upwards to reflect these pieces of information. The adjustment will have to be necessarily judgmental in nature.

Assess Market Psychology Shares prices are influenced by fundamental factors as well as psychological factors. Exhibit 22.4 shows graphically how these factors influence price behaviour. **AA**^{1} represents the intrinsic value line which reflects fundamental factors. (The assumption made here is that the intrinsic value rises gradually over time as the underlying fundamental factors like book value per share, earnings per share, and dividend per share improve). The actual price tends to gyrate around the intrinsic value line mainly under the influence of psychological forces. For example, when a wave of euphoria and greed sweeps the market, the price may rise to P_1, far above the intrinsic value line. On the other hand, if fear and panic envelop the market, the price may fall to P_2, far below the intrinsic value line.

Exhibit 22.4 ***Price Behaviour***



To judge the mood of the investors, consult the price chart and other indicators. While they are not infallible guides, they do provide help in judging, at least broadly, whether the share is technically strong (indicative of investor bullishness) or technically weak (suggestive of investor bearishness). In addition, technical analysis may be profitably used in assessing roughly the resistance level and support level.

Apart from technical analysis, which may provide ambiguous signals or delayed indications, you should use your experience, intuition, insight, and judgment to feel the pulse of the market. Ask the questions: Will the stock catch the fancy of the investors? Is the stock likely to generate contagious dreams and induce investors to build castles in the air?

Combine Fundamental and Technical Analysis As stock prices are governed by fundamental factors as well as psychological influences, practical wisdom suggests that fundamental analysis must be used in conjunction with technical analysis. The indications of fundamental and technical analyses may be combined as follows in a decision matrix:

		Fundamental Analysis	
		Undervalued	Overvalued
Technical	Weak	Wait	Sell
Analysis	Strong	Buy	Wait

It is instructive here to recall three rules prescribed by Burton Malkiel in his fascinating book *A Random Walk Down Wall Street:*

1. Buy only companies that are expected to have above-average earnings growth for five or more years.
2. Never pay more for a stock than its firm foundation value.
3. Look for stocks whose stories of anticipated growth are the kind on which investors can build castles in the air.

Guidelines for Aggressive Investors

Aggressive equity investors play the equity game actively and vigorously. They spend more time and effort in managing their portfolio than their conservative counterparts. They are inclined to take greater risks, albeit in a calculated manner, to earn superior rates of return. They seem to relish the thrill and adventure of playing the equity game. In addition to the general guidelines for equity investment, aggressive equity investors should also bear in mind the following guidelines specially relevant for them.

1. Focus on investments you understand and play your own game.
2. Monitor the environment with keenness.
3. Scout for 'special' situations in the secondary market.
4. Pay heed to growth shares.
5. Beware of the games operators play.
6. Anticipate earnings ahead of the market.
7. Leverage your portfolio when you are bullish.
8. Take swift corrective action.

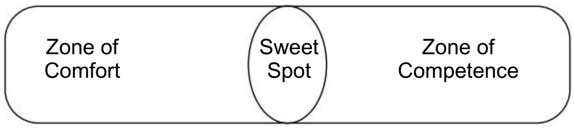
Focus on Investments Your Understand and Play Your Own Game If you want to manage your investments you should know more than the market does about the company you are investing in. Hence you will have to decide on what to focus on. Most investors go about this very casually. Yet this decision will be the key to your success. You have to decide whether you will concentrate on growth, value, small companies, or multinational companies, or public sector companies, or high-grade bonds, or low-grade bonds, or whatever. As John Train says: "Whatever strategy you follow, you should follow three rules: be thorough, tough-minded, and flexible; know a great deal about any company you buy into; and only buy when the company is misunderstood by the market."

Benjamin Graham, perhaps the most revered guru in the investment field, has persuasively argued that an investor should play the game that he knows best. His advice goes as follows: "Do things as an analyst that you know you can do well, and only those things. If you can really beat the market by charts, by astrology or by some rare and valuable gift of your own, then that's the row you should hoe."[5] He adds: "If

[5] Benjamin Graham, "The Decade 1965-74; Its Significance for Financial Analysis" in *The Renaissance of Value*, Charlottesville, Virginia: The Financial Analysts Research Foundation, 1974.

you believe—as I have always believed—that the value approach is inherenty sound, workable, and profitable, then devote yourself to the principle. Stick to it and don't be led astray by Wall Street's fashions, its illusions, and its constant chase after the fast dollar."

As Charles Ellis argues,[6] every investor has a zone of competence that defines the kind of investing in which he is really skillful and a zone of comfort that represents the area of investing in which he is calm and comfortable. He says that the sweet spot of the investor is represented by the overlap between the zone of competence and the zone of comfort as shown in the following Venn diagram:



Monitor the Environment with Keenness If you want to manage your investments aggressively, you have to monitor important developments affecting the economy, various industrial sectors, and individual companies. You should try to understand, evaluate, and anticipate change with keenness. Remember the following verse:

I keep six honest serving men,
They taught me all I knew,
Their names are What and Why and When,
*And H*ow and Where and Who.

Rudyard Kipling

What should be your sources of information? Here is a useful list:

Dailies	: (a)	*The Economic Times*
	(b)	*Financial Express*
	(c)	*Business Standard*
Business Periodicals	: (a)	*Business India*
	(b)	*Business World*
	(c)	*Business Today*
Investment Magazines	: (a)	*Capital Market*
	(b)	*Money*
Directories	: (a)	*Bombay Stock Exchange Official Directory*
Websites	: (a)	*www.myiris.com*
	(b)	*www.indiainfoline.com*
	(c)	*www.valuenotes.com*

[6] Charles D. Ellis, *Winning the Loser's Game* 4/e, New York: Mc Graw-Hill 2002.

Scout for Special Situations in the Secondary Market Profitable investment opportunities exist in the secondary market. However, they are often not easy to identify. You have to be alert, discerning, and also lucky to locate them. They perhaps occur with greater likelihood in the following situations.

Turnaround Situations A turnaround occurs when a company steeped in bad performance and losses for years begins to recover. Because of its dismal past and accumulated losses, its shares often sell at a discount - a Rs. 10 per value share may sell for Rs. 2 to Rs. 5. When the company recovers fully and can look forward to a confident future, the share price appreciates dramatically. A Rs. 10 par value share may zoom to Rs. 20 to Rs. 40 or even more. Some examples of such turnaround performance are: EID parry, SAIL and Arvind Mills. In cases of this kind, investors who anticipate the turnaround ahead of the market and buy when the share prices are relatively depressed, gain substantially. In other words, they reap the rewards for their alertness and perceptiveness.

Amalgamations An amalgamation, also referred to as a merger, refers to a combination of two (or more) companies into one company. Generally, an amalgamation is advantageous to both the companies as it results in operational economies, better utilisation of tax shields, and risk reduction. Hence, shares of companies participating in an amalgamation scheme tend to be attractive investment opportunities.

In particular, an amalgamation favours a weaker company more. Recall how SEWA Papers - Ballarpur Industries merger provided substantial benefits to the shareholders of SEWA Papers.

Takeovers A takeover involves the acquisition of a certain block of equity capital of a company which enables the acquirer (also referred to as the raider) to exercise control over the affairs of the company. Whenever there is a takeover bid, the market price of the target company tends to shoot up because of frantic buying by the raider as well as the existing controlling group (which is interested in consolidating its holding to avert the takeover bid). We have witnessed this in many cases like DCM, Escorts, Raasi Cement, and Indian Aluminium. Whether successful or not, takeover bids provide opportunities for the shareholders of target company to sell their shares at inflated prices and for other investors who buy in anticipation of the price rise.

Bonus Issues and Stock Splits When a company issues bonus shares, it capitalises a portion of its reserves and surplus and when a company resorts to a stock split, it reduces the par value of the share and issues more shares correspondingly. In both the cases: (a) the shareholders' proportional ownership remains unchanged; and (b) the book value per share, the earnings per share, and the market price per share decrease, but the number of shares increases. This implies that a bonus issue or a stock split is more or less a financial gimmick without any real impact on the welfare of equity shareholders. Still shareholders greet bonus issues and stock splits with a lot of cheer.

Why? The primary reasons are: (a) Shareholders regard them as a firm indication that the prospects of the company are bright and they can look forward to higher earnings and dividends. (b) The bonus issue (or stock split) tends to bring the share price within a more popular range and hence stimulates greater investor interest. Due to these reasons, bonus and stock split announcements are typically accompanied by price increases. (Often, the bulk of the price increase may occur in anticipation.) Given this imperfection of the stock market, you would do well if you can anticipate bonus or stock split candidates ahead of the market. In your search for such candidates, ask the following questions: What is the ratio of reserves and surplus to paid up capital? What has been the track record of the company in issuing bonus shares or stock splits? Is the market price per share of the company very high in relation to its par value?

What Makes a Multibagger

Active equity investors constantly search for potential multibaggers. What can make a stock a potential multibagger. A stock of a company can be a potential multibagger when:

- The external opportunity for the company is huge.
- The company has certain distinctive competencies that gives it an edge over competitors.
- The management of the company is ambitious, determined, and capable – it should indeed be hungry to dominate the market.
- There is no governmental regulation on pricing that can subdue profits.
- The stock is available at a low price.

Stocks of companies like Microsoft, Intel, Hero Honda, Infosys, Suzlon, and Divi's Laboratories had such characteristics at some stage or the other.

Pay Heed to Growth Shares There are many fundamental analysts who believe that investors would do well if they focus on growth stocks. Their investment philosophy consists of three basic guidelines: (a) Develop sound standards for selecting growth stocks. (b) Invest in growth stocks, without much concern for the price. (c) Hold growth stocks, as long as they remain growth stocks. Without being unduly bothered about timing, growth stock advocates argue that if the right growth stocks are bought and held as long as they remain growth stocks, superior returns are earned.

What criteria are relevant for selecting growth stocks? Philip A. Fisher, a prominent growth stock advocate, lists fifteen distinct points to identify growth stocks. The major points suggested by him are: (a) products and services with significant potential for increases in sales; (b) managerial determination to develop new products to substitute the present products when they reach maturity; (c) substantial profit margin; (d) good labour relations; (e) effective cost controls; (f) competitive strength; (g) integrity; and (h) depth of management. While different growth stock advocates may suggest different criteria, the essence of these criteria would be substantially the same.

Though I subscribe to the growth stock philosophy, I do not believe in paying a very high price-earnings multiple for a growth stock. If it commands a very high price-earnings multiple, it means that the anticipated high growth is already discounted in the price. Such a stock is highly vulnerable to a decline in earnings. If that happens, the price tends to drop sharply as the multiple declines along with earnings. *A recommended strategy is to identify growth situations which have not been fully discounted by the market. If the growth actually takes place, you will benefit doubly.* Along with the increase in earnings the price-earnings multiple would also rise, generating large gains.

Beware of the Games Operators Play Ideally, the stock market is supposed to be highly competitive and efficient, where no single participant (or group of participants) can significantly influence prices. In practice, however, the stock market in India suffers from imperfections and inadequacies that permit operators to play certain games that can be detrimental to the unwary and unguarded; though, of course, the smart investors can profit from them.

As an investor beware of the manipulation done to artificially push up share prices and create conditions for disposing of a large block at inflated prices. The operation often involves the following steps:

- The manipulator 'activates' the target share by resorting to scattered buying in a disguised manner through a few brokers simultaneously.
- As the price moves up in response to this buying, newsletters, brokers, and financial magazines are persuaded to recommend the share to the investing public, sometimes with very specific claims that the price will double in three to six months.
- As investors are drawn into the game, the upward price movement is maintained with some further support from the manipulator. As a result, the claims of doubling or so are fulfilled. This in turn attracts the interest of more and more investors which tends to further fuel the price rise.
- When the share becomes very buoyant and the volume of trading increases sufficiently, the manipulator begins to offload his bulk holding. This is usually done in installments, taking into account the absorptive capacity of the market. Sometimes, the manipulator may even resort to short-selling when the price is buoyant because he knows that the investor demand would eventually fall off, leading to price declines when he can profitably square off his short sales.

If his strategy works well, the manipulator gains in two ways: (a) he liquidates his large holdings during the buoyant phase; and (b) he covers his short sales in a declining market. Along with the manipulator, the early entrants benefit provided they book their profits at the right time. Finally the brokers gain in the form of large trading commissions. The real losers are the late buyers who are lured into this game when the prices are near their peak level.

Anticipate Earnings Ahead of the Market Expectation of future earnings is perhaps the most important single factor affecting stock prices. Projected earnings are the key element for establishing a stock's intrinsic value. If the market expects earnings per share to increase, the price per share would go up; likewise if the market anticipates earnings per share to fall, the price per share will decline. While I am not aware of any empirical study defining the relationship between future earnings and market prices in

India, it is my guess that the market price anticipates earnings by about six months to a year. This roughly means that the expected changes in earnings six months to a year from now would be reflected in stock prices today. If you can anticipate earnings per share ahead of the market, you will be richly rewarded. As the *Institutional Investor* put it "Earnings are the name of the game and always will be." If you are more adept in playing this game than others, you have a greater chance of being a winner."

While forecasting future earnings, do not rely on mechanical extrapolation of the past trend. Empirical studies suggest that past growth in earnings is almost useless in predicting future growth in earnings. Bear in mind the following insights provided by the extensive empirical work on the time series behaviour of earnings.

- There is a substantial degree of randomness in the time series behaviour of earnings. Put differently earnings follow a martingale process, implying that successive changes in earnings are independent. However, this martingale process is superimposed on an upward trend.
- Whenever departures from randomness have been found, correlation coefficients of successive changes in earnings have been found to be slightly negative. This suggests that earnings behaviour is characterised by mean-reversion. Or, as Richard Brealey put it: "…a good or succession of good years were more frequently followed by a poor year, and vice versa."

Leverage Your Portfolio When You are Bullish You may at times feel very bullish about some shares but lack the funds to buy them. On such occasions you may consider obtaining overdrafts/loans by pledging your existing securities.

When you buy shares with the help of a loan obtained by pledging your existing securities, you are essentially leveraging your portfolio. This tends to raise your risk exposure as it enhances your portfolio beta. So, resort to it only when you feel that the potential reward justifies it. Remember that interest on borrowings is a tax-deductible expense.

Take Swift Corrective Action The smart investor knows when to shed a share, which is a losing proposition, but the dumb investor does not. The average investor is reluctant to sell at a loss. This is understandable. Since he bought the shares to make a profit, he cannot reconcile himself to a loss. Yet, one must have the candour to admit one's mistakes - we all make mistakes in our investment decisions and we must have the courage to discard losing shares.

When the market price of a share is less than what you have paid for, perhaps you have erred. So, you must cut your losses as early as possible rather than wishfully think that the share will rebound so that you can break even. There is a simple way of doing this. When you buy a share, specify the stop-loss limit. (It may be 5 to 15 percent.) When the share falls by 10 percent (or whatever your stop-loss limit is) unload it. This may be an easy approach to discipline yourself and avoid irrational considerations like loss of pride, sentimental attachment to the share, or wishful thinking about its recovery.

Guidelines for Conservative Investors

Conservative equity investors seek to minimise investment risk as well as the time and effort devoted to portfolio management. What they want is peace of mind, not the adventure of aggressive investment. Satisfied with a reasonable return, they do not deliberately strive for spectacular gains.

Conservative equity investors should also bear in mind the following guidelines specially applicable to them.

1. Participate in the schemes of mutual funds.
2. Join a suitable portfolio management scheme
3. Consult an investment advisor
4. Avoid certain kinds of shares
5. Apply stiff screening criteria
6. Look for relatively safe opportunities in the primary market

Participate in the Schemes of Mutual Funds Apart from the Unit Trust of India which was set up in 1964, a number of mutual funds have been set up in recent years. In addition to a number debt-oriented schemes, these mutual funds have floated equity-oriented schemes meant for investors who want to have a share in a broadly diversified equity portfolio.

In general, these schemes are good vehicles for participating in the market. Why? The primary reason is that investing in equity can be very demanding for an individual investor. It requires a lot of time, attention, and effort to gather and process information. Unless the investor likes it, he may not feel upto it.

If you have neither the time nor the inclination to manage your portfolio of equity shares, you will find the schemes of mutual funds very convenient. The general advantages of such schemes are:

- Benefit of diversification
- Tax shelter
- Professional management
- High liquidity
- Minimal paper work

Given the dynamic changes in the world of investments, most individual investors may find it difficult to manage their equity investments. So they would do well to invest a substantial portion of the stock component of their portfolio in equity-oriented mutual fund schemes.

Indeed, for most investors the real contrarian approach to investing is to rebel against their instinct to analyse trends, financial statements, technical factors, investment recommendations, and various other factors that have a bearing on stock prices. They are likely to be a lot richer if they invest in a few broadly diversified equity oriented mutual fund schemes and make regular contributions to them for the next 10, 20, or 30 years, ignoring everything else.

An attractive option for a conservative investor may be an index scheme which pursues a passive strategy and entails a lower management fees. Another attractive option is a close-end mutual fund scheme selling at a tempting discount over its NAV.

Join a Suitable Portfolio Management Scheme While mutual funds have great attraction for smaller investors, portfolio management schemes offered by financial companies, banks, and money managers may have greater appeal to larger investors. These schemes are of two types: (i) discretionary schemes, and (ii) non-discretionary schemes.

Under a discretionary portfolio management scheme, the client places the funds with the portfolio manager who invests these funds as per his discretion and looks after all the attendant paper work. While the profits and losses on the portfolio belong to the investor, the portfolio manager receives a fee for the services rendered which is generally linked to the returns provided by the portfolio.

The basic difference between a discretionary scheme and a non-discretionary scheme is that under the former scheme, the portfolio manager enjoys the discretion to invest, whereas under the latter scheme the portfolio manager offers advice which the investor may accept or reject. Thus, under the non-discretionary scheme, the investor places funds with the portfolio manager, the portfolio manager offers counsel to the investor, the investor communicates his decisions, the portfolio manager executes the decisions of the investor and looks after all the paper work. For the services provided by him, the portfolio manager charges a fee. The profits and losses of the portfolio, of course, belong to the investor.

