

Security Analysis AND PORTFOLIO MANAGEMENT

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SECOND EDITION

ROHINI SINGH

EXCEL BOOKS

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ISBN: ??

First Edition: New Delhi, 2009

Second Edition: New Delhi, 2017

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EXCEL BOOKS

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Published by **Dr Rajan Chopra** for **EBPL**, B-25/5&6, Sector-59, Noida-201 301
and printed by Excel Printers, Delhi-110 002

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Preface

I have been teaching Security Analysis and Portfolio Management for over twenty five years at the University of Delhi and this book is the result of what I have learnt and taught over the years. I have read many internationally renowned textbooks for my classes and sourced information and examples related to India from books, newspapers, journals, and the Internet. My students and I felt the need for a comprehensive user-friendly book, which combines a sound theoretical base with examples and references related to the Indian financial system —a need which this book aims to fulfil.

The subject is presented in a simple manner with minimum formulae and mathematical derivations to suit readers studying the subject for the first time. Mathematical derivations and more advanced concepts have been provided in the appendices for those interested in a more rigorous approach. Most students find it easier to understand financial formulae when results are demonstrated with the use of spreadsheets. For this, exercises to be done on the computer have been given.

There is a vast reservoir of information and software available on electronic medium; some are free of cost over the internet and others are available on payment. A student or professional would be in a better position to understand and analyse financial alternatives if they are familiar with such databases and software. For this reason, some short practical exercises requiring information to be collected or to be retrieved from the Internet/databases are given at the end of each chapter.

The last chapter has been devoted to the analysis of financial information as most universities are giving importance to term papers and projects. The process is illustrated using a sample of research assignments. It covers sources of data, analysis of data, precautions to be observed when collecting and analysing data and interpretation of results.

The aim of this book is to make the reader familiar with the theory and practical aspects of investment management. The emphasis is on providing a conceptual framework for analysis from an investor's perspective of maximising return on investment rather than going into the details of rules and regulations and other institutional aspects. There is, however, one chapter on the Indian financial system, as it is necessary to understand the environment in which we function.

The second edition has been updated to reflect the current market including a section on the subprime and euro crisis and failure of Satyam and Enron. Solved examples and multiple choice questions have been added to give students more practice. Certain proofs have been added in the appendices for students who are mathematically inclined.

ROHINI SINGH

Acknowledgements

Dr R S Dhankar, my PhD guide, introduced me to the joy of writing and publishing. For this, I will always be grateful to him. I also thank my friend and colleague Dr Tanuja Sharma for motivating me to write this book.

I am indebted to iCharts Financial Services for allowing me to use their charts extensively in the chapter on technical analysis. This book also has inputs from various other sources, authors and publications, which have been duly acknowledged at the relevant places.

While writing this book, I had to refer to many books, journals, Internet sources and the Prowess database. The entire library and computer staff of Shaheed Sukhdev College of Business Studies was very cooperative and I am grateful for their help. I also thank the staff of FMS Library, Ratan Tata Library, and the Central library at the South Campus, University of Delhi, for the facilities provided.

I am grateful to Excel Books and, in particular, to Mr Anurag Jain and Ms Vimmi Sethi for their patience and help in bringing this book to fruition. For the second edition I must thank Ms Anshu Sharma.

The book is based on my continuously evolving class lectures, questions, problems, practical exercises and research work given to the students and their feedback. I must also acknowledge that writing this book has been a huge learning experience for me.

I also thank my husband, my parents, my parents-in-law, my sister and my children, as they supported me in my work and gave me time off from family duties.

About the Author

Dr Rohini Singh is an Associate Professor at Shaheed Sukhdev College of Business Studies, University of Delhi. She did her PhD from FMS, University of Delhi, postgraduation in management from IIM, Ahmedabad, and graduation in Economics (Hons) from LSR, University of Delhi. She has over 33 years of experience in industry, consulting and teaching. She has taught Security Analysis and Portfolio Management, Valuation, Strategic Finance, Business Research, Quantitative Techniques, Production and Operations Management, and Cost Accounting at the Bachelor of Business Studies programme (University of Delhi). She has been actively involved in the design and revision of the syllabus for the BBS, BMS and BBA(FIA) program from time to time. She guides the finance specialization project work every year.

Her paper entitled *Application of Technology in Teaching Finance* was adjudged as the “Best Written Paper” at the Conference on Best Teaching Practices using ICET, organised by Centre for Research on Cognitive Systems, NIIT Institute of Information Technology, Delhi, in December, 2008.

Prior to teaching, she worked in the public and private sector in Ballarpur Industries (Thapar group), Bongaigaon Refinery and Petrochemicals Ltd. and Twiga Fiberglass Ltd. She designed and implemented budgeting and cost control systems for them, applied for government grants and loans from financial institutions and banks, and worked on several special assignments including product mix optimisation, price fixation and wage revision.

She also worked as a consultant to Twenty First Century Electronics and ERG Electronics for setting up a computerised budget and cost control system and a user-friendly system for project and working capital finance. She also undertook Techno-Economic Feasibility Studies for Anand Consultants and Industrial Management Consultancy Organisation and conducted training in Finance and Management Accounting for JCOs and other ranks of the Defence Services.

She has several publications to her credit, in leading finance and management journals, such as *Decision (IIM Calcutta)*, *Journal of Financial Management and Analysis*, *ICFAI Journal of Applied Finance*, *Asia Pacific Business Review*, *Finance India and Business Analyst*.

PART I

Background

Chapter 1

Introduction

Chapter 2

Risk and Return

Chapter 3

A Brief Overview of the Indian Financial System

CHAPTER - 1

Introduction

LEARNING OBJECTIVES

At the end of this chapter, you will be able to:

- Appreciate the need for security analysis and portfolio management
- Describe the types of assets available for investment
- Understand the concept of risk associated with investment
- Differentiate between investment and speculation

Investment is the commitment of funds for a period of time with the expectation of receiving more than the current outlay. The returns could be in the form of annual income and/or appreciation in price. Many readers would already have studied investment analysis from the perspective of the firm. In this book, we will examine financial decisions from the perspective of persons investing in corporate securities and other assets. These could be individuals, societies and trusts, mutual funds etc.

Why invest? While the reasons for investing are unique to each individual, common reasons could be to have money for emergencies, to beat inflation, buy a car or house, pay for education, indulge in travel and hobbies, to give to children or charity and for retirement. It is important for each investor to have a financial plan in order to achieve these goals.

Various types of assets are available for investment such as land, buildings, fixed deposits, shares, bonds, gold etc. As investors, we need to understand the implications of investing in various assets, and the associated risks and returns. Most investors hold a combination of assets, known as a portfolio. Since, a portfolio may have different risk and return characteristics as compared to the simple aggregation of its component assets, we also need to analyse the risk/return characteristics of portfolios and select portfolios suited to individual risk and return preferences. As individual needs and the risk and return of the portfolio change over time, the selected portfolio needs to be reviewed periodically and revised if necessary.

■ TYPES OF ASSETS

Assets can be broadly classified into tangible assets, financial assets and intangible assets. Tangible assets consist of real/physical assets such as buildings, land, precious metals, commodities and luxury or collector's items. Financial assets/paper assets represent a claim on physical assets or future cash flows. They include savings deposits, fixed deposits, cash back insurance policies, shares, bonds and derivative instruments. Intangible assets include patents, trademarks, goodwill etc. Some assets such as collector's items may have more sentimental value than financial value. In this book, we will be concentrating on financial assets, although majority of the concepts and techniques can also be applied to real assets.

Financial assets can be further divided into debt and equity, based on the timing and nature of expected cash flows. Debt is a fixed period loan, which comprises of periodic or cumulative interest payments and return of the principal on maturity. Equity, on the other hand, represents ownership of a company, where returns are received in the form of dividends and capital appreciation. Over the years, a variety of financial instruments have evolved in response to the needs of borrowers and investors. These will be discussed in detail in the respective chapters relating to debt, equity and derivative instruments.

Financial assets can be held in the form of personal contracts or in the form of securities. In personal contracts, the amount of money invested, rate of interest and period of deposit etc. are based on mutually agreeable terms between the borrower and the lender. For example, the bank announces interest rates applicable for various periods and amounts invested, while

the investor decides the amount of money and time period for his deposit. The principal is paid back on maturity or on premature withdrawal with a penalty. Such deposits normally cannot be sold or transferred to a third party. Securities on the other hand, are issued in fixed denominations and are fungible (each unit is indistinguishable from the other) and tradable. Examples of securities include shares and bonds.

The choice of investment depends on many things including the investment period, the amount of money available for investment, need for liquidity, current income versus capital appreciation, tax considerations and ability to take risk. The features of some commonly held assets are briefly described below:

Tangible Assets

Real Estate can be viewed as an investment that provides regular income in the form of rental and appreciation in value. In India, there is scarcity of land and the value of property normally appreciates in the long run. The rate of appreciation and rental depend on whether the property is commercial or residential, the city/town and exact location. Since all individuals require housing services, one way to hedge against fluctuations in rentals is to purchase a house. Tax benefits are available on payments for housing loans; self-occupied houses are also given concessions in property tax. However, real estate requires a large investment and may need to be financed. The disadvantages are that it cannot be liquidated in parts, it also takes time and effort to sell because each property is unique. At the time of purchase, the buyer must ensure that the title deed is genuine, and provide for transaction costs such as stamp duty and brokerage. After purchase, arrangements need to be made for its physical safety to prevent encroachment, fire, theft of contents etc. Although property forms a major part of the investment portfolio for many individuals, there is no historical data on property returns in India due to the lack of transparency. *Real Estate Investment Trusts (REITs)* and *Real Estate Mutual Funds* recently introduced in India should help overcome many of these disadvantages.

Gold is a very liquid asset that has been traditionally held by central banks all over the world. Gold jewellery is also a common investment in most Indian households. The disadvantage of investment in gold is that it requires expenditure for safe storage and its purity can only be guaranteed if purchased and stored in the form of certified bars. Investors can invest in *gold exchange traded funds* to overcome these disadvantages.

Art: Appreciation in value depends on the painter and future demand and supply for the paintings. The market is unorganised and there is the problem of fakes, for which proper documentation and authentication is necessary.

Financial Assets — Personal Contracts

Savings bank accounts offer a safe deposit facility for cash and a nominal interest rate, with facilities for instant withdrawal and transfer. Fixed deposits in banks offer a higher rate of interest. However, the funds are locked in for a fixed period of time and there is a penalty for premature withdrawals. There are also some flexible plans, which combine the features of savings and fixed deposit accounts.

Tax Saving Instruments u/s 80C¹

Public provident fund: Contributions to the fund qualify for deduction from income up to the permissible limit and interest and withdrawals are tax free. The disadvantage is the lock-in period of 15 years, with limits on loans and withdrawals before maturity.

Pension plans: These are annuity schemes where contributions qualify for deduction in the years when payments are made but the interest and principal are taxable at the time of withdrawal (pension payments).

National Pension scheme (NPS): The government shifted to the NPS from January 1, 2004. For government employees the employer and employee contribute 10 % of basic pay including DA. At maturity 40% of the corpus is tax free , of the 60% taxable corpus, 40% has to be compulsorily used to purchase an annuity, the income from the annuity is taxable. the remaining 20% is taxable on withdrawal. From 2016, an additional tax benefit of Rs 50,000 under Section 80CCD(1b) was provided under NPS, over the Rs 1.5 lakh exemption of Section 80C. Limited premature withdrawals are allowed for certain specified purposes.

Insurance: Some life insurance plans build in an investment component, which offer periodic and/or terminal cash benefits. The returns can be compared with other investments if the payment for pure insurance is deducted from the annual premium before calculating returns.

In all such schemes, the individual investor should consider the alternative investment avenues and decide whether it is better to pay tax and invest elsewhere or invest in these schemes. The liquidity, and returns and risks of alternative investment avenues need to be considered.

Financial Assets—Securities

Debt Securities: Bonds and debentures are debt securities like loans that offer a predetermined rate of interest for a fixed period. *Central government bonds* will usually offer the lowest interest among all debt securities as they are default-free and need to compensate the lender only for the time and the inflation. *State government bonds* and *municipal bonds* would incorporate some premium for risk and offer slightly higher interest rate. Although the probability of default in any government backed bonds is very low, there is lower liquidity in these bonds. *Corporate bonds* should normally offer higher returns than all the other bonds to compensate for the risk associated with the issuer of the bond. The interest will be based upon the credit rating of the issue, the lower the rating the higher the risk premium. In the corporate bonds, the *public sector bonds* are perceived to be safer than private sector bonds because of the implicit backing of the government.

Equity shares represent partial ownership in a company. Returns are earned in the form of dividends and appreciation in the value of shares. The equity holders have a residual claim on the earnings and assets of the company; interest and preference dividend are paid before equity dividends and in case the company is liquidated, all other claimants are paid first.

¹Refer Appendix at the end of this chapter for a comparative table on investments under section 80C.

Because of this, the returns on equity are normally higher than interest on corporate bonds and preference shares. *Preference shares* combine some of the features of debt and equity. They normally have no maturity date, and represent ownership in the company like equity shares, but do not have voting rights. They have a fixed dividend payable every year just like interest payments on debt. Normally, dividend is cumulative, i.e. gets added to the amount payable in subsequent periods if not paid when due. The shareholders get voting rights if dividend is not paid consecutively for three years. *Redeemable preference shares* are more like debt as the principal amount is repaid at the end of a fixed period.

Derivatives are financial instruments that derive their value from underlying assets. The underlying asset can be real assets, financial assets, stock market indices, exchange rates etc. Derivatives include futures, options, warrants, convertible bonds, swaps, mortgage derivatives and securitised assets.

■ RETURN AND RISK

Investors sacrifice current consumption in order to be able to consume more in the future. The required rate of return therefore depends on the time for which funds are locked up, the expected rate of inflation during that period and risk involved. The real risk-free rate of return can be considered as the compensation for time. Since inflation erodes the future purchasing power of money, the return has to be higher to account for expected inflation. Investors are also concerned with the safety of their returns, so more risky investments have to offer higher returns to attract investors.

The expected return on any asset depends on the initial outlay and timing of expected cash flows. For debt, the calculation is relatively simple as cash flows are known and fixed in advance. For equity, we need to project future expected cash flows i.e., expected dividends and projected stock price. For both debt and equity, there is a risk that expected cash flows are not realised, i.e. the return actually realised could be lower than expected return. There could be fluctuation in expected returns in the form of delayed or rescheduled payments or non-payment. The estimation of risk and return is, therefore, a very important part of investment analysis. Realised return can also be higher than expected return if there are unexpected favourable events that result in increased annual payments such as dividends or prices of assets owned.

The absolute and relative returns on assets have varied over the years. In order to be able to forecast returns, we also need to examine the factors that influence returns on debt and equity. This includes the impact of global and country specific economic conditions, the influence of macroeconomic variables such as inflation and interest rates, oil prices, and the importance of industry and company specific variables. This analysis of information related to economic, industry, and company-specific data, to arrive at a fair present or future price of a security is known as fundamental analysis.

There are various theories and models that attempt to explain the complex dynamics of risk

and return. The Efficient Market Hypothesis (EMH) basically asserts that it is not possible to consistently outperform the market by using historical prices, fundamental analysis or even insider information. The Capital Asset Pricing Model (CAPM) and the competing Arbitrage Pricing Theory (APT) describe how assets should be priced relative to risk. We study these theories and their implications and see whether they are applicable in the Indian context.

The prices of certain assets such as stocks, commodities and precious metals fluctuate everyday. The same asset would give higher profit if purchases could be timed to buy when prices are low and sell when prices are high. Technical analysis claims that a study of past prices and volumes can help forecast future price movements. Though this is contradictory to the efficient market hypothesis, these techniques have become very popular and are reported in leading economic dailies and finance sites.

Portfolios and Individual Requirements

Investors forgo current consumption in order to have higher income in the future. Most individual investors also plan and build up capital for security in their old age. Depending on their age, current financial situation and forecasted earnings, they need to decide on the amount to be saved and the composition of their portfolios. This means they need to determine the proportion to be invested in property, money back insurance policies, shares and bonds etc. and whether to diversify internationally or not. All investors want higher returns while keeping risk at an acceptable level, and investment advisors try to build optimum portfolios for each one. In order to do this, we study the modern portfolio theory and traditional portfolio analysis. We will learn how to combine assets in order to reduce risk and also the factors that should be kept in mind when assessing individual requirements. There is no single prescription available for all investors, each one has to choose based on his or her financial needs, tax status and risk/return preferences.

Mutual Funds

An individual can choose to invest directly or through an institution such as a mutual fund, pension fund or an insurance company. There has been a phenomenal growth in the amount of money being managed by mutual funds in the Indian economy. Institutions have the advantage of being managed by professionals, however, returns vary with the type of scheme and the capability of the managers. We will study the various types of schemes that are available and learn how to evaluate their performance.

■ INVESTMENT VS. SPECULATION

It is important at this point to make a distinction between investment and speculation. Investment is the long-term commitment of funds, with the expectation of returns in the form of periodic returns and/or capital appreciation. On the other hand, speculation seeks abnormally high return mainly due to fluctuation in prices over a very short period, but in the process incurs more risk. An investor seeks to protect his capital with expectation

of moderate returns, while a speculator risks his capital for higher returns. Gambling, like speculation, seeks very high returns; however, unlike the speculator, the gambler does not analyse or measure risk and recklessly puts money based on tips and hunches.² The same shares can be purchased for investment, speculation, or gambling depending on the motives of the purchaser. An investor may study the fundamental strengths of the company and hold its shares to avail of dividend and capital appreciation over a period of time. A speculator who feels that shares are undervalued and price is likely to rise in the near future may buy them to be sold soon thereafter. The same individual may also act as an investor, a speculator or a gambler at different points of time. We will be studying security analysis and portfolio management from the point of view of an investor, though a speculator can also use the same concepts and techniques.

While speculators and gamblers act in their own interest in an attempt to make quick profits, they add liquidity (ease of finding a trading partner), to financial markets. They also add to the depth (deep markets need very large orders to cause price fluctuations) and breadth (wider distribution of ownership) of the market, which makes it more competitive and efficient. However, speculative purchasing and selling can also make markets more volatile and can lead to market bubbles and crashes.

The Financial System

As investors, we are concerned with what we actually get, i.e., return on investment after taxes and expenses. For example, dividend income is tax free, while interest income is taxable. Investing electronically may be cheaper than placing an order through a broker. The structure of the financial markets, government policies, regulation and tax structure affect the functioning of the market and influence the return on investment. In this text, we will study financial markets within the framework of the Indian financial system.

Jobs in Investment Analysis and Portfolio Management

Careers in finance offer a variety of jobs in corporate finance and in the financial services sector ranging from strategic financial planning to sales. The financial services sector including stock trading, asset management, insurance, private equity, and commercial banking is a fast growing sector in India and the global economy. Knowledge of security analysis and portfolio management is useful for financial planners in any organisation including bankers, mutual fund managers, stock brokers, venture capitalists, insurance companies, depositories, custodians, clearing houses etc. The subject is covered in degree courses in business studies with specialization in finance at the bachelors level and masters level. Certifications are also available from CRISIL, Institute of Chartered Financial Analysts of India (ICFAI), National Stock Exchange (NSE), Bombay Stock Exchange (BSE) and Association of Mutual Funds of India (AMFI). Certification is mandatory for certain jobs; for example, any person engaged in marketing and selling of mutual fund products has to pass the AMFI certification test (advisors module) and obtain a registration number from AMFI. Brokers, dealers and

²According to Warren Buffet, gambling involves creation of a risk where no risk need be created.

salespersons in the derivatives market have to be certified by an institution approved by SEBI. Prospective students should choose appropriate courses keeping in mind their career goals, and the time and resources required.

■ SUMMARY

Investment is the commitment of funds for a period of time with the expectation of receiving more than the current outlay. Various investment avenues are available, which need to be evaluated with respect to the risk, return, liquidity, divisibility etc. There are real assets and financial assets; financial assets can further be divided into debt, equity and derivatives. Financial assets can also be held in the form of personalised contracts and securities. Historical returns for the same class of assets and relative returns between asset classes have varied over time. As investors, we are interested in expected future returns, which we attempt to forecast using fundamental analysis, technical analysis, and theories of risk and return such as EMH, CAPM and APT. As the risk and return of portfolios is not a weighted average of the individual components, we also study portfolio analysis to optimise the risk return trade-off and learn how to design portfolios to suit individual needs.

This book will guide the reader through the maze of alternative investment avenues and provide tools and techniques for assessing and analysing them. In other words, the investment advisor and investor will be in a better position to make rational choices. However, there is no prescription that guarantees the maximum profit. In this world with infinite investment choices that involve a variety of risks and returns, the final decision rests with each individual as to how the tools are to be used, where and when to invest, and whether to invest or not. Even if the money is invested through a mutual fund or an investment advisor each investor has to take responsibility for these decisions, because the money to be invested and the consequences of the investment belong to him alone.

■ QUESTIONS

1. What is an investment?
2. Is money in a bank locker, in a drawer at home, in a savings deposit in a bank an investment?
3. What is the difference between investment and speculation?
4. Distinguish between physical assets and financial assets.
5. Distinguish between expected return and realised return.
6. What are the possible reasons for variation between expected and realised return?
7. List the various types of assets that are available for investment.
8. “Since debt has fixed payments that are known in advance it is not risky”. Is this statement true?
9. How are the returns expected from equity and debt different? Why is equity considered more risky?
10. What is meant by depth and breadth of the market? Are deep and broad markets desirable?

■ MULTIPLE CHOICE QUESTIONS

1. Return on investment includes
 - (b) Interest
 - (c) Dividend
 - (d) Capital Gain
 - (e) All of the above
2. Tangible assets include
 - (a) Real Estate
 - (b) Real Estate Mutual funds
 - (c) Real Estate Investment Trusts
 - (d) All of the above
3. An investor is a person who
 - (a) Depends on fundamental analysis
 - (b) Commits funds for normal returns
 - (c) Does not earn very high returns
 - (d) Earns very high returns
4. Which of the following are investments ? (mark all correct options)
 - (a) Gold kept at home
 - (b) Cash in the bank locker
 - (c) Savings account in the bank
 - (d) Fixed deposit in bank
5. Which of the following represent ownership in the company?
 - (a) Municipal bonds
 - (b) Preference Shares
 - (c) Equity Shares
 - (d) Corporate debentures

■ PRACTICAL EXERCISES

1. If you had Rs. 25 lakhs to invest today where would you invest it and why? Answer the same question after reading the whole book.
2. Survey 5-10 persons in your neighbourhood — where have they invested and why?
3. Look at the following and make a note of the information that seems useful at this stage, do the same after reading the whole book and see the difference.
 - (a) Market Intelligence page of the *Economic Times* or financial pages of any newspaper.

- (b) AMFI website all about mutual funds including historical data on net asset values. www.amfiindia.com/
- (c) NSE and BSE websites for historical data on stock prices and annual reports. www.nseindia.com/www.bseindia.com/
- (d) Data bases such as Prowess or Capitaline, if available in your institution, have a wealth of company and stock market data.

APPENDIX 1

	<i>Tax Saving Schemes under Section 80C (as in 2013-14)</i>				
	Return	Risk	Liquidity	Taxation	Remarks
PPF Public Provident Fund	linked to Govt bond yield. Announced every year.	Safe, government backed	15 year lockin, can extend in 5 year blocks. Partial withdrawal after 5 years	EEE Exempt Exempt Exempt	Longest lock in. Invest before 5th of month to get interest for the month
EPF Employee Provident Fund	Announced by Govt.	Low, government guidelines on investment of funds	Withdrawals allowed for specific purposes	EEE after 5 years	Needs to be transferred when employer changes
VPF Voluntary Provident Fund	same as EPF	same as EPF	same as EPF	same as EPF	same as EPF
ELSS Equity linked Savings Schemes	Market linked	depends on portfolio and market movements	3 year lock in	EEE as no tax on long term capital gains	lowest lock in
NSCs National Savings Certificates	linked to Govt bond yield at time of investment	Safe, Government backed.	Premature encashment not possible	EET Exempt, Exempt, Taxable- interest is taxable.	
Tax Saving FD	Bank dependent	Low	Lockin for five years till maturity	EET, Interest accrued/paid is taxable.	
Senior Citizens' Saving Scheme	Linked to Govt. Bond yield	Safe, backed by Government	minimum holding 5 years for tax benefits	EET, Quarterly interest paid is taxable.	Early withdrawal attracts reversal of tax benefits
ULIPs Unit Linked Insurance Plans	Market linked	depends on portfolio and market movements	5 year holding for full tax benefits	EEE after 5 years	Early surrender attracts charges
NPS National Pension Scheme	Market linked	depends on portfolio and market movements	Withdrawal only at vesting age	Commuted amount and annuity (pension) taxable	Can choose equity/debt
Life Insurance	Have been lower than other fixed return schemes	Safe, backed by Government	Lock in for term of policy	EEE	Explore pure life plans and other investment combinations

CHAPTER - 2

Risk and Return

LEARNING OBJECTIVES

At the end of this chapter, you will be able to:

- Understand how return and risk are measured
- Discuss the sources of risks
- Identify the components of required return
- Discuss the types of risks associated with alternate investments
- Appreciate the need to manage risk

Securities can be classified and analysed according to their characteristics which include return, risk, maturity, liquidity, minimum investment, transaction costs, tax treatment, options etc. A straight bond promises payment of periodical interest and the principal at maturity, the amount and timing of cash flows are fixed and known at the time of investment. An equity share, on the other hand, represents ownership in a company, which promises future dividends and a share of the value of its assets, the timing and amount of cash flows are however not known in advance. All securities, however, have some things in common; they represent a claim on assets or future cash flows and they all have the risk that expected cash flows are not realised. In this chapter, we will look at the two basic features of securities, risk and return.

■ MEASURES OF HISTORICAL RETURN

The return actually received on an investment is its historical return or *realised return*. Historical returns are important because they reveal the return received on various assets over the years, and form the basis for projection of *expected returns*. The amount of money gained or lost on an investment is called its return. This includes periodic payments such as interest and dividend and the capital gain or loss if any. Since an investor is concerned with the net gain, returns on alternative investments should be compared after accounting for taxes and other costs. Commissions, stamp duty and other out of pocket costs should be deducted from returns before calculating return¹.

There are various concepts related to return. For example, if a share is bought at Rs 200, dividends received are Rs 20 and the share is sold at Rs. 220 the *absolute return* is Rs 40. In order to evaluate this return across large and small investments or to compare it with alternative investments, we calculate the rate of return as a percentage of the amount of money invested. In this example, the return over the period for which the asset was held, or *holding period return* (HPR) is $(40/200) \times 100 = 20\%$. To generalise

$$\text{Holding Period Return} = \left(\frac{\text{Dividend} + \text{Selling Price} - \text{Purchase Price}}{\text{Purchase Price}} \right) \times 100$$

$$\text{HPR} = \frac{(D + P_t - P_0)}{P_0} \times 100 = \left\{ \frac{(D + P_t)}{P_0} - 1 \right\} \times 100$$

where P_0 is the purchase price and P_t is the selling price at the end of the holding period and $(D + P_t)/P_0$ is known as the *return relative*.

In order to judge whether 20% is a satisfactory return or not, we also need to know the period for which the investment was made. Since the period of investment can vary, it is convenient to express returns in terms of annualised returns. If the return was earned over a period of one year the *annual return* is 20%, if this was earned over six months the *annualised return* would be $20/0.5 = 40\%$, and if 20% was earned over two years the

¹Similarly for loans, the initial charges and advance installments payable, if any, should be taken into account while calculating the effective interest rate.

annualised return would be $20/2 = 10\%$. In this example, we have used the arithmetic average to calculate the annualised return by dividing the holding period return by the number of years so we call this the *arithmetic return*. This can be shown as

$$\text{Average Return} = \left(\frac{\text{Dividend} + \text{Selling price} - \text{Purchase price}}{\text{Number of years} \times \text{Purchase price}} \right) \times 100$$

$$R = \frac{(D + P_t - P_0)}{n \times P_0} \times 100$$

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

where n is the number of years, and R_i are annual returns

However, this is an over simplification; periodic payments such as dividend or interest, also become part of capital and can be reinvested to earn higher returns. In such cases, the arithmetic average is not appropriate and it becomes necessary to calculate the *geometric return* or *compound return* or *yield* as is shown in the next section.

■ ARITHMETIC RETURNS VS. GEOMETRIC RETURNS

It is useful at this stage, to revise the concepts of simple and compound interest. Simple interest (SI) is the product of the principal (P), interest rate per period (r), and the number of time periods (t)

$$SI = P \times r \times t.$$

For example, if Rs 100 is invested at 10% simple interest for two years the interest received at the end of two years will be $100 \times 10\% \times 2 = \text{Rs } 20$.

The total amount received with simple interest (SA) i.e. principal plus interest is

$$SA = P + SI = P + P \times r \times t = P \times (1 + rt)$$

In the given example, the total amount received will be $100 \times (1 + 0.10 \times 2) = \text{Rs. } 120$.

Compound interest (CI) considers the interest accrued at the end of each period as additional capital and calculates interest on interest for the next period. The additional principal at the end of the first period will be $P \times r(t = 1)$ and $P \times r \times (1+r)$ for the second period ($t = 2$) and interest for all the periods will be

$$CI = P \times ((1 + r)^t - 1)$$

and total amount received along with compound interest (CA) i.e. interest and principal will be

$$CA = P \times (1 + r)^t$$

For Rs 100 invested at 10% per annum the interest earned will be $100 \times ((1 + 0.1)^2 - 1) = 21$ and amount received will be $100 \times (1 + 0.1)^2 = 121$

As can be seen, reinvestment of interest due to compounding results in higher interest received as compared to simple interest. The *effective interest* or *yield* further increases with the frequency of compounding, as can be seen in the example given below where 12% interest is compounded annually, quarterly, monthly and continuously².

Compounding	Calculation	Amount	Effective Interest
Annual	$100*(1.12)^1$	112.00	12.00
Half yearly	$100*(1.06)^2$	112.36	12.36
Quarterly	$100*(1.03)^4$	112.55	12.55
Monthly	$100*(1.01)^{12}$	112.68	12.68
Continuously	$100*e^{0.12}$	112.75	12.75

Similarly, the two methods of calculating average returns are the arithmetic average and the geometric average. In the *arithmetic average*, we simply add all the cash flows and divide by the number of years. The *geometric average* uses the concept of compounding of returns, we add 1 to the return for each year, multiply these expressions for all yearly returns and take the t^{th} root, where t is the number of years:

$$\text{Geometric Average} = \sqrt[t]{(1+r_1) \times (1+r_2) \dots \times (1+r_t)}$$

The holding period return (HPR) and return relative can also be converted into annualised HPR or yield as follows:

$$\text{Annual HPR} = \left(\sqrt[t]{1+\text{HPR}} - 1 \right) 100 = \left(\sqrt[t]{\frac{P_t}{P_0}} - 1 \right) 100$$

where the initial investment or present value is P_0 and future value is P_t (which includes the payment at maturity and all periodic payments and their reinvestment benefits at time period t)

Let us compare the results using arithmetic and geometric means using the first example where a share is bought for Rs 200, dividend received is 20 and the share is sold for Rs 220.

If we assume the dividend is received at the end of the period, if the holding period is six months, the yield would be $((240/200)^{1/0.5}) - 1 \times 100 = 44\%$, as compared to $20 \times 2 = 40\%$ calculated using arithmetic return. This is because the dividend and capital gain received at the end of six months is assumed to be reinvested at the same rate for the next six months, so the one year rate is equivalent to $((1.2 \times 1.2) - 1) \times 100 = 44\%$.

If the return is earned over two years the yield would be $((1.2^{1/2}) - 1) \times 100 = 9.544\%$, which is lower as compared to $20/2 = 10\%$ calculated using arithmetic mean. This is because we assume that interest accrued after the first year is reinvested for the second year and $((1.09544 \times 1.09544) - 1) \times 100 = 20\%$.

²As the frequency of compounding is increased, the periods can be reduced from monthly to daily to hourly and ultimately to continuous compounding. Continuously compounded return or natural log return or logarithmic return is used in research and for valuation of options. The advantage of continuous compounding is that returns for sub-periods can be added up and antilog taken to give holding period return.

■ RISK

Risk is defined as the possibility of realised returns being lower than expected returns. Risk management involves identifying the sources of risk, measuring the risk, and plans to address the risk. Realised return may be lower than expected returns due to fluctuations in the periodic or income component of returns, price changes in the investment value, or fluctuations in reinvestment rates. The risk associated with investment depends on the type of investment. Factors that contribute to risk could be common to similar kinds of securities, while others may be specific to a particular company. *Systematic risk* is that part of risk, which influences all stocks or all bonds though the extent may differ for each security and is beyond the control of individual firms. The causes could be economic such as an economic boom or recession, political such as a regime that is capitalist or socialist, or even sociological such as changes in the attitude of investors towards equity. When we talk of country risk or exchange rate risk we are referring to systematic risks that impact all stocks or bonds. *Unsystematic risk* or *fundamental risk*, on the other hand, is specific to a particular industry or company and could include government policies that affect a particular industry, factors such as the availability of skilled labour, quality of management, or change in consumer preferences. The common sources of systematic and unsystematic risk are only briefly described here as they will be taken up in greater detail in later chapters. Sources of systematic risk can further be divided into market risk, interest rate risk and purchasing power risk and sources of unsystematic risk can be classified as business risk, financial risk, liquidity risk and exchange rate risk. Each of these influences is discussed below assuming all other conditions remain unchanged.

Sources of Systematic Risk

Market risk is the risk that overall investor expectations will change due to changes in the economic, political or social conditions in the international or domestic economy. This is more important for stock returns than for bond returns. When the economy is in a growth phase, most stocks tend to do well and vice versa. Government decisions such as minimum alternate tax on companies had a negative impact on stock prices, while removing tax on dividends and long-term capital gains on stocks had a favourable impact on market sentiments. Permitting FIIs to invest in the Indian stock market had a positive impact on the market, but it also exposed the market to international market fluctuations. A major international event that affected our stock market was the terrorist attack in the US, followed by the war in Afghanistan. The impact of these factors is accentuated by the herd mentality of investors, which pushes the market further up or down.

Interest rate risk is the response of security prices to changes in the level of interest rates in the economy. Increase in risk-free interest rates will raise interest rates in the entire economy. This makes investment in debt more attractive, which may lead to withdrawal of funds from the stock market, which in turn should lead to a decline in stock prices. All companies have some proportion of their assets financed through debt, so if interest rates rise this would reduce profits, again leading to an unfavourable effect on stock prices in general. For bonds that exist in the market, an increase in interest rates will lead to a fall in bond prices, because new issues of bonds will offer better returns.

Purchasing power risk is depletion in the value of money due to inflation. Investment involves the sacrifice of current consumption for expected higher consumption in the future. Any rational investor would demand compensation for reduction in purchasing power due to increase in the general price level. For interest bearing securities, this would result in an increase in the interest rates.

Sources of Unsystematic Risk

Business risk is the variation in expected profits of a company. If a company has an expected profit of 10% with two equally probable situations of 0% and 20% profit, it will be considered more risky than one with probable profits of 9% and 11%. The variation in profits could be due to be *internal business risk* such as problems in operating efficiency, high level of fixed costs or high turnover rates of key management personnel. This could also be due to *external business risk* such as business cycles which affect certain industries like luxury goods more than others. Government policies towards industries such as tobacco may prompt increase in taxes specific to the industry. Currency risks, such as the weakening of the dollar had an adverse effect on exporters and a favourable impact on importers. If economic conditions in the US reduce the demand for outsourcing, it will affect returns of IT companies in India.