Generally, discretionary portfolio management schemes offer better returns because the portfolio manager can respond quickly to market developments and also participate in money market instruments to avoid funds from remaining idle. However, when you decide to participate in a portfolio management scheme (discretionary or non-discretionary) remember two things:

- The minimum amount accepted under such schemes is quite high. (It is typically Rs 2 million or so); further there is a minimum lock-in period.
- There are portfolio managers and portfolio managers. Hence satisfy yourself about the integrity and competence of the portfolio management firm before joining its portfolio management scheme.

Consult an Investment Advisor A professional investment advisor (or counsel) assesses your situation and suggests a portfolio that can realistically help you to achieve your investment objectives. An investment advisor, as compared to a mutual fund, is not interested in selling you anything. Hence he is likely to suggest a portfolio that is more suitable to your needs and circumstances.

While choosing a professional advisor ask the following questions: Does he have intellectual honesty? Is he realistic? Does he have patience? Is he competent in at least one investment approach? Does he derive satisfaction from helping others, rather than becoming rich himself?

You should meet your investment advisor periodically (every six months or so), discuss your situation, and take suggestions and ideas.

Avoid Certain Kinds of Shares Experience suggests that the following kinds of shares are not suitable for conservative investors.

Shares of Unlisted Companies There are more than 10,000 public limited companies in India. Only about 7,000 of these are listed on the stock exchanges, the rest are not. Don't buy shares of unlisted companies. There is no organised market for them and there is no reliable way of assessing their market price. How does one find out whether a share is listed or not? It is very simple: a listed share is included in the quotation list of the stock exchanges where it is listed; an unlisted share is not included in the quotation list.

Inactively Traded Shares Listing does not ensure liquidity. A major bane of the Indian equity investors is that many listed shares are not actively traded. You should avoid such shares. To find out whether a share is actively traded or not, look at the frequency with which it has been traded in the last three months or so. If it is traded less than once in a week, it may be regarded as an inactively traded share.

Manipulated Shares Some business groups resort to manipulation of the shares of their companies. This mostly is in the form of market support to boost share prices, particularly before a public issue or rights issue. It can take other forms as well. Besides manipulating share prices, such groups also resort to 'creative accounting' meant to enhance reported profit artificially. As a general guideline, avoid such manipulated shares.

Cornered Shares Stock market operators engage in cornering operations from time to time. While such shares may excite aggressive investors, conservative investors, as a rule, should scrupulously avoid such shares.

Apply Stiff Screening Criteria The conservative investor should consider only those shares in the secondary market which satisfy stiff requirements. The screening criteria I recommend are as follows:

Size The company should not be very small. Its turnover should preferably be greater than Rs 100 crore and its equity base larger than Rs 20 crore.

Competitive Position The company must have a reasonably strong competitive position. It should enjoy a respectable share of the market. Better still, it should have a market share that is growing.

Industry Prospects The prospects of the industry to which the company belongs must be above average. It should certainly not be an industry that is stagnating or declining.

Price-earnings Ratio The price-earnings ratio of the company must not be very high. As a general guideline, one has to be very cautious if the price-earnings ratio is more than 15 and/or significantly higher than the industry average.

Dividend and Bonus Record The company should have a reasonably good track record of dividend payment and bonus shares. Such a record indicates that the management is investor-friendly. And this should be an important consideration for investors.

Reputation of Management The management of the company must have a reputation for competence, commitment, dynamism, and integrity. Remember that the 'management' factor often plays a decisive and critical role in the success or failure of a company.

Look for Relatively Safe Opportunities in the Primary Market If you are a conservative investor, you may be hesitant to buy shares in the secondary market. This may be partly because volatility bothers you and partly because you feel that locating good bargains may be very time-consuming. So, you may turn your attention to the primary market, the market where the companies issue new securities. Here you may be interested in the following:

(a) Public issues of equity shares and/or convertible debentures by established companies.
(b) Rights issue of equity shares and/or convertible debentures by established companies.

Public Issues of Equity Shares and Convertible Debentures of Established Companies When an established company issues equity shares and convertible debentures to the public at large, the issue price is likely to be set in such a manner that it represents a discount over the prevailing market price. Hence, such issues may represent an attractive investment opportunity for investors. Obviously, when such issues are very attractive, they are heavily oversubscribed. As a result, the chances of allotment and hence expected gains diminish. Yet, such issues should not normally be missed by investors who are looking for opportunities in the stock market.

Rights Issues of Equity Shares and Convertible Debentures of Established Companies When a company issues additional equity capital, it has to be offered in the first instance to the existing shareholders on a *pro rata* basis. This is required under Section 81 of the Companies Act, 1950 (the shareholders, however, may forfeit this right by passing a special resolution).

Theoretically, the market value of a right is equal to:

Expected market price per share after the rights issue – Subscription price per share

For example, if the expected market price after the rights issue is Rs. 30 and the subscription price per rights share is Rs. 20, the market value of a right theoretically will be Rs. 10. Hence, the wealth of a shareholder remains unaffected whether he exercises his rights or sells them. In practice, however, the market value of a right is usually less than its theoretical value. So, the investor who sells his rights tends to lose. Hence, as a shareholder, you should exercise your rights in full and also, whenever possible, buy additional rights in the market place.

Switching If you are a shareholder of a company which is making a public issue and/or rights issue of equity shares or convertible debentures, it may be advisable to sell your equity shares just when they become ex-rights and subscribe to the new issue. Put differently, it may be profitable to switch from the old shares to the new shares. Why is such a switching strategy recommended? Due to imperfections and/or interventions in the stock market, the price decline, which ought to occur instantaneously on the day the share becomes ex-rights tends to take place over a period of time.

Refrain from Short-term Switch Hitting Share prices tend to swing and sometimes rather violently. This may induce investors to trade frequently in the hope of benefiting from short-term market fluctuations. A strategy of frequent trading based on the premise that one can outguess the market often produces inferior investment results, after transaction costs.

Given the futility of such a strategy, it seems much more sensible to adopt a 'buy-and-hold' strategy. Of course, it should be emphasised that I am not recommending that a share, once bought, should be held for ever. What is recommended is that a policy of short-term switch-hitting must be eschewed in favour of a policy of reviewing stocks periodically, say once in six months.

Perceptive observers of the investment scene have lamented the short-termism displayed by most portfolio managers and investors. As Robert Kirby says: "Are we traders, or are we really investors? Most good money managers are probably investors deep down inside. But quotrons, news services, and computers that churn out daily investment results make them act like traders."[7]

What is Robert Kirby's suggestion? He says that the best policy is to construct a diversified portfolio using the best research available, bury it in a coffee can in the backyard, and leave it alone for 10 years. He believes that such a portfolio would outperform the market index. Warren Buffet, too, advocates a similar approach.

While I believe in minimising trading, I suggest that no mercy be shown to losers. Barring cases where patience is warranted because of adverse temporary developments and attractive long-term potential, I recommend that losers should be sold as early as possible. In this context, a disciplined adherence to a "stop loss order" rule is a good insurance against errors of judgment which invariably occur in the world of investment.

SUMMARY

- There are ten commandments of investing which should serve as basic guidelines for all investors. They are as follows: (i) Start saving early and save regularly. (ii) Maintain an adequate cash reserve and an appropriate insurance cover. (iii) According top priority to a residential house. (iv) Match your stock-bond mix to your investment situation. (v) Select bonds and stocks judiciously. (vi) Diversify adequately. (vii) Avail of tax shelters. (viii) Periodically review and revise your portfolio. (ix) Check your irrationality. (x) Maximise your lifetime financial success.
- Aggressive investors play the equity game actively and vigorously. In addition to the general guidelines for investment, aggressive equity investors should bear in

[7] Robert G. Kirby, "The Coffee Can Portfolio," *The Journal of Portfolio Management*, Fall 1984.

mind the following guidelines specially relevant for them: (i) Focus on investments you understand and play your own game. (ii) Monitor the environment with keeness. (iii) Scout for 'special' situations in the secondary market. (iv) Pay heed to growth shares. (v) Beware of the games operators play. (vi) Invest selectively in new issues. (vii) Anticipate earnings ahead of the market. (viii) Leverage your portfolio when you are bullish. (ix) Take swift corrective action.

- Conservative equity investors seek to minimise the investment risk as well as the time and effort devote to portfolio management. In addition to the general guidelines for investment, conservative equity investors should also bear in mind the following guidelines specially applicable to them: (i) Avoid certain kinds of shares. (ii) Apply stiff screening criteria. (iii) Look for relatively safe opportunities in the primary market. (vi) Participate in the schemes of mutual funds. (v) Join a suitable portfolio management scheme. (vi) Consult an investment advisor, (vii) Refrain from short-term switch hitting.

QUESTIONS

1. Discuss the ten basic guidelines for investing.
2. Discuss the guidelines for aggressive equity investors.
3. Discuss the guidelines for conservative equity investors.

MINICASE

Rajiv Gupta is 40 years old and his annual income for the just concluded year was Rs. 800,000. He expects his income to increase by 12 percent per year till he retires at the age of 60.

Rajiv Gupta expects to live till the age of 75. In the post-retirement period, Rajiv Gupta would like his annual income from his financial investments to be 40 percent of his salary income in his last working year. Further, he would like the same to be protected in real terms.

Rajiv Gupta owns a house (on which all the mortgage payments have been made) and has Rs. 500,000 of financial assets. He wants to bequeath the house to his son and Rs. 10,000,000 to his daughter when he dies.

The current financial assets and the future savings of Rajiv Gupta are expected to earn a nominal rate of return of 10 percent per annum. The expected inflation rate for the next 50 years is likely to be 4 percent.

1. What proportion of his salary income should Rajiv Gupta save till he retires so that he can meet his post-retirement financial goals?
2. If Rajiv Gupta wants to retire at the age of 50, to pursue other interests in life, what proportion of his salary income should he save?

Chapter 23

Strategies of the Great Masters

The Timeless Wisdom

LEARNING OBJECTIVES

After studying this chapter, you should be able to:

- Describe the strategies followed by investment wizards like Warren Buffett, John Templeton, Peter Lynch, and George Soros.
- Explain the guidelines for contrarian investors as defined by David Dreman.
- Discuss how the loser's game has to be played.
- Explain the Zurich axioms.

John Train wrote a fascinating book *The Money Masters*[1], first published in 1980, in which he explained the investment strategies of nine great investors: Warren Buffett, Paul Cabot, Philip Fisher, Benjamin Graham, Stanley Kroll, T. Rowe Price, John Templeton, Larry Tisch, and Robert Wilson.

The overwhelming response to this book prodded, in a way, John Train to describe the techniques of present day investment gurus in a complementary book *The New Money Masters*.[2] This book describes the investment strategies of Jim Rogers, Michael Steinhardt, Philip Carrat, George Soros, George Michaelis, John Neff, Ralph Wanger, and Peter Lynch.

From the galaxy of investments masters, surveyed so ably by John Train, six names seem to stand out for their distinctive style and exceptional long-term performance: Benjamin Graham, Philip Fisher, Warren Buffett, John Templeton, Peter Lynch, and George Soros.

This chapter seeks to provide a synoptic view of the methods and strategies followed by these investment wizards. Obviously the succinct presentation here cannot do full justice to their rich style and subtle technique. The reader interested in learning more

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[1] John Train, *The Money Masters*, New York; Harper & Row, Publishers, 1980.
[2] John Train, *The New Money Masters*, New York; Harper Collins, Publishers, 1989.

about their approaches is advised to read full-length volumes dedicated to them, which have been referred to in the following pages.

In addition, it explores the approach of David Dreman, widely regarded as the 'dean' of contrarians, the tips given by Charles Ellis, a highly regarded investment professional, for playing what he calls the Loser's Game, the counsel provided by John Bogle, a doyen in the world of finance, the wisdom of Swiss speculators, who have been immensely successful, as embodied in the Zurich axioms, and the strategies followed by a few Indian Investment gurus.

23.1 BENJAMIN GRAHAM: THE QUANTITATIVE NAVIGATOR

Benjamin Graham, the father of security analysis, loved mathematics and followed a quantitative approach to investment. He looked at investments solely through numbers, without bothering about the quality of the business or the capability of its management. Throughout his professional career, Graham tried to develop specific, quantitative techniques that he could teach to others to enable them to manage their investments profitably.

Apart from being an eminently successful money manager, who ran Graham-Newman Corporation from 1936 to 1956, he was an outstanding investment theorist and educator: In 1934, along with David Dodd, he published *Security Analysis,* a monumental work, which is regarded as a basic text for serious students of investing.

In a tribute written in the November/December 1976 issue of the *Financial Analysts Journal,* Warren Buffett made the following comment on the book *Security Analysis:* "But over forty years after publication of the book that brought structure and logic to a disorderly and confused activity, it is difficult to think of possible candidates for even the runner-up position in the field of security analysis."[3] Jason Zweig echoed a similar view: "Before Graham, money managers behaved much like a medieval guild, guided largely by superstition, guesswork, and arcane details. Graham's *Security Analysis* was the text book that transformed this musty circle into a modern profession."[4]

In 1949, Benjamin Graham published *The Intelligent Investor* which appeals to almost all readers and which according to Warren Buffett is: "By far the best book on investing ever written." From 1928 to 1956, Benjamin Graham taught an immensely popular course at Columbia Business School that attracted students like Warren Buffett.

Till the end of his long and illustrious professional career, Graham emphasised the "look for values with a significant margin of safety relative to prices approach to security analysis." His focus was on developing methods that could be used by anybody and hence relied entirely on readily available published material, such as the company's own reports.

To illustrate Graham's methods, let us look at the following set of standards developed by him for stock selection by the defensive investor in his book *The Intelligent Investor*.

[3] Benjamin Graham, *op. cit.*
[4] Benjamin Graham, *op. cit.*

1. **Adequate Size of the Enterprise** A company should not have less than \$100 million of annual sales if it is an industrial company or less than \$50 million total assets if it is a public utility.
2. **A Sufficiently Strong Financial Condition** For an industrial company, the current ratio should be at least two and the long term debt should not be greater than the net current assets. For a public utility, the debt-equity ratio (at book value) should not exceed 2.
3. **Earnings Stability** Equity earnings must be positive in each of the past ten years.
4. **Dividend Record** The company must have a record of paying uninterrupted dividends for at least the past twenty years.
5. **Earnings Growth** Earnings per share must have increased by at least one-third in the past ten years, using three-year averages at the beginning and end.
6. **Moderate Price/Earnings Ratio** The current price should not exceed 15 times average earnings for the past three years.
7. **Moderate Ratio of Price to Assets** The current price should not exceed 1 ½ times the last reported book value. However, a price-earnings multiplier of less than 15 may justify a higher price-to-book value approach. As a rule of thumb, the product of the price-earnings multiplier and the price-to-book value ratio should not be more than 22.5.

23.2 PHILIP FISHER: THE INVESTIGATIVE GROWTH STOCK INVESTOR

Philip Fisher set up his office as an investment counselor in 1931, when he was just 24 years old, and gradually acquired a reputation as an original, profound, and thorough investment thinker. He became the dean of investment counselors in San Francisco and maintained that stature for decades.

A pioneer in growth stock investing, he took huge positions in companies like FMC, Texas Instruments, Motorola, and Dow chemicals in their nascent stages. He received national recognition with the publication of his book *Common Stocks and Uncommon Profits and Other Writings* in 1958. Deeply impressed with this book, Warren Buffett went to meet Fisher and learn his strategies first hand.

Outstanding Companies Fisher concentrated on identifying outstanding companies. As he said: "I don't want a lot of good investments; I want a few outstanding ones."[5] To evaluate whether a company is outstanding, Fisher employed several criteria, which can be grouped under two main categories: characteristics of the business and qualities of management.

[5] John Train, *Money Masters of Our Time*, New York: Harper Business, 2000.

Characteristics of the Business An attractive business has the following characteristics: (a) growth from existing products and new products, (b) high profit margin and return on capital along with favourable trends in them, (c) effective research, (d) an excellent sales organisation, (e) a leading industry position, and (f) a durable "franchise".

Qualities of Management The desirable qualities of management include the following: (a) integrity, (b) accessibility, (c) long-term orientation, (d) appreciation that change is pervasive, (e) strong financial controls, (f) sound personnel policies, (g) special skills required for particular industries, and (h) multidisciplinary skills where relevant.

Fisher's Technique Fisher suggests that a proper analysis of a company involves three phases:

a. Absorbing printed material including the annual and interim reports and the 10-K statement.
b. Gathering additional information from business sources – Fisher emphasises the importance of scuttlebutt, which he also refers to as "the business grapevine" in investing. As he put it: "The business grapevine is a remarkable thing… Go to five companies in an industry, ask each of them intelligent questions about the points of strength and weakness of the other four, and nine times out of ten a surprisingly detailed and accurate picture of all five will emerge."
c. Visiting the company to assess the management and ascertain whether they are carrying out the stated policies.

23.3 WARREN BUFFETT: THE ULTIMATE BUSINESSMAN

Hailed as the world's most successful stock market investor, Warren Buffett was ranked as the richest American in a list compiled by Forbes in 1993. His track record in accumulating wealth through successful stock market investments is nonpareil. In 1956, he commenced his investment partnership with $10,000; in 2005 his net worth was estimated at $44.0 billion.

Robert G. Hagstrom, Jr. has described the investment strategies of Warren Buffett in a fascinating book titled *The Warren Buffett Way: Investment Strategies of the World's Greatest Investor*.[6] The key tenets of the Warren Buffett way are:

- Turn off the stock market
- Don't worry about the economy
- Buy a business, not a stock
- Manage a portfolio of business

Turn Off the stock market The stock market exhibits manic-depressive tendencies. At times it is wildly euphoric and at other times it is unduly pessimistic. Hence Buffett says that one should not take direction from the market. In fact, Buffett does not have a stock quote machine in his office. He says, "After we buy a stock, consequently, we

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[6] Robert G. Hagstrom Jr., *The Warren Buffett Way*, New York: John Wiley & Sons, 1994

would not be disturbed if markets closed for a year or two." In a similar vein, he adds "We don't need a daily quote on our well being in a 100 percent subsidiary. Why, then, should we need a quote on our 7% interest in Coke?"

While the stock market should not be regarded as a preceptor, its wild gyrations present wonderful opportunities for a disciplined investor. As Buffett says, "As far as I am concerned, the stock market doesn't exist. It is there only as a reference to see if anybody is offering to do anything foolish."