Financial risk is the variation in profits due to financial leverage. Companies normally borrow money to expand their operations when the cost of financing is lower than the return on assets. As long as sales are steady or growing, the additional assets can be utilised to increase company profits. However, if sales fluctuate, the fixed interest costs will magnify the losses in lean periods.

If assets are held in another currency, fluctuation in the value of that currency, which may affect value of investment and returns is known as *currency risk*. Certain investments take time to sell and also involve higher transaction costs as there are not too many buyers and sellers of the same; this is referred to as *liquidity risk*.

■ STANDARD DEVIATION AS A MEASURE OF RISK

Since risk is associated with variability in profit, we can quantify it using measures of dispersion such as *variance* and *standard deviation*. The variance of historical returns is calculated as:

$$\text{Variance} = \sigma^2 = \frac{\left\{ \sum_{i=1}^n (R_i - R_A)^2 \right\}}{n}$$

where R_i are the individual returns in n periods and R_A is the average return, the positive square root of the variance σ^2 is the standard deviation.

$$\text{Standard Deviation} = s \sqrt{\sigma^2}$$

Standard deviation is a measure of total risk, which includes both systematic and unsystematic risk. Since fluctuations above the average return are not considered as a risk, some economists

prefer to use semi deviation, which measures only the downside risk. However, if we assume that stocks follow a normal distribution, which is symmetrical, decisions taken on the basis of standard deviation will be the same as those taken on semi deviation.

The *coefficient of variation* is a measure of risk per unit of return. This can be used to compare the risk and return of alternative investments. A higher coefficient of variation indicates that the investment is more risky. It is calculated as the ratio of the standard deviation divided by the return on the investment:

$$CV = \sigma/R_A$$

For example, if the returns over five years have been as follows:

Year	Holding Period Return %
1	20
2	30
3	-10
4	20
5	10

$$\text{Average Return} = R_A = \sum R_i/n = (20 + 30 - 10 + 20 + 10)/5 = 14$$

$$\begin{aligned}\text{Variance} = \sigma^2 &= [(20 - 14)^2 + (30 - 14)^2 + (-10 - 14)^2 + (20 - 14)^2 \\ &\quad + (10 - 14)^2]/5 = 184\end{aligned}$$

$$\text{Standard Deviation} = \sigma = 184^{0.5} = 13.56 \%$$

$$\text{Coefficient of Variation} = CV = \frac{13.56}{14} = 0.97$$

■ EXPECTED RETURN AND RISK

At the time of investment, investors are interested in knowing the rate of return that can be expected in future. For debt securities, the cash flows are known in advance, but we need to make assumptions about the reinvestment rates for periodic cash flows. If reinvestment rates are lower, the realised returns will be lower than expected return and vice versa. Estimating returns on equity is more complicated because dividends and prices also fluctuate over time. Expected return and standard deviation are calculated using probabilities³ as follows:

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

$$\sigma^2 = \sum_{i=1}^n P_i \{R_i - E(R)\}^2$$

$$\sigma = \sqrt{\sigma^2}$$

³Expected outcomes and probabilities are based on future forecasts by experts, keeping in mind historical returns and future scenarios.

Where (R_i) are the possible returns, and (P_i) are their associated probabilities. Probabilities must add up to 1, to take care of all the possible outcomes.

For example, if returns and probabilities are as follows:

Return %	Probability
10	.20
20	.50
-10	.30

$$E(R) = .20(10) + .50(20) + .30(-10) = 9\%$$

$$\sigma^2 = .20(10 - 9)^2 + .50(20 - 9)^2 + .30(-10 - 9)^2 = 169$$

$$\sigma = 13$$

$$CV = 13/9 = 1.44$$

The standard deviation of returns is 13%. If we assume that returns are normally distributed, this means that about 95% of the time we should expect annual return within the range of mean plus/minus two standard deviations i.e. $(9 - 13 \times 2) = -17\%$ and $(9 + 13 \times 2) = + 35\%$.

■ BETA AS A MEASURE OF SYSTEMATIC RISK

Stocks are subject to systematic risks, which are common to all, and unsystematic risks which are industry or firm specific. Unsystematic risk is considered as diversifiable through creation of portfolios⁴. The risk that remains is the systematic risk, which can be represented by beta. Beta is calculated for individual stock returns using regression analysis with return on the market index as the independent variable. The regression line is known as the *characteristic line* of the security and *beta* is the slope of the regression equation. The intercept is known as *alpha*⁵ and represents the return on the security when the market return is zero. Beta can be positive and negative, though negative betas are rare in the stock market. Risk-free securities such as government bonds have a beta of zero. A related concept is the *coefficient of correlation*, which measures the strength of the relationship between the security and the market index. The square of the correlation or the *coefficient of determination R²* is the proportion of variability in the stock returns that is accounted for by the stock market returns. Beta can be used to forecast return as follows:

$$R_i = \alpha + \beta R_m$$

Where R_i and R_m are the return on the security and the market index respectively, and α and β are the intercept and slope.

In Example 2.1, the BSE Sensex is taken to represent the market index and alpha, beta and correlation are calculated for ACC. The regression line is shown in Figure 2.1 As can be seen the intercept is negative, -0.49 and beta is 1.84. If we use these figures to forecast

⁴This will be done in detail in the chapter on portfolio analysis.

⁵The term alpha is also used in a different context for performance measurement of portfolio returns.

return on ACC based on forecasts of market return, if return on the sensex is zero, the expected daily return on ACC would be -0.49% , and if return on the sensex is forecast at 0.5% , expected return on ACC would be $-0.49 + 1.84 \times 0.5 = 0.43$.

The correlation coefficient is 0.83 and R^2 is 0.69, this means that the Sensex can explain 69% of the variation in returns for ACC. The higher the coefficient of variation, the closer is the association between the variables.

Example 2.1: Return on ACC and Sensex 1/1/2007 to 6/2/2007

	Date	Sensex	ACC price	Market return (x)	ACC return (y)	x^*y	x^2	y^2
1	02-Jan-07	13942.24	1254.10					
2	03-Jan-07	14014.92	1265.15	0.52	0.88	0.46	0.27	0.78
3	04-Jan-07	13871.71	1243.75	-1.02	-1.69	1.73	1.04	2.86
4	05-Jan-07	13860.52	1244.30	-0.08	0.04	0.00	0.01	0.00
5	08-Jan-07	13652.15	1212.90	-1.50	-2.52	3.79	2.26	6.37
6	09-Jan-07	13566.33	1174.50	-0.63	-3.17	1.99	0.40	10.02
7	10-Jan-07	13362.16	1136.90	-1.50	-3.20	4.82	2.26	10.25
8	11-Jan-07	13630.71	1150.00	2.01	1.15	2.32	4.04	1.33
9	12-Jan-07	14056.53	1223.45	3.12	6.39	19.95	9.76	40.79
10	15-Jan-07	14129.64	1222.00	0.52	-0.12	-0.06	0.27	0.01
11	16-Jan-07	14114.73	1209.25	-0.11	-1.04	0.11	0.01	1.09
12	17-Jan-07	14131.34	1222.75	0.12	1.12	0.13	0.01	1.25
13	18-Jan-07	14217.75	1231.60	0.61	0.72	0.44	0.37	0.52
14	19-Jan-07	14182.71	1221.40	-0.25	-0.83	0.20	0.06	0.69
15	22-Jan-07	14209.24	1224.20	0.19	0.23	0.04	0.03	0.05
16	23-Jan-07	14041.24	1173.95	-1.18	-4.10	4.85	1.40	16.85
17	24-Jan-07	14110.46	1172.95	0.49	-0.09	-0.04	0.24	0.01
18	25-Jan-07	14282.72	1175.80	1.22	0.24	0.30	1.49	0.06
19	29-Jan-07	14211.96	1155.40	-0.50	-1.73	0.86	0.25	3.01
20	31-Jan-07	14090.92	1138.05	-0.85	-1.50	1.28	0.73	2.25
21	01-Feb-07	14267.18	1203.10	1.25	5.72	7.15	1.56	32.67
22	02-Feb-07	14403.77	1181.35	0.96	-1.81	-1.73	0.92	3.27
23	05-Feb-07	14515.90	1196.80	0.78	1.31	1.02	0.61	1.71
24	06-Feb-07	14478.19	1195.80	-0.26	-0.08	0.02	0.07	0.01
		Sum		3.91	-4.09	49.63	28.06	135.85
		Average		0.17	-0.18			
		Number of observations	23					
		$\text{Slope} = \text{beta} = b = (nSxy - SxSy) / (nSx^2 - (Sx)^2) = (23 \times 49.63 - 3.91 \times -4.09) / (23 \times 28.06 - 3.91 \times 3.91) =$						1.84

Contd...

Intercept = alpha = $a = (\bar{y})/n - b ((\bar{x})/n) = -0.18 - 1.84 \times 0.17 =$	-0.49
Coefficient of correlation = $(nSxy - SxSy)/((nSx^2 - (Sx)^2)^{0.5}) \times ((nSy^2 - (Sy)^2)^{0.5})$	
$= (23 \times 49.63 - 3.91 \times -4.09) / (((23 \times 28.06 - 3.91 \times 3.91)^{0.5}) \times (23 \times 135.85 - (-4.09 \times -4.09))^{0.5}) = 0.83$	0.83
The proportion of variability explained by the regression = $R^2 = 0.83 \times 0.83 = 0.69 = 69\%$	
To cross-check, use inbuilt formulae in excel: slope, intercept and correl	

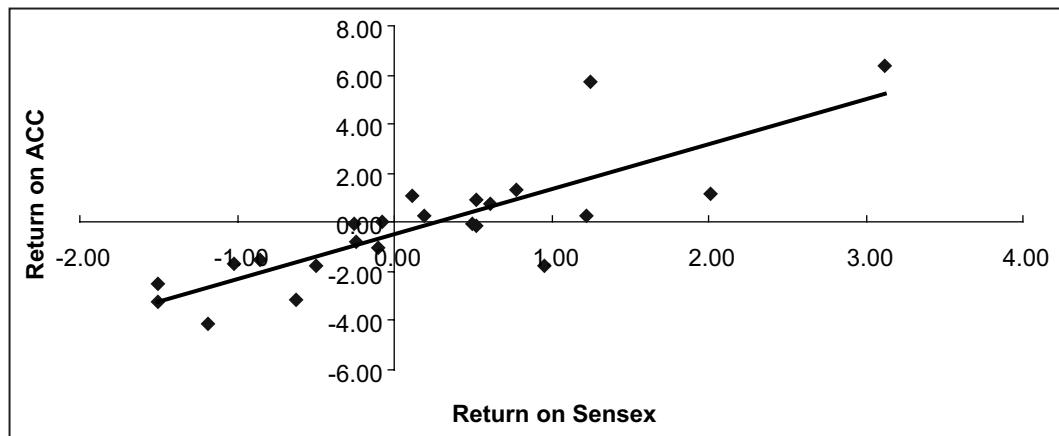


Figure 2.1: Regression of Return on ACC and Sensex 1/1/2007 to 6/2/2007

■ HISTORY OF RETURNS IN INDIA

Asset prices including prices of stocks and bonds and interest rates and dividends fluctuate over time. The absolute and relative returns on assets have varied over the years, as can be seen in Table 2.1.

Table 2.1: Percentage Return on Alternative Investments (1980 - 2016)

Investment	Average Annual Return	Standard Deviation	Range of Return
Stocks (Sensex)*	20.41	32.86	-52.54 to 93.97
Gold	10.71	13.23	-14.27 to 46.45
Fixed Deposits **	8.38	1.83	4 to 12
Government Securities @	8.51	2.28	4.49 to 13.4
WPI	6.84	3.53	-2.48 to 18.24

*Jan -Dec for sensex , Apr- Mar for fixed deposits, WPI & gold
** 1-3 year rate
@ lower of range for 1-5 years

Source: RBI

Stocks gave the highest return as compared to fixed deposits and gold over this period. This difference in return is normally attributed to the difference in the risk associated with stocks as compared to fixed deposits and government bonds. A look at the range of returns shows

that bond returns were always positive whereas stocks and gold had a range of returns that included negative returns and the range was widest in the case of stocks. The variation in returns and negative returns in stocks make them more risky and all investors may not be willing to assume that much risk. For example, a person saving for post-graduation or purchase of a house planned for the next year, may not want to risk a decline in the principal amount which is a possibility if invested in the stock market, and may prefer a fixed deposit in the bank with lower expected returns. On the other hand, someone who wants higher returns and is willing to wait for a long period and for the right moment to sell may prefer to invest in stocks. There is no investment that is ‘best’ for all investors in all circumstances.

The difference between the return on the sensex and risk free securities is called the *equity premium*. It is the amount of return that investors demand for holding risky stocks, as compared to risk free securities. In the Indian context, Treasury bills, government bonds and deposits with public sector banks such as the State Bank of India are considered to be “risk free”.

■ COMPONENTS OF REQUIRED RETURN

The required rate of return on an investment takes into account the time for which the funds are committed, the expected rate of inflation and uncertainty of future flow of funds. This is also called the discount rate and is used to calculate the present value of future cash flows. Each investment has a different discount rate, based on the components of required return. This can be easily understood with the help of the rate of return on debt securities and can be applied to all types of investments.

The *real risk-free rate* is a theoretical rate that compensates investors for the time value of money. It assumes there is no inflation and depends upon the time preference for consumption and investment opportunities in the economy. The *nominal risk-free rate of return* is the rate offered on Treasury Bills and government bonds, it is commonly referred to as the *risk-free rate*. This incorporates the time value of money and compensation for expected inflation. The nominal risk free rate of return is related to the real risk free rate of return as follows⁶:

$$\text{Nominal risk free rate} = (1 + \text{Real risk free rate}) \times (1 + \text{Expected inflation rate}) - 1$$

Any investment with a return less than the annual inflation rate represents a loss of value, as it results in decrease in purchasing power. This may happen if inflation is actually higher than was expected at the time of commitment of funds.

The *nominal rate of interest* offered by other bonds and debentures includes the time value of money, compensation for inflation and compensation for risk. It can be considered as the sum of the risk-free rate of interest and a risk premium. If there is a change in the risk-free rate or the risk specific to the investment, there will be a change in required return.

⁶Some textbooks show the components as pure addition or subtraction for conceptual purposes. The method shown above is the correct method for calculation.

In India, various interest rates are used as bench mark rates/representative rates such as the Prime Lending Rate (PLR), repo rates, call money rates, bank rate, savings bank rate, 3-year fixed deposit rate and 10-year government bond rate. The *prime lending rate* is the interest rates that banks charge for loans to large corporate borrowers with the highest credit rating or the lowest risk. Loans to customers with lower ratings are made at higher rates of interest.

■ RISK MANAGEMENT

Since higher return is generally associated with higher risk, an investor needs to manage the risk at acceptable levels without sacrificing return. An investor can adopt various strategies for risk management. Totally avoiding risk by investing only in risk free investments such as government bonds is one option. However, it will result in very low returns. It may instead be advisable to keep part of the portfolio in risk free assets and part in risky assets with a higher expected return. Higher return can also be earned without a proportionate increase in risk through diversification. It is also possible to reduce risk by transferring the risk through insurance or by using financial derivatives such as options⁷.

■ SUMMARY

The two most important characteristics of any investment are risk and return. Investors seek compensation for the time for which resources are committed, the expected rate of inflation and the uncertainty of future payments i.e., risk. The higher the risk, the higher the risk premium or compensation demanded. Historical or realised returns are calculated after taking into account all expenses and taxes; they also form the basis for projecting future returns. Returns are calculated using the concept of compounding or geometric returns and risk is measured with the standard deviation of returns. Since investors are interested in forecasting future risk and return, we study the factors that influence risk. Risk can be divided into systematic risk, which is common to all stocks and all bonds and unsystematic risk, which is industry or company specific. As unsystematic risk can be diversified through creation of portfolios , we can use beta as a measure of systematic risk.

■ SOLVED EXAMPLES

- One share of ACC Ltd was purchased on 30th July 2014 for Rs 1409.60 and sold six months later for Rs 1583.40 What was the holding period return and annualised return?

Ans: Holding period return = $((1583.40-1409.60)/1409.60)*100= 12.33\%$

Annualised return = $((1.1233^2)-1)*100 = 26.18\%$

- One share of ACC Ltd was purchased on 14th August 2014 for Rs 1481.11 and sold six months later for Rs 1613.40 immediately after receiving dividend of Rs 19. What was the holding period return?

Ans: Holding period return = $((1613.40+19-1481.11)/1481.11)*100= 10.21\%$

⁷Portfolio analysis and risk management with derivatives is covered in detail in later chapters.

3. In question 2 above if the inflation during this period was 2% what was the real return ?

Ans: $((1.1021/1.02)-1)*100 = 8.05\%$

4. 100 shares of Bhushan Steel Ltd were purchased at Rs 450 per share on 13th of March 2014. Six months later they were sold at only Rs 135 per share. Calculate the absolute return, holding period return and annualized return.

Ans: Absolute return /loss = Rs 135-450 = Loss of Rs 315

Holding period return/loss = $-315/450 = \text{Loss of } 70\% \text{ in 6 months}$

Annualised return/loss = $((((1-0.7)*(1-0.7))-1) * 100 = -91\%$

5. Calculate average return and risk represented by standard deviation and coefficient of variation.

Year	Price	Dividend
2001	80	
2002	90	5
2003	105	5
2004	110	6
2005	125	6
2006	150	7

Ans: Return = (dividend + price change)/price in previous period

Variance= $S((\text{return}-\text{average return})^2)/n$

Standard deviation= variance^{0.5}

Year	Price	Dividend	Price change	Return %	R-Avg R	(R-AvgR) ²
2001	80					
2002	90	5	10	18.75	-0.48	0.23
2003	105	5	15	22.22	2.99	8.97
2004	110	6	5	10.48	-8.75	76.59
2005	125	6	15	19.09	-0.14	0.02
2006	150	7	25	25.60	6.37	40.60
			Total	96.14		126.41
			Average	19.23	Variance	25.28
					Std devn	5.03

Coefficient of variation = Standard deviation/mean return = $5.03/19.23 = 0.2615 = 26.15\%$

6. Calculate expected return, standard deviation and coefficient of variation from the following

Probability	Return
0.2	8
0.6	10
0.2	12
Exp retn	10

Ans: Expected return = $\Sigma(\text{probability} * \text{return})$

Variance = $\Sigma(\text{probability} * (\text{return} - \text{expected return})^2)$

Standard deviation = variance^{0.5}

Probability	Return	R-Exp R	(R-Exp R) ²	P*(R-Exp R) ²
0.2	8	-2	4	0.8
0.6	10	0	0	0
0.2	12	2	4	0.8
Exp retn	10		Variance	1.6
			Std devn	1.26

Coefficient of variation = Standard deviation/expected return = $1.26/10=0.126=12.6\%$

7. An investor is considering the following securities for investment. He knows that higher risk should give higher reward. What do you advise and why?

Stock	Expected Return	Standard deviation
ABC	12.5	5.5
PQR	15	7.5
XYZ	14.6	6.5

Ans: One way of choosing is to calculate the coefficient of variation. Lower the risk per unit of return is better.

Stock	Expected Return	Standard deviation	Coefficient Of Variation
ABC	12.5	5.5	0.44
PQR	15	7.5	0.50
XYZ	14.6	6.5	0.45

Therefore ABC is preferable

8. XYZ offers 10 % interest per annum with quarterly interest. What is the effective rate of interest ?

Ans: $(1+0.025)^4 = 1.1038$ ie 10.38%

■ MULTIPLE CHOICE QUESTIONS

- The coefficient of variation is used to compare
 - Systematic risk
 - Unsystematic risk
 - Risk and return
 - Variance
- A share is trading at Rs 100. The expected prices after one year are Rs 110, 120 and 130, and probabilities are .2, .5 and .3 respectively. What is the expected return ?
 - 20

- (b) 17
 - (c) 21
 - (d) None of the above
3. Beta is
- (a) A form of standard deviation
 - (b) A measure of co movement with the market index
 - (c) Systematic risk
 - (d) A measure of unsystematic risk
4. The nominal risk free rate incorporates compensation for
- (a) Time value of money, inflation and unsystematic risk
 - (b) Time value of money and systematic risks
 - (c) Time value of money and unsystematic risk
 - (d) Time value of money and expected inflation risk
5. The alpha of a stock represents
- (a) Systematic risk
 - (b) Unsystematic risk
 - (c) Return when market return is zero
 - (d) Return dependent on market return

■ QUESTIONS

1. What are the components of the required rate of return on an investment?
2. What macroeconomic factors are likely to contribute to a change in the required rate of return on investments in general?
3. What microeconomic factors/company specific factors are likely to contribute to a change in the required rate of return for individual securities?
4. What may change the required return on an investment over time?
5. If two securities have the same return but different standard deviations, which is preferable and why?
6. If return is 10 % and standard deviation is 15% what does it tell us about the expected future returns?
7. What is beta and how is it measured?
8. Sketch the characteristic line for a stock with negative beta. What does this imply?
9. A risk averse investor will not invest in risky assets. True or false?
10. List four basic risk management strategies.

■ PROBLEMS

1. A bond offers a nominal rate of return of 15%. If expected inflation is 5%, what is the real rate of return?
2. Two cumulative fixed deposit schemes offering 10% interest for 3 years are under consideration. Scheme A offers annual compounding and scheme B offers monthly compounding. What is payable at the end of three years if Rs 100 is invested in each scheme?
3. A person in the 30% tax bracket has a choice between investment A offering a nominal return of 15% and B, a tax free investment offering 10%. If all other things are equal, which is preferable?
4. The return on a stock for the past five years was 10%, 15%, -5%, 20% and 12%. Calculate annualized return over the period.
5. Stock A was purchased for Rs 100 and sold after 6 months at Rs 150. Stock B was purchased at Rs. 100 and sold after 3 months for Rs. 125 immediately after receiving dividend of Rs. 25. Calculate the absolute return, holding period return and annualized return for both.
6. Stock XYZ and ABC had the following returns over the previous periods. Which would you consider as more risky and why?

Year	Return on XYZ	Return on ABC
1	15	10
2	20	25
3	25	30
4	20	15

7. Stock PQR and KLM had the following returns over the previous periods. Which would you consider as more risky and why?

Year	Return on PQR	Return on KLM
1	15	10
2	20	15
3	25	20
4	20	15

8. Experts forecast the return on stock ABC as given below. Calculate expected risk and return.

Return on ABC	Probability
15	0.2
20	0.4
25	0.3
30	0.1

9. The return on stock ABC and the market index are given below. What is the equation for the characteristic line? If market return is expected to be 10%, what is expected return on the stock? How much of the variation in return of ABC can be explained by the market?

Return on ABC	Return on Market Index
14	12
17	13
15	11
18	15

■ SPREADSHEET EXERCISES

Problems based on the Appendix to be solved without using the formulae/with formulae/spreadsheet functions:⁸

- How much money should be invested today if Rs. 100 is required after 5 years and current rates of interest are 5%? (Present value)
- If Rs 100 is put in a cumulative deposit, how much money will be received after 5 years if the interest rate is 5%? (Future value)
- An investor is offered an annual income scheme wherein he has to pay a sum of Rs. 450 in order to get Rs 100 per annum at the end of each year for 5 years. Evaluate the offer if interest rate is 5%. (Present value of an annuity)
- A recurring deposit scheme with annual deposits of Rs 100 offers Rs. 540 at the end of 5 years. Evaluate the offer if interest rate is 5%. (Future value of an annuity)
- A senior citizen offers his house for reverse mortgage, the estimated present value that is to be used for the annual payments is Rs. 432.947. What is the annual payment he should receive at the end of every year for 5 years if rate of interest is 5%?
- What should an investor pay for a preference share giving Rs. 10 dividend per annum if current rates of interest are 5%?

■ PRACTICAL EXERCISES

- Find out the rates of interest on savings bank deposits and fixed deposits in any one bank over various tenures. Why do they differ?
- Find out the rates of interest on corporate debentures and government bonds of approximately the same tenure. Why do they differ?
- Find historical return information for the last 3, 6, and 12 months on a popular stock market index such as the sensex or nifty. Similarly, find historical stock return for some individual stocks and mutual fund schemes. Compare these with the wholesale price index and with the returns on government bonds.
- Look up published sources of beta in India to find the range of beta.

⁸Problems have been deliberately kept simple to illustrate the concepts instead of getting lost in large calculations.

5. Visit a bank /finance company /electronics store and find out the terms and conditions for a car loan/ house loan/purchase on installments. Take into account timing of all charges, down payment, loan disbursements, EMIs. Calculate effective interest rate and compare with advertised rate.
6. Extract daily adjusted closing prices for one year for any share of your choice from yahoo finance or any other data base and save in a spread sheet. Also extract the daily values of a stock index such as the Sensex or Nifty 50 for the same dates and save in the same sheet with dates synchronised.

For the stock and for the index calculate daily return as $((p_t/p_{t-1})-1)*100$, average return using the average function in your spread sheet, standard deviation using the stdevp function. Which has higher return and risk?

Calculate the beta of the stock using the returns on the index as the independent variable (x) and returns on the stock as the dependant variable (y). This can be done using regression or simply using the slope function. The alpha of the stock can be calculated using the intercept function. Write the equation to show the relationship between stock returns and market index.

Calculate the correlation between the return on the index and the stock returns. How much of the return on the stock can be explained by the market index?

CASE STUDY

Ashok completed his engineering from IIT last year and is working with a multinational company. His company deducts tax at source and credits the rest of his salary to his bank account every month. Over the past six months, he has accumulated Rs.40,000 in his salary account, where he gets 3.5% interest per annum. A public provident fund agent visited his office last week and tried to convince him to invest the entire amount in PPF since he would get a tax benefit. Yet another agent tried convincing him that a money back life insurance policy was the best option at this point in his life as he gets a life cover and liquidity every five years. Some of his friends in office advised him to invest in shares as they give higher returns while others said they were risky. Some relatives said investing in the stock market is akin to gambling and they only invest in fixed deposits or gold as they are safer, while others emphasised that property was a good option for the long run.

He has no idea about the returns and features of various investment alternatives. As an investment advisor, you are expected to know this and answer his queries based on the current financial scenario in the country.

1. He wants to understand the various aspects that he should consider before making any investment.
2. He also wants to know what people mean when they say an investment is risky.
3. He wants to know in brief the features and advantages and disadvantages of the various investments suggested.

APPENDIX 1

Present Value and Future Value

The following formulae are used in later chapters; it is useful to review them at this stage and work out simple examples using a spreadsheet. An important assumption in all these formulae is that the cash flows occur at the end of each period, and will need adjustment if the cash flows occur at the beginning of each period. Most spreadsheets have built in financial functions that allow for such adjustments.

Future Value

$FV = PV (1 + r)^t$	(annual compounding of a single cash flow) e.g., a cumulative fixed deposit
$FV = PV \{1 + (r/m)\}^{mt}$	(compounding m times a year)
$FV = PV e^{rt}$	(continuous compounding) used for valuation of options
$FV = SC_t \times (1 + r)^t$	(annual compounding of multiple cash flows)

Present Value

$PV = FV/(1 + r)^t$	(annual discounting of a single cash flow)
$PV = FV/ \{1 + (r/m)\}^{mt}$	(discounting m times per year)
$PV = FV e^{-rt}$	(continuous discounting) used for valuation of options
$PV = SC_t / (1 + r)^t$	(annual discounting of multiple cash flows)
$PV = SC_t / (1 + r/m)^t$	(discounting of multiple cash flows, m times a year e.g., interest paid six monthly, m = 2 and t = years×2)

Future Value of an annuity

$FV = (C/r) \{(1 + r)^t - 1\}$	(annual compounding) e.g., equal annual deposits in a public provident fund account at end of period ⁹
$FV = \{C/(r/m)\} \{(1 + r/m)^{mt} - 1\}$	(compounding m times a year) e.g., monthly recurring deposit deposited at end of period

Present Value of an annuity

$PV = (C/r) \{ 1 - 1/(1 + r)^t \}$	(annual discounting)
$PV = \{C/(r/m)\} \{1 - 1/(1 + (r/m))^{mt}\}$	(discounting m times per year) e.g., Present value of EMI for a car or house loan/ lease rentals/ pension paid at end of period

⁹For beginning of period multiply C by $(1 + r)$

Annuity from future value

$$C = FV \times (r/(1 + r)^n - 1)$$

Annuity from present value

$$C = PV \times r \times (1 + r)^n / ((1 + r)^n - 1)$$

Present Value of a perpetual annuity

$$PV = C/r$$

(constant annuity C) e.g., value of a preference share

$$PV = CF_0 \times (1 + g) / (r - g)$$

(annuity grows at g% per annum, only if $g < r$)

APPENDIX 2

Sum of a perpetual geometric progression (GP)

In our example of a perpetual annuity where cash flow C is received every year and we discount these cash flows with discount rate i to get present value as follows:

$$C/(1+i) + C/(1+i)^2 + C/(1+i)^3 + \dots + C/(1+i)^\infty$$

The sum of a perpetual GP in the standard form is written as

$$a + ar + ar^2 + ar^3 + \dots + ar^n + \dots = ar^\infty$$

$$= a(1 - r^\infty)/(1 - r)$$

But when $r < 1$, r^∞ will = 0

And the sum of the GP will become $a/(1 - r)$

$$= \{C/(1 + i)\} / \{1 - 1/(1 + i)\} = C/i$$

CHAPTER - 3

A Brief Overview of the Indian Financial System

LEARNING OBJECTIVES

At the end of this chapter, you will be able to:

- Understand the functions of financial markets and institutions
- Appreciate the role of regulatory authorities in the Indian financial system
- Discuss the features of the Indian financial system before and after the 1990s
- Describe the organisation and functioning of the Indian stock market
- Understand the process of trading
- Discuss the formation and maintenance of a stock index
- Understand the structure of the Indian debt market
- Describe the Indian money market and its instruments.

A financial system provides payment systems, promotes savings and investments and helps manage the associated risks. It helps mobilise surplus funds from investors, and allocates funds among borrowers. Lenders earn returns on investment while borrowers can use the money to increase their productive capacity and improve profitability. Financial markets help bring buyers and sellers together, help in price discovery, facilitate trading and enable transfer of risk. Financial markets and instruments have evolved over the years to cater to specialised products and needs.

Governments realise the importance of financial systems as a basis for efficient allocation of funds and economic development; they try to provide the infrastructure of legal and regulatory framework to facilitate trade through reliable payment systems and mobilise funds for priority sectors. Efficient financial systems are characterised by low transaction costs, liquidity, availability of timely and accurate information of past transactions and rapid adjustment of prices to new information.

■ FINANCIAL MARKETS AND INSTITUTIONS

Financial markets can be classified in a number of ways, based on the time period of lending, the nature of securities traded, timing of payment and delivery, and the parties involved in the transaction. Instruments with maturities exceeding one year are traded in the *capital market*. The capital market is further classified into the *stock market* for trading of equity and preference shares and *debt market* for bonds and debentures. Financial instruments having less than one year maturity are traded in the *money market*; this is a debt market for short-term borrowing and lending, with highly liquid instruments for periods ranging from one day to one year. Debt markets can further be divided into the government securities market and the corporate debt market. The *primary market* deals with new issues of securities (debt and equity) through public or private placement, where the issuer collects money from investors, whereas the *secondary market* facilitates trade in existing securities between investors. Secondary markets are important as they provide liquidity to investors and help determine market pricing for new issues.

A *spot or cash market* permits transactions where delivery takes place immediately, and *forward and futures markets* allow delivery and payment at a fixed future date. The *foreign exchange (forex) market* facilitates transfer of funds and risk management with multiple currency requirements. The term *derivatives market* is used for markets where futures, options, swaps etc. are traded, which are used for risk management in the capital market, money market and foreign exchange markets. Transactions may take place on an organised exchange with standardised contracts or over-the-counter to take care of customised requirements.

The volume of transactions in some of the financial markets in India can be seen in Table 3.1. Money market and foreign exchange have the highest turnover. These markets are dominated by large players such as banks and financial institutions. Since small investors and the general public are more interested in equity and mutual funds, they are given more media coverage.

Table 3.1: Turnover in Various Markets

Year	Money Market	Government Securities	Non Govt. Securities	Equity	Equity derivatives	(Rs Billion)
						Currency futures and Options
2013-14	292,616	162,739	2,232	33,414	474,308	40,125
2014-15	283,806	180,314	2,877	51,845	759,692	19,085

Source: SEBI and CCIL

The infrastructure required for efficient functioning of financial markets includes institutions that provide for accounting and payment systems such as depositories and clearing houses, trading platforms such as stock and commodity exchanges, credit rating agencies, a legal framework and a regulatory system. Financial institutions also provide services as intermediaries of the capital and debt markets.

One of the functions of the financial system is to facilitate the transfer of funds from surplus units (lenders) to deficit units (borrowers). Borrowers and lenders comprise of individuals, organisations and the government. Business houses in the public and private sector borrow money through loans and issue shares and debentures to finance their fixed assets and working capital. Governments borrow money to cover the deficit between revenue and expenditure by issuing bonds at the central, state and municipal level. Households take loans for purchase of property, shares, cars, consumer durables etc, for expenditure during festivals and family functions, and for credit cards payments. Companies, households and the government are also lenders who supply funds directly to each other or through financial intermediaries. Savings can be transferred directly to users through investment in shares, debentures, fixed deposits and trade credit. Savings are also transferred to users through intermediaries such as banks¹, all India and state financial institutions, insurance companies, provident fund schemes, post office savings and deposit schemes, Non-Banking Financial Companies (NBFCs)² and mutual funds.

Other services provided by financial intermediaries include transformation of the type of lending with respect to size, maturity and risk. For example, banks accept fixed deposits from investors and lend to corporate houses. They facilitate the pooling of lots of small deposits into one large corporate loan, they also promise the depositors a relatively risk free interest and assume the default risk of the corporate loan. The individual deposits have various maturities but may be lent to the corporate for a longer period assuming that more deposits will come in when these mature. Similarly, insurance companies pool

¹ In March 2006, there were 84 commercial banks, over 3,000 cooperative banks, and 133 Regional Rural Banks, which together accounted for about 95 per cent of total assets of the financial sector. (YV Reddy Governor RBI, speech in Moscow 2 July 2007)

² NBFCs were earlier broadly of eight types: (i) equipment leasing companies, (ii) hire-purchase finance companies, (iii) loan companies, (iv) investment companies, (v) mutual benefit financial companies (Nidhis), (vi) miscellaneous non-banking companies, (chit funds), (vii) residuary non-banking companies, and (viii) housing finance companies. The new classification by RBI in Dec 2006 is (i) asset financing companies, (ii) investment companies and (iii) loan companies and one additional category of Residuary Non-Banking Companies (RNBCs).

the contribution of thousands of individuals and promise to cover their risk based on the probability of insurance claims.

■ REGULATION AND SUPERVISION

The Indian financial system is regulated and supervised by the Finance Ministry, Department of Economic Affairs, through the Reserve Bank of India (RBI) and the Securities Exchange Board of India (SEBI). The main acts being administered by them are Reserve Bank of India Act, 1934, the Banking Regulation Act, 1949, Foreign Exchange Regulation Act, 1973, The Companies Act, 1956, Securities and Exchange Board of India Act, 1992, Securities Contracts (Regulation) Act, 1956, and Depositories Act, 1996. The Insurance Regulatory and Development Agency (IRDA) regulates and supervises the insurance sector.