Don't Worry about the Economy A commonly recommended approach to investments calls for forecasting the economic environment and selecting stocks that are likely to benefit most from it. Buffett, however, does not subscribe to this approach for two reasons:

(a) It is as difficult to predict the economy as it to forecast the stock market.
(b) A strategy of selecting stocks that benefit from a particular economic environment invariably leads to speculation and excessive turnover. Instead, Buffett prefers to invest in businesses that do well irrespective of what happens to the economy.

Buy a Business, Not a stock Buffett believes that when one invests one must buy a business, not a stock. This means that the investment must be viewed from the long-term perspective of a businessman.

How should one think about an investment? Buffett applies the following tenets.

Business Tenets Buffett is interested in businesses which satisfy the following criteria:

Simplicity and Understandability The business must be simple and understandable. Otherwise you may not be able to figure out how it generates profits.

Consistent History In order to bet on the future of the company you should know how it has fared in the past. A good track record provides an assurance about the ability of the company to earn profits.

Franchise A franchise offers the best long-term prospects. A franchise is a business that sells a desired product or service which has no close substitute. Further, its profits are not subject to regulation. As against a franchise, a commodity business offers poor prospects.

Coca-Cola, Gillette, See's Candy, and the *Washington Post* are excellent examples of franchise businesses in which Berkshire Hathaway, a Buffett controlled company, has huge investments. Buffett's edge seems to be in his ability to invest in and, if required, shape the franchise businesses.

Management Tenets For assessing the quality of management, Buffett employs the following criteria:

Management Rationality Rational managers invest cash in projects that earn returns in excess of the cost of capital. If such projects are not available, they will return the money to shareholders. Irrational managers, on the other hand, look for ways to invest surplus funds, somewhat unmindful of their profitability. As a consequence, they tend to earn returns less than the cost of capital.

Managerial Candour The openness with which the management communicates with shareholders is important. Does the management explain how various operating divisions are performing? Does the management forthrightly claim that its primary objective is to maximise the returns to shareholders?

Resistance to Institutional Imperative Most managements succumb to the institutional imperative. They mindlessly imitate the behaviour of others and tend to build a big empire, often hurting the shareholders in the process. An important measure of managerial competence is its ability to resist the institutional imperative and its unwavering commitment to the welfare of shareholders.

Financial Tenets The following financial yardsticks are considered important by Buffett:

Return on Equity Investors often judge a company's annual performance by its earnings per share. A better measure of a company's annual performance is its return on equity –this measure takes into account the company's growing equity base.

Profit Margin High profit margins reflect a strong business as well as a firm managerial determination to control costs.

Market Tenets Naturally, Buffett is interested in buying businesses which are available at a significant discount over their value. He focuses on the following.

Value of the Business A strong advocate of the discounted cash flow method, Buffett values a business by discounting its estimated cash flow at a suitable discount rate.

Purchase at a Significant Discount Buffett believes in purchasing the business when its price is substantially lower than its value. Note that Buffett looks at the stock market price only at this juncture. To deal with the potential errors in valuation, Buffett (a) adheres to businesses which are simple and stable in character, and (b) insists on a 'margin of safety' which acts as a cushion.

Manage a Portfolio of Business Since Buffett manages a portfolio of businesses and not stocks, he does not believe in wide diversification. He thinks that wide diversification makes sense only for the "know-nothing" investors who would do well to buy an index fund. "Paradoxically," he says, "when 'dumb' money acknowledges its limitations, it ceases to be dumb."

"On the other hand," Buffett argues, "if you are a know-something investor, able to understand business economics and to find five to ten sensibly-priced companies that possess important long-term competitive advantages, conventional diversification makes no sense to you." "In our view," Buffett says, "what makes sense in business also makes sense in stocks: an investor should ordinarily hold a small piece of an outstanding business with the same tenacity that an owner would exhibit if he owned all of that business."

23.4 JOHN TEMPLETON: THE BARGAIN HUNTER

John Templeton has excelled in bargain hunting. His style is characteristically reflected in an order that he placed with his broker in 1939: "I want you to buy me a hundred dollar's worth of every single stock on both major exchanges that is selling for no more than one dollar a share."

Templeton is considered as one of the most outstanding fund managers of twentieth century. A pioneer in the global investing, he was one of the first to make money in different markets. In 1972–74 he cleverly shifted most of his fund's assets in Canadian and Japanese stocks, saving his shareholders from the collapse of the US market. Further, he was one of the first to take advantage of the Japanese market by moving there in 1960s, ahead of others. In recognition of his global investment skills, in 1999 *Money Magazine* called him "arguably the greatest global stock picker of the century."

Templeton, founder and former Chairman of the Templeton organisation, has distilled his years of experience and expertise into the 16 Rules of Investment Success[7].

1. *If you begin with a prayer, you can think clearly and make fewer mistakes*.
2. *Outperforming the market is a difficult task*. The challenge is not simply making better investment decisions than the average investor. The real challenge is in making investment decisions that are better than those of the professionals who manage the big institutions.
3. *Invest—don't trade or speculate*. The stock market is not a casino, but if you move in or out of stocks every time they move a point or two...the market will be your casino and…you may lose eventually—or frequently.
4. *Buy value, not market trends or the economic outlook.* Ultimately, it is the individual stocks that determine the market, not vice versa… Individual stocks can rise in a bear market and fall in a bull market. So buy individual stocks, not the market trend or economic outlook.
5. *When buying stocks, search for bargain among quality stocks.* Determining quality in a stock is like reviewing a restaurant. You don't expect it to be 100% perfect, but before it gets three or four stars you want it to be superior.
6. *Buy low. So simple in concept. So difficult in execution*. When prices are high, a lot of investors are buying a lot of stocks. Prices are low when demand is low. Investors have pulled back, people are discouraged and pessimistic. But, if you buy the same securities everyone else is buying, you will have the same results as everyone else.
7. *There's no free lunch. Never invest on sentiment. Never invest on a tip.* You would be surprised how many investors do exactly this. Unfortunately there is something compelling about a tip, its every nature suggests inside information, a way to turn a fast profit.
8. *Do your homework or hire wise experts to help you*. People will tell you: Investigate before you invest. Listen to them. Study companies to learn what makes them successful.

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[7] Sir John Templeton, 16 *Rules for Investment Success,* Templeton Investment Series.

9. *Diversify by company, by industry.* In stock and bonds, there is safety in numbers. No matter how careful you are…you can neither predict nor control the future. So you must diversify.
10. *Invest for maximum total return.* This means the return … after taxes and inflation. This is the only rational objective for most long term investors.
11. *Learn from your mistakes.* The only way to avoid mistakes is not to invest - which is the biggest mistake of all. So forgive yourself for errors…and certainly don't try to recoup your losses by taking bigger risks. Instead, turn each mistake into a learning experience.
12. *Aggressively monitor your investments. Remember, no investment is forever.* Expect and react to change. And there are no stocks that you can buy and forget. Being relaxed…doesn't mean being complacent.
13. *As investor who has all the answers doesn't even understand all the questions.* A cocksure approach to investing will lead, probably sooner than later, to disappointment if not outright disaster…the wise investor recognises that success is a process of continually seeking answers to new questions.
14. *Remain flexible and open-minded about types of investment.* There are times to buy blue chip stocks, cyclical stocks, convertible bonds…And there are times to sit on cash. The fact is there is no one kind of investment that is always best.
15. *Don't panic.* Sometimes you won't have sold when everyone else is buying and you will be caught in a market crash. Don't rush to sell the next day…instead, study your portfolio…if you can't find more attractive stocks, hold on to what you have.
16. *Do not be fearful or negative too often.* There will, of course, be corrections, perhaps even crashes. But over time studies indicate, stocks go up…and up…and up. In this century or the next, it's still "Buy low, sell high".

The Templeton approach, although clear and simple, requires skill, dedication, and astute judgment. For, it is never easy to deliver consistently superior performance by investing differently from the crowd. Templeton's time-tested strategy is "buying bargains where they exist". The key ingredient is the search for those few investment opportunities that offer outstanding long-term value.

23.5 PETER LYNCH: THE RELENTLESS CHASER

Arguably one of the most successful money managers of our times, Peter Lynch was responsible for the phenomenal growth of Fidelity Magellan Fund. Under his stewardship, Magellan Fund became the largest mutual fund in history, with $12 billion in assets at its peak in August 1987. More important, during the thirteen years when Lynch managed the Magellan Fund, till he retired in 1990, Magellan was the top-ranked general equity mutual fund. An investment of $1,000 in Magellan in 1977 grew to $28,000 in 1990. No wonder *Time* magazine called Lynch the "#1 Money Manager".

How did Lynch accomplish this? What are the tenets of his investment strategy? What are his prescriptions for the lay investor? In a highly readable and insightful book, *One Up on Wall Street*[8], which became a runaway bestseller, Lynch shares his secrets and offers a number of valuable suggestions. Here is a distillation of his advice:

Address Basic Personal Issues before Buying Shares The important personal issues that you should address are: (a) Do I own a house? Investment in a house is most attractive for various reasons. (b) Do I need the money? Losses from investment should not have an effect on your standard of living in the foreseeable future. (c) Do I have personal qualities that will bring me success in investments? According to Lynch, this is the most important question. He says, "It seems to me the list of qualities ought to include patience, self-reliance, common sense, a tolerance for pain, open-mindedness, detachment, persistence, humility, flexibility, a willingness to do independent research and an equal willingness to admit to mistakes and the ability to ignore general panic."

Devote Time and Effort If you want to manage your investment on your own, you should, says Lynch, devote at least one hour a week to investment research. Merely adding the dividend income and figuring out gains and losses does not serve any purpose.

The need to spend effort in investment research is driven vividly when Lynch says: "Invest at least as much time and effort in choosing a new stock as you would in choosing a new refrigerator." For those who can't devote such attention, Lynch recommends the mutual fund. As he says: "The mutual fund is a wonderful invention for people who have neither the time nor the inclination to test their wits against the stock market, as well as for people with small amounts of money to invest who seek diversification."

Try Going it Alone When you have decided to invest on your own, you should try going it alone. As Lynch says: "This means ignoring the hot tips, the recommendations from brokerage houses, and the latest can't miss suggestion from your favourite newsletter, in favour of your own research. It means ignoring the stocks that you hear Peter Lynch, or some, similar authority, is buying."

Invest in Something You Know or Understand Your edge in investment comes from something you know or understand. If you find that some product is moving very fast in the departmental store you visit, you have a potential investment idea. Ironically, people ignore such clues and look for exotic propositions that they don't understand. As Lynch says: "People seem more comfortable investing in something about which they are entirely ignorant. There seems to be an unwritten rule on Wall Street: If you don't understand it, then put your life savings into it. Shun the enterprise around the corner, which can at least be observed and seek out the one that manufactures an incomprehensible product."

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[8] Peter Lynch, *One Up on Wall Street,* Penguin, 1990.

Look for Companies that are "Off the Radar Scope of the Market" The scope for appreciation seems to be greater for small, obscure and apparently unexciting companies which the market does not fancy. As Lynch says: "If it's a choice between owning stock in a fine company with excellent management in a highly competitive and complex industry, or a humdrum company with mediocre management in a simple minded industry with no competition, I'd take the latter."

Apply Simple Fundamental Criteria Lynch relies on fundamental analysis and eschews technical analysis. He looks at the price-earnings (p/e) ratio carefully. He says: "In general, a p/e ratio that's twice the growth rate is very negative. We use this measure all the time in analysing stocks for the mutual funds." Other factors considered are the cash position, the debt factor, dividends, book value, cash flow, and profit after tax.

Don't Try to Predict the Market It is impossible to predict the direction of the market over one year or even two years. Hence it is futile to predict the market. As Lynch says: "When it comes to predicting the market, the important skill is not listening, it's snoring. The trick is not to learn to trust your gut feelings, but rather to discipline yourself to ignore them. Stand by your stocks as long as the fundamental story of the company hasn't changed."

Avoid Market Timing Lynch believes in staying in the stock market all the time, rather than switching from stock to cash and vice versa as market timers do. As he says: "Going into cash would be getting out of the market. My idea is to stay in the market forever, and to rotate stocks depending on the fundamental situations." He argues that an investor can save himself a lot of mistimed moves and general agony if he decides that a certain amount will always remain invested in the stock market.

Avoid Generic Formulae Lynch thinks that it is erroneous to rely on generic formulae. As he says: "Basing a strategy on general maxims such as 'Sell when you double your money', 'Sell after two years', or 'Cut your losses by selling when the price falls 10 percent, is absolute folly. It's simply impossible to find a generic formula that sensibly applies to all the different kinds of stocks."

Diversify Flexibly *A priori* one should not fix the number of stocks to be included in the portfolio. Instead, the degree of diversification should be determined on a case-by-case basis. As Lynch says: "In my view it's best to own as many stocks as there are situations in which (a) you've got an edge; and (b) you've uncovered an exciting prospect that passes all the tests of research. May be that's a single stock, or may be it's a dozen stocks."

Be Patient Don't expect quick results. Remain invested in your stocks if the fundamentals continue to be good. Eventually patience is rewarded. As Lynch says: "It takes remarkable patience to hold on to a stock in a company that excites you, but which everybody else seems to ignore. You begin to think everybody else is right and you are wrong. But where the fundamentals are promising, patience is often rewarded."

Carefully Prune and Rotate Based on Fundamentals Lynch practised very successfully the art of rotating his portfolio based on fundamentals. As John Train says: "The essence of Lynch's technique is fluency, letting his portfolio flow easily from one idea to another. He notices some apparent opportunity in the market and moves on it forthwith, without delaying for extensive analysis."[9] He further adds: "Since like a racing skipper, he is constantly changing course to take advantage of small shifts in the wind, there is unending movement in Lynch's Portfolio."

Eschew Financial Derivatives Lynch is not favourably disposed towards financial derivatives. He says: "I have never bought a futures nor an option in my entire investing career. It's hard enough to make money in regular stocks without getting distracted by these side bets, which I'm told are nearly impossible to win unless you're a professional trader." He further adds: "I know that the large potential return is attractive to many small investors who are dissatisfied with getting rich slow. Instead, they opt for getting poor quick. That's because an option is a contract that's good only for a month or two, and unlike most stocks it regularly expires worthless."

23.6 GEORGE SOROS: THE GLOBAL SPECULATOR

George Soros has an unparalleled record. If someone had invested $100,000 in 1969 when Soros set up the Quantum Fund, his investment (presuming that dividends were reinvested) would have grown to $130 million by the spring of 1994 - a compound growth rate of 35 percent over a period of 25 years. As Robert Slater says: "Quite simply, no one has done as well for so long in the financial markets as George Soros. Not Warren E. Buffett, not Peter Lynch. Not anyone. His record was the best on Wall Street."[10] Indeed, Soros deserves the title of "The World's Greatest Money Manager" conferred by the *Institutional Investor* magazine.

The methods employed by Soros[11] are inordinately complex and beyond the comprehension and grasp of most of us. Even Soros's own effort in expounding his approach in a book called *Alchemy of Finance*[7] has not been very helpful. Notwithstanding these difficulties, it is worth taking a peep into what Soros does. Our principal guide in this undertaking will be an incisive book titled *Soros*: *The Life, Times, and Trading Secrets of the World's Greatest Investor* by Robert Slater.[12]

Complex Manoeuvres Soros speculates internationally in commodities, currencies, stocks and bonds with massive amounts of margin. He employs derivatives extensively. Here is an example of one of his manoeuvres:

"If I start with a fully invested position and then sell short an equal amount, a 20 percent decline, even if it affects the longs and the shorts equally, leaves me only 80

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[9] John Train *op. cit.*

[10] However since Soros uses highly leveraged positions, it is strictly not fair to compare his performance with those of conservative investors.

[11] George Soros, *The Alchemy of Finance,* New York: Simon and Schuster, Inc., 1987.

[12] Published by McGraw-Hill in 1997.

percent invested on the long side. If I cover my shorts at the right time, I come out way ahead, but even if I cover shorts with a loss I am better off than I had sold my longs at the wrong time."

Reflexivity Theory Soros believes that the financial world is unstable and chaotic and governed by mass psychology or herd instinct. In this world, the classical theory of economics, that holds that there is an equilibrium price which represents the market-clearing price, does not apply. As Soros says:

"The generally accepted view is that the markets are always right—that is market prices tend to discount future developments accurately even when it is unclear what those developments are. I start with the opposite point of view. I believe that market prices are always wrong in the sense that they present a biased view of the future. But distortion works in both directions: not only do market participants operate with a bias, but their bias can also influence the course of events."

He refers to the two-way connection between flawed perceptions and the actual course of events as "reflexivity". He breaks this connection into two functional relationships.

Cognitive function	:	The perception of the participants depends on the situation.
Participating function	:	The situation is influenced by the perception of the participants.

Using simple mathematics, he depicts reflexivity as a pair of recursive functions:

Cognitive function $Y = f(X)$
Participating function $X = f(Y)$

Hence

$$Y = f[(Y)] \text{ and } X = f[(X)]$$

Soros argues that the two recursive functions do not lead to an equilibrium but an endless process of change. Apparently, he applied this theoretical foundation with consummate skill. As he says: "I had to use all my intellectual resources and I discovered, to my great surprise, that my abstract ideas came in very handy. It would be an exaggeration to say that they accounted for my success: but there can be no doubt that they gave me an edge."

Greatest Coup The method and approach of Soros may best be illustrated by his greatest coup to date.

When the Berlin Wall came down on November 9, 1989, many people believed, or at least hoped, that a new unified Germany would rise and prosper. Soros, however, thought differently. He felt that the new Germany would experience difficulty in financing the unification, remain preoccupied with its internal economic problems, and pay less attention to other western European countries. Such a German outlook would have important implications for the economies as well as currencies of other European countries.

In this backdrop, when Great Britain joined the new western European system, the ERM or the Exchange Rate Mechanism, Soros thought it was a wrong move. Britain would become dependent on Germany, the strongest economic power in Western Europe. Such dependence, when Germany was inward-looking, would be fatal to Britain. Hence, Soros expected Britain will pull out of ERM. On September 15, 1992, confident that Britain will pull out of the ERM and devalue its currency (as long as it remained in the ERM it had limited flexibility to devalue), he sold $10 billion worth of sterling short. Indeed the British pulled out of the ERM on September 15 and devalued. Soros's gains from various positions he took during the ERM crisis totalled to nearly $2 billion, the largest ever by a global speculator.

Arthur Lerner, who worked with George Soros, considers him as a pioneer in global thinking who can figure out how an event here could impact an event there. Barton M. Briggs, a highly acknowledged expert on investment management, pays a rich tribute to George Soros: "He's the best pure investor ever. He is probably the finest analyst of the world in our times."

23.7 DAVID DREMAN: THE CONTRARIAN INVESTOR

Regarded by many as the "dean" of contrarians, David Dreman is the Chairman and Chief Investor of Dreman Value Management, a firm that manages several billion dollars of individual and institutional funds and has a very impressive track record. Dreman has articulated his views and strategies in several works, the most influential being *Contrarian Investment Strategies: The Next Generation*[13], a highly acclaimed work. About this book Marshall Loeb, former editor, *Fortune* magazine, says: "David Dreman has written one of those rare, original books on the market that appear every generation or so. Powerful, profound, and extremely well documented, it provides totally new strategies for investing in the 1990s and beyond."

Dreman has discussed 41 rules of contrarian investment in his above cited work. For our purpose, these 41 rules may be distilled into 11 rules which are discussed below:

Ignore Technical Analysis Technical analysis is based on the assumption that past behaviour of prices can be used to forecast the future behaviour of prices. Though widely used on Wall Street (Dalal Street in India), technical analysis does not seem to have any validity. Scientific studies have demonstrated that stock prices behave like a random walk. This implies that future price movements cannot be forecast on the basis of past price behaviour. Given the unpredictability of stock prices, it makes no sense to rely on technical analysis.

Don't Rely on Experts Experts, like lay persons, are prone to errors. The failure of experts is traceable to difficulties in processing information. Current psychological research suggests that man is primarily a serial or sequential processor of information. He can handle information reliably for problems that require essentially linear processing of information. However, many decision situations, including investment decision situations, require configural or interactive reasoning and not linear reasoning.

[13] David Dreman, *Contrarian Investment Strategies: The Next Generation, New York:* Simon Schuster, 1998.

In configural problems, the interpretation put on some piece of information depends on how other pieces of information are evaluated. For example, the interpretation placed on earnings would depend on how the analyst evaluates several other inputs like leverage, business risk, growth, payout ratio, tax structure, quality of accounting, and so on. When multiple factors interact in complicated ways and point in different directions, human judgments, however well informed and well-reasoned, tend to be fallible. As Dreman says: "What had not been known until recently is that under certain conditions, experts err predictably and often... And the conditions for such errors are as fertile in the stock market as anywhere."

In his revolutionary book, *The Limits of Scientific Reasoning*,[14] David Faust says that "Human judgment is far more limited than we think. We have a surprisingly restricted capacity to manage or interpret complex information." In a variety of professions, Faust found that simple quantitative models outperformed human judges.

Beware of the Forecasts of the Analysts The investment analyst operates in an environment of considerable complexity and uncertainty. To cope with this challenge he demands as much information as possible and information services emerge to cater to this demand. The availability of more information, however, does not necessarily improve the judgment of the analyst because he cannot realistically comprehend, digest, and interpret the sea of information that swamps him.

Although more information does not improve the accuracy of analysis, it seems to increase the degree of confidence that analysts have in their forecasts. This is evident in the high rate of forecasting errors, despite the supreme confidence displayed by the analysts. Hence beware of the forecasts of the analysts. As Dreman warns: "The analysts' chances of being on the money with their forecasts are not much higher than winning a lottery... Putting your money on these estimates means that you are making a bet with the odds stacked heavily against you."

Invest in Out of Favour Stocks Stocks that are perceived to have glowing prospects sell at a high price in relation to earnings, cash flow, and book value and invariably have a negligible dividend yield. Conversely, stocks that are perceived to have bleak prospects sell at a low price in relation to earnings, cash flow, and book value and typically have a high dividend yield. Often the disparities between the two groups are exaggerated. Favourite stocks command fancy multiples and neglected stocks get dismal multiples because investors are in general over-confident of their forecasts.

What happens if the forecasts miss the mark? Positive surprises (actual performance exceeds forecast performance) seem to affect the favourite stocks and neglected stocks in very different ways. A positive surprise leads to a small increase in the price of a favourite stock but a large increase in the price of a neglected stock. A negative surprise, on the other hand, causes a significant drop in the price of a favourite stock but only a small decline in the price of a neglected stock.

[14] Published by University of Minnesota Press in 1984.

Given such an asymmetric impact of surprises - and thanks to forecasting errors, surprises are common - it makes a lot of sense to invest in neglected stocks and to eschew favourite stocks. Empirical evidence suggests that such a strategy works. As Dreman argues: "For the findings show that companies the market expects the best futures for, as measured by the price-earnings, price-to-cash flow, price-to-book value and price-to-dividend ratios, have consistently done the worst, while the stocks believed to have the most dismal futures have always done the best."

Supplement Your Analysis with Ancillary Financial Indicators In his application of the low P/E approach, Dreman looks at the two lowest quintiles (that is the bottom 40 percent) of the stocks and considers the following ancillary indicators:

- A strong financial position - reflected in ratios like the current ratio, debt-to-equity and interest coverage ratio - which provides the sinews to the company to weather a difficult period.
- Favourable operating and financial ratios that provide an assurance that the company has no structural flaws.
- An above-average past earnings growth rate and fair indication that it will not plummet in the near future.
- Earnings estimates that are conservative.
- An above-average dividend yield that the company can maintain and even increase.

Diversify Broadly If your assets are of sufficient size, Dreman suggests that you should invest equally in 20 to 30 stocks across 15 or more industries. Defending the diversification principle, Dreman argues: "Returns among individual issues will vary widely, so it is dangerous to rely on only a few companies or industries. By spreading the risk, you have a much better chance of performing in line with the out-of-favour quintiles shown above, rather than substantially below or above this level."

Within an Industry Buy the Cheapest Stocks as Determined by the Contrarian Strategies When Dreman wrote *Contrarian Investment Strategy*[15] in 1980, he advocated the low P/E strategy as it was the best documented strategy to outperform the market at the time. In this latest book *Contrarian Investment Strategies: The Next Generation* he argues that there are other contrarian strategies that perform well. One of them, a powerful one, is to buy the cheapest stocks within an industry, as determined by the four contrarian strategies, irrespective of how high or low the general price of the industry group is. This is the 'relative' contrarian strategy and it enables you to participate in stocks across the board. Empirical evidence suggests that this strategy works. Dreman says: "Our study indicates the returns dwarf those of an index fund. While it is not a strategy of everybody, it will work out for investors who can afford to own a 40 or 50 stock portfolio across 30 or 40 major industry groups."

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[15] The precursor to his recent work.

In defence of the 'relative' contrarian strategy, Dreman says: "The advantage of the relative contrarian strategy is that you have more diversification by industry than you do in the original contrarian strategies. This diversification should protect you from the underperformance that occurs when the most out-of-favour stocks and industries in the market are taboo."

Why does this strategy work? Dreman speculates: "Industry laggards often tighten their belts, improve their management and find ways of increasing their market share or developing new products, which results in their continued outperformance of the market for long periods… Now when earnings surprise pleasantly the market applauds and awards higher prices."

Don't Be Carried away by the Short-term Record of an Analyst for a Money Manager Due to the chance factor many experts have an excellent record for a while and occasionally even for several years. However, they are most likely to stumble later. Hence, don't be carried away by short-term performance, however impressive it may be, and don't accept investment news without ample substantiation. Dreman cautions: "If you buy the record just after a period of spectacular performance, chances are the letter writer or manager will not sustain it."

Rely More on the Base Rate and Less on the Case Rate While making a decision we are overly influenced by a recent experience and less by what happens in similar situations in the long run. As Dreman says: "People, it appears, become prisoners of such experience and view the future as an extension of the immediate past. The more memorable the circumstances the more they're expected to persist, no matter how out-of-line with prior norms." Put differently we rely heavily on the 'case rate' and tend to ignore the 'base rate'.

The law of regression to the mean, however, suggests that we must pay more attention to the 'base rate' than to the 'case rate' because deviations from the long term norms are corrected sooner or later. As Dreman says: "The greater the complexity and uncertainty in the investment situation, the less emphasis you should place on your current appraisal and more you should look at the rate of success or failure of similar situations." In a similar vein Dreman says: "Don't be seduced by recent rates of return for individual stocks or the market when they deviate sharply form past norms… If returns are particularly high or low, they are likely to be abnormal."

Give Your Strategy a Reasonable Time to Work Out Investors abhor uncertainty and hence expect quick results. Any investment strategy, however, takes time to deliver results. More so, a contrarian investment strategy that is pitted against the market mood. So give it reasonable time to work out. As Dreman argues: "Demanding immediate success invariably leads to playing the fads or fashions currently performing well rather than investing on a solid basis. A course of investment, once charted, should be given time to work out. Patience is a crucial but rare investment commodity."

View Risk Differently Investors often equate risk with short-term volatility because they are unnerved by price fluctuation. This view is reinforced by modern portfolio theory which regards variance of returns as the measure of risk. Dreman, however, argues that a risk measure that reflects short-term volatility is not appropriate for investors who have long investment horizons - 5, 10, 15, or even 30 years.

According to him a good measure of risk should focus on preservation and enhancement of purchasing power in real terms in the long run and not on volatility of short-term nominal returns. More specifically, he lays down two criteria: (a) the probability that the investment will preserve capital (in real terms) over time; and (b) the probability that the investment selected will outperform alternative investments over time. Judged by these criteria, equities have been less risky compared to other investments, even though they are characterised by a great deal of short-term volatility.

23.8 CHARLES ELLIS: PLAYING THE LOSER'S GAME

The investment game (or money game) was a phenomenal Winner's game from late 1970s to late 2000s. Most investors who participated in this game earned healthy returns. Naturally this game attracted a lot of talented, determined, and aggressive players. Thanks to the intense competition among numerous institutional players, the money game has now become a Loser's game.

The investment management business traditionally operated on the simple premise that professional money managers can outperform the market. This premise, in turn, rested on two assumptions: (i) liquidity offered by the stock market is an advantage, and (ii) institutional investing is a Winner's game.

Unfortunately, due to important changes in the investment field, these assumptions are no longer valid. Market liquidity seems to be more of a **liability** and less of an **asset** and institutional investors may underperform the market because money management is now a **Loser's game** rather than a **Winner's game**.

Before explaining why institutional investing has become a Loser's game, let us understand the key difference between a Winner's game and a Loser's game. In an interesting book, *Extraordinary Tennis for the Ordinary Tennis Player*,[16] Simon Ramo points toward the crucial difference between a Winner's game and a Loser's game. Based on his extensive observation he says that tennis is not one game, but two. While professional tennis is a Winner's game, amateur tennis is a Loser's game. Professional tennis players stroke the ball with well-aimed shots and play long and often exciting rallies. Eventually one player wins the point by driving the ball or placing it deftly, beyond the reach of his opponent. It is a Winner's game because the outcome is determined by the actions of the Winner. The victor gets a higher score by **winning** more points.

Amateur tennis, on the other hand, is a different game. Well aimed powerful shots, long and splendid rallies, deft placements, and brilliant serves are rare. On the contrary, the ball is often hit into the net or pushed out of bounds. In addition, double faults at service are rather common. The amateur player rarely beats his opponent; instead he

[16] Published by Crown Publishers in 1977.

beats himself. The victor in this game is the player who gets a higher score, not because he wins more points but because his opponent loses even more. To win this game one must avoid mistakes.

Charles Ellis[17] says that if you want to win the Loser's game, you should adhere to the following guidelines.

1. **Play your own game** Define your investment policy intelligently, adhere to it, and play your game in accordance with it. As Charles Ellis puts it: "All we need to do to be long-term winners is to orient ourselves and concentrate on realistic long-term goal setting, sound policies to achieve our goals, and the requisite self-discipline, patience, and fortitude required for persistent application."
2. **Keep it simple** As Ramo says: "Every game boils down to doing the things you do best, and doing them over and over again." The methods used by great players rely on simplicity, concentration, and economy of time and effort. While they focus on few things, others are lost in a maze of details. Charles Ellis put it this way: "Why not bring turnover down as a deliberate, conscientious practice? Make fewer and better investment decisions. Simplify the professional investment management problem. Try to do a few things unusually well."
3. **Concentrate on your defence** In the investment business, most of the information is purchase-oriented. Hence it is hard to outperform others in buying. So concentrate your efforts on selling. As Charles Ellis says: "In a Winner's game, 90 percent of all research effort should be spent on making purchase decisions; in a Loser's game most researchers should spend most of their time in making sell decisions."

23.9 JOHN BOGLE: TWELVE PILLARS OF INVESTMENT WISDOM

John C. Bogle, the founder of The Vanguard Group, the world's largest no-load mutual fund company, was named by *Fortune magazine* as one of the four financial giants of the 20th Century. In his best-selling work, *Bogle on Mutual Funds*[18], arguably the most definitive book on mutual funds, he has spelt out the "twelve pillars of wisdom" to guide investors in their search for a sensible, productive investment programme.

1. *Investing is not nearly as difficult as it looks* Successful investing calls for doing just a few things right and guarding against serious mistakes.
2. *When all else fails, fall back on simplicity* Occam's razor says that when there are multiple solutions to a problem, select the simplest one. The simplest policy for an investor would be to commit half of the assets to a stock index fund and half to a bond index fund and ignore short-term fluctuations.

[17] Charles D. Ellis, *Investment Policy: How to Win the Loser's Game,* Business One Irwin, 1989.
[18] Published by Richard D. Irwin, Inc in 1994.

3. *Time marches on* Thanks to the magic of compounding, time dramatically enhances capital accumulation.
4. *Nothing ventured, nothing gained* In order to earn higher long-term rates of return, one has to take reasonable interim risks.
5. *Diversify, diversify, diversify* Investment in mutual funds eliminates the unique risk associated with the ownership of an individual stock or bond.
6. *The eternal triangle* Risk, return, and cost are the three sides of the triangle of investing.
7. *The powerful magnetism of the mean* Returns tend to regress toward the mean, implying that returns fall after exceeding historical norms by wide margins and vice versa.
8. *Do not overestimate your ability to pick superior equity mutual funds, nor underestimate your ability to pick superior bond and money market funds* In the selection of equity funds, past analysis does not help. However, in the selection of bond and money market funds, comparative evaluation does help.
9. *You may have a stable principal value or a stable income stream, but you may not have both* A short-term debt instrument, like a Treasury bill has a volatile income stream but stable market value. A long-term fixed-interest bond, however, has a stable income stream but volatile market value. As Bogle puts it, "Intelligent investing involves choices, compromises, and trade-offs, and your own financial position should determine which type of stability - or, more likely, which combination of the two - is most suitable for your portfolio".
10. *Beware of "fighting the last war"* Too many investors base their decisions on their experiences of the recent past. While past should not be ignored, remember that no cyclical trend lasts for ever.
11. *You rarely, if ever, know something that the market does not* Financial markets reflect the collective knowledge, judgment, hopes, and fears of investors everywhere. So, it is unlikely that you know something that the market is unaware of.
12. *Think long term* Short-term volatility in stock prices should not alter your investment programme. As Bogle says, "The best rule is: stay the course".

23.10 THE ZURICH AXIOMS: THE SWISS WISDOM

Despite meagre natural resources, the Swiss are a wealthy lot. To a great extent their affluence is due to their skill in investment and risk taking. Max Gunther refers to the Swiss as "the world's cleverest investors, speculators, and gamblers."

A club of Swiss stock and commodity speculators who gathered around Wall Street after the Second World War began to articulate the principles that guided their investment decisions. Over time, a list of rules evolved gradually. They were referred to as "Zurich Axioms". In a fascinating book entitled *The Zurich Axioms*[19], Max Gunther presents the Swiss wisdom in terms of 12 major axioms.[20] They are described below:

[19] Max Gunther, *The Zurich Axioms*, 1985.

[20] In addition, there are 16 minor axioms. However, our focus will be on the major axioms.

Major Axiom 1 ON RISK *Worry is not a sickness but a sign of health. If you are not worried, you are not risking enough.*
Life should be an adventure in which you face jeopardies. When you tackle or face a jeopardy you are naturally likely to worry. Hence regard worry as a normal and healthy response to an adventurous life in which you deliberately choose risks, rather than shun risk.

Major Axiom 2 ON GREED *Always take your profit.*
Moderate acquisitiveness is a virtue whereas uncontrolled acquisitiveness, which is nothing but greed, is a vice. If you are motivated by greed you are likely to forego the profits that you would have otherwise enjoyed. An old saw says: "If they wanted less, they would go home with more". This is because winning streaks often tend to be short.

Major Axiom 3 ON HOPE *When the ship starts to sink, don't pray. Jump.*
Learn how to get out of a bad situation. Everyone makes mistakes. A good speculator however knows how to get out of a bad situation. He has the courage to admit his error and cut short his losses. This is a rare skill because typically an investor hangs on to a loser because he can't admit his mistake easily and fears that a loser will, after he has gone way, turn into a winner. As Max Gunther says: "Refusing to be wrong is the wrongest response to them all."

Major Axiom 4 ON FORECASTS *Human behaviour cannot be predicted. Distrust anyone who claims to know the future, however dimly.*
Human behaviour is inherently unpredictable. So beware of those who claim that they can divine the future. As Max Gunther says: "In the world of money, which is the world shaped by human behaviour, nobody has the foggiest notion of what will happen in future. Mark that word Nobody." Notwithstanding this difficulty of forecasting, economists, market pundits and self-styled oracles forecast often as they know that if they forecast often, some forecasts will turn out to be true, thanks to the chance factor. Since forecasts are often not scrutinised carefully, failures often go unnoticed. As Theodore Levitt, an eminent economist, once said: "It's easy to be a prophet. You make twenty-five predictions and the ones what come true are the ones you talk about."

Major Axiom 5 ON PATTERNS *Chaos is not dangerous until it begins to look orderly.*
In the world of finance there are no patterns or orderly designs. As Max Gunther says: "The truth is that the world of money is a world of patternless disorder, utter chaos. Patterns seem to appear in it from time to time, as do patterns in a cloudy sky or in the froth at the edge of the ocean. But they are ephemeral."