The RBI formulates, implements and monitors the monetary policy, with the objective of maintaining price stability and ensuring adequate flow of credit to productive sectors. It regulates the banking sector, money market, the government securities market and the foreign exchange market. The RBI also issues and maintains the amount of currency in circulation and acts as banker and merchant banker for central and state governments and as banker to banks. The Reserve Bank of India also manages public debt and issues loans on behalf of the central and the state governments and manages their cash and liquidity requirements. The government is in the process of separation of debt management functions from RBI to the Public Debt Management Agency (PDMA).

SEBI regulates public issues by corporate entities and trading in the capital market. The objectives of SEBI are to protect the interest of investors in securities and to promote the development of the securities market and regulate it. It aims to strengthen market infrastructure and ensure that appropriate risk management systems are in place. It promotes investor education and prohibits fraudulent and unfair practices including insider trading. It regulates the Stock Exchanges, Brokers, Depositories, Depository participants, Mutual Funds, FIIs and other participants.

The unorganised sector or non-corporate players include money lenders, pawn brokers, informal personal credit, nidhis and chit funds. These entities are less regulated than the organised sector. Money lenders and chit funds are regulated by the state governments and Registrar of Chits, while the nidhis are overseen by the Ministry of Corporate Affairs.

■ REFORMS

After independence in 1947, the Indian financial system was designed to cater to the needs of planned development in the framework of a mixed economy. The government played a major role in the planning and execution of economic activities. The majority of the financial institutions were nationalised, set up by the government, or controlled by it³. The RBI,

³ The RBI was nationalised soon after independence and life insurance and general insurance were nationalised in 1956 and 1973 respectively. IFCI and IDBI were set up in 1948 and 1964 respectively. The banking sector was nationalised in two phases in 1969 and 1980. The UTI was set up in 1963, public sector MFs in 1987. Regional Rural Banks (RRBs) were set up in 1975 to cater to rural India. The specialised DFIs were promoted in the 1980s.

insurance and banking were nationalised to ensure that credit allocation was in accordance with plan priorities. All-India development financial institutions such as IFCI and IDBI and State Finance Corporations were set up to provide long-term capital for industrialisation. Specialised development institutions such as the National Bank for Agriculture and Rural Development (NABARD), the Export Import Bank (EXIM Bank) for export financing, the Small Industries Development Bank of India (SIDBI) for small scale industries and the National Housing Bank (NHB) for housing finance catered to special sectors, while cooperative banks catered to agricultural finance. UTI, the first mutual fund in India, was promoted to mobilise resources from retail investors for investment in the capital market. The banking system had high cash reserve ratio (CRR) and statutory liquidity ratio (SLR)⁴ to provide cheap finance to the government at very low interest rates. Commercial loans were governed by administered interest rates, and banks and financial institutions were directed to provide concessional loans to certain sectors. In the capital market, the price and quantity of issues was regulated by the Controller of Capital Issues.

While these initiatives were intended to contribute to industrial development, they also had the following drawbacks⁵. Debt was a major form of financing, while the capital market and money market remained underdeveloped. The majority of the intermediaries operated in a protected environment; developmental financial institutions were assured funds at low rates, there was no competition in the insurance sector, and UTI had a monopoly for almost twenty five years. Interest rates were controlled by the government, and quantitative targets were set without any accountability for recoveries and bad debts, which led to high costs, inefficient allocation of resources and mounting of non-performing assets. The Indian money market had very few instruments and participants and interest rates were regulated to suit the government. Physical record-keeping led to delays and use of informal transfer documents such as bankers receipts led to the securities scam in 1992⁶.

The Indian financial system changed radically following liberalisation, globalisation and introduction of economic reforms⁷ after 1990. Economic reforms focused on creating market driven, efficient and stable financial institutions and markets. Major reforms included de-licensing, trade liberalization, reduction of subsidies, tax reforms, privatization, removal

⁴ Statutory Liquidity Ratio (SLR) and Cash Reserve Ratio (CRR) are the percentage of net demand and time liabilities that has to be invested in cash, gold, government notified securities and cash balance deposited with the RBI respectively. Net demand and time liabilities include aggregate deposits, borrowings and other demand and time liabilities and not just aggregate deposits.

⁵ These weaknesses have been documented by Gambhir and Sood (1988), Gupta (1988) and Sahni (1988), Dhameja and Ahuja (1988) and recommendations for reform have been discussed by Maheshwari (1988) and Kaul (1988).

⁶ Bankers receipts were issued by banks instead of actually giving securities for the loan in repo transactions. These were accepted on trust by the bank that loaned the money and even used in subsequent transactions in the place of securities. However, when the market was booming in 1991-92, false BRs were issued, the money raised was invested in stocks market, and the BRs were retired after booking profits. Unfortunately, in the Harshad Mehta scam, the market crashed and the money invested could not be recovered. When the lender demanded securities listed in the bankers receipt, it was discovered that the BRs generated by Bank of Karad and Metropolitan Co-operative Bank were fake.

⁷ Santiswaroop and Verma (1998) have documented the series of structural reforms that were introduced to promote control and regulate the capital market.

of barriers to entry, deregulation of interest rates, introduction of new debt instruments and derivatives and establishment of specialised institutions and systems for trading in equity and debt instruments. The public sector monopoly in banking was reduced; government shareholding in public sector banks was reduced and new private and foreign banks were permitted. The role of developmental financial institutions was redefined; ICICI and IDBI were converted into banks and IFCI is in the process of a change. Norms for capital adequacy were introduced and accounting and provisioning standards were modified. Financial institutions were allowed to operate across markets, resulting in increased integration among the various segments of the financial markets.

In the debt and money market, primary dealers⁸ (underwriters and market-makers for government securities) were appointed and new instruments such as Commercial Paper (CP), Certificates of Deposit (CD) and Collateralised Borrowing and Lending Obligation (CBLO) were introduced. Repo operations, which had been banned after the securities scam in 1992 were reintroduced and also used by the RBI for the Liquidity Adjustment Facility (LAF). Measures were undertaken to minimise the default risk in the money market such as dematerialisation of money market instruments, transactions in government securities based on the delivery versus payment system, limits on call/notice money transactions and encouraging growth of the collateralised market.

The government's liquidity needs were earlier financed through low cost treasury bills which were issued on tap. To bring about financial discipline, these were replaced with the scheme of ways and means advances, which is at market determined rates and has limits on the amount of finance available. The monetary policy framework was also transformed, in keeping with the market orientation of the economy. The emphasis was shifted from direct instruments such as the CRR, SLR, directed credit and administered interest rates to indirect instruments such as purchase and sale of government securities through Open Market Operations (OMO) and sale and repurchase of securities (repos). The Liquidity Adjustment Facility (LAF)⁹, which operates through repo and reverse repo auctions sets a corridor for short-term rates is used for short-term liquidity management. The Market Stabilisation Scheme (MSS) is used to absorb liquidity over longer periods through issue of treasury bills and dated government securities. Government pre-emption of bank resources through SLR and CRR was gradually brought down and interest rates were deregulated for better price discovery and efficient resource allocation.

RBI introduced Marginal Standing Facility (MSF) in 2011, wherein banks are able to borrow overnight from RBI against government securities. The rate of interest on the amount accessed from this facility is higher than the repo rate while the repo rate is higher than the reverse repo rate. These are all short term rates whereas the bank rate is the long term rate at which RBI lends to commercial banks.

Before the initiation of reforms India's equity market suffered from various problems. Stock exchanges were under the control of broker members. There were entry barriers, lack of

⁸ Primary dealers include the Discount and Finance House of India (DFHI), Securities Trading Corporation of India (STCI), J.P. Morgan, ABN Amro, Deutsche Bank, and DSP-Merrill Lynch

⁹ The Liquidity Adjustment Facility (LAF) of RBI allows injection of liquidity through repo auctions (lend to banks) and reduction of liquidity through reverse repo auctions (take surplus from banks).

transparency, market manipulation, counter party risk due to bad deliveries and payment problems, excessive speculation, rampant insider trading, and inadequate accounting and auditing standards. In the decade following reforms, the market witnessed fundamental institutional changes resulting in significant improvements in transparency and safety and drastic reduction in transaction costs. SEBI was given the status of a statutory body in January 1992 with authority and powers for issuing guidelines, norms, regulations, and registration. The Controller of Capital Issues was abolished in 1992 allowing for free pricing in the primary market, subject to SEBI guidelines for disclosure and investor protection. The National Stock Exchange (NSE) commenced screen based capital market operations for debt and equity in 1994, the National Securities Clearing Corporation Ltd. (NSCL) started novation/settlement guarantee from April 1996 and the National Securities Depository Ltd. (NSDL) started dematerialisation in December 1996. Efforts were made to corporatise the stock exchanges and broad base boards of various stock exchanges to remove the influence of brokers in the functioning of stock exchanges. Trading infrastructure in the stock exchanges was modernized; on-line screen based electronic trading resulted in improved liquidity and better price discovery. New derivative instruments for risk management such as stock index futures, stock index options and futures and options in individual stocks were introduced.

■ STOCK MARKETS IN INDIA

A *stock exchange* or *share market* or *bourse* provides facilities for the trade of shares and other securities such as bonds, mutual fund units and derivative instruments. Financial instruments have to be listed¹⁰ or permitted¹¹ on the exchange and trades are permitted among members of the exchange. Off-market trades or over-the-counter trades can also take place outside organised stock exchanges; such deals are often undertaken for currency derivatives, wholesale debt market deals and offers for bulk purchases.

The Indian stock market dates back to 1875 when the Bombay Stock Exchange (BSE) was established. There were 23 recognised stock exchanges in the country in 2007. However majority of the regional stock exchanges have closed down¹² and three major players are emerging, BSE Ltd., National Stock Exchange (NSE) and Metropolitan Stock Exchange of India Ltd. (MSEI), formerly known as MCX Stock Exchange Ltd. Stock exchanges are listed in table 3.2.

¹⁰ Companies which have signed Listing Agreement with the Exchange.

¹¹ Securities of the companies actively traded at other exchanges but are not listed on an exchange, may be permitted for trading provided they meet the specified norms.

¹² The Stock Exchanges at Hyderabad, Coimbatore, Saurashtra Kutch, Mangalore, Inter-Connected Stock Exchange, Cochin, Bangalore, Ludhiana, Gauhati, Bhubaneswar, Jaipur, OTC Exchange of India, Pune, Madras, U.P., Madhya Pradesh and Vadodara have been granted exit by SEBI between 2013 and 2015. SEBI has not renewed recognition to Magadh Stock Exchange. Ahmedabad and Calcutta stock exchanges

Pursuant to Central Government notification in August, 2015 all recognized associations (Commodity derivatives exchanges) under the Forward Contracts (Regulation) Act are deemed to be recognized stock Exchanges under the Securities Contracts (Regulation) Act.

Table 3.2: Stock Exchanges in India

National Stock Exchanges	Recognition
1 Bombay Stock Exchange	Permanent
2 National Stock Exchange of India	Permanent
3 Metropolitan Stock Exchange	Sept 15, 2017
National Commodity Derivatives Exchanges	
1 Multi Commodity Exchange of India Limited, Mumbai	Permanent
2 National Commodity & Derivatives Exchange Limited, Mumbai	Permanent
3 National Multi Commodity Exchange of India Limited, Ahmedabad	Permanent
4 Indian Commodity Exchange Limited, New Delhi	Permanent
5 Ace Derivatives and Commodity Exchange Limited, Mumbai	Permanent
6 Universal Commodity Exchange Limited, Navi Mumbai	Permanent
Regional Commodity Derivatives Exchanges	
1 Cotton Association of India, Mumbai	Permanent
2 India Pepper & Spice Trade Association, Kochi	Permanent
3 Spices and Oilseeds Exchange Ltd., Sangli	Permanent
4 Bombay Commodity Exchange Ltd., Vashi	Permanent
5 Chamber Of Commerce, Hapur	Feb 28, 2018
6 Rajkot Commodity Exchange Ltd., Rajkot	Mar 31, 2018

Source: SEBI

In the *primary market*, securities are purchased directly from the issuing company. These include equity shares, debentures, etc. The company may have a public issue, a rights issue, or sell securities to a limited number of buyers through private placement¹³. Shares may also originate in the form of bonus shares, or from convertible securities¹⁴, warrants and employee stock options. When a private company sells stocks to the public for the first time, it is known as an Initial Public Offering (IPO). The process of buying shares in the primary market depends on whether the shares are offered at a fixed price or the price is to be determined through book building. In book building, bids are collected from investors within a price band. Retail investors are given the option to purchase at the issue price, which is determined at the end of the book building process¹⁵. Once the price is determined, the company decides the basis of allotment, issues shares to successful applicants and refunds the balance.

In the *secondary market*, investors trade previously issued securities among themselves without involving the issuing company. This also provides an exit route for investors who had bought

¹³ For details on the procedures to be followed by companies for various types of share issues see a book on merchant banking.

¹⁴ Convertible securities and warrants are discussed in detail in a later chapter.

¹⁵ Retail investors—application for less than Rs 1,00,000

shares in the primary market. Although the issuing company has no monetary interest in these transactions, prices of stocks in the secondary market are a reflection of the company's performance and therefore of interest to the management. The pricing and success of a new stock or debt issue is dependent on past performance. Prices in the secondary market are also important for promoters with a substantial share holding, and for employees having stock options. A booming secondary market leads to favourable investor sentiments, which are reflected in the primary market subscriptions and vice versa.

In the *auction market system*, which was prevalent up to the early 1990s, buyers and sellers of securities used to collect on the floor of the stock exchange and announce the prices at which they were willing to buy (bid) and sell (ask). *The Over The Counter Exchange of India (OTCEI)*, was the first¹⁶ national screen based exchange with a paperless trading system. Listed securities, permitted securities, debentures and mutual funds are traded on it. New shares were issued through a direct public issue or through a bought out deal. A *bought out deal* was a concept promoted by the exchange to ensure the success of public issues of new unknown companies, which is similar to venture finance. In this, the company appoints a *sponsor* who is also a member of the OTCEI. The sponsor buys the entire issue with an agreement to go public at a fixed future date with compulsory market making (offering buy and sell quotes) for a stipulated period from the date of listing. However, the OTCEI was not a success. The OTCEI is no longer a functional exchange as the same has been de-recognised by SEBI vide its order dated 31 Mar 2015. NSE launched its SME platform, EMERGE, in September 2012. The *National Stock Exchange of India (NSE)*¹⁷ was the second to set up a nationwide screen-based trading network in the country and currently has the highest volume of trades. The NSE was also the first to provide a formal screen-based trading facility for the debt market in its *Wholesale Debt Market (WDM)* segment in 1994 and provided trading facilities for central and state government securities, treasury bills, bonds and debentures, mutual fund units, commercial paper and securitised debt. Buy and sell orders for securities are entered into the system, and matched according to the price, time and volume; this is an *order driven system*. Metropolitan Stock Exchange of India Ltd. (MSEI), formerly known as MCX Stock Exchange Ltd. Was founded in 2008.

The size and growth of the stock market can be assessed from the trends in market capitalisation and turnover given in Table 3.3

Table 3.3: Stock Market Statistics for 2015-16

	BSE	NSE	MSEI
Listed Companies	59,115	1,808	80
Cash segment turnover (Rs crore)	740,089	4,236,983	206
Derivative segment turnover (Rs crore)	4,475,008	618,258,340	

Source: SEB

¹⁶ OTCEI, promoted by the UTI, ICICI, and SBI Capital Markets Ltd., began operations in 1992. It allows listing of companies with a paid up capital from Rs. 30 lakh to Rs. 25 crore.

¹⁷ Sponsored mainly by financial institutions including IDBI, GIC and LIC.

Table 3.4: Market Capitalisation and Turnover Ratios

Year	Market Capitalisation (Rs crore)		BSE Market Cap/GDP Ratio	Turnover/ GDP Ratio	
	BSE	NSE		Cash segment	Derivative segment
2014-15	10149920	9930122	81.3	41.5	608.3
2015-16	9475328	9310471	69.8	36.7	510.8

Source: SEBI

■ INSTITUTIONAL AND GLOBAL INFLUENCE

The increasing role of mutual funds in mobilisation of resources and the FII investment can be seen from Table 3.5. Mutual funds sponsored by banks, financial institutions and the private sector were permitted in phases and Foreign Institutional Investors (FIIs) such as mutual funds and pension funds were allowed to invest in India in January 1993. Indian firms were also allowed to raise capital from international capital markets through Global Depository Receipts (GDRs), American Depository Receipts (ADRs) and Euro Convertible Bonds (ECBs). This has led to institutionalization of the market and integration with international capital markets. While the presence of institutional players is expected to increase volumes and market efficiency, some authors feel it leads to increased volatility and manipulation¹⁸.

Table 3.5: Net Investment by Mutual Funds and Foreign Institutional Investors (Rs crore)

	Mutual Funds		Foreign Institutional Investors		FII + MF	
	Equity	Debt	Equity	Debt	Equity	Debt
2010-11	-20574	251132	110530	42145	89955	293277
2011-12	-1117	342168	46493	50997	45376	393165
1012-13	-22865	477872	138586	39952	115721	517823
2013-14	-21274	542970	81729	-27892	60455	515078
2014-15	40714	594457	108673	162822	149387	757279
2015-16	63889	383464	-17579	14382	46310	397846

Source: SEBI and RBI

■ TRADING

The actual process of trading takes place through brokers, internet etc. A *full service broker* interacts personally with the client, facilitates trade and may also give investment advice. In the past, this was the main method for purchase of stocks, bonds and mutual funds.

¹⁸ Bhide (1994) feels that the market increasingly being dominated by institutional investors may lead to deficient governance due to “arms length” stockholding as has been observed in the US. KPMG (1998) cautions that globalisation can create problems as governments and institutions are susceptible to the whims and perceptions of foreign investors and speculators. Nagaishi (1999) also expresses his concern regarding the possibility of increased foreign portfolio investment increasing volatility in the stock market.

A *discount broker* charges lower commissions and may allow trading through investment representatives or over the Internet¹⁹. *Internet trading* is likely to have the lowest commissions. The broker or the Internet site records details of the security to be purchased or sold, price, quantity, and other special terms and conditions and submits the same to the exchange for processing.

In order to have paperless screen based trading, shares have to be dematerialised. *Dematerialization* (demat) is the process by which physical certificates are converted into an electronic account. A depository is like a bank for securities; investors open accounts with the depository through Depository Participants (DPs) which maintain records of securities deposited and withdrawn. Securities can be dematerialised and rematerialised (reconverted into paper form) through the DP. Trading in the demat segment eliminates the risk of fake certificates, bad deliveries, loss and/or damage in transit and saves the cost of stamp duty and postage. It also facilitates immediate transfer and registration, direct credit of dividend, bonus and rights into the depository account. While physical shares are traded in market lots of 50 or 100 shares, and smaller quantities are sold as “odd lots”, shares in demat form have no concept of a market lot and trades can be done even for a single share.

There are two depositories in India namely National Securities Depository Ltd. (NSDL) and Central Securities Depository Ltd. (CSDL). DP services are provided by banks, brokers, and financial institutions such as ICICI bank, India Infoline, and Stock Holding Corporation. The depository interacts with a clearing corporation, which oversees the payment of funds and delivery of securities.

■ TYPES OF ORDERS

There are various types of orders that can be placed on the exchanges. These may be related to the price, the volume, time of the order or payment terms.

Price-related Conditions

A *Market Order* does not specify a price, it is used by investors who want to buy/sell the share regardless of price. The execution will be at the best offer price on the exchange. For a buyer, the lowest price that a share is offered at is considered the best, while for a seller, the highest price that someone is willing to buy at is considered the best. The price at which the order is actually executed depends on the prices available in the system at that time.

A *Limit Order* as the name suggests puts a limit on the price. For a buy order, it sets an upper limit on the purchase price and for a sell order it sets the lower limit. In case of a buy order for ACC for Rs 1,000 if there are no sellers at or below Rs 1000, the order will remain pending and get executed only when the price falls to or below the specified amount. In case there are existing offers for sale below Rs 1000, the order will be executed at that best (lowest) price available. A limit buy order can, therefore, get executed below

¹⁹ The National Stock Exchange of India was the first exchange in India that started trading stock on the Internet in 2000.

the limit price but will never exceed it. Similarly, for a limit sell order the execution price will never be below the limit.

A *Stop Loss Order* allows the trader to place an order which gets activated only when the last traded price of the share is reached or crosses the trigger price. It is possible to place a stop loss order with a limit on the execution price. For example, if a buyer wants to buy shares of ACC only if prices are rising, a stop loss order may be placed with a trigger price of Rs 1005, so the order will enter the market when the last executed trade is at Rs 1005 or more. However, even if prices are rising the buyer may not want to buy at a price exceeding Rs 1010, which is set as the limit price. As soon as the order enters the system, it becomes a regular limit order and will be executed at the best price available between Rs 1005 and 1010. If there is no sell offer available at these prices, the trade will remain in the system till a suitable sell order arrives. The order will be executed at the limit price of Rs 1010 even if the seller is willing to sell at a lower price, since this order was entered first. For a stop-loss sell order, the order enters the system when the last traded price reaches or goes below the trigger price. This is useful for a person who wants to sell shares only in case of a price decline.

Volume-related Conditions

An order can also specify the quantity to be disclosed to the market, which is useful for large buy and sell orders, so that price is not adversely affected. Once the *disclosed quantity* is fully matched and traded, the next lot is disclosed, till the whole order is executed²⁰.

Time-related Conditions

An order may be valid for a specified period such as a day order, good till cancelled or good till a specified number of days. An *immediate or cancel order* is a market or limit price order which has to be executed (whole or part) as soon as it is placed, and the portion not executed is to be treated as cancelled.

Price Time Priority

The concept of *price time priority* ensures that every order will be matched against the best available price and that if two orders have the same price, the one which came first will be matched first. The best buy order is the one offering the highest price and the best sell order is the one asking for the lowest price.

The concept of price-time priority is illustrated in Example 3.1.

Example 3.1: Arrival of orders before trading starts

Time	Trader	Buy / Sell	Quantity	Price
9.01	A	Buy	300	200
9.05	B	Sell	300	201

Contd...

²⁰ All or none and minimum fill were scrapped by SEBI in 1999, to prevent bilateral trades as they can be used for market manipulation.

9.08	C	Buy	200	200
9.09	D	Sell	500	198
9.10	E	Sell	400	202
9.15	F	Buy	500	market price
9.18	G	Buy	300	201
9.20	H	Sell	600	200
9.29	I	Buy	700	198

Orders arranged by price-time priority at opening of market**								
Buy orders				Sell orders				
Time	Quantity	Price	Buyer		Price	Quantity	Seller	Time
9.15	500	mkt	F	Match F & D at Rs. 198	198	500	D	9.09
9.18	300	201	G	Match G (300) & H at Rs. 201*	200	600	H	9.20
9.01	300	200	A	Match A (300) & H at Rs. 200	201	300	B	9.05
9.08	200	200	C		202	400	E	9.10
9.29	700	198	I					

* G arrived before H so price at which order is executed is 201

C, I and E do not find any match as buyers want to pay less than what sellers demand. They remain in system and wait for matching orders or till the time expires or are cancelled.

**If the orders had arrived in the same sequence after the opening of the market, they would have been processed differently – A & C would have been matched with D first.

Offers for buy and sell are based on the *tick size* specified by the exchange, i.e. the minimum difference in rates between orders that can be entered for a particular scrip²¹. If the tick size is 5 paise then prices can be entered as Rs. 100, 100.05, 100.10 and so on, but not as 100.04 or 100.03 etc. Transactions in equity and fixed income securities are settled on T + 2 basis²². This means that the final settlement of transactions by exchange of money and securities between the buyers and sellers takes place on the second business day after the trade day. In case, if a member-broker fails to deliver the securities, then the value of shares delivered short is recovered from him at the standard/closing rate²³ of the shares on the trading day.

■ PAYMENT CONDITIONS

Cash orders are intended for settlement by delivery, for this you need to have the money to pay for purchases and shares to deliver for sales. At the NSE and the BSE, trades in rolling

²¹ Normally 5 paise for equity shares, may be 1 paise to increase liquidity in some cases.

²² w.e.f. from April 1, 2003

²³ The closing price of scrips is computed by the Exchange on the basis of weighted average price of all trades executed during the last 30 minutes of the continuous trading session. However, if there is no trade recorded during the last 30 minutes, then the last traded price of a scrip in the continuous trading session is taken as the official closing price.

settlement are settled on a T + 2 basis i.e., trades taking place on Monday are settled on Wednesday, Tuesday's trades settled on Thursday and so on. Selling shares when you do not have them is known as *short selling or selling on margin*; this is normally done when prices are expected to decline. At the time of settlement, if prices fall as expected, the seller buys stocks at a cheaper price for delivery and makes a profit. Buying shares without making full payment is known as *buying on margin*, this is normally done when prices are expected to rise. At the time of settlement, if prices rise as expected, the buyer sells stocks at a higher price and makes a profit. In both cases if the price movement is adverse, you will make a loss and will have to make payment to the exchange. The exchange imposes *margins* through brokers to safeguard against adverse price movements, in the form of a deposit of a percentage of the value of the transaction. In a rolling settlement cycle, only intra-day margin trading is possible and positions need to be squared off or converted into delivery before the end of the day, failing which they are automatically squared off. *Squaring off* a position means placing an order for the reverse transaction type; a buy position is squared off by placing a sell order. Both margin and cash positions can be squared off. The earlier system of Badla²⁴ allowed for carry forward of margin trades into the next settlement period through borrowing of stocks and money. SEBI may permit a modified carry forward system in future through the securities lending and borrowing mechanism.

The *Securities Lending and Borrowing Mechanism* will allow borrowing and lending of securities through approved intermediaries such as the clearing house. Short sellers can borrow the securities for delivery, and investors with idle securities can lend them to earn extra returns. At the end of the period, they will get back the securities with all accrued benefits such as dividend, bonus etc.

Buying on margin: Suppose you have Rs 10,000 to invest, this can be used to buy 10 shares of ACC at Rs 1000 each²⁵. Alternatively if the initial margin is 20%, this can be used to buy 50 shares valued at Rs 50,000 ($10000/0.2 = 50,000$). Since you do not plan to take delivery of the shares, the transaction has to be squared off by placing a sell order by end of the settlement period which is the end of the day. If the transaction is squared off at Rs 1100 per share there will be a profit of $50 \times 100 =$ Rs 5000. If 10 shares had been bought for delivery, the profit would have been $10 \times 100 =$ Rs 1000. However, if the price at settlement was Rs 900, the loss would have been Rs 5000 for the margin trade versus Rs 1000 on a delivery order. Losses are adjusted against the margin amount.

Selling on margin: Suppose you do not have shares in your demat account and you want to sell ACC at Rs 1000 each expecting the prices to go down. You can sell 50 shares and give the margin of Rs 10,000 to the broker. As there are no shares to deliver, the position will be squared off by placing a buy order before the end of the day. In case the price at settlement is 900, there will be a profit of Rs 5,000. In case price goes up to Rs 1100, the loss of Rs 5,000 is adjusted against the margin amount.

Accounting for margins: If stocks are not sold immediately, they are kept as collateral with the broker as he finances the debt and charges interest for the same. When stock in the margin

²⁴ An Indian term for a system for deferring payment for shares purchased or delivery of shares sold. Badla was discontinued from March 1994

²⁵ In November 2007, the price of ACC was approximately Rs. 1000, prices mentioned at different places in the book for the same share may vary because the market has been very volatile.

account is sold, the proceeds are first used to repay the loan. For stocks that are purchased and carried forward to future periods two types of margins are imposed, *initial margin* which is payable at the time of placing the order and the *maintenance margin* or minimum balance. The broker makes a *margin call* or demand for more money if the money in the margin account falls below the minimum amount due to adverse price movements. If the required balance is not maintained, the broker can sell the stock to recover the loan. SEBI allows brokers 50% initial margin, 40% maintenance margin and 30% liquidation margin. The stock exchange or the broker can increase the margin depending on market situation. We take a very simple hypothetical example to illustrate the process assuming an initial margin of 50% and maintenance margin of 30%.

Day 1

10 shares bought at Rs 100 each Value of shares = Rs 1000,

Debt = 500, Margin account = 500 = 50 %,

Day 2

Price of shares falls to Rs 75 Value of shares = Rs 750

Debt = 500, Margin Account = 250 ($750 - 500$) = $250/750$

Margin percentage = 33% of 800 [No action as maintenance margin requirement is 30%]

Day 3

Price of shares falls to Rs 60 Value of shares = Rs 600

Debt = 500, Margin Account = 100 (600-500 debt)

Margin percentage = $100/600 = 16.6\%$

A margin call of Rs. 80 will be issued to bring the margin up to 30%.

■ RISK MANAGEMENT

Several measures have been taken by SEBI to ensure the safety and integrity of the market including a margining system, intra-day trading limits, exposure limits and real time monitoring of the same. Setting up of a trade/settlement guarantee fund and disclosure requirements such as furnishing of audited annual results and unaudited financial results on a quarterly basis. Some of the risk management measures are discussed in detail:

Margin Requirements: Margin payments ensure that buyers and sellers are serious about their trades. They also reduce the risk due to non-payment/delivery by traders in case the market does not move as per their expectations. These margins can be used to cover the losses arising from the adverse movements. For example, if an investor places an order for purchase of shares worth Rs 1 lakh hoping that the price will go up. If the value of the shares falls to Rs. 90,000, the buyer suffers a loss of Rs. 10,000, he may not want to pay for the shares. However, if he has paid a margin of Rs. 15,000, the loss can be recovered from his margin account. Similarly, a seller may not want to deliver the securities if the price goes up. If the securities have been bought on margin and pay-in is after a given period, the notional loss in the intervening period also needs to be covered every day through additional margins

i.e., mark to market margins. Securities have been divided into three groups for imposition of margins in the cash market segment based on their liquidity and volatility. Margins are collected from retail and institutional investors. The exchange calculates margins on the gross open position of the broker, based on value at risk to cover 99% of the risk²⁶ and additional margins to cover extreme loss. The open positions are also subject to mark to market margins. Adequacy of margins are monitored on a real-time basis with automatic deactivation of terminals in case of a shortfall.

SEBI has also instituted two *circuit breakers*, one is applicable to the stock market in general and the other is applicable to individual stocks. The *market wide circuit breakers* get activated when there is an index movement in the NSE Nifty or BSE Sensex of plus or minus 10 percent, 15 percent and 20 percent on any single day, calculated on the closing index value of the previous quarter day. For example, on 28th April 2017, the NIFTY 50 closing was 9304.05, the trigger limit for the next day will be plus/minus 930.40, 1395.60, 1860.80 for 10%, 15% and 20% respectively. The circuit filters trigger a nationwide halt in trading in all equity and equity derivative markets²⁷. The time for which trading is halted depends on the time of the day and percentage variation in the index as can be seen from Table 3.6.

Table 3.6: Market-wide Circuit –breakers

Rise or Fall in Index	Before 1 p.m.	1-2 p.m.	1-2.30 p.m.	After 2/2.30 p.m.
	Trading suspended for			
10%	45 minutes		15 minutes	no action
15%	1 hour 45 min	45 minutes		rest of day
20%	rest of day			

Source: NSE

Individual stocks have price bands or price filters; however there are no price bands on the stocks that trade in the derivatives market. Scrips on which no derivatives products are available but which are part of Index Derivatives, are also subjected to price bands. The previous day's closing price is taken as the base price for calculating the price bands. The NSE and BSE fix price bands of 2,5,10 and 20% for individual stocks depending on the price movement and liquidity of the stock. As this is done at the level of the exchange, the circuit limits on the two exchanges need not be the same.

■ STOCK INDICES

A *stock index* is a statistic that reflects the value of a list of stocks as compared with a standard or base value. A *broad-based* index represents the performance of the whole stock market and is considered to be a reflection of investor sentiment, while *specialised indices* track the performance of specific sectors or industries. The index may be price weighted like the Dow Jones Industrial Average, value weighted like the S & P 500, or equal weighted

²⁶ Projected loss in value in the next one day based on standard deviation of past returns and confidence intervals to cover 99 % of the risk.

²⁷ Index-based circuit breakers were introduced in November 1992, and used for the first time on the BSE on March 9, 1993. Thereafter market-wide circuit-breakers were introduced on July 02, 2001, which were activated on some days such as May 17, 2004 and January 22, 2008.

like the NASDAQ-100 equal weighted index²⁸. In a *price-weighted* index, a simple average of prices is used to determine the value of the index. The price movement of each security will influence the value of the index to the same extent, irrespective of the relative size of the company. The disadvantage of this method is that securities with a higher price per share will influence the index more than others. A market *value weighted* or capitalization weighted index takes price multiplied by total number of shares issued by the company to calculate the value. The same price movement for large company will influence the value of the index more than a small company. The advantage of value weighted indices over others is that stock splits and other capital adjustments are automatically taken care of. A further refinement in capitalization weighted indices is the use of *free float* instead of total number of shares. Share holdings that would not normally come into the open market for trading are not included in free-float²⁹. The market capitalization is multiplied by the free float factor of each stock to calculate the free float market capitalization. If 40% of shares are held by promoters etc., the free float factor would be 0.6. An *equal weighted* index is created by assuming that an equal investment is made in each share, i.e. if there are 20 shares in the index each share will have 5%. The index is calculated using simple or geometric average of percentage price changes.

The primary index of the Bombay Stock Exchange is BSE Sensex comprising of 30 stocks; it is a value weighted index using free float with the base year 1978-79 and base value of 100. Towards the end of 2007, the Sensex touched 20,000, which means that over 28 years the value of the Sensex increased 200 times. The NSE has the S&P NSE 50 Index (Nifty), a value weighted index which consists of fifty stocks, and base year 1995 and the base value 1000. These are diversified indexes constructed from large and actively traded stocks, representative of various sectors. The component stocks are reviewed and modified periodically to ensure that they reflect current market conditions and safeguards are built in to prevent its manipulation³⁰. The stock exchanges also provide indices to cater to the needs of various segments of users. There are indices covering up to 500 stocks, small and medium sized companies, sector specific indices, dollar denominated and customised indices as can be seen in Table 3.7. Details of selection criteria for various indices may be seen from the websites of the respective stock exchanges³¹.

²⁸ This is a relatively new concept, the NASDAQ-100 Equal Weighted Index began on June 20, 2005. It contains the same securities as the NASDAQ-100 Index, but each of the securities is initially set at a weight of 1.00% of the Index, which is rebalanced quarterly.

²⁹ This includes holdings by founders/directors/acquirers, persons/bodies with “Controlling Interest”, government holding as promoter/acquirer, FDI, Strategic stakes by private corporate bodies/individuals, associate/group companies, Employee Welfare Trusts and Locked-in shares. Globally, the free-float methodology of is used by major index providers like MSCI, FTSE, S&P and STOXX. The SENSEX was shifted to the free-float methodology with effect from September 1, 2003.

³⁰ The Sensex is calculated and made available every 15 minutes during trading hours and the closing figure for the day is computed taking the weighted average of all in the last 30 minutes. If a constituent has not traded in the last 30 minutes, the last traded price is. If a constituent has not traded at all in a day, then its last day's closing price is taken. This prevents any intentional manipulation of the same.

³¹ For the BSE, SENSEX companies are selected to give a balanced representation of the companies listed on the BSE. They should have a listing history of at least 3 months, should have traded on each and every trading day in the last three months, figure in the top 100 companies based on total market capitalisation and liquidity, weightage of each scrip based on free-float market capitalisation should be at least 0.5% of the Index and they should have an acceptable track record.