Major Axiom 6 ON MOBILITY *Avoid putting down roots. They impede motion.*
Preserve your mobility. Don't allow sentiments like loyalty and nostalgia to come in the way of revising your decisions. Don't get trapped in a souring venture. Do not hesitate to switch to more attractive options as they emerge. Of course, you should avoid bouncing from one speculation to another in a restless manner. As Max Gunther says: "All your moves should be made only after careful assessments of the odds for and against, and no move should be made for trivial reasons. But when a venture is

clearly souring, or when something clearly more promising comes into view, then you must sever those roots and go."

Major Axiom 7 ON INTUITION *A hunch can be trusted if it can be explained.*
When you have a hunch you feel that you know something but you may not be fully confident of it. A hunch or intuition feels something like knowledge but is not fully trustworthy. People seem to adopt three distinct approaches towards this phenomenon:

1. They ignore it as it is imperfectly understood.
2. They have indiscriminate faith in it as it is psychologically appealing.
3. They use it discriminately.

The Swiss wisdom calls for using hunches discriminately, which implies trusting hunches provided you can explain it. As Max Gunther says: "If you are hit by a strong hunch trust it only if you can explain it, that is, only if you can identify within your mind a stored body of information out of which that hunch might reasonably be supposed to have arisen."

Major Axiom 8 ON RELIGION AND THE OCCULT *It is unlikely that God's plan for the universe includes making you rich.*
Money and the supernatural have nothing to do with each other. Religious faith, superstitious belief, or occult practice do not bring good financial results consistently. While investors may attribute their occasional good performance to divine intervention, the reality is that it represents a chance occurrence. Do not expect help from God or some occult power to improve your investment results. It is not only useless but dangerous as well. As Max Gunther says: "It can lull you into an unworried state, which as we have seen, is not a good state for a speculator to be in. In handling your money, assume you are entirely on your own. Lean on nothing but your own good wits."

Major Axiom 9 ON OPTIMISM AND PESSIMISM *Optimism means expecting the best, but confidence means knowing how you will handle the worst. Never make a move if you are merely optimistic.*

Optimism is a human quality. Without it, life perhaps would be impossible. Speculation, too, would be impossible in the absence of optimism. Here is where the paradox of investment seems to lie. While optimism feels so good and is perhaps necessary, it can lead to financial disaster, if it gets out of control. As Max Gunther says: "Optimism can be a speculator's enemy. It feels good and is dangerous for that very reason. It produces a general clouding of judgment. It can lead you into ventures with no exits. And even when there is an exit, optimism can persuade you not to use it."

Don't make a move just because you are optimistic: Before investing in a venture think clearly about how you will save yourself if things turn sour. If you have a clear and coherent plan to do so, you have confidence—not just optimism.

Major Axiom 10 ON CONSENSUS *Disregard the majority view. It is probably wrong.*
More often than not the majority tends to be wrong. As Rene Descartes, the great philosopher and mathematician, said over three hundred years ago: "And it would

avail nothing to count votes…for in the matter of a difficult question, it is more likely that the truth should have been discovered by few than by many."

In matters of investment, guard yourself against betting unthinkingly with the majority. Think independently before investing your money. As Max Gunther says: "The greatest pressure on you, and the most frequently felt, will be those that push you into betting with the majority…The strongest line of resistance against these pressures is a keen awareness of their existence and insidious power."

Major Axiom 11 ON STUBBORNNESS *If it doesn't pay off the first time, forget it.* Perseverance is regarded as a virtue in many walks of like. However, in the field of speculation, it is not an unmixed blessing. At times it helps at other times it hurts. Avoid the trap of perseverance in a bid to make every speculative activity profitable. As Max Gunther says: "Don't chase an investment in a spirit of stubbornness. Reject any thought that a given investment 'owes' you something. And don't buy the alluring but fallacious idea that you can improve a bad situation by averaging down."

Major Axiom 12 ON PLANNING *Long-range plans engender the dangerous belief that the future is under control. It is important never to take your own long-range plans, of other people's, seriously.*

The future is unpredictable. It is naïve to think that one can forecast future on the basis of current trends. Over time the present trends may weaken or even reverse themselves. Further, new trends will emerge in a totally undreamt of fashion.

Given the uncertainty about future, beware of plans that give you an illusion of order. As Max Gunther says: "Do not get rooted in long-range plans or long-term investments. Instead, reach to events as they unfold in the present. Put your money into ventures as they present themselves and withdraw it from hazards as they loom up."

23.11 INDIA'S MONEY MONARCHS

In an interesting book titled **India's Money Monarchs**[21]**,** Chetan Parikh, Navin Agarwal, and Utpal Seth reported their interviews with leading investors and money managers of India. Here are some insightful observations made by them.

1. Raamdeo Agarwal: "I believe that if you identify about ten fast growing large companies and even if you are wrong on 3-4 of these, you could still get the desirable result."
2. Sameer Arora: "We really aim to anticipate and recognise change early. Perhaps the maximum amount of money is made early in the cycle, when there is a maximum change in a company, an industry, the perception of a company, in corporate governance, and so on."
3. Sanjoy Bhattacharya: "Asset allocation is far more important than valuation… Valuation is the most overworked thing going around in investing. Because it is simple and permits analytical dexterity, people spend too much time over it… Common sense and discipline are key to investing success."

[21] Published by Cerebrum Online Pvt. Ltd. in 2005.

4. Manish Chokhani: "So when everyone thinks that the trend is down, things are going to basically completely crash and burn and die, we get excited. Or when the trend is up and people think that this is going to grow to the moon, we are fearful."
5. Kisan Choksey: "Most investors do not look at risk, but look at returns. One must ensure margin of safety in investment decisions and wait for opportunities rather than diving headlong into markets especially in frenzies… If you have the money and the patience, you will get the opportunity to make money."
6. Arjun Divecha: "We have two very simple ideas. We buy cheap and we buy momentum. But we do it every single month and we don't flinch… We place a big bet when there is value and positive momentum."
7. Sanjiv Duggal: "We are basically business cycle investors, wherein we decide which sectors to buy or sell depending upon the business or economic cycle we are in. Having analysed India from an investment point of view, we are then able to assess the Indian markets and identify investment opportunities."
8. Prashant Jain: "I think it (i.e. portfolio management) is an art to the extent that you are dealing with something that is not definite. I mean you have to anticipate the future. Ascertaining the quality of the management and the sustainability of the business is an art… It is science to the extent that you have benchmarks available – you have equations and formulae that help you to arrive at a particular value."
9. Rakesh Jhunjhunwala: "I look at an investment opportunity where I feel that my capital is safe and the possible upside is large. I keep reviewing my investment decisions continuously and sell when I feel that the time is ripe. So I have no fixed targets."
10. Parag Parikh: "I believe in diversification, but diversification in another way-investing in different vehicles like stocks, debt, bonds, mutual funds, real estate etc. As far as stocks are concerned, ideally we would like to have a maximum of 15 stocks in a portfolio. We don't put more than 10% of the corpus in any stock."
11. Sukumar Rajah: "My investment philosophy is very simple. My objective is to invest in businesses that can generate superior return on capital over a period of time. I think this can come primarily out of intellectual capital mostly in terms of quality of management.
12. Chandrakant Sampat: "I think there are 5 attributes that an investor should be looking at: 1. Management quality. 2. Is there any unallocable capital in the balance sheet? 3. The competitive advantage period. 4. The RONW (return on net worth). 5. The understanding of risk and what we pay for it."
13. Bharat Shah: "The most important thing is to read the annual report carefully… The annual report also contains discussions by management that tells you what they think will happen in the future… In addition, an objective dispassionate analysis of the past numbers done meticulously is an indispensable attribute to good stock picking."

14. Nilesh Shah: "In a real sense, we don't have any fixed valuation tool. We don't use the DCF valuation model because our forecasts are fairly hazy beyond one or two years. Also, in emerging markets like ours we have high event risks. So, we try to arrive at valuations based on multiples (P/E, P/B)."
15. Ruchir Sharma: "There are three cornerstones to our investment philosophy- valuations, dynamics and sentiment - that we pay a lot of attention to when it comes to analysing any asset class (or stock or market or currency). However, the weightage that one gives to each of them is very subjective?
16. Zaheer Sitabkhan: "Our greatest successes have come when we identified a company with the following criteria – the company is in a fast-growing industry, it has a distinct competitive and comparative advantage, the management has a track record of performance... the company has paid for its capital expenditures from the internal cash flow."

SUMMARY

- Benjamin Graham, widely acclaimed as the father of security analysis, was an exceptionally gifted quantitative navigator who relied on hard financial facts and religiously applied the 'margin of safety' principle.
- Philip Fisher, a prominent growth stock advocate, displayed rare ability in judging the potential of businesses and evaluating management capabilities.
- Warren Buffett, the most successful investor of our times, is the quintessential long-term investor with an exceptional ability in evaluating business "franchise."
- John Templeton had an unusual feel for bargain stocks and achieved remarkable success globally.
- Peter Lynch, perhaps the most widely read investment guru in recent years, performed unusually well, thanks to a rare degree of openness and flexibility in his approach.
- George Soros, a phenomenally successful global speculator, developed and applied a special insight which he labels as the 'reflexivity' principle.
- David Dreman, regarded by many as the 'dean' of contrarians, has an impressive record of investing in a disciplined way in out of favour stocks.
- Charles Ellis, a highly respected investment thinker, says that the investment game has turned from a Winner's game to a Loser's game. To win this game one must avoid mistakes and concentrate on defences.
- John Bogle, a doyen in the world of finance, has spelt out the 'twelve pillars of wisdom.' Essentially he argues for simplicity, broad diversification, and long-term investing.
- The Swiss are considered to be the world's cleverest investors, speculators, and gamblers. Their wisdom is captured in Zurich axioms.
- In a book titled **India's Money Monarchs,** Chetan Parikh, Navin Agarwal, and Utpal Seth have tried to capture the strategies followed by some of India's leading investors.

QUESTIONS

1. "Benjamin Graham was a quantitative navigator." Illustrate.
2. Explain the technique of Philip Fisher.
3. Discuss the key tenets of the Warren Buffett's strategy for investing.
4. Describe the Rules of Investment Success spelt out by John Templeton.
5. Distill Peter Lynch's advice presented in his book *One Up on Wall Street*.
6. Explain George Soros' reflexivity theory.
7. Expound the rules of contrarian investment strategy articulated by David Dreman.
8. What is the difference between a Winner's Game and a Loser's Game. How should the Loser's Game be played according to Charles D. Ellis?
9. Discuss the Swiss investment wisdom as embodied in Zurich axioms.
10. Discuss the 'twelve pillars of wisdom" spelt out by John Bogle.
11. Describe the strategies followed by some of India's leading investors.

■ ■

Chapter **24**

International Investing
The Global Search

LEARNING OBJECTIVES

After studying this chapter, you should be able to:

- Discuss the benefits and risks of global investing.
- Explain the formulae for measuring the return and risk of foreign investments.
- Describe the important investment options globally and the procedure for investing.
- List the important MSCI global benchmarks.

The world was swept by a tidal wave of globalisation at the turn of the twentieth century. Unfortunately, most investors who rode that wave were hurt by the collapse or decline of many of the emerging markets (which were really colonial states) for extended period of time.

The world is being swept by a second wave of globalisation at the beginning of the twenty first century. How would investors fare now? We believe that investors would fare better this time because of the following fundamental geopolitical changes that have taken place in the world.

- With the apparent demise of communism as a valid economic philosophy, the threat of nationalisation and government expropriation has decreased considerably.
- With the passing of colonialism, tensions among developed countries and between developed and developing countries have diminished.
- Capitalistic philosophy is maturing, leading to a kinder system—a system that mitigates some of the destabilising political tensions that characterised free markets earlier.

Of course, the world is not perfect and is plagued by a new set of problems at the beginning of the third millennium. The relative order imposed by colonial powers has given way to political instability in many countries. More important, problems like overpopulation, resurgence of nationalism, and environmental pollution loom large. Notwithstanding these portents, we are fairly optimistic about the prospects of global investing in the years ahead.

From early 2003, Indian citizens have been allowed to invest abroad. To begin with, investment in mutual funds up to $25,000 in a calendar year was permitted. Since then, the Reserve Bank of India has enhanced the limit to $200,000 in a calendar year. You can now invest in stocks, mutual funds, hedge funds, foreign currencies, foreign currency derivatives, insurance policies, and real estate anywhere in the world. So, the vast array of financial products in the global markets may be just a click away.

24.1 BENEFITS AND RISKS OF GLOBAL INVESTING

Benefits of Global Investing Global investing provides two advantages, viz., attractive opportunities and diversification benefits.

Attractive Opportunities While the Indian securities market and real estate market have provided excellent returns in recent years, valuations in many sectors have become somewhat stretched. Savvy investors are aware that attractive opportunities are available outside.

Diversification Benefits By diversifying across nations whose economic cycles do not move in perfect lockstep, investors can achieve a better risk-return tradeoff. In general, the broader the diversification, the less variable the returns.

Empirical evidence supports this hypothesis. Solnik,[1] and others have found that returns from different national equity markets are weakly correlated with one another. This is mainly because variations in growth rates, fiscal and monetary policies, institutional and legal regimes, and regional economic conditions cause large country-specific variations in returns.

A word of caution is in order here. Studies of Roll,[2] Longin and Solnik,[3] and others have found that during periods of high market volatility, international stock markets tend to move in tandem. This was observed in October 1987 market crash when most developed markets declined together. This was observed again in January 2008 when almost all the markets, developed as well as emerging, declined simultaneously. Since investors need diversification benefit more during periods of market turbulence, this finding casts shadow on the benefits of international diversification. Of course, if investors do not liquidate their portfolio during turbulent periods, they can still benefit from international diversification.

Risks in Global Investing There are several risks which exist or become more pronounced in global investing: political risk, currency risk, custody risk, liquidity risk, and market volatility.

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1 B. Solnik, "Why Not Diversify Internationally Rather than Domestically," *Financial Analysts Journal*, July 1976.

2 Richard Roll, "The International Crash of October 1987," *Financial Analysts Journal*, September-October 1988.

3 F. Longin and B. Solnik, "Is the Correlation in International Equity Returns Constant: 1960-1990? *Journal of International Money and Finance* 14(1995).

Political Risk Many national markets, particularly emerging markets, are vulnerable to political risk that may stem from coups, assassination, social unrest, and so on. This can lead to an unexpected change in the policies of the government toward foreign investors. In the extreme case, it may result in expropriation of the assets owned by foreigners.

Currency Risk Exchange rates change over time. So, global investors have to live with currency risk. For example, an Indian investor who invests in the US equities will have to bear the risk of dollar declining against the rupee.

Custody Risk In many countries, domestic investors enjoy a certain degree of protection against frauds, bankruptcies, and broker misdeeds. This protection may not be available to foreign investors. So, when you invest in foreign markets you may be exposed to such risks. You must understand the investment protection norms in the country where you propose to invest to ascertain the custodial risks involved.

Liquidity Risk In many emerging markets trading is concentrated on a small proportion of listed securities. Other securities are not traded frequently and hence somewhat illiquid.

Market Volatility Emerging markets are, in general, more volatile than developed markets. So, global investors who have exposure to emerging markets have to bear higher market volatility.

24.2 MEASURING THE RETURN AND RISK OF FOREIGN INVESTMENTS

The realised rupee return for an Indian resident investing in a foreign market depends on the return in the foreign currency as well as the change in the exchange rate between the foreign currency and the Indian national rupee (INR). Formally, the rate of return in INR terms from investing in the i^{th} foreign market is as follows:

$$\begin{aligned} R_{i,\,\text{INR}} &= (1 + R_i)\,(1 + e_i) - 1 \\ &= R_i + e_i + R_i e_i \qquad (24.1) \end{aligned}$$

where R_i is the foreign currency rate of return in the i th foreign market and e_i is the rate of change in the exchange rate between the foreign currency and the INR. e_i will be positive (negative) if the foreign currency appreciates (depreciates) vis-à-vis the INR.

To illustrate, suppose an Indian resident just sold shares of IBM he purchased a year ago and earned a rate of return of 14 percent in terms of the US dollar ($R_i = 0.14$). During the same period the US dollar depreciated 4 percent against the INR ($e_i = -.04$). The realised rate of return in INR terms from this investment is:

$$\begin{aligned} R_{i,\,\text{INR}} &= (1 + 0.14)\,(1 - 0.04) - 1 \\ &= 1.0944 - 1 = .0944 \text{ or } 9.44 \text{ percent} \end{aligned}$$

The risk of foreign investment, measured in terms of variance, is:

$$\text{Var}\,(R_{i,\,\text{INR}}) = \text{Var}\,(R_i) + \text{Var}\,(e_i) + 2\text{Cov}\,(R_i, e_i) + \Delta\,\text{Var} \qquad (24.2)$$

where Var (R_i) is the variance of foreign currency rate of return, Var (e_i) is the variance of the exchange rate change, Cov (R_i, e_i) is the covariance between the foreign currency rate of return and the exchange rate change, and Δ Var reflects the contribution of the cross-product term, $R_i e_i$, to the risk of the foreign investment.

If the exchange rate remains unchanged, implying that e_i is zero, only one term, Var (R_i), remains on the right side of Eq. (24.2). From Eq. (24.2), it is clear that exchange rate change contributes to the risk of foreign investment in three ways:

- Its own volatility : Var (e_i)
- Its covariance with the returns in the foreign market: Cov (R_i, e_i)
- Its contribution to the cross-product term: Δ Var

Empirical evidence suggests the following:

- Exchange rate uncertainty contributes more significantly to the risk associated with foreign bond returns and less significantly to the risk associated with foreign equity returns.
- Exchange rate changes tend to covary positively with foreign bond returns and, interestingly, negatively with foreign equity returns.
- The cross product term, Δ Var, as expected, contributes little to volatility.

24.3 EQUILIBRIUM IN INTERNATIONAL CAPITAL MARKETS

We can use the capital asset pricing model (CAPM) or the arbitrage pricing theory (APT) to estimate expected returns in the international capital market, just as we do for domestic assets. However, these models have to be adapted to the international context.

Capital Asset Pricing Model For developing a world CAPM, we have to replace the domestic market portfolio with the world market portfolio and measure beta relative to the world market portfolio.