Table 3.7: Indices provided by NSE and BSE

<i>BSE</i>	<i>NSE</i>
SENSEX	S&P CNX Nifty
MIDCAP	CNX Nifty Junior
SMLCAP	CNX 100
BSE-100	S&P CNX 500
BSE-200	CNX Midcap *
BSE-500	Nifty Midcap 50
	CNX Midcap 200 **
	Customised Indices
Sector/Industry Indices	
AUTO	CNX PSU BANK Index
BANKEX	CNX Bank Index
FMCG	CNX FMCG Index
HC (health care)	CNX Pharma Index
PSU	CNX PSE Index
REALTY	CNX Realty Index
IT	CNX IT Index
OIL&GAS	CNX Energy Index
POWER	CNX MNC Index
TECK (IT, media and telecom)	CNX Service Sector Index
METAL	CNX Infrastructure Index
CD (consumer durables)	
CG (capital goods)	
Dollar Denominated Indices	
DOLLEX-30	S&P CNX Defty
DOLLEX-100	
DOLLEX-200	
Note: The calculation of all the indices provided by the BSE is free float market capitalisation except for BSE PSU.	
* CNX Midcap – Introduced from July 18, 2005	
** CNX Midcap 200 – Discontinued from July 18, 2005	

Calculation of indices using various methods is given in Example 3.2.

Example 3.2: Calculation of Indices

	<i>No. of Shares</i>	<i>Share Prices (Rs)</i>		
		<i>Day 1</i>	<i>Day 2</i>	<i>Day 3</i>
Stock A	10	100	102	104
Stock B	20	50	45	48

Contd...

Stock C	30	60	62	68	
		Index values			
	Base calculation	Base pd. Index #	Day 2	Day 3	
Price-weighted		70.00	69.67	73.33	
Arithmetic average of price		(100+50+60)/3	(102+45+62)/3	(104+48+68)/3	
Value/Capitalization-weighted		100.00	99.47	106.32	
Base period index*(current market cap/base market cap)	(100*10+50*20 +60*30)=3800	(3800/3800)*100	((102*10+45*20+ 62*30)/3800)*100	((104*10+48*20+ 2*30)/3800)*100	
Equal-weighted Arithmetic		100.00	98.44	104.45	
Arithmetic average of price change*previous day index			{(102/100+45/50 +62/60)/3}*100	((104/102+48/45 +68/62)/3)*98.44	
Equal-weighted Geometric		100.00	98.26	104.20	
Average (geometric) price change*previous day index			{(102/100+45/50 +62/60)^1/3}*100	((104/102+48/45 +68/62)^1/3)*98.26	
# The base period index is arbitrarily set at any value for all indices except the Price-weighted index					

The change in the index value shows the relative change in the aggregate market value of the constituent stocks. For the value-weighted index, there is a 6.32% increase in value on day 3 as compared to the base period. In the simple example shown above, the number of shares outstanding has been assumed to remain the same. If there is a change in the capital of any of the constituents of the index, an adjustment in base value may be required to maintain continuity of the index value. Since all the indices provided by the NSE and BSE are value weighted the adjustments required for the same are discussed below:

Adjustments for Rights Issues: When a company issues right shares, there is an increase in the number of shares and the value of these shares is taken at the theoretical (ex-rights) price³². The base market capitalisation is adjusted by this increased value in market capitalisation. Suppose company A issues 10 rights shares at the end of day 2 which increases the market capitalisation by Rs.1000. The Base market capitalisation is Rs. 3800 and the current market capitalisation on day 2 before the rights issue is Rs. 3780. The new base market capitalisation will be: old base market capitalisation ×(new market cap/old market cap)= 3800×(3780 + 1000)/3780 = 4805.3 and the index calculated after the rights issue will be 100×(4780/4805.3) = 99.47.

Adjustments for Bonus Issues: When a company issues bonus shares, say in the ratio of 1:1, the number of shares is multiplied by 2 and the price of the share is divided by 2, i.e.,

³² Simple numbers have been taken to illustrate the concept, see valuation of a rights issue in a later chapter.

the market capitalisation does not change. Therefore, there is no need to change the base market capitalisation. In the earlier example on day 2, company A will have $2 \times 10 = 20$ shares with closing price of $102/2 = 51$, and market capitalisation for A will remain the same as $20 \times 51 = 10 \times 102 = 1020$.

Adjustments for other Changes: Base market capitalisation will also need to be adjusted when a company is replaced in the index, when new shares are issued due to conversion of debentures, mergers, etc., or when equity is reduced due to buy back of shares or corporate restructuring etc.

■ INDIAN DEBT AND MONEY MARKET

The Indian debt and money market instruments can broadly be divided into government securities, public sector bonds and other corporate companies. In the primary market, the Reserve Bank of India issues securities on behalf of the central and state governments. The RBI manages the maturity profile, timing of issue, composition of debt and the type of instruments issued. Corporate debt securities are issued in accordance with SEBI regulations.

We can look at debt instruments in terms of their denomination, maturity, size of the market, periodicity of issue, mode of issue and redemption, whether they are secured/unsecured, interest rate, transferability, regulations, etc. Debt instruments, with less than one year to maturity when issued, are classified as money market instruments. They include call money, treasury bills, Certificates of Deposit (CDs), commercial paper etc. Dated government securities and PSU bonds with residual maturity of less than one year are similar to some of the money market instruments. The volume of transactions in some of the money market instruments can be seen in Table 3.8.

Table 3.8: Volume of Transactions in Money Market Instruments

	2013-14	2014-15	2015-16	2016-17
Daily Turnover (Rs Crore)				
Call Money	15383	12989	13717	15714
Repos	24585	27440	31125	43833
CBLO	59613	58413	64384	85010
Annual Trades (Rs Crore)				
Commercial Paper	553702	741289	904256	
Certificates of Deposit	1698860	1560787	1272810	

Source: CCIL

Corporate Bonds and Debentures

Public Sector Undertakings (PSU) and private sector companies issue bonds and debentures of various types—coupon bearing, zero coupon, floating rate, convertible debentures etc.³³, with maturity normally ranging from 3–7 years. Public issues of debentures greater than 18 months maturity have to be rated by one or more credit rating agencies. The day count

³³ Discussed in detail in the chapters on debt.

convention for interest payments on bonds and debentures interest is generally calculated on the basis of actual/365 days per year.

For the past few years, the majority of debentures and bonds have been privately placed with institutional buyers. Unlike public issues, private placement does not have stringent disclosure norms, has lower issue and servicing costs, and also takes less time to complete.

Dated Government Securities

Government securities issued by the Central Government in the form of long term debt known as dated, government securities or gilts. These instruments are of the face value of Rs. 100 and maturity ranging from 1-30 years. The RBI auctions them on behalf of the government, and investors bid either in terms of the rate of interest for a new securities or in terms of the price for an existing security being reissued. Bidders such as banks, insurance companies and mutual funds have Subsidiary General Ledger (SGL) accounts with the RBI or constituent SGL accounts with banks and primary dealers³⁴ which are demat accounts for government securities. SGL accounts ensure prompt settlement of trades, interest payments, redemption etc. Small investors³⁵ who do not have an SGL account and do not require more than Rs. one crore (face value) of securities per auction can buy government securities through non-competitive bidding. They are allotted bonds at the weighted average price arrived at through competitive bidding. The minimum amount for bidding and allotment is Rs.10,000 and multiples thereof. In case, the aggregate amount bid is more than the reserved amount of 5% for non-competitive bidding, allotment is made on a pro rata basis.

RBI also issues securities on behalf of state governments. State government bonds are eligible for SLR are backed by the Central Government. Bonds of state utilities and state finance corporations were entirely backed by the guarantees of the respective state governments. They normally have a higher interest rate than Central Government bonds, but are less liquid.

Banks are the major investors in the government securities, as they are required to maintain a part of their net demand and time liabilities for SLR in the form of liquid assets; however, they sometimes hold a larger percentage as a portfolio choice. Other major investors in government bonds include insurance companies, mutual funds, pension funds, FIIs, and trusts and societies³⁶.

The most common types of bonds issued are regular coupon bonds offering six monthly interest; zero coupon bonds, floating rate bonds, partly paid bonds³⁷ and capital index bonds³⁸ have also been issued in the past. These bonds do not attract stamp duty or TDS. The accounting convention³⁹ for calculation of accrued interest is 360 days a year with 30 days each month.

³⁴ Similar to depository accounts with DPs.

³⁵ The Retail Trading in G-Secs. commenced in January 2003.

³⁶ According to the RBI, more than 70 % of government securities are held by banks and the Life Insurance Corporation of India.

³⁷ Like a recurring deposit, issued in 1994.

³⁸ Linked to WPI, issued in January 1998.

³⁹ SEBI may prescribe a uniform day count convention for all debt securities in future.

Treasury Bills

Treasury Bills are short-term borrowing instruments of the Central Government, normally issued for 91, 182 and 364 days. They are issued at a discount to the face value; the rate of discount and the corresponding issue price are determined at each auction. 91 day bills are allotted at uniform cut off prices (Dutch auction), others are at multiple prices (French auction)⁴⁰. They are available in multiples of Rs. 25,000. Any person in India including individuals, firms, companies, corporate bodies, trusts and institutions can purchase the bills. The bills are available in demat form for SGL account holders and in scrip form for others. They are eligible securities for SLR purposes. The accounting convention for calculation of price is 365 days a year.

Call/Notice Money

Historically, the most active segment of the money market has been the call money market, used by banks to take care of day-to-day imbalances in their funds position with respect to the CRR. *Call money* is borrowed or lent on demand for one working day and *notice money* is borrowed or lent for 2-14 days. There is no collateral security is required for these transactions. Commercial banks, co-operative banks and primary dealers are allowed to borrow and lend in this market⁴¹. Interest rates in this market are highly sensitive to demand and supply rates have fluctuated from 0.5% to 140% (annualised).

The call rates have historically been found to rise at the end of March every year, coinciding with the year closing for banks, when bulk payments are required for oil purchases etc.

Ready Forward Contracts (Repos)

Ready forward contract or *Repo* or repurchase agreement is a transaction in which the borrower sells securities to the lender with a mutual agreement to repurchase the same at a decided future date and a price. If the buyer initiates the deal, it becomes a *reverse Repo* deal. The difference in the sale and buy back price represents the borrowing/lending rate for use of the money in the intervening period. This is a short-term financing arrangement, and is also used to manage short-term SLR/CRR mismatches. The seller gets the funds for CRR or any other purpose, at a specified interest rate without parting with the securities permanently and the buyer gets the security to meet his SLR requirements. Internationally, Repos are versatile instruments and used extensively in money market operations. In India, interbank Repos were banned after the securities scam in 1992; they were reintroduced following the reforms and building in of better controls after dematerialisation and computerisation.

The market lot for Repos is Rs 5 crores. Repos are permitted in Treasury Bills, central and state government securities, PSU bonds and private corporate debt securities, provided they are held in dematerialised form in a depository and the transactions are done in a recognised

⁴⁰ Till November 6, 1998, all types of T-Bills auctions were conducted by means of 'Multiple Price Auction'. However, since November 6, 1998, auction of 91-days T-Bills are being conducted by means of 'Uniform Price Auction'.

⁴¹ Non-bank entities were not allowed access to this market w.e.f. 6 Aug 2005.

stock exchange. Banks, PDs and entities having SGL with the RBI can use Repos. All entities with SGL accounts are permitted to enter into repos and non-SGL holders having a gilt account with any bank or PD, which operates a Constituent SGL (CSGL) with the RBI on their behalf subject to their fulfilling RBI regulations in this respect.

The RBI also uses Repos for its liquidity management, both for absorbing liquidity and also for injecting funds into the system and introduced a system of daily fixed rate repos from November 1997. The annualised interest is known as the *reverse repo rate* (RBI sells securities and borrows money) and Repo rate (RBI buys securities and lends money)⁴². The Repo and reverse Repo rates act as a reference rate corridor for other borrowers and lenders⁴³.

Collateralised Borrowing and Lending Obligation (CBLO)

CBLO as the name suggests, is borrowing with collateral with an obligation by the borrower to return the money at a specified future date. The lender has the right to receive the money lent, with an option to transfer the right to another person. Banks, primary dealers, mutual funds, financial institutions and insurance companies, who are members of the NDS, open Constituent SGL accounts with CCIL and deposit securities which are offered as collateral under this scheme. The eligible securities are Central Government securities and Treasury Bills with a residual maturity period of more than six months. CBLOs have maturity between one day and one year.

The borrowing limit for the members is fixed daily, based on the securities in the account. The drawing power is based on the post-haircut mark to market value. Members have the flexibility to access the auction market and normal market (screen based matching) for borrowing/lending of funds. As can be seen, there is an overlap between the call money market, repo market and the CBLO. Over the years, the CBLO market has emerged as the most active segment in the market.

Certificates of Deposit

Certificates of Deposit (CDs) are deposit certificates issued by commercial banks and financial institutions at discount to face value, with maturity ranging from 15 days to one year. The lock-in period ensures they do not compete with call money. Unlike ordinary fixed deposits, they are transferable through endorsement and delivery. They are issued in multiples of Rs 5 lakhs, and can be issued to individuals, corporations, companies, trusts, funds, and NRIs on non-repatriable basis. CDs attract stamp duty as applicable to negotiable instruments.

Commercial Paper

Commercial Papers (CPs) are unsecured, promissory notes, issued in multiples of Rs 5 lakhs, at a discount to face value, with maturity ranging from 15 days to one year. They

⁴² Prior to 2002, the term repo was used by RBI when it borrowed money, this was changed in 2002 in accordance with international usage.

⁴³ The bank rate can only be used for refinance by banks upto a certain limit, beyond that they use the repo rate.

allow highly rated companies to raise working capital finance at competitive rates. In order to ensure that the borrowers are creditworthy the following conditions must be fulfilled. Only companies with an investment grade rating i.e., at least equivalent of P2/A2 or higher can issue CPs. The tangible net worth and fund based working capital limit of the issuing company should be not less than Rs. 4 crores.

They are privately placed through merchant bankers, after informing the banker who has already sanctioned working capital limits to the company. Companies can issue CP up to 100% of their fund based working capital limits. However, the working capital finance sanctioned by the bank gets reduced to that extent. Stamp duty is payable on CPs. Major players in the market include corporate entities, financial institutions, mutual funds and primary dealers.

Commercial Bills

Bills of exchange are negotiable instruments drawn by the seller (drawer) on the buyer (drawee) for the value of the goods delivered to him. Such bills are called trade bills. When they are accepted by commercial banks, they are called commercial bills. If the seller allows payment at a later date, it is a usance bill. Banks provide credit to customers by discounting commercial bills and collecting the maturity proceeds from the buyer. Banks can rediscount the bill in the commercial bill rediscount market. RBI introduced a derivative instrument based on such bills with usance of up to 90 days, to facilitate rediscounting in the secondary market. These derivative usance promissory notes are transferable by endorsement and delivery with rediscounting for a minimum period of 15 days. Participants include banks and PDs, mutual funds and financial institutions.

Inter-corporate Deposits

Inter-corporate deposits are short-term, unsecured loans normally given for 3-6 months. The interest rate varies, depending upon the period, quantity borrowed and the credit rating of the borrower. Collateral security of shares or guarantees may be added to improve the credit worthiness of the borrower. The ICD market is not well organised, and deals are normally arranged through personal contacts or brokers. ICDs are unique to India; they existed because of the under developed financial market.

■ SECONDARY MARKET

Debt securities can be traded on the BSE and NSE. The Wholesale Debt Market (WDM) segment of the NSE⁴⁴ provided the first formal screen-based trading facility for deals in fixed income securities in the country. This segment provides trading facilities for a variety of debt instruments including Central and state government securities, T bills, Bonds issued by PSUs, corporate sector and banks, commercial papers, CDs, mutual fund units and securitised debt. It is characterised by large investors and a high average trade value. The

⁴⁴ It commenced operations on June 30, 1994.

government debt market is dominated by institutional investors. Though trading in the Retail Debt Market (RDM) segment on NSE was introduced in January 2003, trading has been sporadic.

Trades on the NSE are conducted through its Wholesale Debt Market (WDM) segment for large players, while retail debt is traded on the capital market segment. The Clearing Corporation of India Ltd.⁴⁵ (CCIL) acts as a central counter-party in the settlement of wholesale trades in government securities, T bills, Repos and CBLOs. National Securities Clearing Corporation Limited (NSCCL) is the clearing and settlement agency for all deals executed in retail debt market. Although the NSE provides a fully automated screen based trading system, with facilities for non disclosure of identity and details of counter party exposure⁴⁶, wholesale trades in government and non-government debt are also negotiated over-the-counter and reported on the NSE.

Primary dealers, are underwriters and market makers for government securities and money market instruments. DFHI buys, stocks and trades in government dated securities regularly. It also trades in CDs and CPs, rediscounts and/or purchases derivative usance promissory notes. Satellite dealers had been set up for promoting retail trade in these instruments, but they were discontinued.

The government debt and money market in India has traditionally been a wholesale market. Institutional investors also dominate the corporate debt market. Retail participation is desirable as it will deepen the markets and improve the liquidity. Although retail trade has been introduced for government securities, individuals normally participate through money market mutual funds and gilt funds. Steps are being taken to increase liquidity in corporate debt and retail participation⁴⁷.

■ SUMMARY

The Indian financial system moved towards a market-driven economy after the process of reforms in the 1990s. The latest technology has been adopted for trading in the stock market. This includes screen based order matching with price time priority, and flexibility of placing various types of orders. Investors follow stock indices to gauge the direction of the market. There are various methods of constructing an index, major stock indices in India are value weighted. SEBI has introduced various measures to regulate the market. Trading in the money market was also modernised after the reforms and a variety of new instruments were introduced.

⁴⁵ Commenced clearing and settlement of transactions in government securities (including repos) in February, 2002

⁴⁶ required by banks

⁴⁷ R H Patil Committee report (December 2005), which concentrated on the micro issues of the corporate and securitised debt markets and made a large number of recommendations, being implemented by SEBI.

■ MULTIPLE CHOICE QUESTIONS

1. Capital market refers to instruments with maturity of more than one year in the
 - (a) Primary stock market
 - (b) Secondary stock market
 - (c) Debt and money market
 - (d) Debt and stock market
2. A market order refers to
 - (a) Trades conducted through a recognised stock exchange
 - (b) Offers that are open to all players in the market
 - (c) Orders that do not specify a price and are executed at the best offer price
 - (d) Orders that specify a price and time and are executed accordingly
3. A limit buy order for XYZ for Rs 500 will be executed when there is a sale offer for
 - (a) Greater than Rs 500
 - (b) Less than or equal to Rs 500
 - (c) Exactly Rs 500
 - (d) Any of the above depending on the time limit specified
4. A buy order from A at Rs 512 is followed by a buy order from B at Rs 515, followed by a sell order from C at Rs 510. Under price time priority
 - (a) A gets the share at 512
 - (b) A gets the share at 510
 - (c) B gets the share at Rs 515
 - (d) B gets the share at 510
5. The base market capitalisation of a stock index does not need to be adjusted when
 - (a) Rights shares are issued
 - (b) Bonus shares are issued
 - (c) Debentures are converted into shares
 - (d) There is a share buyback
6. Certificates of deposit are issued by banks
 - (a) To large investors for deposits with maturity up to 1 years
 - (b) To small investors for deposits with maturity up to 1 year
 - (c) To large investors for deposits with maturity up to 5 years
 - (d) To small investors for deposits with maturity up to 5 year
7. Over the counter trades are conducted
 - (a) Through stock exchanges that are not computerised
 - (b) Through the Over the Counter exchange of India (OTCEI)

- (c) Through stock exchanges where the parties meet face to face
 - (d) Not through a recognised stock exchange
8. Dematerialisation refers to
- (a) Buying shares online without any physical paperwork
 - (b) Conversion of physical securities into an electronic account
 - (c) Buying units in a gold mutual fund instead of physical gold
 - (d) None of the above
9. A share is currently available for Rs 100. How much money is required for purchase of 100 shares at 40 % margin?
- (a) Rs 10000
 - (b) Rs 6000
 - (c) Rs 4000
 - (d) Rs 2400
10. Free float methodology for calculating a stock index is used with
- (a) Value weighted indices
 - (b) Price weighted indices
 - (c) Equal weighted indices
 - (d) All of the above
11. Which of the following is true
- (a) A repo is the same as a ready forward transaction
 - (b) The repo rate always higher than reverse repo rate
 - (c) The MSF rate is higher than the repo rate
 - (d) All of the above

■ QUESTIONS AND PROBLEMS

1. What are the functions of
 - (a) A financial system
 - (b) Financial markets
 - (c) Financial intermediaries
2. What are the characteristics that determine the quality of a market?
3. What are the different ways of classifying financial markets?
4. What is the difference between a primary and secondary capital market? Are they related in any way?
5. When would an investor place a limit order?
6. When would you short sell a security?

7. What steps have been taken to prevent excess volatility in the stock market?
8. What are the major types of orders available to investors?
9. What is the difference between Certificate of Deposit and Savings Deposit?
10. When will the customers limit order to sell ABC common stock at Rs. 50 per share be executed?
11. What is a market maker?
12. Compare REPO and collateralised borrowing and lending obligation.
13. Explain the concept of a circuit breaker.
14. Write short notes on:
 - (a) Dematerialisation
 - (b) Wholesale debt market on NSE
 - (c) Commercial paper
15. An investor has Rs. 10,000 and shares of XYZ are priced at Rs. 100 each. How many shares can he buy if
 - (a) Margin requirements are 25%
 - (b) He pays the full price of the share
16. An investor has Rs 10, 000, and shares of ABC are priced at Rs 200 each. Margin money requirement is 50% and the cost of borrowed funds is 12 % per annum. What is his profit with and without using debt if
 - (a) After 3 months the price of the share is Rs 300
 - (b) After 3 months the price of the share is Rs 100
17. Mr A buys 100 shares priced at Rs 500 on margin. If the initial margin is 50% and maintenance margin is 30%
 - (a) What is the initial margin payable?
 - (b) What is margin call if the price declines to Rs 350?

■ PRACTICAL EXERCISES

1. Compare the composition of the stocks included in the Sensex and Nifty. Study the changes in the composition of these indices over the past 10 years. Make a note of the frequency and number of stocks substituted. How many of the original stocks are still present?
2. Calculate the correlation between various indices – broad indices, sector specific indices, international indices. Comment on the relationship over time.
3. Play the online stock exchange game available at moneybhai.moneycontrol.com/

PART II

Debt Markets

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- | | |
|-----------|-------------------|
| Chapter 4 | Systematic Risk |
| Chapter 5 | Unsystematic Risk |
| Chapter 6 | Bond Management |

CHAPTER - 4

Systematic Risk

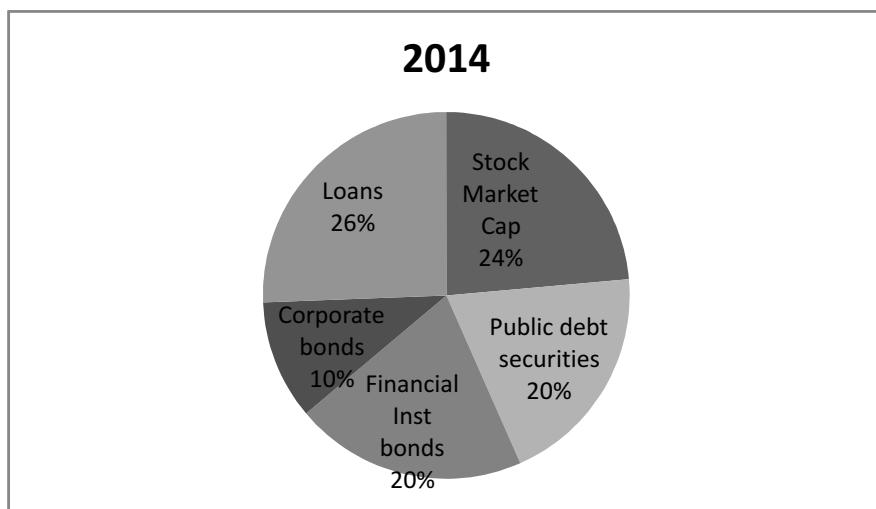
LEARNING OBJECTIVES

At the end of this chapter, you will be able to:

- Appreciate the size and the importance of the debt market
- Describe the various instruments available in it
- Calculate the intrinsic value of a bond and the various measures of return
- Understand the risks that all bonds are exposed to
- Discuss the factors that determine interest rates in the economy
- Understand the reason for differences in yields across maturities.

Debt instruments or fixed income securities are financial instruments that have a series of future cash flows that are fixed in advance. Unlike equity, they do not represent ownership in the issuing company. Although they have historically given lower returns than equity, they also have lower risk. Investors may look at investment in bonds when they require a steady income, or when they are risk averse. A portfolio of stocks and bonds can also provide a suitable risk return combination based on investor's requirements. Various types of instruments are available, which differ in the amount and timing of the payment of interest and principal, in credit risk, liquidity of markets, and in tax treatment. Risk varies across borrowers and also changes over time depending on the economic environment. The risks that are common to all securities are known as systematic risk and borrower or security-specific risks are unsystematic risk. In this chapter, we will first study bond valuation in general and then discuss systematic risks in detail.

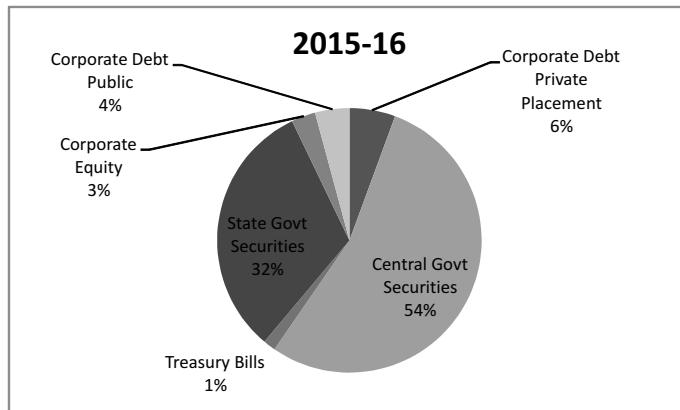
Debt markets are important for mobilizing capital. As can be seen from Figures 4.1 and 4.2, all over the world and in India, debt markets are larger than the stock market. The percentage of resources raised from the market by the corporate sector and government during 2005-06 is given in Figure 4.2. As can be seen, the government debt market is larger than all corporate issues at 59% and corporate borrowings only 41%. Moreover, 78% of corporate resources raised from the market were through debt issues. Debt also forms a substantial part of household savings in the form of deposits, bonds and debentures, and government saving schemes including PPF, NSC and KVP as can be seen from Figures 4.3 and 4.4.



Source: Deutsche Bank report: "Mapping the World's Financial Market 2015"¹

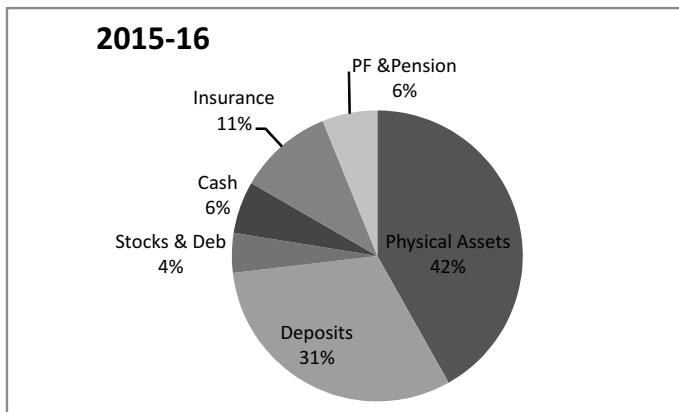
Figure 4.1: World Financial Markets

¹ Sanjeev Sanyal (2014) The Random Walk . Mapping the World's Financial Markets 2014 <https://etf.deutschteam.com/DEU/DEU/Download/Research-Global/47e36b78-d254-4b16-a82f-d5c5f1b1e09a/Mapping-the-World-s-Financial-Markets.pdf>



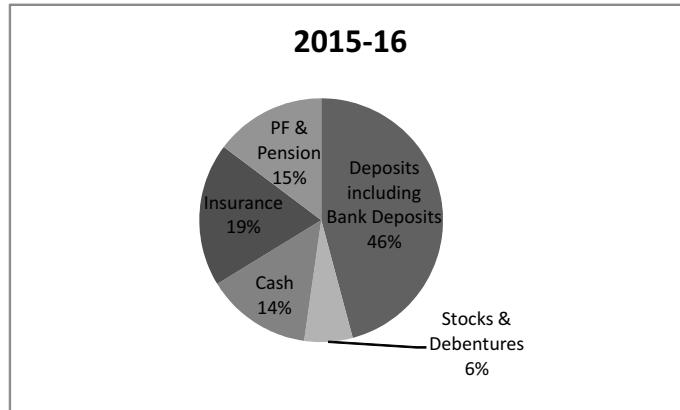
Source: SEBI and RBI

Figure 4.2: Government and Corporate Sector Resource Mobilization from the market



Source: RBI

Figure 4.3: Distribution of Household Savings



Source: RBI

Figure 4.4: Change in Gross Financial Assets of Indian Households

■ TYPES OF BONDS

The market for debt securities can be broadly divided into government and corporate bonds and debentures². Central and State Governments issue bonds to meet budget deficits; these may be general purpose bonds, or may be tied to specific revenue generating or developmental projects. In India, the RBI issues treasury bills and bonds on behalf of the government. Treasury bills are issued in maturities of 91 days, 182 days and 364 days, and bonds in maturities up to 30 years. Government securities are default-free for all practical purposes, therefore interest rate offered is lower than on similar corporate securities. Since state governments may be considered to be more risky than the central government, they offer higher returns. The interest may be tax free, in which case returns offered are lower than for taxable securities. In India, there is a large, liquid market for government securities, which is dominated by institutions and banks because of the SLR requirement³.

Private and public sector companies issue bonds to raise money for fixed assets and working capital. There are a huge variety of bonds available and their characteristics and perceived credit risk vary widely. Corporate bonds have a greater probability of default as compared to government bonds. The risk can be assessed to some extent from the credit rating assigned. The corporate debt market in India is dominated private placements by as can be seen from figure 4.4. This can be attributed to can be attributed to the small size of issues and higher cost of public issues⁴. As a result, corporate bonds also lack liquidity in the secondary market, and the market is limited to a few sophisticated investors comprising of institutions like banks, insurance and mutual funds. A high level expert committee under the Chairmanship of Dr. R.H. Patil⁵ has recommended policy actions necessary to develop an appropriate market infrastructure for the growth of an active corporate bond market.

As corporate bonds are considered to be risky, they sometimes offer a lien on specific assets. Bonds without lien are *unsecured bonds*; those with a lien are called *secured bonds*. In the case of bankruptcy, the holders of secured bonds have a first claim on the fixed assets mortgaged as security, or on the financial assets offered as collateral. The unsecured debenture-holders on the other hand, are considered at par with other creditors, and have a claim on the remaining assets before preference and equity shareholders. The advantage of unsecured debentures to the issuer is that they leave specific assets unencumbered, which can be used as security for subsequent borrowing.

Various types of cash flows have been designed to suit the needs of issuers and investors. The coupon rate is the rate of annual interest payable on the par value of the bond or debenture. *Coupon bonds* or *fixed interest bonds* offer periodic interest, normally annually, six-monthly, quarterly or monthly, with repayment of the principal or par value on maturity. *Deferred interest bonds* defer the interest payments in the initial years, and give higher cash

² A debenture is usually unsecured and a bond is secured. However, in India the terms are used interchangeably.

³ More than 70% of government bonds are held by the banking sector and Life Insurance Corporation of India.

⁴ Even in the US, 92% of corporate debt is privately placed and only 1% is traded on exchanges.

⁵ In Dec 2005.

flows in later periods; one of the variants is the *zero coupon bond* or *cumulative bond*, which has only one payment at maturity that includes the principal and cumulative compound interest. *Deep discount bonds* are issued at a price lower than the face value and offer a coupon lower than prevailing market yields. *Step up bonds* offer higher interest in later years, while *floating rate bonds* have interest rate tied to a market related benchmark such as the RBI repo rate, the SBI deposit rate, or a price index (called inflation bonds) etc. Some bonds offer payment in kind, such as gold bonds, or may issue additional bonds for the interest amount. Investment is also possible in *foreign currency bonds* where returns depend on currency fluctuations in addition to the usual factors. Special features, like *call option* (issuer can call back the bond at a fixed price and date) and *put option* (bond holder can sell back bond at fixed price and date) are also provided in some issues⁶.

Zero coupon bonds can also be created by STRIPS (Separate Trading of Registered Interest and Principal Securities). Specified dated government securities in India allow ownership of interest and principal payments to be registered separately, so they can be traded and priced separately. For the issuer, the cash out flows remain the same, but for investors it offers an opportunity to invest in zero coupon bonds of various maturities. For example, a five year coupon bond with semi annual coupons can be traded as ten bonds comprising of the coupon payments and one of the principal amount.

A special class of bonds is created through securitisation of loans. These asset-backed securities are based on the future the cash flows from a specified pool of underlying loans. The assets can be any type of receivables from auto loans, housing loans, credit card payments etc. Assets are pooled to reduce the risk of individual underlying assets, as only a small percentage of individuals who take car/house loans etc. are expected to default. These future cash flows are repackaged into fixed income securities and sold to another set of investors. The procedure for issue, risks and benefits of asset-backed securities is given in detail in the next chapter.

■ BOND VALUATION

Bond valuation can be expressed in terms of spot rates and forward rates. A *spot rate* assumes an investment that begins immediately and lasts for the given period and interest rates are assumed to be constant during that time. When rates are expected to change in future, or if investment is planned in the future we make use of forward rates. A *forward rate* covers a period that begins in the future. A one-year forward rate is the same as a spot rate for a one year loan. Spot rates can be derived from forward rates and vice versa. For example, if the spot rates for a one year, two year and three year zero coupon bond are given as 8%, 8.5% and 9%, the forward rates are calculated as

$$f_0 = s_1 = 8\%$$

$$f_1 = \{(1 + s_2)^2 / (1 + s_1)\} - 1 = (1 + 8.5\%)^2 / (1 + 8\%) - 1 = 9\%$$

⁶ In Feb 2002, Kerala Infrastructure Investment Fund Board issued 5-year bonds offering a semi-annual coupon of 10.50 % with put options at the end of 18,36 and 48 months and call options at the end of 24,36 and 48 months.

$$f_2 = \{(1 + s_3)^3 / (1 + s_2)^2\} - 1 = (1 + 9\%)^3 / (1 + 8.5\%)^2 - 1 = 10\%$$

where f_1 is the forward rate for the period beginning at the end of year 1 and ending at the end of year 2.

Similarly, if the forward rates had been given as 8%, 9%, and 10% the spot rates would be calculated as

$$s_1 = f_0 = 8\%$$

$$s_2 = \sqrt{(1 + f_0) * (1 + f_1)} - 1 = \{(1 + 8\%) * (1 + 9\%)\}^{(1/2)} - 1 = 8.5\%$$

$$s_3 = \sqrt[3]{(1 + f_0) * (1 + f_1) * (1 + f_2)} - 1 = \{(1 + 8\%) * (1 + 9\%) * (1 + 10\%)\}^{(1/3)} - 1 = 9\%$$

When a bond is issued it has to be fairly priced, otherwise it will not get any buyers. When a bond is purchased/sold between the issue date and maturity we need to calculate the fair value of the bond. If a bond is purchased at par value and held when interest rates are rising, the seller will receive a lower price because similar bonds now offer a higher rate of return. By paying a lower price the buyer ensures that he gets a return equivalent to the market rates. Similarly, when interest rates decline, older bonds have higher coupons than the new securities, making them more valuable, so their prices go up. The fair value of a bond is calculated as the present value of all future cash flows. The discount rate used is the current rate of interest offered on similar bonds.