Although such a straightforward generalisation of CAPM appears to be a reasonable first step, it is characterised by some problems:

- Capital barriers across countries, taxes, and transaction costs may prevent investors from holding a world index portfolio. In fact, some assets may simply be not available to foreign investors.
- Investors in different countries view exchange rate risk from the point of view of their countries. So, their assessment of the risk characteristics of various securities will differ. Hence, they will not have identical efficient frontiers.
- Consumption baskets of investors in different countries tend to vary. If relative prices of goods change over time, investors in different countries will have different inflation risks.

Due to these problems, the simple CAPM will not work as well in a global context. There is some empirical evidence that assets that are less accessible to foreign investors carry higher risk premiums compared to what a simple CAPM would predict.

Arbitrage Pricing Theory Compared to the CAPM, the APT appears to be more useful in the international context as it can incorporate special risk factors that arise in international investing. Inter alia, the following factors are natural candidates for inclusion in an APT model for global investing.

- A world stock index
- A national (domestic) stock index
- Currency movement factor
- Industrial sector index.

24.4 GROWING IMPORTANCE OF GLOBAL FACTORS

In recent years, stock markets across the world seem to have become more closely aligned. Several factors have contributed to a higher correlation between changes in stock prices in different countries.

- **Increase in cross-border trading** The abolition of control on capital along with more efficient trading systems has increased cross-border trading.
- **Multiple listing** Increasingly, bigger companies are getting listed in more than one country.
- **Spurt in cross-border mergers and acquisitions** Due to growing cross-border mergers and acquisitions, profits from overseas operations account for a larger share of overall profits for many companies.
- **Internet** Thanks to Internet, investors can easily get information on foreign companies. So valuation of firms in the same industry, but in different countries, tends to be similar.

A study by economists at the IMF attempted to find out how much of a stock's performance is explained by global factors (global business cycle and global industry effects), rather than country factors. As expected, the study found that the importance of global factors increased significantly since the mid-1990s in explaining stock price movements.

24.5 WHERE TO INVEST AND HOW TO INVEST

There is a bewildering range of investment options available globally, both in developed markets as well as emerging markets. The more important options in these markets are described below.

Developed Markets You can buy stocks of domestically-oriented companies in various developed markets as well as stocks of multinational companies such as Coca Cola, Toyota, and Unilever – more than 70 percent of Coca Cola's value stems from operations outside North America and Toyota's sales in the US are more or less comparable to its sales in Japan.

A convenient way of investing in major multinational companies, not headquartered in the US, is to buy their American Depository Receipts (ADRs). Many foreign companies, interested in gaining access to the US capital market, issue ADRs which are listed on stock exchanges in the US. Each ADR traded on a US exchange represents a specific number of foreign shares held by a custodian bank. ADRs are bought and sold in US dollars, dividends on ADRs are paid in US dollars, and annual reports to ADR holders are issued in English. ADRs have to be registered with the Securities Exchange Commission, US. ABB Ltd., British Airways Plc., CNOOC Ltd., Deutsche Telekom Ag., Noika Oyj., Nomura Holdings Inc., Novo Nordisk A/S, Sony Corp., Toyota Motor Corp., and Unilever Nv. are some of the prominent multinational companies that have listed their ADRs on NYSE.

If you find investing on your own to be daunting—as is the case with most individual investors—your best bet will be to invest through mutual funds. In this context, the following options seem attractive:

- Index funds
- Exchange-traded funds like the World Equity Benchmark Securities (covering developed markets)

Just as equity investors seeking to diversify globally may buy ADRs, bond investors wanting to diversify globally may find it convenient to buy **Yankee bonds.** These are dollar-denominated bonds issued by non-US companies (as well as governments) in the US bond market. For example, bonds issued by Astra Zeneca (British firm), Naples (Italian City), and New Zealand (government) trade on the NYSE. Like ADRs, Yankee bonds have to be registered with and are regulated by the SEC. Similarly, foreign companies can issue yen-denominated bonds in Japan (called Samurai bonds) and pound-denominated bonds in UK (called Bulldog bonds).

Emerging Markets Emerging markets, Wall Street's politically correct expression for what used to be called "less developed countries," seem to offer good investment opportunities, thanks to their faster rate of growth.

You can invest in emerging markets through mutual funds or on your own. For most investors, the mutual fund route is the most sensible route. While there are hundreds of emerging markets investment funds available, the following appear to be the more attractive options.

- Close-ended mutual funds selling at a significant discount.
- Open-ended index funds like the Vanguard Emerging Markets Index Fund.
- Exchange-traded funds like the World Equity Benchmark Securities (covering emerging markets).

Although the mutual fund route is the generally recommended route for individual investors, some investors love the excitement and challenge of investing on your own. If you have such an inclination, you will find the following tips useful: (a) Invest in countries that have low price-earnings ratio, low price-to-book value ratio, and high dividend yield. (b) Choose countries where political risk is diminishing. (c) Trade minimally. (d) Do not hedge currency risk.

How to Invest To invest in equities abroad you need a bank account with a bank that allows foreign remittances and an account with a domestic broker who has a tie up with a foreign broker. Alternatively, you must have an account with a foreign broker. (You can sign up directly with an online broker abroad). You have to transfer the investible amount to your brokerage account by filling up Form A2. Once the money is transferred, you can buy shares online on your trading screen. Likewise, you can sell shares online and transfer money electronically to your bank account.

24.6 TRACKING GLOBAL MARKETS

Each country's stock market has one or more indices to measure how equities in that country have performed. Some of the well known national equity indices are Dow Jones Industrial Average of the US, Nikkei 225 of Japan, FTSE 100 of UK, and DAX of Germany.

One problem with these domestic indices is that they are not comparable as they are computed in local currency and computed in different ways (some are price-weighted, some are capitalisation-weighted, and some are equally weighted). To address this problem, Morgan Stanley Capital International (MSCI) compiles indices for individual countries, regions, developed markets, emerging markets, and the entire world. MSCI employs the same selection criteria and methodology across all markets for constructing its indices. All MSCI equity indices are capitalisation-weighted, covering more than 60 percent of market capitalisation for the respective markets. MSCI indices have become popular among investment managers.

The premier MSCI benchmarks used by investment managers to measure the performance of global markets are as follows:

- The MSCI World Index
- The MSCI EAFE (Europe, Australia, Far East) Index
- The MSCI Emerging Markets Free Index.

SUMMARY

- The world is being swept by a **second wave of globalisation** at the beginning of the twenty first century.
- Within limits, Indian citizens can invest in various assets abroad.
- Global investing provides two advantages viz., **attractive opportunities** and **diversification benefits.**
- There are several risks which exist or become more pronounced in global investing: **political risk**, **currency, risk**, **custody risk**, **liquidity risk**, and **market volatility**.
- The **rate of return** in INR (Indian national rupee) terms from investing in the i^{th} foreign market is:

$$R_{i,\,\mathrm{INR}} = R_i + e_i + R_i\,e_i$$

- The **risk** of foreign investment measured in terms of variance is:

$$\text{Var}(R_{i,\,\text{INR}}) = \text{Var}(R_i) + \text{Var}(e_i) + 2\text{Cov}(R_i, e_i) + \Delta\,\text{Var}$$

- With some adaptation, we can use the capital asset pricing model (CAPM) or the arbitrage pricing theory (APT) to estimate expected returns in the international capital market.
- In recent years, stock markets across the world have become more closely aligned.
- There is a bewildering range of investment options available globally for developed markets as well as emerging markets.
- The premier Morgan Stanley Capital International (MSCI) benchmarks used by investment managers to measure the performance of global markets are as follows: the MSCI World Index, the MSCI EAFE (Europe, Australasia, Far East) Index, and the MSCI Emerging Markets Free index.

QUESTIONS

1. What fundamental geopolitical changes have taken place in the world in recent years?
2. Discuss the benefits and risks of global investing.
3. How is the return and risk of foreign investment measured?
4. What problems characterise a straightforward generalisation of CAPM to the world market portfolio?
5. What factors have made stock markets in the world more closely aligned?
6. Discuss the important investment options in the developed markets.
7. Discuss the important investment options in the emerging markets.
8. What is the procedure for investing abroad?
9. List the important MSCI indices.

SOLVED PROBLEMS

1. Mahesh has just sold shares of Microsoft that he purchased a year ago and earned a rate of return of 13 percent in terms of the US dollar. During the same period the US dollar depreciated 5 percent against the INR. What is the realised rate of return in INR terms from this investment.

Solution

The realised rate of return in INR terms is:

$$R_{i,\,\text{INR}} = (1 + 0.13)\,(1 - 0.05) - 1$$
$$= 1.0735 - 1 = .0735 \text{ or } 7.35 \text{ percent}$$

2. Sandeep is considering investment in the shares of Berkshire Hathaway. The variance of the US dollar rate of return from Berkshire Hathaway shares is 100 percent, the variance of the exchange rate change is 25 percent, and the covariance between the US dollar rate of return and the exchange rate change is – 20 percent. What is the variance of the rupee rate of return from Berkshire Hathaway shares? Ignore the cross-product terms.

Solution

Ignoring the cross-product term, the variance of rupee rate of return is:

$$\text{Var}(R_{i,\text{ INR}}) = \text{Var}(R_i) + \text{Var}(e_i) + 2\text{Cov}(R_i, e_i)$$
$$= 100 + 25 - 40 = 85 \text{ percent}$$

PROBLEMS

1. Raghuram has just sold shares of British Airways that he purchased a year ago and earned a rate of return of 10 percent in terms of the British pound. During the same period, the British pound appreciated 3 percent against the INR. What is the realised rate of return in INR terms from this investment?
2. Mahaveer is considering investment in the shares of General Electric. The variance of the US dollar rate of return from General Electric is 150 percent and the variance of the exchange rate change is 30 percent. What covariance between the US dollar rate of return on General Electric and the exchange rate change will result in a variance of 100 percent on the rupee rate of return from General Electric? Ignore the cross-product term.

Appendix A

Tables

Table A.1 Future Value Interest Factor (*FVIF*)

$FVIF(r, n) = (1 + r)^n$

Period n	*1%*	*2%*	*3%*	*4%*	*5%*	*6%*	*7%*	*8%*	*9%*	*10%*	*11%*	*12%*	*13%*
0	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1	1.010	1.020	1.030	1.040	1.050	1.060	1.070	1.080	1.090	1.100	1.110	1.120	1.130
2	1.020	1.040	1.061	1.082	1.102	1.124	1.145	1.166	1.188	1.210	1.232	1.254	1.277
3	1.030	1.061	1.093	1.125	1.158	1.191	1.225	1.260	1.295	1.331	1.368	1.405	1.443
4	1.041	1.082	1.126	1.170	1.216	1.262	1.311	1.360	1.412	1.464	1.518	1.574	1.630
5	1.051	1.104	1.159	1.217	1.276	1.338	1.403	1.469	1.539	1.611	1.685	1.762	1.842
6	1.062	1.126	1.194	1.265	1.340	1.419	1.501	1.587	1.677	1.772	1.870	1.974	2.082
7	1.072	1.149	1.230	1.316	1.407	1.504	1.606	1.714	1.828	1.949	2.076	2.211	2.353
8	1.083	1.172	1.267	1.369	1.477	1.594	1.718	1.851	1.993	2.144	2.305	2.476	2.658
9	1.094	1.195	1.305	1.423	1.551	1.689	1.838	1.999	2.172	2.358	2.558	2.773	3.004
10	1.105	1.219	1.344	1.480	1.629	1.791	1.967	2.159	2.367	2.594	2.839	3.106	3.395
11	1.116	1.243	1.384	1.539	1.710	1.898	2.105	2.332	2.580	2.853	3.152	3.479	3.836
12	1.127	1.268	1.426	1.601	1.796	2.012	2.252	2.518	2.813	3.138	3.498	3.896	4.335
13	1.138	1.294	1.469	1.665	1.886	2.133	2.410	2.720	3.066	3.452	3.883	4.363	4.898
14	1.149	1.319	1.513	1.732	1.980	2.261	2.579	2.937	3.342	3.797	4.310	4.887	5.535
15	1.161	1.346	1.558	1.801	2.079	2.397	2.759	3.172	3.642	4.177	4.785	5.474	6.254
16	1.173	1.373	1.605	1.873	2.183	2.540	2.952	3.426	3.970	4.595	5.311	6.130	7.067
17	1.184	1.400	1.653	1.948	2.292	2.693	3.159	3.700	4.328	5.054	5.895	6.866	7.986
18	1.196	1.428	1.702	2.026	2.407	2.854	3.380	3.996	4.717	5.560	6.544	7.690	9.024
19	1.208	1.457	1.754	2.107	2.527	3.026	3.617	4.316	5.142	6.116	7.263	8.613	10.197
20	1.220	1.486	1.806	2.191	2.653	3.207	3.870	4.661	5.604	6.728	8.062	9.646	11.523
25	1.282	1.641	2.094	2.666	3.386	4.292	5.427	6.848	8.623	10.835	13.585	17.000	21.231
30	1.348	1.811	2.427	3.243	4.322	5.743	7.612	10.063	13.268	17.449	22.892	29.960	39.116

(Contd)

Table A.1 *(Contd)*

Period n	*14%*	*15%*	*16%*	*17%*	*18%*	*19%*	*20%*	*24%*	*28%*	*32%*	*36%*	*40%*
0	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1	1.140	1.150	1.160	1.170	1.180	1.190	1.200	1.240	1.280	1.320	1.360	1.400
2	1.300	1.322	1.346	1.369	1.392	1.416	1.440	1.538	1.638	1.742	1.850	1.960
3	1.482	1.521	1.561	1.602	1.643	1.685	1.728	1.907	2.097	2.300	2.515	2.744
4	1.689	1.749	1.811	1.874	1.939	2.005	2.074	2.364	2.684	3.036	3.421	3.842
5	1.925	2.011	2.100	2.192	2.288	2.386	2.488	2.392	3.436	4.007	4.653	5.378
6	2.195	2.313	2.436	2.565	2.700	2.840	2.986	3.635	4.398	5.290	6.328	7.530
7	2.502	2.660	2.826	3.001	3.185	3.379	3.583	4.508	5.629	6.983	8.605	10.541
8	2.853	3.059	3.278	3.511	3.759	4.021	4.300	5.590	7.206	9.217	11.703	14.758
9	3.252	3.518	3.803	4.108	4.435	4.785	5.160	6.931	9.223	12.166	15.917	20.661
10	3.707	4.046	4.411	4.807	5.234	5.695	6.192	8.549	11.806	16.060	21.647	28.925
11	4.226	4.652	5.117	5.624	6.176	6.777	7.430	10.657	15.112	21.199	29.439	40.496
12	4.818	5.350	5.936	6.580	7.288	8.064	8.916	13.215	19.343	27.983	40.037	56.694
13	5.492	6.153	6.886	7.699	8.599	9.596	10.699	16.386	24.759	36.937	54.451	79.372
14	6.261	7.076	7.988	9.007	10.147	11.420	12.839	20.319	31.961	48.757	74.053	111.120
15	7.138	8.137	9.266	10.539	11.974	13.590	15.407	25.196	40.565	64.359	100.712	155.568
16	8.137	9.358	10.748	12.330	14.129	16.172	18.488	31.243	51.923	84.954	136.969	217.795
17	9.276	10.761	12.468	14.426	16.672	19.244	22.186	38.741	66.461	112.139	186.278	304.914
18	10.575	12.375	14.463	16.879	19.673	22.901	26.623	48.039	85.071	148.023	253.388	426.879
19	12.056	14.263	16.777	19.748	23.214	27.252	31.948	59.568	108.890	195.391	344.540	597.630
20	13.743	16.367	19.461	23.106	27.393	32.429	38.338	73.864	139.380	257.916	468.574	836.683
25	26.462	32.919	40.874	50.658	62.669	77.388	95.396	216.542	478.905	1033.590	2180.081	4499.880
30	50.950	66.212	85.850	111.065	143.371	184.675	237.376	634.820	1645.504	4142.075	10143.019	24201.432

Table A.2 ***Future Value Interest Factor for an Annuity FVIFA (r, n)*** $= \dfrac{(1+r)^n - 1}{r}$

Period *n*	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%
1	1.000	1.000	1.000	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	2.110	2.120	2.130
3	3.030	3.060	3.091	3.122	3.152	3.184	3.215	3.246	3.278	3.310	3.342	3.374	3.407
4	4.060	4.122	4.184	4.246	4.310	4.375	4.440	4.506	4.573	4.641	4.710	4.779	4.850
5	5.101	5.204	5.309	5.416	5.526	5.637	5.751	5.867	5.985	6.105	6.228	6.353	6.480
6	6.152	6.308	6.468	6.633	6.802	6.975	7.153	7.336	7.523	7.716	7.913	8.115	8.323
7	7.214	7.434	7.662	7.898	8.142	8.394	8.654	8.923	9.200	9.487	9.783	10.089	10.405
8	8.286	8.583	8.892	9.214	9.549	9.897	10.260	10.637	11.028	11.436	11.859	12.300	12.757
9	9.369	9.755	10.159	10.583	11.027	11.491	11.978	12.488	13.021	13.579	14.164	14.776	15.416
10	10.462	10.950	11.464	12.006	12.578	13.181	13.816	14.487	15.193	15.937	16.722	17.549	18.420
11	11.567	12.169	12.808	13.486	14.207	14.972	15.784	16.645	17.560	18.531	19.561	20.655	21.814
12	12.683	13.412	14.192	15.026	15.917	16.870	17.888	18.977	20.141	21.384	22.713	24.133	25.650
13	13.809	14.680	15.618	16.627	17.713	18.882	20.141	21.495	22.953	24.523	26.212	28.029	29.985
14	14.947	15.974	17.086	18.292	19.599	21.015	22.550	24.215	26.019	27.975	30.095	32.393	34.883
15	16.097	17.293	18.599	20.024	21.579	23.276	25.129	27.152	29.361	31.772	34.405	37.280	40.417
16	17.258	18.639	20.157	21.825	23.657	25.673	27.888	30.324	33.003	35.950	39.190	42.753	46.672
17	18.430	20.012	21.762	23.698	25.840	28.813	30.840	33.750	36.974	40.545	44.501	48.884	53.739
18	19.615	21.412	23.414	25.645	28.132	30.906	33.999	37.450	41.301	45.599	50.396	55.750	61.725
19	20.811	22.841	25.117	27.671	30.539	33.760	37.379	41.446	46.018	51.159	56.939	63.440	70.749
20	22.019	24.297	26.870	29.778	33.066	36.786	40.995	45.762	51.160	57.275	64.203	72.052	80.947
25	28.243	32.030	36.459	41.646	47.727	54.865	63.249	73.106	84.701	98.347	114.413	133.334	155.620
30	34.785	40.568	47.575	56.805	66.439	79.058	94.461	113.283	136.308	164.494	199.021	241.333	293.199