The present value formula for annual interest payments using spot rates is

$$PV = \sum_{t=1}^T \frac{I_t}{(1+r)^t} + \frac{P_t}{(1+r)^t}$$

$$\text{or, } PV = \sum_{t=1}^T C_t (1+r)^{-t} = I_1/(1+r)^1 + I_2/(1+r)^2 + I_3/(1+r)^3 + \dots + I_t/(1+r)^t + P/(1+r)^T$$

Where,

PV : present value of the bond

I : interest on the bond in rupees

r : required rate of interest in decimals

P : principal to be received at maturity

t : number of years

If coupons are paid more than once a year, we simply divide the interest and discount rate by the number of periods and multiply the years by the periodicity. For six monthly interest.

$$PV = \sum_{t=1}^{2T} \frac{I_t/2}{(1+r/2)^{2t}} + \frac{P_t}{(1+r/2)^{2T}}$$

Example:

If current interest rates are at 10%, a bond with Rs. 100 face value paying 8% coupon and maturing in 3 years would have a present value =

$$8/(1 + 0.10)^1 + 8/(1 + 0.10)^2 + 8/(1 + 0.10)^3 + 100/(1 + 0.10)^3 = \text{Rs. } 95.026$$

Note: Since the discount rate is higher than the coupon, the price is lower than the par value.

In India, in the government bond market, interest is normally paid twice a year, therefore, yields should be compounded semi-annually⁷. To convert from annual to semi-annual rate we use an approximation, multiply the number of periods by two and divide the coupon rate by two. The present value with semi annual compounding for the above example =

$$4/(1 + 0.05)^1 + 4/(1 + 0.05)^2 + 4/(1 + 0.05)^3 + 4/(1 + 0.05)^4 + 4/(1 + 0.05)^5 + 4/(1 + 0.05)^6 + 100/(1 + 0.05)^6 = \text{Rs. } 94.923$$

Note: Since the frequency of discounting is higher than the earlier example the price is lower than with annual discounting.

The present value formula using forward rates is

$$\text{PV} = I_1/(1 + r_1) + I_2/(1 + r_1) \times (1 + r_2) + I_2/(1 + r_1) \times (1 + r_2) \times (1 + r_3) + I_2/(1 + r_1) \times (1 + r_2) \times (1 + r_3) \times (1 + r_4) \dots\dots$$

■ BOND RETURNS

Yield or rate of return is an important concept that is used to measure and compare the returns of various bonds by measuring return in terms of an annual percentage rate. If a bond is purchased at par/face value and held till maturity, its yield is equal to the coupon offered⁸. However, if a bond is bought above/below par the yield reflects the return after taking into account the capital loss/gain. If the bond is to be sold before maturity, the yield reflects the price movements caused by fluctuating interest rates etc. Yield is measured in many ways: nominal yield, current yield, yield to maturity and yield to call/put.

Nominal yield is the coupon rate, expressed as a percentage of the par value. This is the periodic interest promised by the issuer at the time when the bond is issued. This is the actual return that the investor gets every period. All other calculations of yield are not actually received, but help compare the returns and prices.

Current yield is the annual return on the current price of a bond, regardless of its maturity. The current yield is the coupon amount divided by the current market price. If a bond is quoting at par, the current yield equals its coupon rate or nominal yield. If the market price of the bond is more than the par value, the current yield is lower than the coupon. Similarly, if the bond is quoting below par, the current yield will be higher than nominal yield. The current yield is important for investors who hold bonds for current income.

Yield to maturity is the annualised return on a bond held until maturity. This is a constant interest rate that makes the present value of all the future cash flows equal its price. It

⁷ For Government of India dated securities, prices are normally quoted for a face value or principal of Rs 100, and market lot size is 10 in the retail debt market on the NSE. Interest is normally paid twice a year (coupon rate divided by two).

⁸ Students may confirm this using a spreadsheet and the IRR function. (see also Chapter 3 for financial formulae)

enables comparison between bonds with different maturities and coupons. Yield to maturity includes all interest payments and any capital gain/loss if the bond was purchased below/above par value. In other words, if the price of a bond is known, its yield to maturity can be calculated using the IRR formula. IRR assumes the bond will be held till maturity and that all coupon payments will be reinvested at the same rate. It is like a promised return; the actual return will depend on the actual holding period and reinvestment rate of coupons received.

Yield to call/put⁹ is very similar to yield to maturity, except that cash flows are considered are only up to the call/put date and repayment amount is as per the call/put provisions. A call option gives the issuer the right but not the obligation to buy back the bond at a specified rate on a specified date. A put option gives the owner of the bond the right but not the obligation to sell it back to the issuer at a given price on a given date.

A simple numerical example can illustrate all these concepts. A bond with face value Rs. 100 and 10% coupon is currently available for Rs. 110. It matures in 3 years and is callable after one year at Rs. 105.

$$\text{Nominal yield} = \text{coupon} = 10\%$$

$$\begin{aligned}\text{Current yield} &= (\text{coupon} \times \text{par value})/\text{market price} = (10\% \times 100)/110 \\ &= 9.09\%\end{aligned}$$

For Yield to call calculate r from the following equation

$$110 = (10 + 105)/(1 + r)$$

$$r = ((115/110) - 1) \times 100 = 4.54\%$$

For Yield to maturity calculate r from the following equation

$$110 = 10/(1 + r) + 10/(1 + r)^2 + 10/(1 + r)^3 + 100/(1 + r)^3$$

$$r = 6.24$$

This can be calculated manually using trial and error, or by using the Internal Rate of Return (IRR) function in a spreadsheet.

Relationship between Current Yield, Yield to Maturity and Coupon Rate

The relationship between price, nominal yield, current yield and yield to maturity can be seen in Figure 4.5.

When a bond sells at par, its current yield = coupon rate = yield to maturity

When it sells at a discount, its yield to maturity > current yield > coupon rate

When it sells at a premium, its coupon rate > current yield > yield to maturity

Conventions in Calculation of Accrued Interest and Price to be Paid

If a trade takes place on the date when the coupon is paid, we simply calculate the price using the present value formula as given above. However, when bonds are bought/sold in

⁹ Call and put options on bonds are discussed in detail in the following chapter on systematic risks.

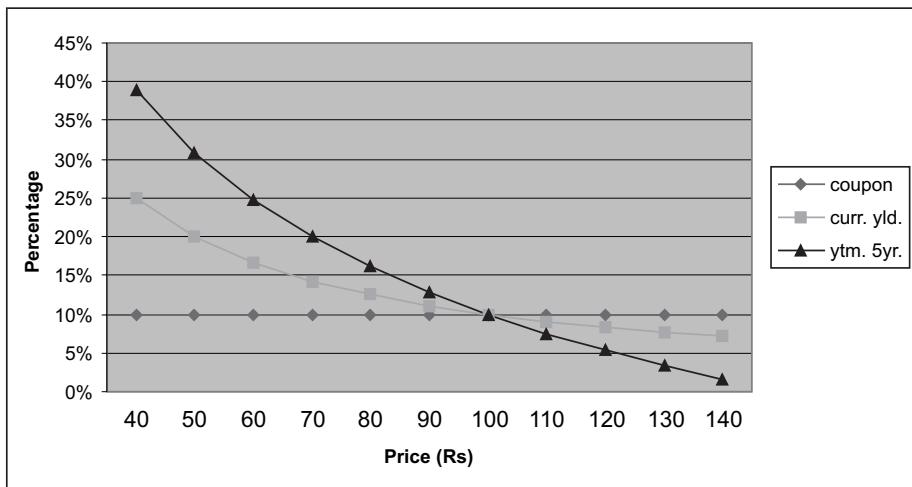


Figure 4.5: Relationship between Price, Coupon, Current Yield and Yield to Maturity
(5 Yr Bond, Par Rs. 100, Coupon 10%),

between coupon payments, the accrued interest needs to be calculated and paid to the seller. Similarly, while discounting the cash flows to present value, the first cash flow will be received before the regular coupon interval. The time to be taken into account for calculation of accrued interest/discounting period is measured in days, according to conventions that vary across markets. In India, for dated government securities, the convention used is 30/360 wherein each month is assumed to have 30 days and the year 360 days. The corporate bond market does not follow any specific convention, although majority follow the actual/365 day count. In the treasury bills market, the actual number of days/365 is used¹⁰. Government securities are traded on a clean price and settled on the dirty price (trade price + accrued interest).

■ SYSTEMATIC RISK IN HOLDING FIXED INCOME SECURITIES

Systematic risk is the risk that is common to all fixed income securities. Even government bonds, which are also referred to as gilt-edged securities as they have the highest degree of reliability, are not immune to systematic risk; they are *default-free* but not *risk-free*. Investors, financial advisors and policymakers are interested in knowing how risk is related to changes in macroeconomic conditions and whether it is possible to forecast systematic risk factors. The two main factors in systematic risk, the rate of inflation and the interest rates in the economy are discussed below:

Purchasing Power Risk

Purchasing power risk occurs due to inflation, which erodes the real value of interest and principal. Interest rates incorporate return for the time value of money, risk of the security

¹⁰ Spreadsheet programs such as Excel have formulae where the start and end dates are fed and the convention can be specified.

and compensation for expected inflation. If interest rates are below the inflation rate the investor is losing purchasing power. Real interest rate is calculated as coupon rate or nominal interest adjusted by the inflation rate. The real rate of interest and purchasing power of money receivable in the future are calculated as

$$\text{Real interest rate} = ((1 + \text{Nominal rate}\%)/(1 + \text{Expected inflation rate}\%) - 1) \times 100$$

$$\text{Purchasing power} = \text{Nominal amount received}/(1+\text{Expected inflation rate}\%)$$

The expected inflation rate can be replaced by actual inflation to get the realized rates.

Example:

In 2006, the interest offered on a one year fixed deposit was 8.25%, expected inflation was 5% and actual inflation was 4.80%. If Rs. 100 was invested in the beginning of the year

$$\text{The expected real rate of interest} = ((1 + 8.25\%)/(1 + 5\%) - 1) \times 100 = 3.095$$

$$\text{The realized real rate of interest} = ((1 + 8.25\%)/(1 + 4.8\%) - 1) \times 100 = 3.292$$

$$\text{Expected purchasing power} = 108.25/(1 + 5\%) = 103.09$$

$$\text{Actual purchasing power} = 108.25/(1 + 4.8\%) = 103.29$$

The effect of inflation on fixed deposit rates in India can be seen in figure 4.6. As can be seen real returns were negative in many years when the purchasing power of money was eroded by inflation.

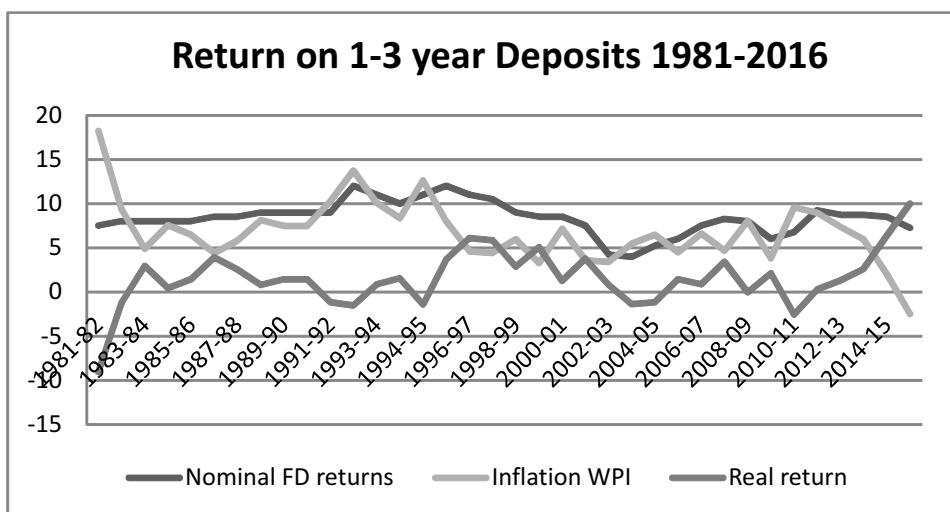


Figure 4.6: Return on Bank deposit

Interest Rate Risk

Interest rate risk is the probability of loss due to change in interest rates; this risk has two components: price risk and reinvestment risk. *Price risk* is the loss in Net Present Value (NPV) of the security when other comparable securities offer higher interest. As explained

earlier, if the market is offering higher returns than an existing security, its price falls. This risk increases with longer maturities, because there are more cash flows involved. The risk, however, increases at a diminishing rate as maturity increases; the minimum price that will be obtained even if the maturity period is infinite is the price that will be obtained for a perpetual bond or a perpetual annuity (like perpetual preference shares). Also, the lower the coupon rate, the higher is the price volatility. These concepts are best understood with a numerical example given in Table 4.1¹¹. In India, average yields on government securities fell from 12% in 2001 to 7% at the end of 2002, and to 5.5% in 2003, this resulted in enormous price gains for holding institutions, and presented a profit making opportunity for those who could anticipate the decline. However, when yields again rose to 8.5% in 2006, there was a reduction in prices leading to losses.

Table 4.1: Effect on Price Risk

<i>Effect of Maturity on Price Risk</i>					
<i>Present value of a 7% bond, paying bi-annual interest and face value Rs.100</i>					
	<i>Maturity in years</i>				
<i>Required yield %</i>	<i>1</i>	<i>10</i>	<i>20</i>	<i>30</i>	<i>Perpetual bond</i>
5	101.93	115.59	125.10	130.91	140.00
6	100.96	107.44	111.56	113.84	116.67
7	100.00	100.00	100.00	100.00	100.00
8	99.06	93.20	90.10	88.69	87.50
9	98.13	86.99	81.60	79.36	77.78

Note: 1. When coupon = required yield, present value=face value

2. When coupon is greater than required yield price increases with maturity, but at a decreasing rate and vice versa.

Effect of Coupon Rate on Price Risk

Present value of a bond, paying bi-annual interest, face value Rs. 100 and 20 years maturity

	<i>interest rate increase by 1%</i>	<i>%price</i>	<i>interest rate decrease by 1%</i>	<i>%price</i>
<i>Coupon %</i>	<i>7%</i>	<i>8%</i>	<i>change</i>	<i>7%</i>
5	78.64	70.31	-10.60%	78.64
6	89.32	80.21	-10.20%	89.32
7	100.00	90.10	-9.90%	100.00
8	110.68	100.00	-9.65%	110.68
9	121.36	109.90	-9.44%	121.36

Note: The percentage price change, positive and negative is progressively lower with higher coupon rate and vice versa.

¹¹ This example has been adapted from Fisher & Jordan (2006). It is recommended that all readers work out this example using a spreadsheet, as it aids in understanding the concept. This can be done using the PV function in EXCEL for given maturities, and for perpetual bond the formula is coupon amount/discount rate in decimals.

Reinvestment risk is the loss in return due to lower reinvestment rate for the periodic cash flows received as interest payments. There is no reinvestment risk in very short-term instruments and cumulative or zero coupon bonds. Yield to maturity (IRR) is calculated with the assumption that periodic cash flows are reinvested at the same rate. When interest rates in the economy fall, the reinvestment income is lower, which reduces the realised yield. Similarly, when interest rates in the economy rise the coupons received can be reinvested at higher rates, which increases the realised yield. When reinvestment rates are not the same, the yield can be calculated as follows:

First calculate the end value of the investment (for t holding periods) by compounding all cash flows as per the assumed reinvestment rates. The ratio of the end value, to the beginning value is called the *value relative*. The yield is computed as:

$$(1 + r) = \sqrt[t]{\frac{V_t}{V_0}}$$

For example, if a 10% coupon, Rs. 1000 face value bond is purchased at par and is to be held till maturity, since it is to be held till maturity and interest rates in the economy are currently 10%, the coupon received after one year can be reinvested at 10%, so the yield will be 10%. However, if interest rates in future go up to 11%, the coupon received will be reinvested at a higher rate and yield will go up.

$$\begin{aligned} V_t &= V_2 = (1000 \times 10\%) \times (1 + 11\%) + 1000 \times (10\%) + 1000 = 1211 \\ (1 + r) &= \sqrt{(1211/1000)} = 1.10045 \end{aligned}$$

$$\text{Yield} = r = 10.045$$

It would be obvious from the foregoing discussion, that price risk and reinvestment risk move in opposite directions. The combined effect could be positive or negative depending on the change in interest rate, maturity and holding period. It is possible to balance these two risks in practice, as will be seen in the chapter on bond management.

Zero coupon bonds have price risk, but no reinvestment risk as there are no coupons that need to be reinvested. Floating rate bonds on the other hand have almost no price risk, because the coupons keep pace with current market yields. However, when interest rates decline, the coupons also decline.

The relationship between bond prices and yields is very beautifully explained in Malkiel's¹² bond pricing theorems¹³.

Theorem 1: Bond prices move inversely to bond yields.

Theorem 2: for a given change in yield from the nominal yield, changes in bond prices are greater, the longer is the term to maturity.

¹² Burton G. Malkiel. Expectations, Bond Prices, and the Term Structure of Interest Rates, The Quarterly Journal of Economics, Vol. 76, No. 2 (May, 1962), pp. 197-218. <http://www.jstor.org/stable/1880816>

¹³ For simple mathematical proofs refer to A Simple and Student-Friendly Approach to the Mathematics of Bond Prices, Edward R. Lawrence and Siddharth Shankar Florida International University. 0747-5535/07/1400/0091 Copyright 2007 University of Nebraska—Lincoln

Theorem 3: The percentage price changes described in theorem 2 increase at a diminishing rate as N increases.

Theorem 4: Price movements resulting from equal absolute (or, what is the same, from equal proportionate) increases and decreases in yield are asymmetric; i.e. a decrease in yields raises bond prices more than an increase in yields lowers prices.

■ THEORIES OF INTEREST RATE

Interest rates vary due to macroeconomic factors and factors that are intrinsic or specific to a given security. We can study the change in interest rates over time due to macroeconomic changes, while holding the intrinsic characteristics of the securities constant. We will also study the differences in interest rates due to intrinsic factors holding macroeconomic factors as constant i.e., at a particular point of time in the next chapter. Intrinsic factors include maturity, default risk, taxability, and marketability/liquidity. Two theories regarding the macroeconomic influences on interest rates are the Loanable Funds Theory and the Liquidity Preference Theory.

Loanable Funds Theory

According to the loanable funds theory, the level of interest rates is determined by the supply and demand for loanable funds. Sources of supply and demand for loanable funds are households, corporate sector and government as discussed in Chapter 3. When interest rates are lower, individuals borrowers are willing to borrow more money for purchasing property, cars etc. and corporate borrowers are willing to borrow more as long as they can earn a reasonable return on investment. When interest rates are high, some borrowers may postpone their purchases and others may limit the amount borrowed. Lenders on the other hand would prefer to lend more when interest rates are higher. In other words, demand is inversely related and supply is positively related to interest rates. As a result we have a downward sloping demand curve and an upward sloping supply curve for loanable funds.

In each segment of the market, depending on the maturity period and risk level, the interest rate will be set by the equilibrium between demand and supply. This is depicted in Figure 4.8, in the given market segment, the equilibrium interest rate is I_1 . If the demand for money increases, the demand curve will shift to the right from D_1 to D_2 and interest rates will rise from I_1 to I_2 . Similarly, increase in the supply will result in a shift in the supply curve to D_3 and decrease in interest rates to I_3 . Analysts try to predict future demand and supply in order to estimate the future direction of interest rates. For example, forecasters in India know that demand for money in the agricultural sector coincides with the sowing season and purchase of fertilisers, while supply of money increases after the harvest. Demand for money also increases when bulk purchases of crude oil are made.

The Liquidity Preference Theory

The liquidity preference theory explains the effect of changes in income, price level and money supply on interest rate levels. In most countries including India, the money supply

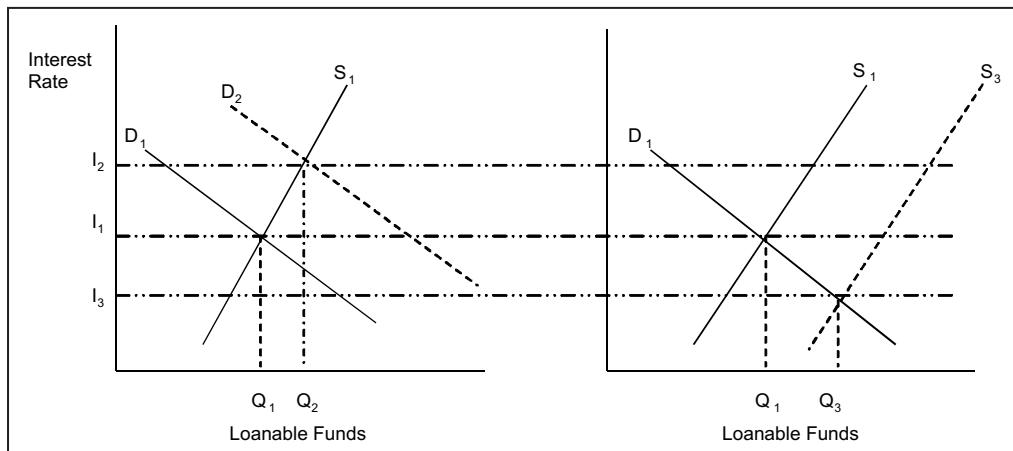


Figure 4.7: Loanable Funds Theory

is determined by its monetary policy. If we assume that money supply as a policy variable determined by the monetary policy, we can take it as fixed and show it as a vertical line as in Figure 4.9.

Demand is influenced by the desire to have liquidity versus investing the money in bonds. As interest rates increase, the reward for investing money goes up and demand for liquidity (holding cash) falls, i.e. interest rate and demand for money are negatively related. Higher incomes mean more demand for money as a medium of exchange, i.e. income level represented by GNP at an aggregate level and demand for money are positively related. If we assume that people want to hold the same real amount of money, with inflation, people will need to hold larger money balances i.e. inflation and demand for money are positively related. So the nominal rate of interest is a function of money supply (-), income (+), and inflation(+) and the real rate of interest is a function income and money supply. Demand is shown as downward sloping in Figure 4.9. The point of equilibrium is at the intersection of demand and supply and interest rate is I_1 .

If there is an increase in demand for money the demand curve will shift upwards from D_1 to D_2 and interest rates will rise to I_2 . If there is an increase in money supply, the supply curve S_1 shifts to the right to S_3 and interest rates fall to I_3 . Similarly, decrease in demand will lead to lowering of interest rates and decrease in money supply will result in increased interest rates.

Generally, the interest rates are determined by the demand and supply for money. In India, the RBI can influence the interest rates¹⁴ through direct and indirect means. It can influence the demand and supply of loanable funds through issue/purchase of government securities and can increase or decrease the money supply by Changing Reserve Requirements (i.e. SLR and CRR); it can also directly influence the interest rate by changing the REPO rate or through moral suasion.

¹⁴ Interest rates are one of the tools of monetary policy.

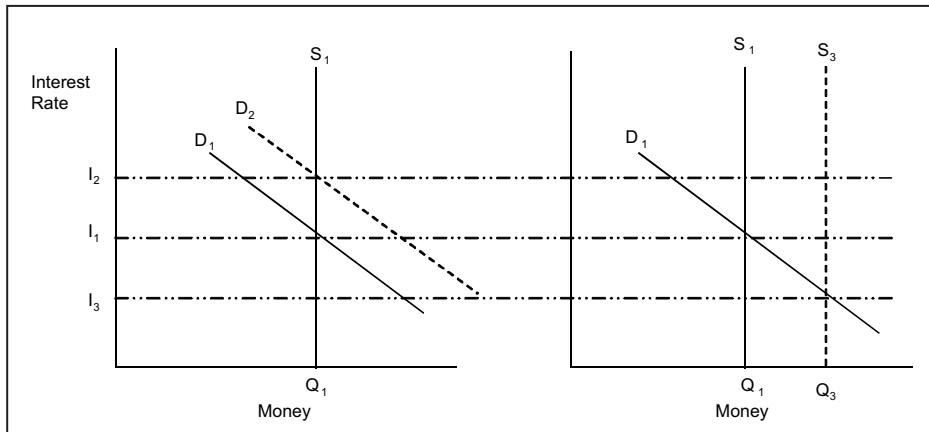


Figure 4.8: Liquidity Preference Theory

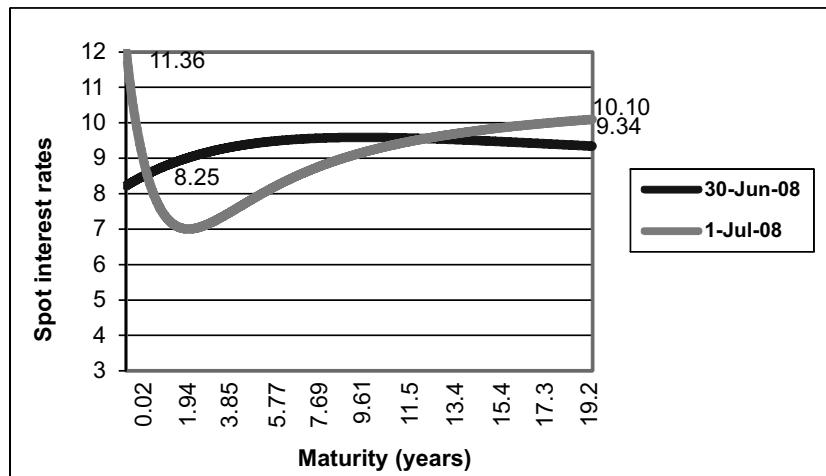
■ THE YIELD CURVE

The *yield curve* or term structure of interest rates is the relation between the interest rate (or returns on lending) and the time remaining to maturity for a particular issuer or debt of the same credit quality. It shows the rate at which market participants are willing to transact in the short, medium and long-term. Yield curves are built from prices available in the bond market; a set of yields to maturity for bonds with varying maturities can be plotted with maturity on the X axis and yield on the Y axis and a curve fitted on the scatter plot. The annualised percentage return available on government securities for various maturities can easily be plotted, as the risk is the same across all maturities. It is more difficult to construct a yield curve for corporate bonds, as it requires bonds of various maturities with identical credit ratings. As prices of debt securities and their yields fluctuate every day based on market perceptions, a yield curve needs to be drawn for each day. As can be seen in Figure 4.10. The shape of the yield curve can be very different on consecutive days. The yield curve for government securities is used as a benchmark for pricing other securities, and is also used by analysts to understand conditions in financial markets, and make forecasts of economic conditions and interest rates. Since most of the government securities in India are coupon-bearing securities, the NSE uses a sophisticated method to derive the spot interest rates from frequently traded coupon bearing government securities in order to plot the zero coupon yield curve¹⁵.

Shape of Yield Curves

Under normal conditions, the yield curve slopes gently upward, as investors who risk their money for longer periods expect higher yields than those who risk their money for shorter-time periods. It has also been noticed that yield curves tend to move together in almost parallel upward and downward shifts. However, the yield curve can have other shapes which may convey economic conditions that are different from normal times.

¹⁵ Details on the method of computation may be seen on the NSE website.



Source: NSE

Figure 4.9: Estimated Zero Coupon Yield Curve

Steep yield curve

Historically, the 20-year yield has averaged approximately 2 to 3 per cent above that of three-month Treasury bills. In situation, when this gap increases, the economy is expected to improve quickly in the future and steeper curves may be observed at the beginning of an economic expansion. Short-term rates are lower because the economy was stagnating, but future expectations justify much higher long-term rates.

Flat or humped yield curve

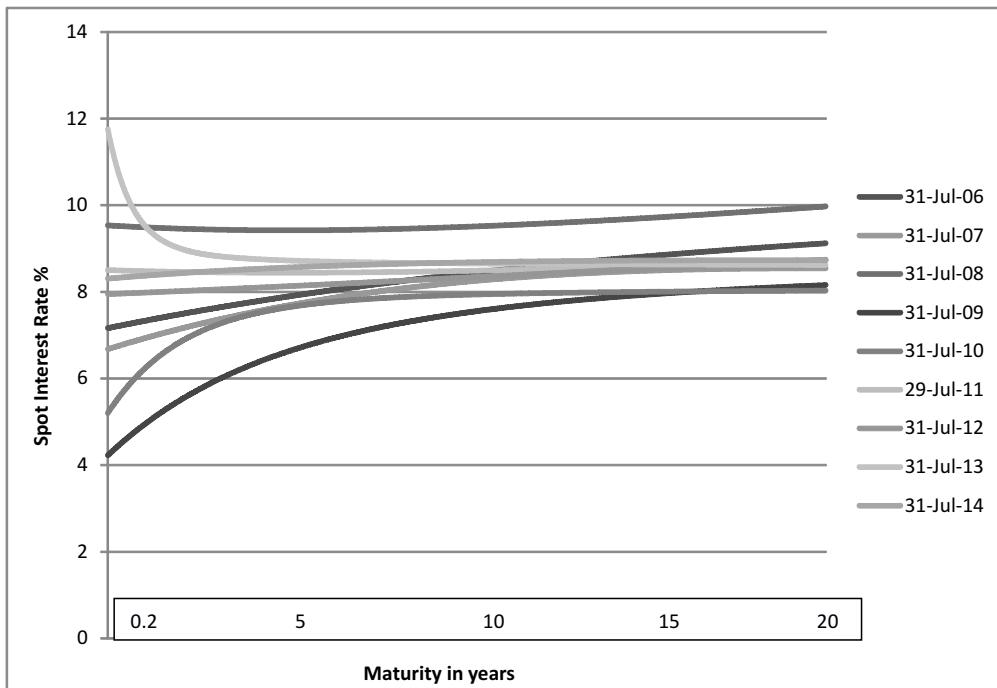
A flat yield curve is observed when all maturities have similar yields, whereas a humped curve results when short-term and long-term yields are equal and medium-term yields are higher than those of the short-term and long-term. A flat curve sends signals of uncertainty in the economy. This mixed signal can revert back to a normal curve or could later result into an inverted curve.

Inverted yield curve

An inverted yield curve is downward sloping i.e., interest rates are higher for shorter maturities than for longer maturities. They are normally caused by increase in short-term rates whereas the long-term rates remain approximately the same. This could be due to raising of the repo rate by the central bank to signal a higher reference rate and reduce speculative pressures and inflation. An inverted yield curve could also signal a forthcoming recession, and strongly inverted yield curves have historically preceded economic depressions¹⁶. In addition to potentially signalling an economic decline, inverted yield curves also imply that the market believes inflation will remain low. This is because, even if there is a recession, a low bond yield will still be offset by low inflation.

¹⁶ Arturo Estrella & Frederic S. Mishkin, The Yield curve as a predictor of U.S. recessions. Federal Reserve Bank of New York, Current Issues in Economics and Finance, Volume 2, No. 7, June 1996. accessed on 25 Aug 2007. http://www.newyorkfed.org/research/current_issues/ci2-7.pdf.

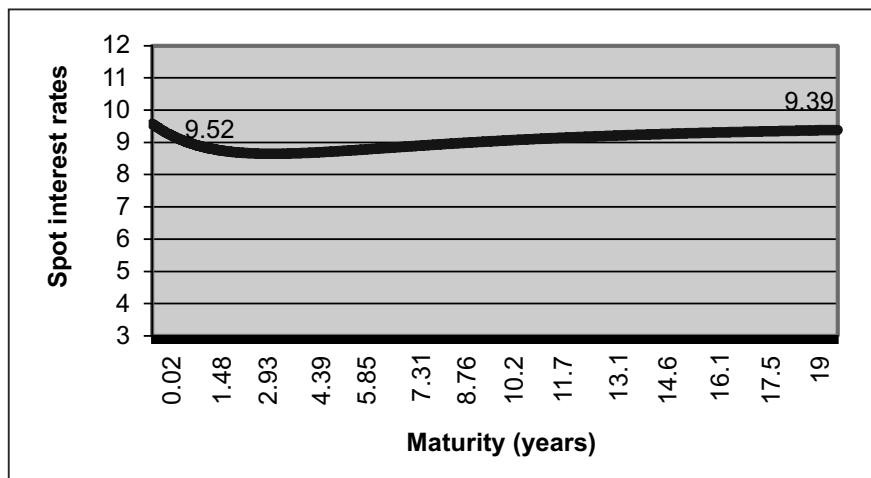
Estimated yield curves for Indian government securities as at the end of July are depicted in figure 4.10. It has been observed that the magnitude and frequency of fluctuations in yields is more in the lower maturities. However the impact of fluctuations on prices is more for the longer maturities.



Source: NSE

Figure 4.10: Estimated Zero Coupon Curve

Figure 4.11 shows a yield curve that is almost flat.



Source: NSE

Figure 4.11: Estimated ZCYC June 26, 2008

There are three theories that attempt to explain the shape of yield curves.

Market expectations hypothesis

This hypothesis suggests that the shape of the yield curve depends on market participants' expectations of future interest rates. It assumes that the various maturities are perfect substitutes and that rates on a long-term instrument are equal to the geometric mean of the yields of shorter-term instruments. This means that an investor with a twenty-year horizon would demand a yield equal to that of twenty future yearly reinvestments. While this theory can explain the fact that yields tend to move together and why yield curves slope downward when short-term rates are high (people expect rates to fall in the future), it fails to explain the persistence of upward sloping yield curves, which imply that investors generally expect interest rates to move up in the future.

Liquidity preference theory

The Liquidity Preference Theory asserts that long-term interest rates reflect investors' assumptions about future interest rates and also include a premium for holding long-term bonds, i.e., the liquidity premium. This is to compensate investors for the risk of parting with their money for a longer period, during which there is greater uncertainty. This can explain the upward sloping yield curve because the risk to be compensated is higher for long-term bonds.

Market segmentation theory

This theory states that financial instruments of different terms are not substitutes and each market segment has its dynamics of demand and supply. Investors who need liquidity will prefer short-term instruments, while institutions offering long-term insurance products would need to keep a part of their portfolio in long-term instruments. Higher demand implies higher prices and lower yield implying that short-term instruments are normally in greater demand. However, if the demand and supply in the various segments are independent, the theory cannot explain the observed fact that yields tend to move together.

■ SUMMARY

Debt markets are important for mobilizing capital; all over the world and in India, debt markets are larger than the stock market. The market for debt securities can be broadly divided into government and corporate bonds. Various types of bonds are available—unsecured and secured bonds, coupon bonds, deferred interest bonds, zero coupon bonds, step up bonds and floating rate bonds. Some have special features, like call and put options, or may be created through securitisation of loan receivables. Bond yields can be measured in terms of nominal yield, current yield and yield to maturity/call/put.

Bonds are subjected to two sources of systematic risk, the rate of inflation and the interest rates in the economy. The interest rate risk can be further divided into the price risk and reinvestment risk. Two theories regarding the macroeconomic influences on interest rates are the Loanable Funds Theory and the Liquidity Preference Theory.

The yield curve shows the relation between the interest rate and the time remaining to maturity for debt of the same credit quality. The yield curve may be upward sloping, flat or inverted. There are three theories regarding the shape of yield curves, the market expectations hypothesis, liquidity preference theory and the market segmentation theory.

SOLVED EXAMPLES

- Mr X invested Rs 5 lakh in two year bonds offering a coupon of 9 % and planned to reinvest the coupons to get a lump sum at the end of the period. What was his realised return if interest rates dropped to 7 % after six months and remained unchanged thereafter?

Ans: The coupon received at the end of the first year can only be reinvested at 7 %

$$\text{Realised return} = ((9 * 1.07 + 109) / 100)^{(1/2)} - 1 = 1.089 - 1 = 0.089 = 8.9\%$$

- A 3 year bond with 10% coupon rate is currently available for Rs. 98.28. It is callable after 2 years at Rs 100. What is the yield to call?

Ans: $98.28 = 10/(1+r) + 110/(1+r)^2$ solve for r using trial and error. $R = 11\%$

- A 15% preference share of XYZ Ltd is priced at 160, and another 13% preference share of ABC Ltd is priced at Rs 140. Both have face value of Rs 100. Which has a higher yield to maturity?

Ans: For XYZ $160 = 15/\text{yield} \Rightarrow \text{yield} = 15/160 = 0.09375$ or 9.375%

For ABC $140 = 13/\text{yield} \Rightarrow \text{yield} = 13/140 = 0.09285$ or 9.285%

- A one year bond offers a nominal rate of return of 12%, if expected inflation is 10% what is the real rate of return?

Ans: $(1.12/1.1 - 1) * 100 = 0.018 * 100 = 1.8\%$

- You are thinking of buying ABC Motor irredeemable preference shares of Rs 5000 par value, currently available in Rs 5800 that will pay a dividend of 14%. What price should you pay for the preference share if you desire a return of 17 %?

Ans: dividend = $0.14 * 5000 = 700$

Price = $700 / 0.17 = 4117.65$

- A zero coupon bond with maturity value of Rs 100 maturing in 2 years is available for Rs. 90. What is the yield to maturity?

Ans: $90 = 100 / (1+r)^2$ solve for r. $R = (100/90)^{1/2} - 1 = 1.05409 - 1 = 5.41\%$

- A zero coupon bond with face value Rs 100 is maturing in 2 years. If yield to maturity is 10% What is the fair price today?

Ans: $100 / (1.1)^2 = 82.644$

- A 15% preference share of XYZ Ltd. with face value 100 of XYZ Ltd is priced at 160, and another 13% preference share of ABC Ltd is priced at Rs 140. Which has a higher yield to maturity?

Ans: Price= dividend/YTM therefore YTM=dividend/price

$$\text{For A} = 15/160 = 0.09375 = 9.375\%$$

$$\text{For ABC} = 13/140 = 0.09285 = 9.285\%$$

9. A bond with face value of Rs 100 is available for Rs. 95. What is the relationship between nominal yield, current yield and yield to maturity?

Ans: We know the current yield always lies between nominal yield and yield to maturity. We also know that price will be lower than face value when the discount rate or YTM is greater than coupon or nominal yield. Therefore in this case, the nominal yield <current yield <YTM.

10. What is the fair price for a perpetual bond with Rs 11 annual coupon if the required yield is 10%?

$$\text{Ans: } 11/0.10 = \text{Rs } 110$$

11. Govt of Karnataka 10% coupon Krishna Bhagyatala Nigama Ltd. BondsA series issued on 15th Feb 2014 is redeemable in 2 equal installments on 15 feb 2023 and 2024. What is the fair value of the bond if required return is 10%, 9%, 11%?

Ans: Assume face value of Rs 100 or we can say for every Rs 100 invested

Cash flows at the end of each year are 10% interest for first 8 years =Rs10, ninth year 10+50 = Rs 60 and tenth year 5+50=Rs 55

End Year	Cash flows	to get PV	R=10%	R=9%	R=11%
1	10	$/(1+r)$	9.09	9.17	9.01
2	10	$/(1+r)^2$	8.26	8.42	8.12
3	10	$/(1+r)^3$	7.51	7.72	7.31
4	10	$/(1+r)^4$	6.83	7.08	6.59
5	10	$/(1+r)^5$	6.21	6.21	6.21
6	10	$/(1+r)^6$	5.64	5.96	5.35
7	10	$/(1+r)^7$	5.13	5.47	4.82
8	10	$/(1+r)^8$	4.67	5.02	4.34
9	60	$/(1+r)^9$	25.45	27.63	23.46
10	55	$/(1+r)^{10}$	21.20	23.23	19.37
		Total	100.00	105.92	94.56

12. In the above example if all principal payments were at maturity what would the present value be?

Ans:

End Year	Cash flows	to get PV	R=10%	R=9%	R=11%
1	10	$/(1+r)$	9.09	9.17	9.01
2	10	$/(1+r)^2$	8.26	8.42	8.12
3	10	$/(1+r)^3$	7.51	7.72	7.31

Contd...

4	10	$/(1+r)^4$	6.83	7.08	6.59
5	10	$/(1+r)^5$	6.21	6.21	6.21
6	10	$/(1+r)^6$	5.64	5.96	5.35
7	10	$/(1+r)^7$	5.13	5.47	4.82
8	10	$/(1+r)^8$	4.67	5.02	4.34
9	10	$/(1+r)^9$	4.24	4.60	3.91
10	110	$/(1+r)^{10}$	42.41	46.47	38.74
		Total	100.00	106.13	94.39

13. If the price of the bond in question 2 is Rs 102 in the market what is the yield to maturity?

Ans: This can be done using trial and error, using the built in excel function RATE or IRR and using a short cut method

Using the short cut to estimate YTM

$$\text{YTM} = \text{Lower interest rate} + (\text{Higher calculated value} - \text{Market value}) * \text{difference in rates} / (\text{higher value} - \text{lower value}) = .09 + (106.13 - 102) * (.01) / (106.13 - 100) = .0967 = 9.67\%$$

Using in built function rate = RATE(10,10,-102,100)=9.68%

Using IRR = =IRR(B21:B31,10%) = 9.68%

14. A bond with face value Rs 1000 and 10% coupon is available at Rs 900. The investor pays 30% tax on interest payments and 20% tax on capital gains. If the bond is held till maturity, what is the present value if required return is 10% after tax? What is the YTM?

Ans: After tax on the coupon cash flow=100-30%tax =Rs 70 every year

Capital gain tax =(1000-900)*.2=20 principal amount after tax=980 +coupon after tax 70=Rs 1050 in the last year

End Year	Cash flows	to get PV	R=10%
1	70	$/(1+r)$	63.64
2	70	$/(1+r)^2$	57.85
3	70	$/(1+r)^3$	52.59
4	70	$/(1+r)^4$	47.81
5	70	$/(1+r)^5$	43.46
6	70	$/(1+r)^6$	39.51
7	70	$/(1+r)^7$	35.92
8	70	$/(1+r)^8$	32.66
9	70	$/(1+r)^9$	29.69
10	1050	$/(1+r)^{10}$	404.82
		Total	807.95

YTM using built in formulae in excel =IRR(N21:N31,0.1)=8.38%

■ MULTIPLE CHOICE QUESTIONS

1. Which of the following form part of systematic risk ?
 - (a) Default risk
 - (b) Purchasing power risk
 - (c) Liquidity risk
 - (d) All of the above
2. The term STRIPS is the short form for
 - (a) Separate Trading of Registered Interest and Principal Securities
 - (b) Short Term Returns in Public Securities
 - (c) Short Term Risk in Private Stocks
 - (d) None of the above
3. Which of the following investments are risk free ?
 - (a) central government bonds
 - (b) zero coupon bonds
 - (c) floating rate bonds
 - (d) none of the above
4. Which of the following statements is not correct
 - (a) When a bond sells at par, its current yield=coupon rate=yield to maturity
 - (b) When it sells at a discount, its yield to maturity < current yield <coupon rate
 - (c) When it sells at a premium, its coupon rate > current yield > yield to maturity
 - (d) All of the above
5. Which of the following statements is not correct
 - (a) Price risk of debt securities increases with longer maturities
 - (b) Price risk is proportionate to the increase in maturity.
 - (c) Price risk is higher for debt securities with lower the coupon rate.
 - (d) None of the above
6. Which of the following statements is correct
 - (a) Systematic risk is the risk of the system failing
 - (b) Unsystematic risk protects against systemic failures
 - (c) Unsystematic and systematic risk can be diversified in portfolios
 - (d) None of the above
7. When interest rates in the economy rise which of the following is true if all other things are the same
 - (a) Price of a 12 year 8% bond will fall less than the price of a 10 year 8% bond

- (b) Price of a 12 year 8% bond will fall more than the price of a 10 year 8% bond
(c) Price of a 12 year 8% bond will fall to the same extent as a 10 year 8% bond
(d) none of the above
8. Which of the following is true (mark each correct option)
(a) Nominal yield incorporates capital gain/loss if any
(b) Current yield incorporates capital gain/loss if any
(c) Yield to maturity incorporates capital gain/loss if any
(d) None of the above
9. When interest rates in the economy rise which of the following is true
(a) Price of a 12 year 6% bond will fall less than the price of a 12 year 8% bond
(b) Price of a 12 year 6% bond will fall more than the price of a 12 year 8% bond
(c) Price of a 12 year 6% bond will fall to the same extent as a 12 year 8% bond
(d) None of the above
10. Which of the following is true
(a) Yield curves are always upward sloping
(b) Central government bonds are risk free
(c) Inflation reduces nominal amount received
(d) None of the above
11. Interest rates are expected to continue declining, if all other things are equal which is most likely to be called
(a) A bond with current yield=yield to maturity
(b) A bond with current yield >yield to maturity
(c) A bond with current yield <yield to maturity
(d) Information is incomplete
12. Interest rates are expected to continue rising, if YTM, maturity and call option is same for following three bonds, which is more likely to be called
(a) A fixed coupon bond
(b) A floating rate bond
(c) A zero coupon bond
(d) Information is incomplete
13. A 4 year Rs 100, 8 percent coupon bond that is available for Rs 100 has YTM of
(a) 6 percent.
(b) 8 percent.

- (c) 10 percent.
(d) none of the above
14. A zero coupon bond with Rs 1000 face value with maturity after one year is available for Rs 800 has YTM of
(a) 10 percent.
(b) 15 percent.
(c) 20 percent.
(d) 25 percent.

■ QUESTIONS

1. Which of the yield curve theories can explain
 - (a) upward sloping yield curves
 - (b) inverted yield curves
 - (c) parallel movement of yield curves
2. Explain the following
 - (a) bank rate
 - (b) repo rate
 - (c) prime lending rate
 - (d) nominal rate
 - (e) real rate
 - (f) benchmark rate.
3. Explain briefly two methods by which the RBI can increase interest rates in the economy.
4. “Central Government bonds are risk free.” Discuss why or why not.
5. When might an individual investor prefer a step-up bond or a deferred interest bond to a regular bond?
6. When a bond is selling at a discount to face value, what is the relationship between the nominal yield, current yield and yield to maturity?
7. Does a floating rate bond have price risk and reinvestment risk?
8. Does a zero coupon bond have price risk and reinvestment risk?
9. When interest rates in the economy are expected to go up, should individuals opt for fixed or floating rates for
 - (a) housing loans
 - (b) debt funds
10. Bond A has a coupon of 8% and bond B 9%, they have the same maturity and are priced to give the same YTM. Which has higher reinvestment risk? Why?

11. Bond A and B have 3 and 10 years to maturity, but offer the same coupon of 8%. Do they have the same reinvestment risk? Why?
12. The RBI is expected to announce an increase in interest rates. Should an investor invest in T-bills or in a 20 year government bond? Why?
13. The RBI announces an increase/decrease in CRR, what is the expected impact on interest rates? Why?
14. Can the three hypotheses explain a downward sloping yield curve?
15. What does a steep upward sloping yield curve imply?
16. Interest rates in the economy are expected to fall, what would you advise a short-term investor and a long-term investor and why?
17. Interest rates in the economy are expected to rise. Which type of bond would you recommend to a long-term investor and why?
18. A bond is quoting at a discount to its face value. What is the relation between coupon, current yield and YTM?
19. Which has greater price risk a 5% coupon bond, a 10% coupon bond or a zero coupon bond with the same maturity?
20. The yield curve in India was almost flat and sometimes downward sloping following the sub-prime crisis in USA. Can the yield curve theories explain this?

■ PROBLEMS

1. What is the fair price for 9% coupon bond with three years to maturity if similar bonds are offering 10%?
2. What is the YTM of an 8% coupon bond with two years to maturity available for Rs. 98?
3. What is the fair price of a three year deep discount bond with face value Rs. 1000 if yields in the economy are 10%?
4. A deep discount bond with face value Rs. 100, maturing in 2 years was purchased for Rs. 79.92. What is the yield to maturity?
5. If the interest rate is 8% and expected inflation is 5% in the first year and expected interest 20% and inflation 12% in the second year. What is the expected two-year real rate of interest?
6. Mr X and Mr. Y invested in 8% three year bonds. Mr X chose the cumulative option, while Mr. Y took the annual coupons and kept the money safely in his bank locker. What was the YTM and realised return in each case if interest rates did not change?
7. In question 6 above, what is the YTM and realised yield in each case if interest rates fell to 6% immediately after the bond was purchased and Mr. Y reinvests the coupons?
8. A 12%, 3-year bond is available for Rs. 97.64. What is the nominal yield, current yield and yield to maturity?

9. 10% preference share of ABC Ltd is priced at Rs 120, and 9% preference share of XYZ Ltd is priced at Rs 100. Which one is preferable?
10. What is the yield to call for a 9%, 10-year bond with par value of Rs. 100, and callable after 2 years at 105, if interest rates in the economy are 7%? The bond is currently available at Rs. 114.05?
11. What is the present value of a 10%, 4-year bond with semi-annual coupon payments if current rates of interest are 8%?
12. ABC Ltd. issued zero-coupon bonds with a face value of Rs 3,00,000 maturing in four years. How much did ABC receive for its bonds if interest rate is 10%?
13. What should be paid for a 5 year zero coupon bond if interest rates in the economy are 10%? At what price can it be sold if interest rates rise to 15% after 3 years? Assume future value of Rs 1000.
14. The yield on zero coupon bonds is given below:
 - (a) 3 year bond 7.2%
 - (b) 2 year bond 6.9%
 - (c) 1 year bond 6.1%What is the forward rate for the third year?

15. Ludhiana Municipal Corporation issued 11.5% non convertible debentures redeemable in 3 installments 30% , 30% and 40% at the end of year 5,6 and 7 respectively. What is the fair value of the bond if required return is 10%? What is the YTM if this bond is available for Rs 110

■ PRACTICAL EXERCISES

1. Visit the NSE site, take a look at a plot of the latest yield curve. What is the shape? What is the difference between yields at the highest and lowest maturity?
2. Find out when the RBI announced the latest increase/decrease in Repo rates, look at the yield curves a month before and a month after the announcement. What do you expect and what do you observe?

APPENDIX 1

Sum of a perpetual geometric progression.(GP)

In our example of a perpetual annuity where cash flow C is received every year and we discount these cash flows with discount rate i to get present value as follows:

$$C/(1+i) + C/(1+i)^2 + C/(1+i)^3 + \dots + C/(1+i)^\infty$$

The sum of a perpetual GP in the standard form is written as

$$a + ar + ar^2 + ar^3 + \dots + ar^n + ar^\infty$$

$$= a(1-r^n)/(1-r)$$

But when $r < 1$, r^n will = 0

And the sum of the GP will become $a/(1-r)$

$$= \{C/(1+i)\} / \{1 - 1/(1+i)\} = C/i$$

CHAPTER - 5

Unsystematic Risk

LEARNING OBJECTIVES

At the end of this chapter, you will be able to:

- Recognise company specific risks associated with debt issues
- Describe the process of credit rating
- Assess risk based on quantitative criteria such as ratio analysis
- Understand the concept of structured finance including asset securitisation
- Discuss the non-risk based factors that impact yields

In the previous chapter, we discussed systematic risk factors and their effect on interest rates and bond returns. Interest rates also differ between securities due to their intrinsic characteristics. These include default risk, term to maturity, tax treatment and marketability/liquidity. Risk that the issuer of the security will not have adequate resources to fulfil the contract (pay interest and principal on time) is known as the default risk. For this, the issuer has to pay a premium over and above the default free yield for a bond with the same maturity. As government bonds are assumed to be default-free, they normally offer lower return than corporate bonds. Within corporate bonds, unsecured debentures (not backed by a mortgage) are likely to have a lower rating than secured debentures of the same company, and will require payment of a higher risk premium. Short-term bonds have less risk of default because the near future is easier to predict. The easier, cheaper and faster an asset can be converted into money, the less the liquidity risk. Taxable securities need to offer higher return than tax free securities because the investor is ultimately interested in the net gain from investment. These aspects are discussed in detail in this chapter.

■ DEFAULT RISK

Default is defined as failure of the issuer to meet the terms of the debt contract. It implies that the bond holder gets less than was promised. This could range from delay in payment of interest and/or principal amount to non-payment or reduced payment on liquidation. Delayed payments result in lower realised returns for the holder because of the time value of money. When a company goes into liquidation there is not only a delay in payments, the amount received may also be lower than promised¹. Normally, before a company goes into liquidation, efforts are made to reorganise the payments in the hope that the company can turn around. *Default risk* is the risk that the company may not have sufficient cash flows to meet the debt obligation in the future. It has two components, namely business risk and financial risk.

Business risk refers to industry and company related factors that affect the company's operating cash flows. The risk comes from the sales side if revenues fluctuate due to trends, seasonality or business cycles. The risk is also on the cost side, if the fixed costs are high and do not get covered when sales fluctuate. Business risk varies from industry to industry, for example sales of luxury goods such as air conditioners are likely to fluctuate more than sales of essential food items. Business risk will also vary between companies in the same industry depending on the size of the company and the technology adopted. Business risk can be measured and compared across industries and companies using the coefficient of variation of operating income, which is calculated as the standard deviation of operating income/mean operating income.

Financial risk refers to company related factors based on the amount of debt taken by the company. Financial leverage allows equity-holders to earn higher returns; profits increase as

¹ Essar Oil issued partly convertible 12.5% debentures of Rs 190 each in April 1995. Of this, Rs 85 were converted into shares and Rs. 105 became 14 per cent non-convertible debentures in December 1997, to be redeemed in April 2003. Essar Oil started defaulting on interest payments from July 1998, and at the time of redemption offered to pay just Rs 55 per debenture, which was far less than 50% of principal and interest due. The other option given to investors was to accept 9.25 % interest with repayment over 22 years.

long as the rate of return from operations exceeds the interest rate and volume of operations is sufficient to cover the fixed financial expenses. If a company is confident of attaining high sales volumes, income and cash flows will be even higher due to financial leverage. However, if sales decline, income and cash flows will decline more than the decline in sales because of the fixed financial expenses. The greater the financial leverage, the greater the possibility of default. Thus, a company that has low business risk and steady operating income can afford to have higher financial leverage than a company with high business risk. Financial risk can be measured through ratio analysis, which is covered in detail later in this chapter.

■ CREDIT RATING²

Credit rating is the process of assessing the capability and willingness of a prospective borrower to meet debt obligations. This can be done for countries³, companies, mutual funds, specific debt and equity issues, real estate projects and individuals. One way of assessing the default risk of bonds is to consult the bond ratings assigned to them by independent credit rating agencies. Rating also helps the borrowers to establish their creditability and raise funds from the market at reasonable costs.

The credit rating agencies operating in India are Credit Rating and Information Services in India Ltd. (CRISIL), Investment Information and Credit Rating Agency (ICRA), Credit Analysis and Research (CARE), Fitch Ratings India Pvt. Ltd, Brickwork India Ratings India Pvt. Ltd., Onicra, SME Rating Agency of India (SMERA) and Credit Information Bureau (India) Ltd. (CIBIL). Credit ratings for debt are symbolic representations of the rater's current opinion on the relative credit risks associated with the specific debt issues. The bonds are graded using alphabets with plus or minus signs to show relatively higher or lower safety within the major grades. The rating scales used by CRISIL and ICRA and CARE for debt instruments and the definition of symbols for long-term instruments are given in tables 5.1 A and 5.1 B.

Table 5.1 A: Debt Rating Scales used by CRISIL and ICRA and CARE

	CRISIL	ICRA	CARE*
Long-term (Debentures, Bonds, Preference Shares, Structured Obligations**)			
Investment Grade			
Highest safety	AAA	LAAA	CARE AAA
High safety	AA	LAA	CARE AA
Adequate safety	A	LA	CARE A
Moderate safety	BBB	LBBB	CARE BBB
Speculative Grade			
Inadequate safety	BB	LBB	CARE BB
Risk prone	B	LB	CARE B

Contd...

² This section is largely based on information from the CRISIL, CARE and ICRA websites.

³ Eg. Moody's and Standard and Poor's (S&P) sovereign ratings.

Substantial risk	C	LC	CARE C
Default Grade	D	LD	CARE D
Medium-term (Fixed Deposits)			
Highest safety	FAAA	MAAA	
High safety	FAA	MAA	
Adequate safety	FA	MA	
Inadequate safety	FB	MB	
Risk prone	FC	MC	
Default	FD	MD	
Short-term (Commercial Paper)			
Highest safety	P1	A1	PR1
High safety	P2	A2	PR2
Adequate safety	P3	A3	PR3
Risk prone	P4	A4	PR4
Default	P5	A5	PR5

* CARE has the same symbols for long and medium-term securities
**structured obligations have credit enhancements such guarantees, escrow accounts for cash flows etc.

Table 5.1 B: Symbols Rating Definition for Long/Medium-term Instruments (CARE)

CARE AAA	Instruments with this rating are considered to be of the best credit quality, offering highest safety for timely servicing of debt obligations. Such instruments carry minimal credit risk.
CARE AA	Instruments with this rating are considered to offer high safety for timely servicing of debt obligations. Such instruments carry very low credit risk.
CARE A	Instruments with this rating are considered to offer adequate safety for timely servicing of debt obligations. Such instruments carry low credit risk.
CARE BBB	Instruments with this rating are considered to offer moderate safety for timely servicing of debt obligations. Such instruments carry moderate credit risk.
CARE BB	Instruments with this rating are considered to offer inadequate safety for timely servicing of debt obligations. Such instruments carry high credit risk.
CARE B	Instruments with this rating are considered to offer low safety for timely servicing of debt obligations and carry very high credit risk. Such Instruments are susceptible to default.
CARE C	Instruments with this rating are considered to be having very high likelihood of default in the payment of interest and principal.
CARE D	Instruments with this rating are of the lowest category. They are either in default or are likely to be in default soon.

Source: www.careratings.com

The return demanded by investors will be higher for securities with higher perceived risk as can be seen from table 5.2, the additional return over and above the risk free government bonds ranged from 0.55% to 4.88% in 2005-2006.

Table 5.2: Corporate Bond spreads over 1 year Government Securities (2005-06)

Rating	% spread
AAA	0.55
AA+	0.62
AA	0.84
AA-	1.17
A+	1.6
A	2.08
A-	2.66
BBB+	3.26
BBB	3.94
BBB-	4.88

Source: FIMMDA

According to a study by CRISIL⁴, the default rates were higher in bonds with lower ratings and in bonds with longer maturities.

CRISIL's latest study on default and transition rates showed that ratings continue to be ordinal, with highly-rated securities being much less likely to default than lower-rated ones.

■ MAJOR FACTORS IN CREDIT RATING PROCESS

In India, credit rating is done at the request of the issuer with its active cooperation. It is compulsory for public/rights issues of debentures with maturity/conversion longer than eighteen months. Rating is also compulsory for public deposits taken by NBFCs and for commercial paper. The aim is to determine the long-term fundamentals and the probabilities of change in these fundamentals, which could affect the creditworthiness of the borrower. Quantitative and qualitative criteria are used to examine key factors like the business, the management, competition, operational factors, the financial position and factors that are specific to the issue being rated. This may include published and unpublished information regarding past performance, company plans and strategies, market position, technological developments, personnel policies and track record of servicing past debt etc. The credit rating agency collects this data from the company, and other reliable sources such as industry and legal experts, bankers, customers and suppliers. The analysis includes absolute numbers, ratios, trends, and volatility of the unit being rated and comparison with industry standards and peers.

A debt rating should not be taken as an evaluation of the corporate entity; it is possible that two debt issues by the same company may receive different ratings⁵. In such cases, the instruments with lower maturity will normally have a higher rating as cash flows are assessable with more certainty. It is also important to keep in mind that ratings do not

⁴ <https://www.crisil.com/pdf/ratings/CRISIL-Default-Study-2015.pdf>

⁵ Icra ratings for CESC Ltd. in its September 2007 monthly bulletin were LA for long-term debt, MA+ for medium term debt and A1+ for short-term debt.

indicate the reasonableness of the return and nor are they recommendations to buy/sell etc. The ratings also do not reflect risks due to changes in market conditions, such as interest rates or liquidity. The inherent credit quality of an instrument may also change over time and if there are any significant developments in the future the ratings may be revised⁶. Rating agencies have started assigning rating outlooks to provide an idea of future rating movements. The outlook assigned may be positive, stable or negative. The factors considered in the rating process are explained with the methodology followed for long-term debt for manufacturing companies⁷.

The rating process for manufacturing companies takes into account economy factors such as the strategic nature of the industry, government policies and regulations that have a bearing on the industry. The industry factors studied include investment plans of the major players, demand supply factors, price trends, changes in technology, international/domestic competition, entry barriers, capital intensity, business cycles etc.

It assesses the company's business risk using key parameters such as diversification, and seasonal and cyclical nature, to assess the long-term fundamentals and size, market share, presence in market segments, access to funds etc to assess its ability to sustain in troubled times. Cost structure, efficiency of existing and future operations are studied and marketing and distribution arrangements may also be evaluated depending on the nature of the product.

Financial risk analysis involves evaluation of past and expected future financial performance with emphasis on assessment of adequacy of cash flows towards debt servicing. The audited and unaudited accounts are studied, and accounting policies relating to depreciation, inventory valuation, income recognition, valuation of investments, provisioning/write off etc. are given special attention. Disclosures of material events, auditors comments and off-balance sheet items are reviewed and quantified if considered necessary. The rating group also forms an opinion on the quality of the audit firms' reputation in the market.

Financial ratios are used to assess the company's financials and its performance relative to its peer group. The major ratios studied are trends in growth ratios, profitability ratios, turnover ratios, leverage and debt coverage ratios and liquidity ratios. Cash flows are assessed in great detail and financial flexibility in case of contingencies is also studied. Financial projections and debt servicing capability are studied in depth using sensitivity analysis.

Qualitative indicators studied include a study of the company's business plans, mission,

⁶ Tata Chemicals non-convertible debenture ratings were revised upwards from AA to AA+ in 2004 based on benefits expected to arise from Tata Chemicals' acquisition of Hind Lever Chemicals Limited and the improvement in Tata Chemicals' financial profile with reduction in debt levels and interest costs.

ICRA revised the rating of long-term debt of Tata Power Company Ltd from LAAA to LAA+. The rating for the commercial paper programme was, however, retained at A1+. This was primarily on account of the uncertainty associated with the Maharashtra Electricity Regulatory Commission deciding the company's tariff and the substantial expansions planned by the company.

ICRA downgraded pass-through certificates (PTC) issued by Indian Retail ABS Trust Series 58 in May 2008. The PTCs were backed by receivables from loans for financing commercial and multi-utility vehicles, originated by ICICI Bank. The delinquency level for this pool was higher than expected, which caused significant utilisation of credit enhancement.

⁷ Adapted and summarised from the CARE website, please see site for further details.

policies and future strategies in relation to the general industry scenario. The rater also studies the performance of group companies and track record of the management team and assesses the capability of management through personal meetings. The adequacy of the company's organisation structure, personnel policies and accounting and control systems are examined in keeping with the company's strategic goals.

The relative importance given to the various aspects studied varies with the type of issuer and the maturity of the instrument. For example, CARE gives special attention to the following industry specific factors:

Cement Industry: Proximity to raw material and markets because of bulk transportation costs. For this reason, regional demand and plant locations are also considered as important.

Commercial Vehicles: As demand is related to economic activity, a diversified product mix would lead to less volatility in sales. A wide distribution network and availability of spares at affordable rates would help in brand building. Technological advancement through international collaboration, and vendor development are also considered favourably.

Banks: The factors considered are very different from manufacturing companies. Quantitative factors include capital adequacy based on regulatory guidelines, asset quality in terms of sector wise exposures and recovery rate of loans, and percentage of assets classified as standard, substandard and doubtful. The resource base i.e. deposits are examined by source of deposits, cost, growth rate etc. as the ability to raise funds at competitive rates is important. Liquidity in terms of asset liability maturity and matching and earnings quality from fee based and fund based activities and their expected growth. Qualitative factors include ownership as banks in India fall into three categories public sector, private Indian and foreign. Modernisation and computerization and internal control systems for fraud prevention, and credit risk and foreign exchange risk management are also important.

The methodology used for credit rating of manufacturing companies is similar to the EIC analysis discussed in detail in the chapter on fundamental analysis. In the following sections, we will discuss some of the specific aspects taken into account for credit rating of debt issues in further detail. These are the debenture trust deed, the debenture redemption reserve and financial ratios.

The Debenture Trust Deed

*The debenture trust deed*⁸ is a legal document that contains the rights and obligations of the lender and the borrower. The deed is executed by a debenture trustee on behalf of the diverse body of debenture holders. The trustee is required to ensure that the company does not commit any breach of the covenants and provisions of the trust deed and take steps to remedy them. Debenture trustees are usually banks or financial institutions, and are responsible for protecting the interests of the debenture holders and redress their grievances. If the trustee considers at any time that the assets of the company are insufficient or likely

⁸ SEBI and Companies Act regulate the provisions relating to debentures, appointment of debenture trustees, their duties, creation of Debenture Redemption Reserve Account etc.

to be insufficient to discharge the principal amount as and when it becomes due, a petition may be filed with the Company Law Board to impose restrictions on the incurring of any further liabilities as it thinks necessary in the interest of the debenture holders. The company is also required by law to create a debenture redemption reserve (DRR) for the redemption of debentures⁹ with more than 18 months maturity. The DRR must cumulate to 50% of the amount of debentures issued before redemption commences. The trustees also supervise the implementation of the conditions regarding creation of security for the debentures and the debenture redemption reserve¹⁰¹¹. The rating agency studies the existing claims on assets and sees if the trust deed has clauses to protect the investors, which could include restrictions on further debt, subordination of new debt, restrictions on dividend payouts and restriction on sale of assets.

Debenture Redemption Reserve/Sinking Fund

In India, the Companies Act¹¹ requires every company which has issued debentures to create a Debenture Redemption Reserve (DRR) in order to protect the interest of debenture-holders. It requires that a company credit adequate amounts to DRR from its profits every year until such debentures are redeemed. The amounts credited to the DRR are not to be utilised by the company except for the redemption of debentures.

In some countries, companies create sinking funds to protect their debt holders. A fixed percentage of outstanding bonds is repurchased and extinguished every year. This may be done through open market purchases or a call feature associated with the sinking fund provision. Although this is for the protection of bond holders, as the debt gets gradually repaid over the years, it may actually work against their interests. The company will exercise the call option only if market prices are higher than the call price. In such cases, the bondholders called upon to surrender their bonds (done through random draw of lots) are getting less than they could have by selling their bonds in the market. On the other hand, if market prices are lower than the call price the company can simply buy bonds in the open market and extinguish them.

■ FINANCIAL RATIOS

The growth ratios, profitability ratios and turnover ratios are covered in detail in the chapter dealing with company analysis. Ratios that are most important for evaluating the safety of debt are the leverage ratios, coverage ratios and liquidity ratios. Since preference shares are hybrid securities

⁹ For public issues by manufacturing companies and NBFCs after December 13, 2000.

¹⁰ In practice, Debenture Trustees in India have not fulfilled their duties in the past. Even large institutional investors like UTI have had problems with ICICI, which was a trustee for many debt issues that it was holding. ICICI left investors in the lurch by transferring the trusteeship of more than 100 defaulting companies to a small unknown company. "The Western India Trustee and Executor Co. Ltd." This was also the case with trusteeship of debentures issued by Essar Oil, wherein the trustees did nothing for the hapless investors.

¹¹ Section 117C of the Companies Act, 1956, was introduced in 2000. The requirements are (a) All India financial institutions regulated by RBI and banking companies — public issue, nil; private placement, nil. (b) NBFCs and other financial institutions — public issue, 50 per cent; private placement, nil. (c) Manufacturing and infrastructure companies — public issue, 50 per cent; private placement, 25 per cent.

with features of debt and equity, ratios for evaluation of preference shares are also discussed in this section. At this point, we should also keep in mind that there is no ideal figure that we are looking for in the ratios studied as the requirements and conventions vary between industries¹².

Leverage Ratios

Leverage ratios measure the proportion of debt in comparison to other sources of capital such as equity and retained earnings. The higher the proportion of debt, the higher the financial leverage and possible profit volatility. One measure is the

$$\text{Debt Equity Ratio} = \frac{\text{Total Long Term Debt}}{\text{Equity} + \text{Retained Earnings}}$$

There are many variations in this simple concept; some analysts add preference shares to equity. Lease expenses can also be added to liabilities if we take the view that the same asset could have been financed with a long-term loan i.e., add the present value of lease obligations. The most conservative approach would be add all liabilities and exclude preference capital.

Net tangible assets to long-term debt measures the safety of the principal amount in case the company needs to liquidate its assets to pay the loan. It is calculated as:

$$\frac{\text{Tangible assets} - \text{Current liabilities} - \text{Deferred taxes}}{\text{Long Term Debt}}$$

Debt and Interest Coverage Ratios

The *interest coverage ratio* shows how many times the fixed interest cost is covered by earnings from operations.

$$\text{Interest coverage ratio} = \frac{\text{Earning Before Interest and Taxes (EBIT)}}{\text{Annual Interest Expenses}}$$

$$\text{Cash Interest Coverage Ratio} = \frac{\text{Operating Cash Flow} + \text{Interest}}{\text{Interest}}$$

The higher the interest coverage ratio, the safer the money lent. An interest coverage ratio of 4 means that even if the company's earnings drop to earns 25% of current earnings, the company will still be able to pay the interest.

The debt service coverage ratio is used to assess the financial ability of a borrower to meet all debt obligations namely interest and principal.

$$\text{Debt Service Coverage Ratio} = \frac{\text{EBIT}}{\text{Interest} + \{\text{Annual Loan Repayments}/(1 - \text{Tax Rate})\}}$$

Since the principal is paid from profits after tax, it is adjusted to reflect the earning before taxes. Some analysts add interest bearing current liabilities to these calculations.

The safety of the principal can also be assessed by studying the *net cash to total debt ratio*. The interest coverage ratio can be modified to reflect the point of view of preference share holders. The *preference dividend coverage ratio* shows how many times the fixed preference dividend is covered after payment of interest.

¹² Some authors refer to an ideal debt equity ratio of 1:2, and current ratio 2:1 etc.

$$\text{Preference Dividend Coverage Ratio} = \frac{\text{EBIT}}{\text{Interest} + \{\text{Preference Dividend}/(1 - \text{Tax Rate})\}}$$

Liquidity Ratios

Liquidity ratios are broad indicators of liquidity level and are important for rating short-term instruments.

$$\text{Current Ratio} = \frac{\text{Current Assets}}{\text{Current Liabilities}}$$

$$\text{Quick Ratio or Acid Test Ratio} = \frac{\text{Current Assets} - \text{Inventory}}{\text{Current Liabilities}}$$

The *quick ratio* or acid test ratio = (current assets – inventory)/current liabilities. The idea behind the quick ratio is that inventory may be difficult to sell or may take time to liquidate. The calculation of these ratios¹³ is illustrated in Example 5.1:

Example 5.1: XYZ LTD

	(Rs crore)
Year ending March 2006	
Net sales	3500
Other Income	<u>200</u>
	3700
Manufacturing & Other Exp	2900
Depreciation	<u>200</u>
	<u>3100</u>
EBIT	600
Interest	<u>100</u>
EBT	500
Taxes	-200
EAT	<u>300</u>
As on 31 March 2006	
Preference Shares	100
Equity	400
Reserves and Surplus	1200
Loans	1400
Deposits	100
Other Liabilities and prov	900
Total Liabilities	4100
Fixed assets	2500
Investments	400

Contd..