(*Contd*)

Table A.2 *(Contd)*

Period *n*	*14%*	*15%*	*16%*	*17%*	*18%*	*19%*	*20%*	*24%*	*28%*	*32%*	*36%*	*40%*
1	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2	2.140	2.150	2.160	2.170	2.180	2.190	2.200	2.240	2.280	2.320	2.360	2.400
3	3.440	3.473	3.506	3.539	3.572	3.606	3.640	3.778	3.918	4.062	4.210	4.360
4	4.921	4.993	5.066	5.141	5.215	5.291	5.368	5.684	6.016	6.362	6.725	7.104
5	6.610	6.742	6.877	7.014	7.154	7.297	7.442	8.048	8.700	9.398	10.146	10.946
6	8.536	8.754	8.977	9.207	9.442	9.683	9.930	10.980	12.136	13.406	14.799	16.324
7	10.730	11.067	11.414	11.772	12.142	12.523	12.916	14.615	16.534	18.696	21.126	23.853
8	13.233	13.727	14.240	14.773	15.327	15.902	16.499	19.123	22.163	25.678	29.732	34.395
9	16.085	16.786	17.518	18.285	19.086	19.923	20.799	24.712	29.369	34.895	41.435	49.153
10	19.337	20.304	21.321	22.393	23.521	24.709	25.959	31.643	38.592	47.062	57.352	69.814
11	23.044	24.349	25.733	27.200	28.755	30.404	32.150	40.238	50.399	63.122	78.998	98.739
12	27.271	29.002	30.850	32.824	34.931	37.180	39.580	50.985	65.510	84.320	108.437	139.235
13	32.089	34.352	36.786	39.404	42.219	45.244	48.497	64.110	84.853	112.303	148.475	195.929
14	37.518	40.505	43.672	47.103	50.818	54.841	59.196	80.496	109.612	149.240	202.926	275.300
15	43.842	47.580	51.660	56.110	60.965	66.261	72.035	100.815	141.303	197.997	276.979	386.420
16	50.980	55.717	60.925	66.649	72.939	79.850	87.442	126.011	181.868	262.356	377.692	541.988
17	59.118	65.075	71.673	78.979	87.068	96.022	105.931	157.253	233.791	347.310	514.661	759.784
18	68.394	75.836	84.141	93.406	103.740	115.266	128.117	195.994	300.252	459.449	700.939	1064.697
19	78.969	88.212	98.603	110.285	123.414	138.166	154.740	244.033	385.323	607.472	954.277	1491.576
20	91.025	102.440	115.380	130.033	146.628	165.418	186.688	303.601	494.213	802.863	1298.817	2089.206
25	181.871	212.793	249.214	292.105	342.603	402.042	471.981	898.092	1706.803	3226.844	6053.004	11247.199
30	356.787	434.745	530.321	647.439	790.948	966.712	1181.882	2640.916	5873.231	12940.859	28172.276	60501.081

Table A.3 ***Present Value Interest Factor PVIF (r, n) = $(1 + r)^{-n}$***

Period n	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%
0	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1	0.990	0.980	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909	0.901	0.893	0.885
2	0.980	0.961	0.943	0.925	0.907	0.890	0.873	0.857	0.842	0.826	0.812	0.797	0.783
3	0.971	0.924	0.915	0.889	0.864	0.840	0.816	0.794	0.772	0.751	0.731	0.712	0.693
4	0.961	0.924	0.889	0.855	0.823	0.792	0.763	0.735	0.708	0.683	0.659	0.636	0.613
5	0.951	0.906	0.863	0.822	0.784	0.747	0.713	0.681	0.650	0.621	0.593	0.567	0.543
6	0.942	0.888	0.838	0.790	0.746	0.705	0.666	0.630	0.596	0.564	0.535	0.507	0.480
7	0.933	0.871	0.813	0.760	0.711	0.665	0.623	0.583	0.547	.0.513	0.482	0.452	0.425
8	0.923	0.853	0.789	0.731	0.677	0.627	0.582	0.540	0.502	0.467	0.434	0.404	0.376
9	0.914	0.837	0.766	0.703	0.645	0.592	0.544	0.500	0.460	0.424	0.391	0.361	0.333
10	0.905	0.820	0.744	0.676	0.614	0.558	0.508	0.463	0.422	0.386	0.352	0.322	0.295
11	0.896	0.804	0.722	0.650	0.585	0.527	0.475	0.429	0.388	0.350	0.317	0.287	0.261
12	0.887	0.788	0.701	0.625	0.557	0.497	0.444	0.397	0.356	0.319	0.286	0.257	0.231
13	0.879	0.773	0.681	0.601	0.530	0.469	0.415	0.368	0.326	0.290	0.258	0.229	0.204
14	0.870	0.758	0.661	0.577	0.505	0.442	0.388	0.340	0.299	0.263	0.232	0.205	0.181
15	0.861	0.743	0.642	0.555	0.481	0.417	0.362	0.315	0.275	0.239	0.209	0.183	0.160
16	0.853	0.728	0.623	0.534	0.458	0.394	0.339	0.292	0.252	0.218	0.188	0.163	0.141
17	0.844	0.714	0.605	0.513	0.436	0.377	0.311	0.270	0.231	0.198	0.170	0.146	0.125
18	0.836	0.700	0.587	0.494	0.416	0.350	0.296	0.250	0.212	0.180	0.153	0.130	0.111
19	0.828	0.686	0.570	0.475	0.396	0.331	0.276	0.232	0.194	0.164	0.138	0.116	0.098
20	0.820	0.673	0.554	0.456	0.377	0.312	0.258	0.215	0.178	0.149	0.124	0.104	0.087
25	0.780	0.610	0.478	0.375	0.295	0.233	0.184	0.146	0.116	0.092	0.074	0.059	0.047
30	0.742	0.552	0.412	0.308	0.231	0.174	0.131	0.099	0.075	0.057	0.044	0.033	0.026

(Contd)

Table A.3 *(Contd)*

Period *n*	*14%*	*15%*	*16%*	*17%*	*18%*	*19%*	*20%*	*24%*	*28%*	*32%*	*36%*	*40%*
0	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1	0.877	0.870	0.862	0.855	0.847	0.840	0.833	0.806	0.781	0.758	0.735	0.714
2	0.769	0.756	0.743	0.731	0.718	0.706	0.694	0.650	0.610	0.574	0.541	0.510
3	0.675	0.658	0.641	0.624	0.609	0.593	0.579	0.524	0.477	0.435	0.398	0.364
4	0.592	0.572	0.552	0.534	0.516	0.499	0.482	0.423	0.373	0.329	0.292	0.260
5	0.519	0.497	0.476	0.456	0.437	0.419	0.402	0.341	0.291	0.250	0.215	0.186
6	0.456	0.432	0.410	0.390	0.370	0.352	0.335	0.275	0.227	0.189	0.158	0.133
7	0.400	0.376	0.354	0.333	0.314	0.296	0.279	0.222	0.178	0.143	0.116	0.095
8	0.351	0.327	0.305	0.285	0.266	0.249	0.233	0.179	0.139	0.108	0.085	0.068
9	0.308	0.284	0.263	0.243	0.226	0.209	0.194	0.144	0.108	0.082	0.063	0.048
10	0.270	0.247	0.227	0.208	0.191	0.176	0.162	0.116	0.085	0.062	0.046	0.035
11	0.237	0.215	0.195	0.178	0.162	0.148	0.135	0.094	0.066	0.047	0.034	0.025
12	0.208	0.187	0.168	0.152	0.137	0.124	0.112	0.076	0.052	0.036	0.025	0.018
13	0.182	0.163	0.145	0.130	0.116	0.104	0.093	0.061	0.040	0.027	0.018	0.013
14	0.160	0.141	0.125	0.111	0.099	0.088	0.078	0.049	0.032	0.021	0.014	0.009
15	0.140	0.123	0.108	0.095	0.084	0.074	0.065	0.040	0.025	0.016	0.010	0.006
16	0.123	0.107	0.093	0.081	0.071	0.062	0.054	0.032	0.019	0.012	0.007	0.005
17	0.108	0.093	0.080	0.069	0.060	0.052	0.045	0.026	0.015	0.009	0.005	0.003
18	0.095	0.081	0.069	0.059	0.051	0.044	0.038	0.021	0.012	0.007	0.004	0.002
19	0.083	0.070	0.060	0.051	0.043	0.037	0.031	0.017	0.009	0.005	0.003	0.002
20	0.073	0.061	0.051	0.043	0.037	0.031	0.026	0.014	0.007	0.004	0.002	0.001
25	0.038	0.030	0.024	0.020	0.016	0.013	0.010	0.005	0.002	0.001	0.000	0.000
30	0.020	0.015	0.012	0.009	0.007	0.005	0.004	0.002	0.001	0.000	0.000	0.000

Table A.4 ***Present Value Interest Factor for an Annuity PVIFA (r, n)*** $= \dfrac{1 - \dfrac{1}{(1+r)^n}}{r}$

Period *n*	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%
0	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1	0.990	0.980	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909	0.901	0.893	0.885
2	1.970	1.942	1.913	1.886	1.859	1.833	1.808	1.783	1.759	1.736	1.713	1.690	1.668
3	2.941	2.884	2.829	2.775	2.723	2.673	2.624	2.577	2.531	2.487	2.444	2.402	2.361
4	3.902	3.808	3.717	3.630	3.546	3.465	3.387	3.312	3.240	3.170	3.102	3.037	2.974
5	4.853	4.713	4.580	4.452	4.329	4.212	4.100	3.993	3.890	3.791	3.696	3.605	3.517
6	5.795	5.601	5.417	5.242	5.076	4.917	4.766	4.623	4.486	4.355	4.231	4.111	3.998
7	6.728	6.472	6.230	6.002	5.786	5.582	5.389	5.206	5.033	4.868	4.712	4.564	4.423
8	7.652	7.325	7.020	6.733	6.463	6.210	5.971	5.747	5.535	5.335	5.146	4.968	4.799
9	8.566	8.162	7.786	7.435	7.108	6.802	6.515	6.247	5.995	5.759	5.537	5.328	5.132
10	9.471	8.983	8.530	8.111	7.722	7.360	7.024	6.710	6.418	6.145	5.889	5.650	5.426
11	10.368	9.787	9.253	8.760	8.306	7.887	7.499	7.139	6.805	6.495	6.207	5.938	5.687
12	11.255	10.575	9.945	9.385	8.863	8.384	7.943	7.536	7.161	6.814	6.492	6.194	5.918
13	12.134	11.348	10.635	9.986	9.394	8.853	8.358	7.904	7.487	7.103	6.750	6.424	6.122
14	13.004	12.106	11.296	10.563	9.899	9.295	8.745	8.244	7.786	7.367	6.982	6.628	6.302
15	13.865	12.849	11.938	11.118	10.380	9.712	9.108	8.559	8.060	7.606	7.191	6.811	6.462
16	14.718	13.578	12.561	11.652	10.838	10.106	9.447	8.851	8.312	7.824	7.379	6.974	6.604
17	15.562	14.292	13.166	12.166	11.274	10.477	9.763	9.122	8.544	8.022	7.549	7.120	6.729
18	16.398	14.992	13.754	12.659	11.690	10.828	10.059	9.372	8.756	8.201	7.702	7.250	6.840
19	17.226	15.678	14.324	13.134	12.085	11.158	10.336	9.604	8.950	8.365	7.839	7.366	6.938
20	18.046	16.351	14.877	13.590	12.462	11.470	10.594	9.818	9.128	8.514	7.963	7.469	7.025
25	22.023	19.523	17.413	15.622	14.094	12.783	11.654	10.675	9.823	9.077	8.422	7.843	7.330
30	25.808	22.397	19.600	17.292	15.373	13.765	12.409	11.258	10.274	9.427	8.694	8.055	7.496

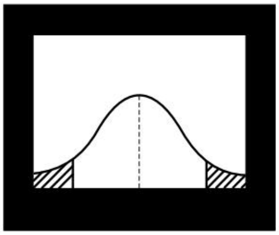
(Contd)

Table A.4 *(Contd)*

Period *n*	*14%*	*15%*	*16%*	*17%*	*18%*	*19%*	*20%*	*24%*	*28%*	*32%*	*36%*	*40%*
0	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1	0.877	0.870	0.862	0.855	0.847	0.840	0.833	0.806	0.781	0.758	0.735	0.714
2	1.647	1.626	1.605	1.585	1.566	1.547	1.528	1.457	1.392	1.332	1.276	1.224
3	2.322	2.283	2.246	2.210	2.174	2.140	2.106	1.981	1.868	1.766	1.674	1.589
4	2.914	2.855	2.798	2.743	2.690	2.639	2.589	2.404	2.241	2.096	1.966	1.849
5	3.433	3.352	3.274	3.199	3.127	3.058	2.991	2.745	2.532	2.345	2.181	2.035
6	3.889	3.784	3.685	3.589	3.498	3.410	3.326	3.020	2.759	2.534	2.339	2.168
7	4.288	4.160	4.039	3.922	3.812	3.706	3.605	3.242	2.937	2.678	2.455	2.263
8	4.639	4.487	4.344	4.207	4.078	3.954	3.837	3.421	3.076	2.786	2.540	2.331
9	4.946	4.772	4.607	4.451	4.303	4.163	4.031	3.566	3.184	2.868	2.603	2.379
10	5.216	5.019	4.883	4.659	4.494	4.339	4.193	3.682	3.269	2.930	2.650	2.414
11	5.453	5.234	5.029	4.836	4.656	4.486	4.327	3.776	3.335	2.978	2.683	2.438
12	5.660	5.421	5.197	4.988	4.793	4.611	4.439	3.851	3.387	3.013	2.708	2.456
13	5.842	5.583	5.342	5.118	4.910	4.715	4.533	3.912	3.427	3.040	2.727	2.469
14	6.002	5.724	5.468	5.229	5.008	4.802	4.611	3.962	3.459	3.061	2.740	2.478
15	6.142	5.847	5.575	5.324	5.092	4.876	4.675	4.001	3.483	3.076	2.750	2.484
16	6.265	5.954	5.669	5.405	5.162	4.938	4.730	4.033	3.503	3.088	2.758	2.489
17	6.373	6.047	5.749	5.475	5.222	4.990	4.775	4.059	3.518	3.097	2.763	2.492
18	6.647	6.128	5.818	5.534	5.273	5.033	4.812	4.080	3.529	3.104	2.767	2.494
19	6.550	6.198	5.877	5.584	5.316	5.970	4.844	4.097	3.539	3.109	2.770	2.496
20	6.623	6.259	5.929	5.628	5.353	5.101	4.870	4.110	3.546	3.113	2.772	2.497
25	6.873	6.464	6.097	5.766	5.467	5.195	4.948	4.147	3.564	3.122	2.776	2.499
30	7.003	6.566	6.177	5.829	5.517	5.235	4.979	4.160	3.569	3.124	2.778	2.500

Table A.5 ***Normal Distribution***

(Area of the Normal Distribution, that is, Z Standard Deviations to the Left or Right of the Mean)



Number of Standard Deviations from Mean, (Z)	*Area to the Left or Right (One tail)*	*Number of Standard Deviations from Mean (Z)*	*Area to the Left or Right (One tail)*
0.00	0.5000	1.55	0.0606
0.05	0.4801	1.60	0.0548
0.10	0.4602	1.65	0.0495
0.15	0.4404	1.70	0.0446
0.20	0.4207	1.75	0.0401
0.25	0.4013	1.80	0.0359
0.30	0.3821	1.85	0.0322
0.35	0.3632	1.90	0.0287
0.40	0.3446	1.95	0.0256
0.45	0.3264	2.00	0.0228
0.50	0.3085	2.05	0.0202
0.55	0.2912	2.10	0.0179
0.60	0.2743	2.15	0.0158
0.65	0.2578	2.20	0.0139
0.70	0.2420	2.25	0.0122
0.75	0.2264	2.30	0.0107
0.80	0.2119	2.35	0.0094
0.85	0.1977	2.40	0.0082
0.90	0.1841	2.45	0.0071
0.95	0.1711	2.50	0.0062
1.00	0.1587	2.55	0.0054
1.05	0.1469	2.60	0.0047
1.10	0.1357	2.65	0.0040
1.15	0.1251	2.70	0.0035
1.20	0.1151	2.75	0.0030
1.25	0.1056	2.80	0.0026
1.30	0.0968	2.85	0.0022
1.35	0.0885	2.90	0.0019
1.40	0.0808	2.95	0.0016
1.45	0.0735	3.00	0.0013
1.50	0.0668	3.05	0.0011
		3.10	0.0010
		3.25	0.0006
		3.50	0.00023
		4.00	0.00003
		4.99	0.0000003

Appendix B

Understanding Regression

To understand the key statistics used to describe linear regressions, let us consider the following returns on stock *A* (R_A) and the market portfolio (R_M) over 16 periods.

	A	B	C
1	Period	R_A	R_M
2	1	10	12
3	2	15	14
4	3	18	13
5	4	14	10
6	5	16	9
7	6	16	13
8	7	18	14
9	8	4	7
10	9	–9	1
11	10	14	12
12	11	15	–11
13	12	14	16
14	13	6	8
15	14	7	7
16	15	–8	10

Using the function Regression in MS Excel, we get the following estimated regression line:

$$R_A = 6.813 + 0.354\ R_M$$

The summary output of regression analysis is given below:

A	B	C	D	E
1 SUMMARY OUTPUT				
2				
3 *Regression Statistics*				
4 Multiple R	0.274			
5 R Square	0.075			

(*Contd.*)

6	Adjusted R Square	0.004			
7	Standard Error	8.619			
8	Observations	15			
9					
10					
11					
12					
13					
14					
15					
16		Coefficient	Standard Error	*t* Stat	P-value
17	Intercept	6.813	3.820	1.783	0.098
18	X Variable 1	0.345	0.354	1.026	0.323

It is instructive to understand the key statistics, which can be divided into three categories: the regression line, the explanatory power of the model, and the accuracy of the estimates.