¹³ These and other ratios are given for ACC Ltd. in the chapter on company analysis.

Current Assets	1200
Misc exp not written off	0
Total assets	4100
Inventories	500
Sundry Debtors	200
Cash & Bank Balances	100
Loans and Advances	400
Total current Assets	1200

Assume loan repayment of Rs. 250 crore per annum, and tax rate of 40%.

Ratios	
Liquidity ratios give an idea about the short term solvency of a company:	
Current Ratio = Current Assets/Current Liabilities	1.33
Quick Ratio = (Current Assets- Inventory)/Current Liabilities	0.78
Cash Ratio = Cash / Current Liabilities	0.11
Leverage ratios show the extent of debt in the company's capital structure:	
Debt/ Equity Ratio (D/E) = Total Debt/Total Equity	0.85
Equity Multiplier = Total Assets/Total Equity	2.41
Coverage ratios show the ability to discharge financial obligations:	
Interest Coverage Ratio = EBIT/Interest	6.00
Cash Coverage (Interest) Ratio = (EBIT +Depreciation)/Interest	8.00
Debt Coverage Ratio= EBIT/ {Interest + Proportional Loan Repayment/(1-tax rate)}	1.16
Preference Dividend Coverage=Income before interest and taxes (EBIT) / {Annual interest expenses +Preference Dividend/(1-Tax rate)}.	5.25

■ NON-RISK FACTORS THAT INFLUENCE YIELDS

So far, we have discussed the risk factors that have a bearing on the required yield for a security. The non-risk factors that influence yields include call options, marketability and tax considerations.

Call Options

A call option allows the issuer to call back the bond at predetermined rates and dates. If interest rates in the economy decline, the issuer can call back bonds and borrow at cheaper rates. In such cases, the investors stand to lose as reinvestment of proceeds are at lower rates, which reduces the overall yield.

The Industrial Development Bank of India had issued 25 year deep discount bonds in March 1992 for Rs. 2700, with a maturity value of Rs 100000, with a put and call option after every five years. The entire issue was called back after 10 years in March 2002, at Rs 12000. This was necessary due to declining interest rates in the economy, the promised

yield to maturity was 15.5% whereas the IDBI was lending at 12.5 %. Although the yield to call was 16%, investors lost the high returns that were expected for the next 15 years.

In September 1997, Reliance Industries prepaid debentures with 14 to 17.5% interest and borrowed abroad between 7-9%. The company did not have a call option, but the debenture trust deed had a prepayment clause subject to approval of the trustees. This was beneficial for the company, but detrimental for investors.

Marketability

Marketability is the ability to buy and sell large quantities of bonds at almost the same price. This is possible only when the bonds are regularly traded. When bonds are not traded frequently the seller may have to offer a discount to sell the bonds, which will result in lowering of yields. The lower the spread between the bid (price at which the dealer is willing to buy) and ask (price at which the dealer is willing to sell) prices, the higher the marketability. The ability to buy and sell bulk quantities at quoted prices is also a sign of marketability. Such markets are also called deep markets. In India, there is an active secondary market for central government bonds, but the secondary market for other bonds such as state government and corporate bonds is not that well-developed.

Tax Considerations

Tax free interest: The government may grant tax free status to certain investments in order to attract investment in priority areas. For example, municipal bond issues are notified as tax free on a case to case basis¹⁴. RBI also offers 6.5% tax free relief bonds, which are available on demand.

Capital gain vs income tax: For deep discount bonds including STRIPS, every holder is required to make a valuation of the bond on the 31st March every financial year in accordance with RBI guidelines for valuation of investments and take the difference between the two values as income for the year. For bonds that are transferred before the maturity date, the difference between the sale price and the cost of the bond are taxable as capital gains in the hands of an investor or as business income in the hands of a trader. Non-corporate persons who invest small amounts in new DDB issues (face value up to Rs.1 lakh) can simply take the sale value minus cost without accounting for annual accrued interest. On final redemption, however, no capital gains will arise and the difference is treated as income.

■ MUNICIPAL BONDS

The Government of India has recognised the importance of funding of developmental municipal projects through private sources¹⁵. Municipal bonds are generally of two types, revenue bonds and general obligation bonds. *Revenue bonds* are tied to specified sources of

¹⁴ Notified bonds of local authority under section 10(15)(vii) e.g., Tax Free Municipal Bonds for an amount of rupees one hundred crores were notified for Ahmedabad Municipal Corporation, and rupees forty four crores eighty lakhs were notified for Corporation of Chennai, in 2004-05.

¹⁵ In order to encourage this, guidelines for issuing tax free bonds were issued in 2001 and 2006.

revenue from the facilities or services that were created. For example, if the water supply system is to be financed, the revenues from sale of water can be used to repay the loans. Revenue bonds can be viewed to some extent like any company in terms of its commercial viability. *General obligation* bonds do not have a specific revenue stream and depend on the general revenue stream of the issuing authority. For example, street lighting or rain water drainage facilities do not have specific user charges. Repayment of bonds for financing such services would depend on the overall collections and disbursements of the municipality.

Municipal corporations are not commercial entities and their operations involve social and political considerations.

According to ICRA, the overall credit quality determinants for urban local bodies are:

1. *Credit Quality of the State and Inter-governmental Fiscal Relationship* in terms of clarity of expenditure responsibility and revenue assignment as laid down in the relevant Municipal Act, as well as the actual practice being followed by the entity whose credit quality is under evaluation.
2. *Economy of the Municipal Area*: Revenue sources of an Urban Local Body (ULB) like property taxes and user fees are dependent primarily on the level of economic activity within its jurisdiction. The economic base is studied in terms of its growth potential and diversity. Demography including the age profile, per capita income, and literacy levels to estimate the size of earning vis-à-vis the dependent population and its ability to pay taxes. Growth prospects are also measured through proxies like the investment planned in the region; employment levels; trend in growth of deposits in the banking and non-banking sectors; growth in output; competitiveness of local industries; linkages to major markets, ports and airports; level of infrastructure; nature of policies that promote growth; and structural changes that could catalyse growth in the region.
3. *Operational Efficiency* based on a study of the obligatory and discretionary services to be provided by the municipality concerned. These are evaluated in the light of the ULB's capacity to deliver the required services both in terms of operational ability and revenue adequacy. The infrastructure is evaluated in terms of organisation structure and manpower adequacy vis-à-vis its range of obligatory functions. The performance is assessed on certain service parameters like: coverage of street lighting; percentage of population covered by piped water supply; days of water supply per week; cost recovery; manpower cost per unit of water supplied; loss levels in water supply etc. The entity's ability to plan for growth and effectively execute projects within the budgeted time and cost is also taken into account.
4. *Municipal Finances* are studied to assess the extent of own revenue as a percentage of the overall revenue of the entity concerned, as well as sustainability of such own revenue sources. A diversified base of own revenue sources is desirable, including property tax, octroi, advertisement tax, motor vehicle tax, entertainment tax, and non-tax sources such as fees, rent for municipal properties, etc. ICRA also reviews the efforts made by the ULBs in administering taxes and their collection efficiency. For non-tax revenues, the track record of service and user charges are assessed. The manner in which the state government concerned extends its subventions and grants both in terms of extent of

support and the schedule of flow of these grants is also evaluated. ICRA also evaluates the timeliness and accuracy of financial reporting, operating statements and budget document.

In India, municipal corporations are plagued by a number of constraints, including a low taxes base, constraints related to cost recovery and lack of credible credit histories, which made it difficult for them to raise resources from the public. The solution to this is credit enhancement through escrow accounts and guaranties. *Structured Debt Obligations* (SDO) help raise the credit quality of the proposed instrument by earmarking reliable and predictable streams of revenue such as octroi and property tax revenues. These cash flows are kept in an escrow account and monitored by an independent trustee. Among others, Ahmedabad, Vijayawada, and Nashik, have taken the SDO approach.

■ STRUCTURED FINANCE PRODUCTS

Structured finance products are synthetic investment instruments specially created to meet the needs of borrowers and lenders that cannot be met from the financial instruments generally available in the cash market. These products are based on some underlying assets with a credit rating that may differ from the concerned entity. In India, structured finance products include the following¹⁶:

Asset-Backed Securitisation (ABS) is the securitisation of a diversified pool of assets, which may include financial assets like automobile loans, commercial vehicle loans, or consumer durable loans. The process of ABS is given in detail in the appendix.

Mortgage Backed Securitisation (MBS) has diversified housing loans as the underlying asset for the transaction.

Collateralised Debt Obligations (CDO) have a pool of corporate loans, bonds or any other debt security, including structured debt, as the underlying asset.

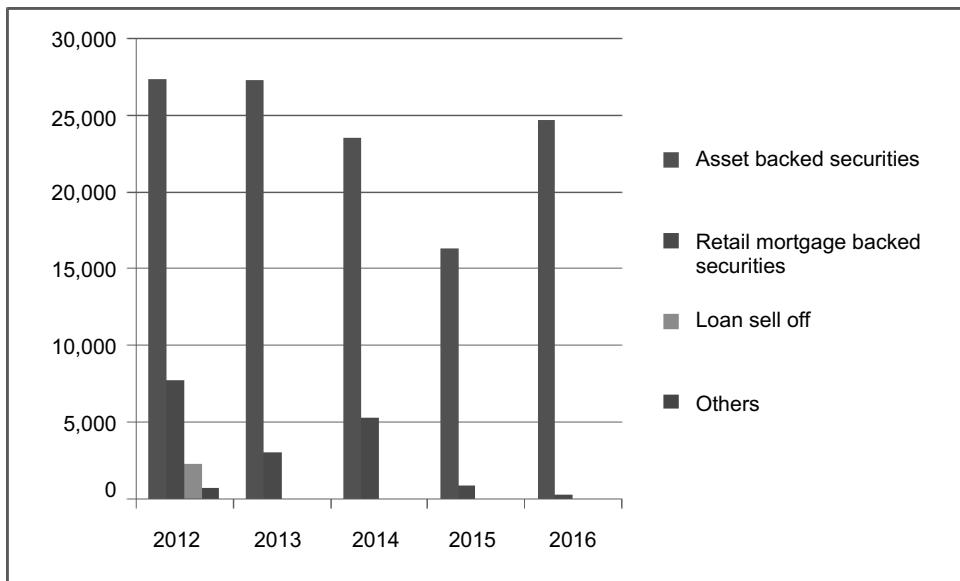
Future Flow Transactions (FFT) involve a structure where specific sources of future cash flows are identified and earmarked for servicing investors. Some examples of such sources are property tax revenues of municipal corporations, power receivables of bulk consumers, and property lease rentals. FFTs are not completely delinked from the credit risk of the issuer, but the structure, through preferential tapping of the cash flows of the issuer, can achieve a rating that is higher than the issuer's credit rating.

Partial Guarantee Structures (PGS) are balance sheet liabilities that are credit enhanced through an external guarantee¹⁷.

The growth of the Indian market for structured finance can be seen in Figure 5.1. The size of the market and trend over the years as estimated by ICRA consisted mainly of asset backed securities, mortgage backed securities and loan sell-off.

¹⁶ These definitions have been taken from ICRA

¹⁷ The International Finance Corporation offered a structured partial credit guarantee for a local currency bond issue by Bharti Mobile Limited (BML) in June 2001. The bond issue of Indian Rupees 2.1 billion was rated by CRISIL and ICRA as AA+ and LAA+ respectively.



Source: ICRA estimates

Figure 5.1: Trends in Structured Finance Products in India (Rs Crores)

■ SUMMARY

The yield on corporate bonds is higher than government bonds because of the risk of default i.e., risk of insufficient cash flows to meet the debt obligation. This risk is made up of two components, namely business risk and financial risk. Credit ratings can be used to assess the default risk of bonds. Risk is assessed using quantitative and qualitative criteria such as the business, the management, competition, operational factors, the financial position and factors that are specific to the issue being rated. It is also important to examine the rights and obligations of the lender and the borrower, which are specified in the debenture trust deed. Ratios studied with respect to debt in particular are leverage ratios, debt coverage ratios and liquidity ratios. The non-risk factors that influence yields are call options, marketability and taxes. Structured financial products such as securitisation of loan receivables help create securities with modified risk return characteristics to suit the needs of investors and borrowers.

■ SOLVED EXAMPLES

- Calculate interest and debt coverage ratios for Maruti Ltd. from the following

For the year ended 31 March 2014 *(Rs '00Crore)*

Total Revenue	445.25
Raw material and Components	313.15
Employee Expenses	13.68
Depreciation	20.84

Other Expenses	59.22
Interest	1.76
Profit before tax	36.60
Profit after tax	27.83
<i>As on 31 March 2014</i>	(Rs '00Crore)
Equity & Reserves	209.78
Long term borrowing (repayable over 2 years)	4.60
Other liabilities and provisions	10.24
Current Liabilities and provisions	<u>80.74</u>
	Total <u>305.36</u>
Fixed Assets	134.11
Other assets	29.53
Current Assets	<u>141.72</u>
	Total <u>305.36</u>

Ans: EBIT = 36.6+1.76= Rs 38.36 crore

Interest coverage ratio = $38.36/1.76= 21.79$

Installment of debt repayable per year = $4.6/2=$ Rs 2.3 crore

Effective Tax rate = $(36.6-27.83)/36.6 = 35.84\%$ and 1-tax rate = 64.16% or 0.6416

Debt service coverage ratio = $38.36/(1.76 +(2.3/0.6416) = 7.18$

2. RBI tax free bonds offer 6% interest and taxable Government bonds offer 8.5% for a similar period of investment. Which of the two would you recommend to tax payers in 20% tax bracket and 30% tax bracket?

Ans: For a tax payer in 20 % tax bracket return after tax= $8.5*(1-0.2)= 6.8\%$ Taxable bonds are preferable to tax free bonds

For a tax payer in the 30 % tax bracket return after tax = $8.5*(1-0.3)= 5.95\%$. Tax free bonds are preferable

3. In December 2015 Dalmia Cement was assigned AA- by ICRA for a proposed Non Convertible Debenture of Rs. 1000 crore. The outstanding Commercial Paper Of Rs 300 crore had highest rating of A1+. Explain how the same company can have two different ratings.

Ans: Ratings are for each instrument issued by a company, not for the company as a whole. Difference could be due to the amount involved and certainty of cash flows over the tenure of the instrument. Commercial paper is a short term instrument and the amount is also smaller than the debenture issue. The company's cash flow in the near future as assessed by the rater would have been sufficient to warrant the highest rating. However Non convertible debenture was for a much larger amount and repayable over a longer period and cash flows as assessed by the rater were probably not sufficient to warrant a higher rating.

Questions

1. What are the factors that determine interest rates?
 - (a) For bonds issued by different entities
 - (b) For a particular time period for all issuers
2. Which of the following bonds is likely to offer a higher return and why?
 - (a) Central government bonds vs municipal bonds
 - (b) Public sector bonds vs corporate bonds
 - (c) AAA rated corporate bond vs BBB corporate bond
 - (d) Central government bond with 12 years to maturity vs 6 years to maturity.
3. List the major factors taken into account in the bond rating process.
4. Can you explain the fact that a bond issue may get different ratings from two rating agencies?
5. Can you explain how various debt issues by the same company can have different ratings at the same point of time?
6. What are the protective covenants that a large institutional investor can negotiate for in the debenture trust deed?
7. If an investor wants to avoid the risk of his bond being called back, should he choose a bond with a higher coupon or a lower coupon (assume YTM is same)?
8. How do you explain the fact that tax-free bonds issued by the same borrower normally offer lower yields than taxable bonds?
9. List the major steps involved in asset securitisation.
10. What are the advantages of securitisation to the originator?
11. Why might an investor invest in securitised assets rather than a straight bond issue?
12. Interest rates have just started to decline and are expected to continue doing so, which is a better measure of return yield to maturity or yield to call? Why?

■ MULTIPLE CHOICE QUESTIONS

1. Which of the following is most likely to offer highest coupon
 - (a) 5 year corporate debenture
 - (b) 5 year RBI bond
 - (c) 5 year PSU bond
 - (d) 5 year State government bond

2. Which of the following is normally most likely to offer lowest coupon if all other things are the same
 - (a) 5 year unsecured debenture
 - (b) 3 year secured debenture
 - (c) 3 year unsecured debenture
 - (d) 5 year secured debenture
3. Which of the following is true
 - (a) All debt issues made by the same company will have same rating
 - (b) The company that is being rated appoints the rating agency
 - (c) The subscribers to the debt issue appoint the rating agency
 - (d) none of the above
4. Which of the following are non risk factors that can adversely affect bond yields
 - (a) Inflation
 - (b) Call options
 - (c) Management of the company
 - (d) All of the above
5. Securitisation is the process of
 - (a) Ensuring security of valuables
 - (b) Mortgaging assets to secure a loan
 - (c) Pledging securities for a bank loan
 - (d) Selling future cash flows in the form of securities

■ PROBLEMS

1. Tax-free bonds offer 6.5% returns while taxable bonds offer 8% interest. At what marginal rate of income tax will an investor be indifferent between the two?
2. A company has EBIT of Rs 10 lakhs, EBT of Rs 6 lakhs and preference dividend of Rs 2 lakhs. What is the interest coverage ratio?
3. The following data is available for XYZ Ltd. for the year ending March 2006.

EBIT	650	Assets	6000
Interest	150	Current Liabilities	450
Taxes	200	8% Debentures (2011)	1250
Dividend	50	10% Debenture (2011)	500
		Equity (Rs 10 par)	3500
		Retained Earning	300

Calculate EPS, interest coverage ratio and debt coverage ratio.

4. The following information is available for ABC Ltd. Calculate all relevant ratios as a potential bond holder:

	(Rs Lacs)
Sales	500
Operating Expenses	250
Depreciation	68
<u>6% bond due in 5 years</u>	<u>200</u>
10% bond due in 10 years	100
Equity and Retained Earnings	600
Current Liabilities	<u>100</u>
	<u>1000</u>
Fixed Assets	800
Cash and Bank balances	10
Other Current Assets	<u>190</u>
	<u>1000</u>

Income tax 50%

5. The following information on three cement companies has been taken from the website of ICRA, a credit rating agency.

<i>Key Financial Indicators</i>					
<i>ACC Ltd.</i>		(Rs million)			
		31.12.06	31.12.05	31.03.05	31.03.04
		9 mths			
Net sales	58183	32034	38874	32733	28774
Operating income	58570	32619	39321	33603	29200
OPBDIT	16818	5632	6822	4711	3351
PAT	12318	5442	3455	2002	1039
Equity	1878	1855	1792	1779	1711
Net worth	31420	21303	15770	13188	10246
OPBDIT/OI %	28.71%	17.27%	17.35%	14.02%	11.48%
PAT/Operating income %	21.03%	16.68%	8.79%	5.96%	3.56%
PBIT/(debt+net worth +deferred tax)	49.22%	32.82%	17.56%	12.53%	9.47%
OPBDIT/Interest and finance charges	22.37	8.40	7.48	4.2	2.5
Net Cash/Total Debt%	152%	68%	29.00%	21.60%	16.00%
Total debt/net worth	0.25	0.5	0.89	1.01	1.37

Source: ICRA

<i>Key Financial Indicators</i>			
<i>Dalmia Cement</i>	<i>(Rs million)</i>		
	31.3.07	31.3.06	31.3.06
Net sales	9865	5724	4494
Operating income	10057	5860	4619
OPBDIT	2865	941	668
PAT	2289	849	309
Equity	86	77	77
Net worth	6750	3412	2644
OPBDIT/OI %	28.49%	16.05%	14.47%
PAT/Operating income %	22.76%	14.48%	6.68%
PBIT/(debt+net worth +deferred tax)	19.51%	12.06%	7.08%
OPBDIT/Interest and finance charges	5	4	3
Net Cash/Total Debt%	26.50%	15.20%	9.40%
Total debt/net worth	1.50	2.00	1.89

Source: ICRA

<i>Key Financial Indicators</i>			
<i>OCL (formerly Orissa Cement Ltd.)</i>	<i>Rs Million</i>		
	2006-07	2005-06	2004-05
Net sales	8090	5971	4860
Operating income	8090	5971	4860
OPBDIT	1601	850	658
PAT	775	378	282
Equity	89	76	59
Net worth	3679	2212	1702
OPBDIT/OI %	19.79%	14.24%	13.54%
PAT/Operating income %	9.58%	6.33%	5.80%
PBIT/(debt+net worth +deferred tax)	16.40%	9.82%	9.39%
OPBDIT/Interest and finance charges	6.39	6.37	4.21
Net Cash/Total Debt%	23.63%	14.46%	13.94%
Total debt/net worth	1.15	1.89	1.98

Source: ICRA

- (a) Non-convertible debentures of ACC of Rs. 3 billion due in 2007 were upgraded from LAA in July 2004 to LAA+ in Oct 2006. List the possible reasons for this from the financial indicators.
- (b) Dalmia Cement Non-Convertible Debentures of Rs 3.7 million due in 2016 were rated LAA-since Jan 2005. Compare the Financial information of Dalmia Cement with ACC Limited. What could be the reasons for the difference in rating?
- (c) OCL has Rs 0.5 billion NCD due Feb 2007 which were rated LAA-in April 2006. What are the similarities and differences between Dalmia and OCL?

■ PRACTICAL EXERCISES

Visit the website of any credit rating company in India. Choose a company that has been recently upgraded/downgraded. Collect financial data for the company from NSE/BSE websites or from paid data bases such as prowess. Study the coverage, capitalization and liquidity ratios over a period of three to five years. Do you find evidence for the changed rating? What was the reason given by the rater?

APPENDIX

Asset Securitisation

Securitisation is the pooling of homogeneous receivables (assets), and selling future cash flows in the form of securities known as *Pass Through Securities* or *Participation Trust Certificates* (PTCs). The assignment of loans is normally without recourse to the original lender. Assets that can be securitized include housing loans, car loans, credit card dues etc.

The lending institution (*originator*), a bank or financial institution sells the future cash flows to a trust or an intermediary called a *Special Purpose Vehicle* (SPV). The SPV holds the loans/mortgages and issues debt instruments to third parties. The proceeds from the issue of securities are used to pay the originator, and the SPV is entitled to receive the future cash flows. The interest and principal due on the loans are collected by the SPV and distributed to the buyers of the securities. The cash flows can be directly passed through to investors after deducting costs (pass through security) or the cash flows can be designed to give a variety of instruments with different risk/return and maturity profiles (structured securities). For example, many housing loans had floating interest rates, so 52% of mortgage based securities issued in 2004-2005 had floating interest rates.

The assets (loans) are carefully selected from a pool (known as *cherry picking*). They are monitored over a period of time to confirm their creditworthiness (called *seasoning*). Credit rating is crucial for this process. A safety cushion may be offered in the form of higher quantity of receivables, with a clause for refund of the excess to the originator. Additional collateral/guarantees may be added to enhance the credit rating. It is possible to enhance the rating of one class of securities by giving it priority in disbursement of interest and principal payments; the lower class of securities has a subordinated claim on the cash flows. Thus it is possible for the securitised instrument to have a higher rating than the originator, or other debt instruments issued by it.

For the buyer, these financial instruments present an attractive investment opportunity. They offer a higher return than other instruments with the same rating and maturity. This is possible because of the spread between the bank's deposit rate and lending rate, a part of which is passed on to the buyer of the securities.

For the bank, the originator, it frees a large amount of illiquid funds, which can be lent again. If the deal is without recourse, the bank enjoys the benefits of lending without the risk. The bank retains the initial processing charges levied at the time of granting the loan and loans are sold at a value higher than the outstanding principal.

At present there is lack of a secondary market for securitised assets in India. There is also high stamp duty for transfer, which varies from state to state. There is also the problem of double taxation of the SPV and the owner of the security.

CHAPTER - 6

Bond Management

LEARNING OBJECTIVES

At the end of this chapter, you will be able to:

- Appreciate the need for bond management
- Understand the various bond management strategies
- Identify situations where active/passive bond management may be appropriate
- Apply the techniques available for bond management

In the previous chapters, we saw that while bonds offer known cash flows, they are subject to systematic and unsystematic risks. The income stream and risks can be managed according to the requirements of the investor by using passive or active bond management strategies.

■ PASSIVE BOND MANAGEMENT

Passive bond management basically means buying and holding bonds till maturity. In case there is a call option, maturity would mean till the call is exercised. Passive bond management is suitable for elderly and retired individuals who need a regular stream of income and are not willing to assume risks for possible additional income with active strategies. It is also suitable for pension funds and income-oriented mutual funds with known future commitments and the need to plan cash flows accordingly. Institutional investors normally have huge fixed income portfolios and may not find it practical to turn them around very frequently because the market is not liquid especially in the case of corporate bonds.

When a bond is held till maturity, the investor is interested in regular coupon payments and payment of the principal on maturity. It is very important to study the unsystematic risks before investing so that the bonds do not default. One of the ways of reducing the risk in passive bond management is to hold a portfolio of bonds with the desired return and maturity profile. It may also be desirable to diversify across sectors as certain sectors may do badly in case of an economic downturn. If higher returns are desired, the investor may choose to diversify across bonds with different ratings, as bonds with lower ratings normally offer higher returns.

When bonds are held till maturity, the cash flows need to planned to match with the investors requirements of income and liquidity to avoid the price and reinvestment risks. This can be done through bond laddering. *Bond laddering* involves investing in bonds of different maturities, for 1,2,3....n years. The advantages are that inflows can be made to approximate the cash flow requirements, which helps minimise the reinvestment risk. It also provides liquidity; in case a bond needs to be sold at short notice bonds with lower time to maturity can be sold as they have lower price risk. However, bonds with lower maturities also normally have lower yields and laddering will give lower yields than a portfolio with bonds of longer maturities. Laddering may also be administratively impractical for small investors with limited time and resources.

■ SEMI-ACTIVE STRATEGIES

One of the problems that bond holders face is the trade off between price risk and reinvestment risk. Bonds with longer maturities normally offer higher yields, but the prices of longer term bonds are affected more by changes in interest rates than bonds with lower maturity. The price sensitivity is also dependant on the coupon, prices of low coupon bonds are more sensitive to interest rate changes than higher coupon bonds with the same maturity. On the other hand, the reinvestment risk (for coupons received) is higher for bonds with higher coupons. The price and reinvestment risks move in opposite directions. When interest rates go up, bond prices fall, but reinvestment of coupons brings higher

returns and when interest rates reduce prices go up but reinvestment is at lower rates. If the investment period is longer than the maturity date of the bonds, the proceeds are subject to reinvestment risk. Similarly, if the bonds mature after the holding period, they have to be sold in the open market and are subject to price risk. The impact of these risks on yield and total amount available at the end of the holding period are best understood with simple numerical examples. Large interest rate changes have been assumed in the examples in order to illustrate the concepts.

Case 1 – Only reinvestment risk: This is illustrated in Table 6.1. An investor requires a fixed sum of money after five years. He invests Rs 100 in 6% coupon bonds and expects to receive Rs 133.88 at the end of five years assuming reinvestment of all coupons at 6%. If interest rates do not fluctuate during this period, he will actually get Rs 133.88 and yield of 6%. However, if interest rates go up to 10% he will get a higher amount of Rs. 136.73 and 6.5% yield. On the other hand, if interest rates go down to 2%, he will get only Rs.131.24 and 5.6% yield.

Table 6.1: Case 1 – The Effect of Reinvestment Risk

Years	Cash Flows	Compounded value after 5 years with various reinvestment rates		
		6%	10%	2%
1	6	7.57	8.78	6.49
2	6	7.15	7.99	6.37
3	6	6.74	7.26	6.24
4	6	6.36	6.60	6.12
5	106	106.00	106.00	106.00
Total value Rs.		133.88	136.73	131.24
Yield		6.0%	6.5%	5.6%

Case 2 – Only price risk: This is illustrated using a zero coupon bond in Table 6.2. The investor invests Rs 74.72 in a five year deep discount bond with face value 100 and 6% yield when he actually needs the money after three years. The price at which he can sell the bond and realised yield will depend on the interest rates prevailing in the market at the time of sale. As can be seen from the table, if interest rates remain at 6% his realised yield is also 6%. However, if there is a steep increase in interest rates to 10%, he only gets a return of 5% . On the other hand, if interest rates fall the return is higher than planned at 7%. If the holding period is only one year the gains/losses are much higher. As can be seen, the planned yield of 6% is attained only in two situations; when interest rates in the economy remain constant, or when the holding period of the zero coupon bond is equal to the maturity.

Table 6.2: Case 2 – The Effect of Price Risk

Holding period	Sale price at end of various holding periods with various discount rates			Yield at the end of various holding periods with various discount rates		
	6%	10%	2%	6%	10%	2%
Years	6%	10%	2%	6%	10%	2%
1	79.21	68.30	92.38	6.0%	-8.6%	23.6%

Contd...

2	83.96	75.13	94.23	6.0%	0.3%	12.3%
3	89.00	82.64	96.12	6.0%	3.4%	8.8%
4	94.34	90.91	98.04	6.0%	5.0%	7.0%
5*	100.00	100.00	100.00	6.0%	6.0%	6.0%

* Redemption value

The final holding period yield is a combination of the two opposite forces of price risk and reinvestment risk. These risks can be eliminated, if it is possible to construct a portfolio of bonds where the two risks are balanced. Such a portfolio is *immunised* against the risks arising from interest rate changes. When the price and reinvestment risk are equal, yield at the end of the planned investment period will be the same as if there had been no change in interest rates. Since zero coupon bonds have no periodic payments, they are exposed only to the risk associated with their maturity. One of the ways of having an immunised portfolio is with the use of duration.

Duration

Duration is the weighted average life of a bond using the present value of cash flows as the weights¹¹. If the holding period of a bond or a portfolio of bonds is equal to its duration we can eliminate the interest rate risk. Duration is calculated as

$$D = \frac{\sum_{n=1}^n \{nC_n / (1+r)^n\}}{\sum_{n=1}^n \{C_n / (1+r)^n\}}$$

Where n is the number of years to maturity and r is the market discount rate. In practice, a bond's duration is usually calculated with a discount function based on its yield to maturity and the denominator is the same as the present value of the bond.

For example, a Rs 100 par value bond with three years to maturity, paying an annual coupon of 6% and 8% market discount rate will have cash flows and calculations for duration as shown in Example 6.1A.

Example 6.1A: Calculation of Duration

Year	Cash flows	$C_n / (1+r)^n$	$nC_n / (1+r)^n$
1	6	$6/(1.08)^1 = 5.56$	$1*6/(1.08)^1 = 5.56$
2	6	$6/(1.08)^2 = 5.14$	$2*6/(1.08)^2 = 10.29$
3	106	$106/(1.08)^3 = 84.15$	$3*106/(1.08)^3 = 252.44$
		$PV = \sum \{C_n / (1+r)^n\} = 94.85$	$\sum \{nC_n / (1+r)^n\} = 268.28$
Duration = $\sum \{nC_n / (1+r)^n\} / \sum \{C_n / (1+r)^n\} = 268.28/94.85 = 2.83$			

¹¹ The derivation of duration is given in the appendix. Duration can also be calculated using built in formulae in spreadsheets. Students will find it useful to check their calculations by feeding the formula in a spread sheet and then cross-checking the same with the built-in formula.

The duration, is 2.83 years, which is lower than the maturity of 3 years. If the bond is held for 2.83 years the planned future value and yield will be realised.

The immunisation is illustrated in Example 6.1B. As can be seen, if the holding period is equal to duration, the yield is 8% irrespective of the market yields. When interest rates in the market rise, yields are higher/lower if the bond is held for a longer/shorter period than the duration. On the other hand, when interest rates decline, yields are higher/lower if the bond is held for a shorter/longer period than the duration.

Example 6.1B: Immunisation with Duration

6% Coupon bond par value 100, purchased at 94.85 (market rate 8%) held for various time periods when market yield is 12%, 8% and 4%				
Holding period in years	1	2	2.83	3
Market yield 12%				
Future value of coupons	6.00	12.72	18.90	20.25
Selling price	89.86	94.64	99.04	100.00
Total at end of period	95.86	107.36	117.93	120.25
Realised yield	1.1%	6.4%	8.0%	8.2%
Market yield 8%				
Future value of coupons	6.00	12.48	18.24	19.48
Selling price	96.43	98.15	99.67	100.00
Total at end of period	102.43	110.63	117.91	119.48
Yield	8.0%	8.0%	8.0%	8.0%
Market yield 4%				
Future value of coupons	6.00	12.24	17.60	18.73
Selling price	103.77	101.92	100.33	100.00
Total at end of period	109.77	114.16	117.93	118.73
Yield	15.7%	9.7%	8.0%	7.8%

Duration of a Zero Coupon Bond

For a zero coupon bond, there is just one cash flow at maturity; the formula for duration becomes

$$D = \frac{\sum \left\{ n C_n / (1 + r)^n \right\}}{\sum \left\{ C_n / (1 + r)^n \right\}} = \frac{n C_n / (1 + r)^n}{C_n / (1 + r)^n} = n = \text{number of years}$$

The duration of a zero coupon bond is equal to its maturity. One way of eliminating the price and reinvestment risk is to invest in zero coupon bonds that mature exactly at the end of the desired holding period.

Some Generalisations Regarding Duration

1. The maximum duration of a bond equals the life of the bond. It is equal to maturity in the case of a zero coupon bond.

2. In general, duration increases as the maturity (life) of a bond increases. Similarly, as time passes the life of the bond decreases and duration also decreases. As can be seen from Figure 6.1, for a bond trading at par (9% yield) and at a premium (7% yield), the duration increases with maturity, but the curve becomes flat towards the end. For a bond trading at a discount (25% yield), the duration rises to a maximum point and then reduces slightly before becoming flat.
3. The upper bound for duration in the case of a perpetual bond is $(1+\text{yield to maturity})/\text{yield to maturity}$. In Figure 6.1, this is where the duration is flat.
4. All other things remaining same, if the market discount rate increases, the duration reduces. This is because the present value of later years reduces, and they carry higher weight.
5. All other things remaining the same, lower coupon bonds will have higher duration.