The Regression Line: What Is the Relationship?

The estimated regression line is

$$R_A = 6.813 + 0.354\ R_M$$

The regression line is defined in terms of y-intercept (alpha) and slope (beta).

***y*-Intercept (Alpha)** The y-intercept is the expected value of the dependent variable (measured on the y-axis) when the independent variable (measured on x-axis) is zero; it is where the estimated regression line crosses the y-axis.

Slope (Beta) The slope of the regression line, formally called beta, reflects the change in Y (the dependent variable) for every one-unit change in $X(\Delta Y/\Delta X)$. The slope of the estimated regression line in our case is 0.354. This means that during the selected period, when R_M is up 1 percent, R_A is up 0.354 percent on average, and when R_M is down 1 percent, R_A is down 0.354 percent on average. Beta, in the context of our regression, is a measure of market or systematic risk. It reflects how sensitive a given stock (A) is to the market (M).

The Explanatory Power of the Relationship

The explanatory power of the relationship is captured by correlation coefficient (R) and coefficient of determination (R-square).

Correlation Coefficient (R) The correlation coefficient (R) is a measure of common relation between two variables. It reflects how strong the linear association is between two variables. It can range from – 1 (perfectly negative linear relation) to + 1 (perfectly positive liner relation). If R equals 0, it means that there is no relationship between the variables.

Coefficient of Determination (R-square) The coefficient of determination is literally the square of R. It can range from 0 to 1 because R is always berween –1 and 1. R-square measures how much of the variation of the dependent variable is explained by the regression relationship.

If R-square is 1 (or 100 percent), it means that all the observations fall exactly on the regressed line. In our case R-square is .075 (or 7.5 percent). It means that just 7.5 percent of the variations in R_A is explained by the variation in market returns. The bulk of the volatility (92.5 percent) is not explained by the variation in market returns.

A variant of R-square is adjusted R-square. It is the value of R-square adjusted for the number of constants in the regression relationship.

Reliability or Confidence in the Quantified Relationship

The reliability or confidence in the quantified relationship is measured by standard error and *t*-statistic.

Standard Error The coefficients of estimated regression relation (alpha=6.813 and beta = 0.354) are point estimates. How much confidence can we have in these point estimates? This is where the standard error helps. The standard error of a coefficient is the square root of its estimated variance; which is nothing but the standard deviation. A small (large) standard error means more (less) confidence in the beta estimate. Given the properties of a normal distribution, we can use standard error to construct a "confidence interval" around the estimated value of the coefficient. For example, if we define a range of beta ± two standard errors, we can say that we are 95 percent confident that the "true beta" falls within this range. For stock A, this range is –0.336 to 1.044.

***t*-statistic** The *t*-statistic is a more formal way of quantifying statistical significance. A standardised measure, the *t*-statistic is the estimated coefficient divided by its standard error. A *t*-statistic of ±1.96 or greater will mean a significance of 95 percent level or above. In our example, *t*-statistic for beta is 1.026. This means that we can say with a confidence (of about 68 percent) that our beta is significantly different from zero.

A related statistic is P-value. It is the probability of getting a *t* value that is as extreme or more extreme than the obtained value of *t*. A P-value of 0.05 or less means that the coefficient is statistically significant (different from zero).

Appendix C
Tax Aspects of Investments

PADMINI SRINIVASAN[1]

Incomes that are associated with various kinds of investments can be broadly classified as rent, interest, dividend, and capital gains. The tax impact is dependent on two factors, namely (a) the status of the entity earning the income (individual, HUF, firm, company, trust, mutual fund) and the residential status of such entity (resident / non-resident) and (b) the character of the income – whether it is earned as part of the business carried on by the entity or otherwise. In this note we will discuss the income tax implications of an individual earning the above categories of incomes otherwise than as part of business. The wealth tax aspects also are briefly touched upon at the end. Remember that taxation is a complex and specialised subject and, where required, you should seek the advice of a tax expert.

FRAMEWORK FOR INCOME TAX

Before we consider the tax aspects of investment incomes, it will be useful to bear in mind the following points regarding the scheme of taxation:

- Income tax is levied on total income (more popularly known as 'taxable income').
- Determination of taxable income involves three essential steps: (a) computation of income under five different heads stipulated by the Income Tax Act ('Act' for short hereafter), (b) aggregation of these incomes (involving setting off negative incomes against positive incomes in the manner and subject of restrictions as stipulated in the Act) to arrive at 'Gross Total Income', (c) and making certain deductions from gross total income to arrive at taxable income.
- The tax payable is computed by applying the tax rate (stipulated by the Finance Act as part of the annual budget) on the taxable income. In certain special cases, the Act itself prescribes the rates of tax relating to certain incomes, like 20% rate (10% in some cases) for long-term capital gains.
- The taxable income is computed with reference to the financial year ending on March 31, which is referred to as the 'previous year'.
- The rates of tax and other provisions dealing with determining tax liability are applied with reference to a period, which immediately succeeds the 'previous year' called the 'assessment year'.

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- The Act provides for certain tax deductions and these are deducted from the gross total income to arrive at the total income.
- The estimated net tax due is required to be paid during the financial year in which the income is being earned as 'advance tax' in three installments on or before September 15, December 15, and March 15 succeeding, covering 30%, 60%, and 100% of the advance tax payable respectively. In determining the 'advance tax', the estimated tax that may be deducted at source by others has to be reduced from the estimated net tax due.
- As of the assessment year 2009-10 (with reference to which the law is discussed in this appendix), an individual who has taxable income before deductions exceeding Rs.150,000 (and who has no income under the head 'business or profession') is required to file a return of income on or before July 31 of the respective assessment year. A return filed after this due date will attract interest and, in extreme cases, other penal consequences.
- For the assessment year 2009–2010 the tax rates applicable to an individual are as follows:

  On the total income falling in the slab between

Rs.150,001 and Rs.300,000	10%
Rs.300,001 and Rs.500,000	20%
Rs.500,001 and above	30%

- No income tax is payable on total income up to Rs.150,000 for an individual. For Senior citizens, no income tax is payable on income up to Rs.225,000. For women assessee's no income tax is payable on income up to Rs.180,000.
- Further a surcharge of 10% of the tax payable is also levied if income exceeds Rs.10,00,000. Additional education cess of 3% is payable on total income tax and the surcharge.

INCOME FROM IMMOVABLE PROPERTY

Rent from immovable property is computed under the head 'Income from house property' (the term 'house' includes both residential and commercial property.) The salient points are as follows:

- Rent due from let out buildings and land appurtenant thereto (which are owned by the person) less municipal tax paid during the financial year, referred to as the 'annual value' is the starting point for computing income under this head. Please note that rentals from bare land or from sublease of buildings do not fall under this head. Also note that only the building and not necessarily the land on which the building stands is required to be owned.
- The following deductions are permitted from the annual value to determine the income from property:

(a) In respect of repairs and collection charges, a standard deduction equal to 30% of annual value.
(b) Interest payable on money borrowed for acquisition, construction or repair or renewal of property. Interest relating to the period prior to the previous year in which the property became ready for use is deductible equally in five succeeding previous years.
(c) Irrecoverable rent as per rules prescribed.

- If the let out property is vacant during the whole or part of the year then the rent received or receivable/ annual value is suitably adjusted as prescribed.
- In respect of one self occupied property (SOP), the annual value is treated as 'NIL'. No deduction other than interest up to a maximum of Rs.150,000 is allowed in computing income from SOP on property that is constructed within 3 years from the year in which the loan was taken. However if the property is let out there is no ceiling on the interest limit. When the assessee has more than one SOP, annual value and other deductions will be operated as if such property was let out at a fair rent. The assessee has the option to choose the SOP for exemption.
- When more than one person owns a property, the income from property is divided between them in the ratio of their interest in the property.
- A loss under the head property can be set off against income under any other head and any loss which could not be so set off can be carried forward and set off against property income of the subsequent year and so on for a period not exceeding eight years.

INCOME FROM OTHER INVESTMENTS

Income from investments other than immovable property, like shares, debentures, bonds, units, fixed deposits, and contributions to provident funds and LIC, postal deposits, government securities (hereinafter referred to as 'investments') are brought to tax under the head 'Income from Other Sources'. In computing the income under this head, any reasonable sum paid by way of remuneration or commission for realising such income and any other expenditure (not being a capital expenditure) incurred wholly and exclusively for earning such income is allowed as deductions. Note that Section 80L, under which certain incomes were tax-exempt earlier, has been deleted in the Finance Act, 2005.

Investments which provide tax benefit may be divided into the following categories

- Investments which are deductible under Section 80C and 80 CCC
- Investments the income from which enjoy total tax exemption.

Investments Which Are Deductible under Section 80C and 80CCC

Under Section 80C the following investments *inter alia* can be deducted before computing the taxable income:

(a) Life insurance premiums to cover the life of self, spouse and any child of the individual (bonus paid on maturity is exempt from tax).
(b) Contribution to statutory or recognised Provident Fund (interest exempt from tax upto prescribed limits).
(c) Contribution to Public Provident Fund in the names of self, spouse and any child (interest exempt from tax).
(d) Contribution to approved superannuation fund.
(e) Deposits in 10 year to 15 year Post Office Cumulative Time Deposit Account.
(f) Subscription to any notified government security or deposit scheme – e.g. National Savings Scheme, 1992.
(g) Subscription to National Savings Certificates VI, VII & VIII Issues and accrued interest thereon.
(h) Contribution to unit linked insurance plan.
(i) Contribution to any notified Equity Linked Savings Scheme of a Mutual Fund/ UTI.
(j) Contribution to any notified pension fund (interest exempted from tax).
(k) Any sum paid under home loan scheme of the National Housing Bank.
(l) Payment towards cost of a new residential house paid to any development authority or housing board or other authority engaged in the construction and sale of house property on ownership basis or cooperative society/ company and repayment of loan borrowed for acquisition of residential house.
(m) Amount invested in eligible equity shares or debentures of a public company or a public financial institution the proceeds of which are utilised for infrastructure facility company or units of notified mutual funds.
(n) Amount invested in a notified term deposit for a fixed period of not less than five years with a scheduled bank.
(o) Amount invested in notified bonds issued by NABARD.
(p) Additionally, for senior citizens investments made as a five year time deposits in an account under the Post Office Time Deposit Rules, 1981 and in an account under the Senior Citizen Savings Scheme Rules, 2004 are also eligible for deductions.

Under Section 80CCC contributions to certain pension funds can be deducted before computing the taxable income.

The maximum deduction permissible under the above sections is limited to Rs.100,000.

Investments the Income from which Enjoy Total Exemption

Total exemption is available *inter alia* in respect of the following incomes.

(a) Interest from Post Office Savings Bank Account.
(b) Interest from tax free bonds.
(c) Interest received by a person who is resident outside India on amounts credited in 'Non-resident (external) Account'.
(d) Interest from notified government securities received by non-resident Indians.
(e) Interest on notified debentures of public sector companies.
(f) Interest on Capital Investment Bonds.
(g) Dividends distributed by domestic companies.
(h) Income received in respect of units of a specified Mutual Fund.
(i) Income arising from a transfer of a long term capital asset, being equity share or unit of an equity oriented fund (Provided such transactions are chargeable to securities transaction tax).
(j) Interest on provident fund deposits.

INCOME FROM CAPITAL GAINS

Gains arising from transfer of a capital asset effected during the previous year are brought to tax under the head 'Capital Gains'. The salient points are as follows:

(a) Transfer with reference to a capital asset includes sale, exchange, relinquishment, compulsory acquisition, and conversion into stock-in-trade. Distribution of capital assets on partition of a HUF, transfer of capital assets under a will, change of shares held by a shareholder on amalgamation of two or more companies, conversion of bonds, debentures and deposit certificates into shares are not treated as transfer. Hence in such situations, no capital gain arises.
(b) Capital asset does not include stock-in-trade, agricultural land located beyond prescribed territories, and personal effects i.e. movable assets other than jewellery, drawings, paintings, sculptures, archaeological collections, and any work of art.
(c) The gain or loss is computed as follows:

    Capital Gain/Loss = [Full value of consideration received or accruing – (Indexed cost of acquisition + Indexed cost of improvement + Expenses relating to the transfer)]

(d) Though the cost of acquisition normally means cost incurred to acquire the asset, there are variations to this definition.
    - When the capital asset is acquired prior to 1-4-81, the assessee has the option to treat the fair market value of the asset as on 1-4-81 as the cost of acquisition.

- In respect of rights shares, the cost of acquisition in the hands of the original right holder is the amount paid by such person to the company. When the right is renounced for a consideration, then the cost of acquisition of the right is treated as 'NIL'. In the hands of the renouncee, the cost is the price paid for acquiring the right plus the amount paid to the company towards the value of the shares.
- Cost of acquisition of bonus shares is treated as 'NIL'.
- Cost of acquisition of assets acquired under partition, gift, or will is the cost in the hands of the previous owner, and so on. If the person gifting, partitioning, or bequeathing through a will had acquired it before 1-4-81, then the fair market value on 1-4-81 will be treated as the cost of acquisition in the hands of the recipient. Indexation benefits will be available only from the date of the transfer to the holder
- When an amalgamated company's shares are allotted on amalgamation, then its cost of acquisition is the same as that of the shares of the amalgamating company.
- When in a demerger shares of the resulting company are allotted, the cost of acquisition is computed as a proportion of the total cost. The proportion is the relevant ratio of the net book value of the assets transferred (resultant company) to the total networth in the demerged company.
- When debentures are converted into shares, the cost of acquisition of shares is equal to the proportional value of the part of the debenture converted.

(e) Capital gains are classified into long term and short term, based on the period of holding of the capital asset by the assessee. Shares in companies and other listed securities held for more than 12 months are long-term capital assets. All other capital assets are treated as long term only if they are held for more than 36 months.

(f) Long-term capital assets enjoy the facility of indexation, i.e., proportion of the declared index value enhances the cost for the year of transfer over such value for the year of acquisition. The index values prescribed by the Government of India for financial years commencing from 1981-82 are given below :

81-82	100	82-83	109	83-84	116
84-85	125	85-86	133	86-87	140
87-88	150	88-89	161	89-90	172
90-91	182	91-92	199	92-93	223
93-94	244	94-95	259	95-96	281
96-97	305	97-98	331	98-99	351
99-00	389	2000-01	406	2001-02	426
02-03	447	03-04	463	04-05	480
05-06	497	06-07	519	07-08	551

(g) Long-term capital gains are generally taxed at a flat rate of 20%. However, there are some exceptions as discussed in the following two points.

(h) Long-term capital gains arising from the sale of equity shares or units of an equity-oriented mutual fund are exempt from tax, provided the transaction is chargeable to securities transaction tax.

(i) Long-term capital gains arising from the transfer of security listed on a recognised stock exchange on which securities transaction tax has not been paid is taxed at the rate 10% without indexation benefit or 20% with indexation benefit at the option of the assessee.

(j) Short-term capital gains from the transfer of equity shares and units of an equity-oriented mutual fund are taxed at 15% provided the transaction is chargeable to security transaction cost. Other short-term capital gains are taxed at the rate applicable to the assessee.

(k) A special provision in relation to computation of capital gains in real estate transactions has been inserted in the Act. As per this provision, where the sale consideration in a transfer of land or building (or both) is less than the value adopted or assessed for levy of stamp duty in respect of such transfer, then the value so adopted or assessed shall be deemed to be the sale consideration for computing the capital gains.

(l) When computation in respect of *transfer* of any capital asset is a loss, it has to be first determined if the loss is long term or short term in nature.

A point to be noted here is that the long-term capital loss can be setoff against long-term capital gain only. However, short-term capital loss in a year can be set off against both short-term capital gains and long-term capital gains of the same year. A loss, which cannot be absorbed, can be carried forward and set off against gains for eight subsequent years. The short-term and long-term capital loss must be separately carried forward. However, short-term capital loss can be set of against long-term capital gains and not vice-versa. (Please note, if a capital gains transaction is exempt then the loss arising out of such transactions cannot be set off or carried forward .)

(m) There are exemptions available against gains from transfer of long-term capital assets if investment is made in new capital assets within the stipulated period, and other prescribed conditions are satisfied. These exemptions include the following cases. (Please note that the exemptions can in no case exceed the amount of capital gains.)

- Transfer of a residential house and acquisition of another residential house (referred to as new asset)

  Exemption = The capital gain or the value of the new asset, whichever is lower.

- Transfer of any capital asset other than residential house and acquisition of another residential house, and the assessee does not own any other residential house.

$$\text{Exemption} = \text{Capital gains} \times \frac{\text{Value of new asset}}{\text{Sale value of original asset, less expenses on transfer}}$$

- Transfer of any capital asset and acquisition of either notified bonds, debentures, shares of public company, units of recognised mutual funds, or other assets specified in official gazette.

$$\text{Exemption} = \text{Capital gains} \times \frac{\text{Value of new asset}}{\text{Sale value of original asset, less expenses on transfer}}$$

WEALTH TAX ACT

The salient features of the Wealth Tax Act relevant for individual investors are as follows:

- Wealth tax is chargeable annually on the net wealth as on the valuation date, which is March 31 of the 'previous year'. (For example, the valuation date for the assessment year 2008-2009 is March 31, 2008.)
- Net wealth means 'taxable wealth' being the excess of taxable assets (excluding debts incurred in relation to assets not forming part of taxable wealth).
- The assets taxable are any building or land appurtenant thereto; motor cars other than those used in the business of running them on hire or as stock-in-trade; yachts, boats and aircraft (other than those used for commercial purposes); cash in hand, in excess of Rs.50,000; jewellery, bullion and furniture, utensils or any other article made wholly or partly of gold, silver, platinum or any other precious metal or alloy of such metals; and urban land other than that held as stock in trade. It may be noted that several items are not included as part of the assets, e.g. shares, debentures, bonds and other securities.
- Taxable assets also include 'deemed assets' which are not owned by the assessee but are in the name of certain related parties.
- Exempted assets include one residential house.
- For wealth tax purposes, different assets are valued in the manner laid down in Schedule III to the Wealth Tax Act and not at the original purchase price.
- Wealth tax is levied at 1% of the net wealth exceeding Rs.15 lakh.

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