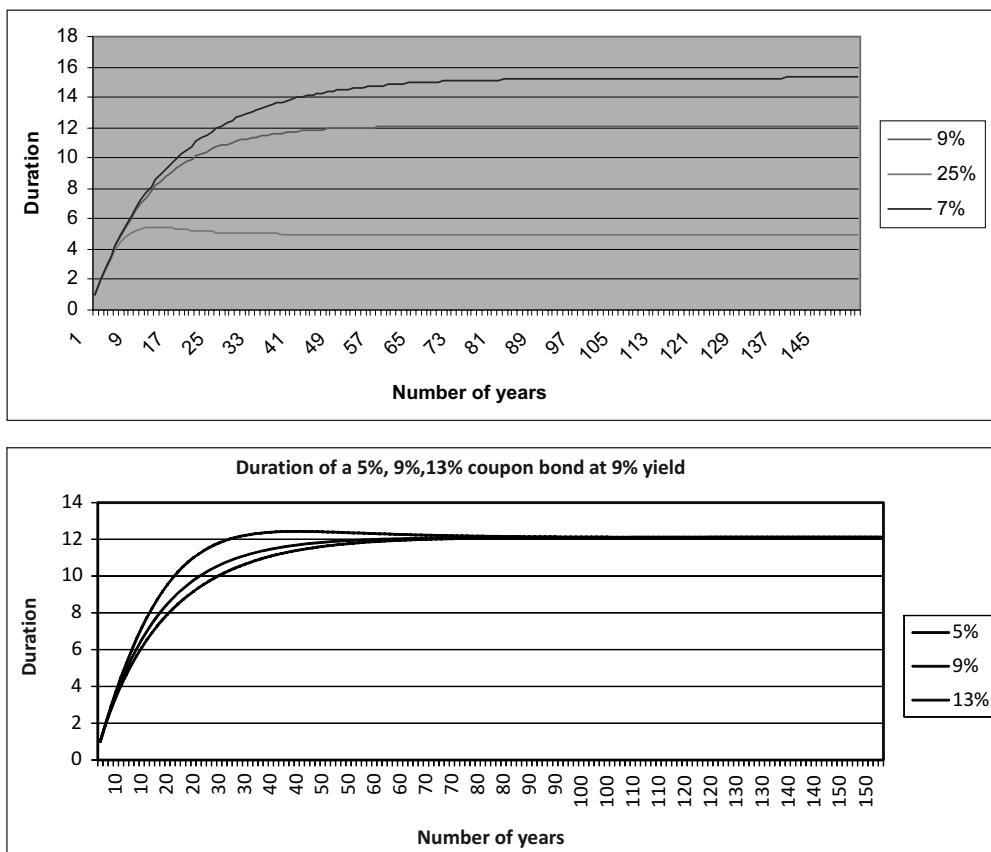


Figure 6.1: Duration of a 9% coupon bond at various yields.

Note: Irrespective of coupon, for a perpetual bond the duration converges at $(1+\text{yield})/\text{yield}$.

Periodicity of Payments and Duration

A three year bond pays 6 percent annual coupon and has an 8 percent yield to maturity. In example 6.1A the duration was calculated as 2.83. What if the coupons were paid semiannually or quarterly? The coupons and discount rate would be divided by the periodicity and the periods multiplied. Use the DURATION function in Excel or the DURATION_ADD function in LibreOffice Calc to calculate or to cross check results. Duration with semiannual payments works out to 2.78 and with quarterly payments is 2.75. Duration decreases as the periodicity of coupon payments increases because cash is being received earlier and therefore are multiplied by lower weights in the duration formula; just like coupon bonds have lower duration than zero coupon bonds,

Immunisation of a Portfolio

It may not always be possible to find a bond with duration that matches with the desired holding period. In such cases, the desired duration can be created with a portfolio of bonds. We simply take the weighted average of individual bond durations to get the desired duration.

For example

An investor needs exactly Rs. 1 lakh after 2 years and has 2 bonds in mind with YTM of 10%. Bond A has annual coupon of 7%, matures in 4 years and is priced at 904.90. Bond B has annual coupon of 6%, matures in one year and is priced at 963.64. How many bonds of each should he buy?

First of all, we need to calculate the amount of money to be invested to get Rs. 1 lakh after two years.

$$\text{Money required} = 100000/1.1^2 = 82644.63$$

The next step is to calculate duration for each bond and calculate the proportion to be invested in each

$$\text{Duration of A} = (70/1.1 + 70 \times 2/1.1^2 + 70 \times 3/1.1^3 + 1070 \times 4/1.1^4)/904.9 = 3.6029$$

Duration of B = 1 year (a single cash flow is like a deep discount bond, so maturity = duration)

We need to combine A and B to get a weighted average duration of 2, taking x as the proportion to be invested in A and 1-x as the proportion invested in B we solve the equation

$$3.6029x + (1 - x) \times 1 = 2$$

$$\text{Proportion in A} = x = 0.3842, \text{ in B} = 0.6158$$

Therefore, the amount to be invested in A = $82644.63 \times 0.3842 = 31752.06$, and in B = 50892.56

The number of bonds that needs to be purchased is the amount to be invested divided by the price per bond:

$$\text{No. of bonds of A} = 31752.06/904.89 = 35.09 \text{ and of B} = 50892.56/963.64 = 52.82$$

We can now show that this portfolio is immunized, just as we had done with a single bond. We use three yields 8%, 10% and 12% and present the results in Example 6.2.

Example 6.2: Immunisation with a Bond Portfolio

	Market Yield		
	8%	10%	12%
Bond B			
Number of bonds = 52.82			
Amount received at end of one year = $1060 * 52.82$	55982	55982	55982
Reinvested for one year at prevailing market rate	1.08	1.10	1.12
(1) Bond B amount at end of second year	60460	61580	62700
Bond A			
Number of bonds = 35.09			
Coupon received at end of first year = $70 * 35.09$	2456	2456	2456
Reinvested for one year at prevailing market rate	1.08	1.1	1.12
(2) Bond A first coupon amount at end of year 2	2653	2702	2751
(3) Coupon received at end of year 2 = $70 * 35.09$	2456	2456	2456
Selling price = PV at end of 2 nd year	982.17	947.93	915.50
(4) Bond A sale value = $35.09 * \text{PV as above}$	34460	33258.9	32120.9
Total amount received at end of year 2 = $(1 + 2 + 3 + 4)$	100032	100000	100031
Annual Return ($(\text{Total amount}/82644)^{0.5} - 1$) * 100	10.02%	10%	10.02%

As can be seen from the table, the total amount received is Rs1 lakh, and annual return is 10% as planned.

Modified Duration

Modified duration helps estimate the change in the price of the bond given a change in the market yield. It is calculated as

$$MD = \frac{\text{Duration}}{(1 + r/p)}$$

And percentage change in price is approximately

$$\% \text{ price change } H \approx -MD \times (\% \text{ yield change}) = (\text{Duration}/(1 + r/p)) \times (\% \text{ yield change})$$

In the earlier example, if the duration of a bond is 2.83 and there is a change in market yield from 8% to 9%, the estimated modified duration and estimated change in price will be

$$MD = 2.83/(1 + .08/1) = 2.62$$

$$\% \text{ price change } H \approx -2.62 \times 1 = -2.62\%$$

Therefore, the price should reduce from Rs 94.85 and become approximately

$$94.85 \times (1 - 2.62\%) = 92.36$$

The estimated price calculated using the present value = $\sum \{C_n / (1 + r)^n\}$
 $= 6/(1.09) + 6/(1.09)^2 + 106/(1.09)^3 = 92.41$

As can be seen, the values are approximately the same. The formula shows that higher modified duration leads to higher price volatility. It also implies that bonds with the same modified duration will have approximately the same price risk. These concepts are useful for quick estimates of price changes when yields are expected to change. In earlier chapters, we had seen that longer maturities and lower coupons were associated with higher price volatility. Duration combines the effect of maturity and coupon in one measure that allows us to estimate the price effect. However, modified duration can only be used for small changes in yield because the relationship between yield to maturity and the bond price is convex, not linear.

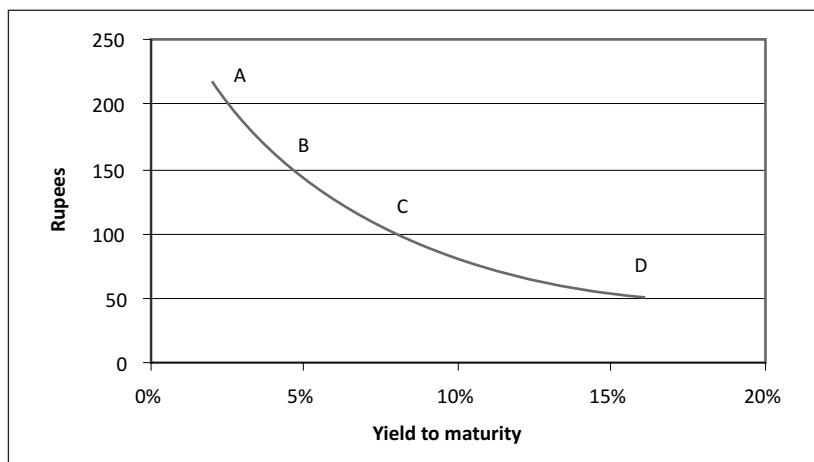


Figure 6.2: Present value of a 25 year, 8% coupon bond

As can be seen in figure 6.2 Change in yield to maturity of just 2% from 2.5% to 4.5% (point A to point B) results in a price change of approximately fifty rupees. However, change in yield of 8% from 8% to 16% is required to get the same change of fifty rupees (point C to D)².

Assumptions of Immunisation with Duration

1. There is a single change in market yield that takes place before the receipt of any cash flows. If this is not true and yields fluctuate during the holding period, the duration will have to be recalculated and the portfolio may need to be revised.
2. There are parallel shifts in a horizontal yield curve i.e., yields are the same across all maturities before and after the change in market yield.
3. There are no defaults.

² Readers will recollect that price risk is more for longer maturities and lower coupons. Similarly, the price-yield relationship is more convex for longer maturities and lower coupons.

Even though the assumptions seem unrealistic, some studies show that duration works quite well as compared to more complicated techniques, while other studies have attempted to find better alternatives³.

■ MULTIPLE PERIOD STRATEGIES

Immunisation with duration is a single period strategy. Duration also makes the assumption that there is a single parallel shift in a flat yield curve, which is unrealistic. If cash flows are required over multiple periods, we can use dedication and cash matching. The aim is to match cash flows with the requirements so that there is no problem if interest rates fluctuate, or if the shape and shifting of the yield curve are not as assumed.

Dedication with zero coupon bonds: The interest rate risk can be completely neutralised if it is possible to hold deep discount bonds that mature at the time cash flows are required.

Cash matching: If only coupon bearing bonds are available, the cash flows from the bonds need to be matched with the required cash flows. The first step is to identify bonds with various maturities which meet other criteria such as safety, yield etc. Cash matching involves working backwards – the process is illustrated with an over simplified example in Example 6.3. First, the cash requirement in the fifth year is satisfied by purchasing sufficient quantities of a bond to match cash flow and maturity. Since the requirement is Rs 2.2 lakhs and coupon for a 5 year bond is 10%, the required investment = $220000/1.10=2$ lakhs. The coupons received every year are $2 \text{ lakhs} \times 10\% = 20000$ and amount received in the fifth year is $2 \text{ lakhs} \times 1.1 = 2.2 \text{ lakhs}$. The balance requirement is given in column 3. Next, we work backwards from the balance requirement for the fourth year and repeat till the entire cash requirements are met.

Example 6.3: Cash Matching

		<i>5 year bond</i>		<i>4 year bond</i>		<i>3 year bond</i>	
Coupon		10%		9%		8%	
Amount invested =		$220000/1.1 =$		$280000/1.09 =$		$156881/1.08 =$	
		200000		256881		145260	
Year	Required cash	<i>5 year bond</i>	<i>Balance required</i>	<i>4 year bond</i>	<i>Balance required</i>	<i>3 year bond</i>	<i>Balance required</i>
Column	1	2	$3 = 1 - 2$	4	$5 = 3 - 4$	6	7
1	150000	20000	130000	23119	106881	11621	95260
2	200000	20000	180000	23119	156881	11621	145260
3	200000	20000	180000	23119	156881	156881	0
4	300000	20000	280000	280000	0		
5	220000	220000	0				

³ Daobai Liu (2006), Bond portfolio's duration and investment term-structure management problem, *Journal of Applied Mathematics and Stochastic Analysis*, Vol. 2006, Article ID 76920, 19 pages, 2006. doi:10.1155/JAMSA/2006/76920

G. O. Bierwag, George G. Kaufman, Cynthia M. Latta, (1987) Bond portfolio immunization: tests of maturity, one and two factor duration matching strategies. *The Financial Review*, Vol. 22 No. 2, Pp 203 - 343.

This was an oversimplified example to illustrate the process; in reality, coupon bonds with the exact maturity may not be available. In such cases, the nearest match that is available before the required date is used and proceeds are reinvested till required. In case, the cash flow from coupon payments is greater than the requirement in the earlier years, the excess will need to be reinvested and reduced from the requirement of a subsequent period.

■ ACTIVE BOND MANAGEMENT

Active bond management involves forecasting of future interest rates and trends and buying/selling of bonds in order to make the maximum gain. The gains or losses will depend on the accuracy of the forecast and can be risky. Active bond management is not easy, assumptions have to be made about the expected interest rates over the horizon of the investment. This includes reinvestment of coupons in the short-term and the impact of long-term rates on the price. It involves forecasting the business cycles and studying the historical response of bond prices and yields. Such information is readily available in developed markets like the US, but needs to be made available in the Indian debt market. Assumptions also have to be made about the investment horizon, unexpected liquidity requirements etc. Active strategies include forecasting the interest rate, the yield curve, and bond swapping

Forecasting future interest rates and the shape of the yield curve are useful for the following types of decisions:

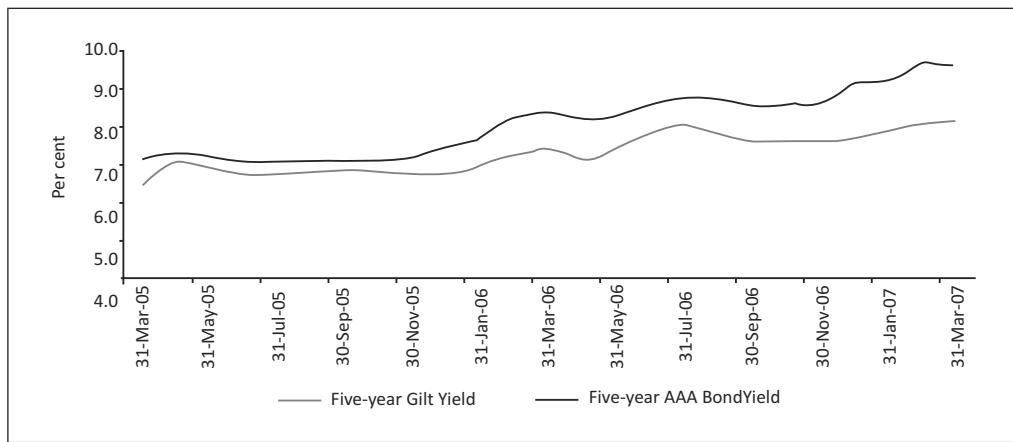
Decisions regarding maturity: Let us assume that an investor plans to invest for three to four years. He has the choice of investing in a six-month to one-year bond and reinvesting every period or investing in a three/four year bond, or he can invest in a twenty-year bond. If yields are expected to fall, he may be better off investing in bonds with a higher maturity, so as to obtain higher yields (assuming an upward sloping yield curve) and a price advantage at the time of sale, provided the expected reinvestment risk is lower. On the other hand, if interest rates are expected to go up, he may prefer a short-term investment, and take advantage of higher yields in the future.

Coupon rate selection: In the above example, let us assume the investor chooses to invest in a long-term bond because of the price advantage expected at the time of sale. If there is a choice between a low coupon bond and a high coupon bond, the lower coupon bond will give higher price advantage than the higher coupon bond.

Decisions on whether to invest in fixed coupon or floating rates bonds would also be based on forecasts of the underlying benchmark rate. If the rates are expected to increase the investor would choose floating rates and vice versa.

Quality of bonds to invest in: As was seen in the previous chapter, bonds with a lower credit rating normally offer higher yields to compensate for increased risk as the default rate is higher. When spreads widen between government and corporate bonds or between corporate bonds with different ratings it implies that the market is anticipating more risk of default on lower grade bonds. As can be seen in Figure 6.3 the yield spread between government bonds and AAA rated corporate bonds widened by approximately 1% between November 2005 and December 2006 and thereafter. This means the market was forecasting a greater default risk implying a possible slowing down of the economy. Similarly, narrowing of spreads would

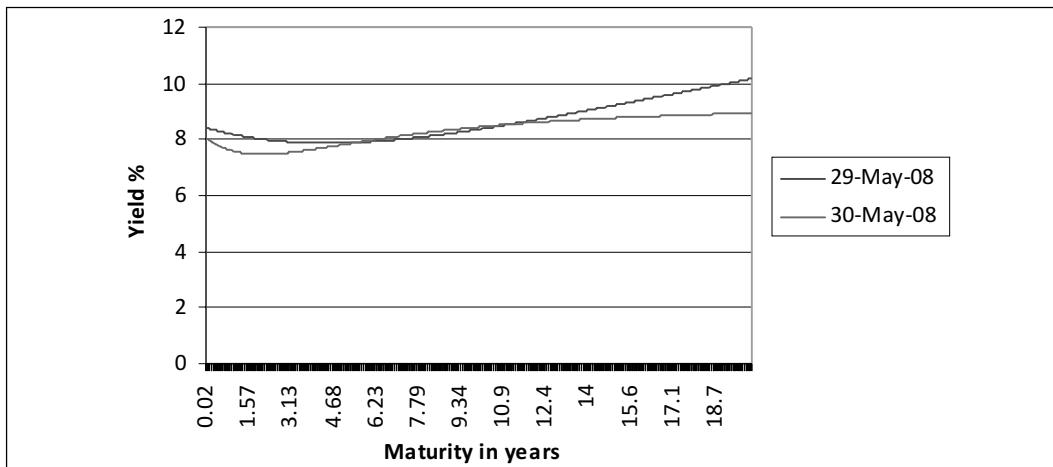
imply an expanding economy. If the economy is likely to boom, the probability of default normally reduces and an investor can include some lower grade bonds in the portfolio to take advantage of the higher yield. However, a detailed study of the issuing company and its prospects needs to be undertaken⁴. Although credit ratings are periodically reviewed and upgraded/downgraded by the rating agency, this may be done with a time lag after the favourable/unfavourable events.



Source: RBI

Figure 6.3: Yield Spreads between Government Bonds and AAA Corporate Bonds

Timing of purchase/sale of bonds: In the chapter on unsystematic risk we saw that the yield curve need to be redrawn every day as yields change in response to market expectations. This can be seen in Figure 6.4.



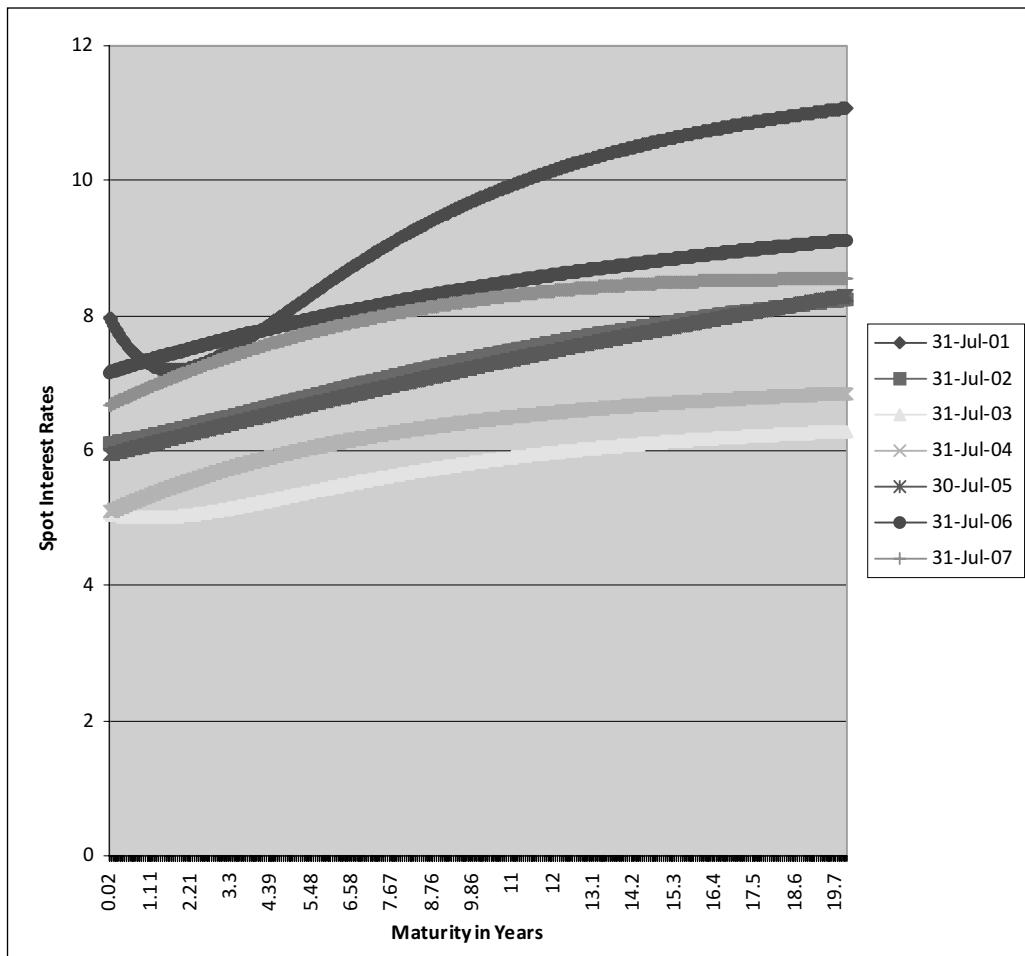
Source: NSE

Figure 6.4: Estimated Zero Coupon Yield Curve

⁴ This includes the EIC analysis.

If an investor was planning to sell a 20-year bond on 29th May, and could anticipate the change in the shape of the yield curve, he would have profited by selling the bond just a day later as yields fell by 1%. On the other hand, for an investor planning to buy/sell bonds with 6-10 years maturity the timing would have hardly made any difference.

As can be seen in Figure 6.5, the yield curve in India has shifted up and down between 2001-2007. Investors who anticipated the future decline in 2003 and had a two-year investment horizon would have profited by purchasing long-term securities in 2001 to be sold in 2003.



Source: NSE

Figure 6.5: Estimated Zero Coupon Yield Curves

■ BOND SWAPS

Bond swapping involves simultaneous purchase and sale of bonds in order to take advantage of an arbitrage opportunity or based on predictions regarding the future movements in the market.

An opportunity akin to arbitrage may be available when there is temporary under pricing/over-pricing of a security. If an investor is holding a security, and a very similar security (similar rating, coupon and maturity) is available at a lower price sell the higher priced security and buy the one available at a lower price. This will result in an immediate gain while all future cash flows remain almost the same.

Swaps may be based on forecasting the spreads between securities. For example in the Indian debt market, if an investor had predicted that spreads would widen (see Figure 6.3) from 0.5% to 1.2% between October 2005 and March 2006, the swap illustrated in Example 6.4 would have been very profitable. Buy government bonds (more expensive) and sell AAA rated corporate bonds incurring a temporary loss of Rs 1.47. After spreads widen, reverse the swap and make a price gain of 5.48, while getting back the corporate bonds that were originally held.

Example 6.4: Illustration of Swaps with Forecasts of Yield Spreads

Oct 2005	AAA Bond	Government Bond	Yield Spread	Buy Govt. sell AAA	Sell Govt Buy AAA
Coupon	7.50%	7.00%			
YTM	7.00%	6.50%	0.50%		
Price	102.05	102.08		-0.03	
Mar 2006					
YTM	8.20%	7.00%	1.20%		
Price	97.22	100.00			2.78

However, unlike the earlier example, where there was an opportunity resembling arbitrage, in this case there is a risk if the spreads do not widen as anticipated.

■ SUMMARY

The income stream and risks associated with bonds can be managed by using passive or active bond management strategies, depending on the requirements of each investor. The risk in passive strategies i.e., buy and hold till maturity can be diversified by holding a diverse portfolio of bonds and through bond laddering. A single period semi-active strategy is immunisation from risk using duration, wherein the price and reinvestment risk offset each other. Multiple period strategies include dedication with zero coupon bonds and cash matching. Active strategies involve forecasting of future interest rates and buying/selling of bonds in order to get the maximum gain.

■ SOLVED EXAMPLES

- What is the fair price of a 10% bond with 3 years to maturity when market yields are 7%. Estimate the new price using modified duration if there is a 1% reduction in interest rates.

Ans: Assume face value of Rs 100

$$\text{Fair Price} = 10/1.07 + 10/(1.07 \times 1.07) + 110/(1.07 \times 1.07 \times 1.07) = 107.87$$

$$\text{Duration} = ((10/1.07 + 2 \times 10/(1.07 \times 1.07) + 3 \times 110/(1.07 \times 1.07 \times 1.07)) / 107.87) = 2.7457$$

$$\text{Modified duration} = 2.7457 / (1.07) = 2.566$$

$$\text{New price} = 107.87(1 + 2.566 \times 1\%) = 107.87(1.02566) = 110.64$$

2. Interest rates in the economy are 8% and an investor needs Rs 5 lakhs after two years. The two bonds he has shortlisted for investment are a one year bond with 6 % coupon and a three year bond with 9% coupon. How he can immunize himself against price and reinvestment risk?

Ans: Amount of money required = $500000 / (1.08 \times 1.08) = \text{Rs } 428669$

$$\text{Duration of one year bond} = 1$$

$$\text{Duration of 5 year bond} = (9/1.08 + 2 \times 9/1.08^2 + 3 \times 109/1.08^3) / (9/1.08 + 9/1.08^2 + 109/1.08^3) = 2.7623$$

Proportion of bonds to dive weighted average duration of 2 years

$$2.7623 \times X + (1-X) \times 1 = 2 \text{ solve to get } X \text{ the proportion in the 5 year bond , } X=0.5674$$

$$\text{Invest } 0.5674 \times 428669 = \text{Rs } 243244 \text{ in the 5 year bond}$$

$$\text{Remainder } 1-0.5674 \text{ in the one year bond} = 0.43256, \text{ invest } 428669 - 243244 = \text{Rs } 185425$$

3. Calculate the duration of a 6% coupon bond, with 8% discount rate, using 3 years annual and semi annual coupons

Ans: Annual coupon

Cash flows	6	6	106	Total	Duration
PV (denominator)	5.555556	5.144033	84.14622	94.84581	
PV*weights 1,2,3(numerator)	5.555556	10.28807	252.4387	268.2823	2.828615

Semi annual coupon

Take weights as 0.5, 1, 1.5, 2, 2.5, 3

	3	3	3	3	3	103	Total	Duration
PV (denominator)	2.884615	2.77367	2.66699	2.56441	2.46578	81.4024	94.7579	
PV*weights (numerator)	1.442308	2.77367	4.00048	5.12883	6.16445	244.207	263.717	2.78306

OR

Take weights as 1,2,3,4,5,6 as periods divide duration by 2

	3	3	3	3	3	103	Total	Duration
PV (denominator)	2.884615	2.77367	2.66699	2.56441	2.46578	81.4024	94.7579	
PV*weights (numerator)	2.884615	5.54734	8.00097	10.2577	12.3289	488.414	527.434	5.566122

$$5.566122 / 2 = 2.78306$$

■ MULTIPLE CHOICE QUESTIONS

1. An 8 year zero coupon bond bought today is to be sold after two years. If yields in the economy rise
 - (a) Expected yield>realised yield
 - (b) Expected yield=realised yield
 - (c) Expected yield<realised yield
 - (d) Cant say
2. When the economy moves from a recession to an expansionary phase, yield spreads between government and corporate bonds are expected to
 - (a) Increase
 - (b) Decrease
 - (c) Remain constant
 - (d) Cant say
3. Which of the following 20 year bonds will have the highest duration
 - (a) 9% bond
 - (b) 12 % bond
 - (c) Zero coupon bond
 - (d) Information is incomplete, so cannot say
4. Floating rate bonds normally have
 - (a) Minimum price risk and reinvestment risk
 - (a) Minimum price risk
 - (a) Minimum reinvestment risk
 - (a) None of the above
5. Which of the following is true
 - (a) When holding period =duration, expected yield=realised yield
 - (b) Duration of a zero coupon bond=its maturity
 - (c) Duration of a bond decreases as time passes
 - (d) All of the above
6. When interest rates in the economy increase the duration of a bond
 - (a) Increases
 - (b) Decreases
 - (c) Remains same
 - (d) Information is incomplete

Questions

1. Which of the following will have longer duration
 - (a) 6% coupon bond with 10 years to maturity or 6 % coupon bond with 15 years to maturity?
 - (b) 6% coupon bond with 10 years to maturity or 8 % coupon bond with 10 years to maturity?
 - (c) 6% coupon bond with 10 years to maturity when market yields are 7% or 6% coupon bond with 10 years to maturity when market yields are 9%?
2. Describe the bond laddering process.
3. If interest rates are expected to fall, what maturity and coupon would you recommend to an investor who plans to invest for a short period. Can duration be used to evaluate alternative investments?
4. If interest rates are expected to fall, what would you recommend to an investor who plans to invest till maturity?
5. How are spreads between government bonds and corporate bonds expected to move when the economy is slowing down? Why?

■ PROBLEMS

1. Calculate duration for a three-year zero coupon bond and a three-year bond with 9% coupon if both have 9% yield to maturity.
2. Mr. X needs Rs 5 lacs for his son's education after 5 years. Current yields in the economy are 7% and he is considering the following two bonds for investment. What do you advise and why?

	<i>Maturity</i>	<i>Coupon</i>	<i>Duration</i>
ABC Ltd.	8 years	9%	6.15 years
XYZ Ltd.	5 years	7%	4.3 years

What assumptions are you making and what else should Mr X keep in mind during the 5-year period?

3. A 3-year bond with 9% coupon has YTM of 10%. What is the current price of the bond? If yields fall by 50 basis points use duration to estimate the new price.
4. A bond with 12% coupon issued 3 years ago is redeemable after 5 years from now at a premium of 5%. The interest rate prevailing in the market currently is 14%. Calculate the duration of the bond.
5. Cash requirements for the next four years are as follows:

End first year Rs 1 lakh

End second year Rs 2 lakh

End third year Rs 3 lakh

End fourth year Rs 4 lakh

Coupon on a 1 year bond is 5%, 2 year bond 6%, 3 year bond 8% and 4 year bond 10%. How much should be invested today in each bond to meet the above requirements for investing according to cash matching?

6. Mr X needs Rs. 50000 after two years for his son's education. He is considering investment in the following two bonds:

Bond A with 7% coupon, 4 years to maturity and current yield of 10% available for 904.90.

Bond B with 6% coupon, 1 year maturity and current yield 10% available for Rs 963.64.

What risks would he face if he invests only in A or B? How much money should he invest and where?

7. Mr. X needs exactly 2 lacs after 2 years. He is considering three bonds A, B and C with maturity of 1 year, 3 years and 5 years respectively. All three have annual coupon of 8%. Current yields in the economy are 8%. Which bond/bonds should he buy, in what proportion and why? State any assumptions made by you.

■ PRACTICAL EXERCISES

1. Using the inbuilt function for duration in a spreadsheet, calculate duration for maturities of 1 to 10 years, and discount rate of 6% for the following:

- (a) a zero coupon bond
- (b) a bond with 5% coupon
- (c) a bond with 10% coupon.

Plot all three on a graph. What relationship do you observe (1) between length of maturity and duration and (2) between coupon and duration?

2. Use the inbuilt function in a spreadsheet to calculate duration of a bond with three and a half years to maturity paying 8% coupon if yields are 6%

APPENDIX 1

Derivation of Formula for Macauley's Duration

The slope of a bond's price-yield relationship measures the bond's sensitivity to YTM. We take the first derivative of the present value formula with respect to yield to maturity.

We know that the present value of a bond =

$$P = \sum C_t (1 + r)^{-t} = \sum C_t (1 + r)^{-t}$$

Taking the first derivative we get

$$dP/dr = \sum -t C_t (1 + r)^{-t-1}$$

Multiply both sides by $-(1 + r)/P$ where P is the current market price of the bond

$$-(1 + r)/P \times dP/dr = \sum t C_t (1 + r)^{-t}/P$$

This is Macauley's Duration = D.

If we go one step further, and divide both sides by $-(1 + r)$

We get $(dP/dr)/P = -D/(1 + r)$ i.e. modified duration, which gives us the change in price for a small change in yield.

APPENDIX 2

Convexity

The relationship between bond prices and yields is not linear , it is a convex function. Convexity is a measure of the curvature of this relationship. Mathematically it is the second derivative of price with respect to yield i.e. d^2P/dr^2 , i.e. convexity is the rate of change of dP/dr for a given change in yield. There is an inverse relationship between coupon and convexity and between yield and convexity and a direct relationship between maturity and convexity.

It is useful to study convexity as it refers to the degree to which duration changes as yield to maturity changes and how a bond will react to yield changes. In figure 6.2 we saw that the price reaction to changes in yield is not symmetric. For a given change in yield, bond prices drop less for a given increase in yield and increase more for the same decreases in yield. This is also stated in the bond theorems by Malkiel. The higher the convexity, the higher is the difference between the upside and downside. Bonds with high convexity are preferred as gain on the the upside is more than loss on the down side.

Earlier in the chapter, we had used modified duration to estimate price changes in response to changes in yield. However, we were also cautioned to use this approximation only for very small changes in yield as the relationship is convex . If we combine modified duration and convexity we get a more accurate estimate of the price change due to a change in yields..

$$\text{Convexity} = (1/(1+r)^2) * \sum (nt * n_{t+1} * (C_t / (1+r)^t) / P)$$

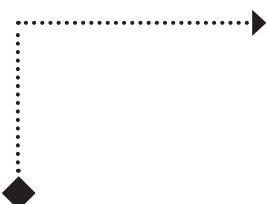
If convexity is calculated using semi annual or quarterly coupons it can be annualised by dividing by the number of payments per year squared.

$$\begin{aligned} \text{Approximate price change} &= (\text{change due to Modified Duration} + \text{change due to convexity}) \\ * \text{starting price} &= [(- \text{Modified Duration} * \Delta y) + (0.5 * \text{convexity} * \Delta y^2)] * P_0 \end{aligned}$$

However use of convexity for estimating approximate price change is not very important, since calculators and computers can be used to calculate exact price.

In the chapter on systematic risk we also learned that bonds prices increase when interest rates fall to bring yields in line with the market. However, this is assuming all other things remain constant. Duration and convexity cannot give a complete picture if the if the default risk changes due to a change in rating, or if the expected cash flows change due to yield changes etc. For example in the case of mortgage backed securities, a fall in interest rates brings the risk that borrowers may resort to prepayment of loans and refinance at the lower rate. A drop in price of such securities when interest rates fall is known as “negative convexity”. In the case of a callable bond, when interest rates decline the call price sets an upper limit for the bond price because the bond issuer is likely to exercise the call option.

PART III



Fundamental Analysis and Valuations

Chapter 7	Economy Analysis
Chapter 8	Industry Analysis
Chapter 9	Company Analysis
Chapter 10	Valuation

CHAPTER - 7

Economy Analysis

LEARNING OBJECTIVES

At the end of this chapter, you will be able to:

- Understand the relationship between stock prices and the economy
- Describe the various factors that influence the economy
- Follow economic news and discuss its implications
- Evaluate various sources of information and form an opinion on the future direction of the economy.

Fundamental analysis attempts to examine the underlying forces that affect stock prices. The aim is to estimate the intrinsic or fair value of a stock and to forecast its future value. Unlike proponents of the efficient market hypothesis, who believe that prices accurately reflect all available information, fundamental analysts look for perceived price discrepancies. If the stock is currently over/undervalued, it helps the analyst decide whether to sell/buy or hold that particular stock. Empirical studies show that stock price movements are influenced by macroeconomic and industry variables in addition to company specific variables¹. Examples of the movement of the Indian stock market in response to various economic, industry and company related factors can be seen from the newspaper reports given in Exhibit 7.1.

One of the methods used for fundamental analysis is the top-down approach, i.e., economic-industry-company or E-I-C analysis. We first judge the general direction of the economy, including assumptions about the impact of the announced fiscal and monetary policies of the government. This is followed by an analysis of various sectors and industries, wherein we attempt to identify the link between them the macro economic variables by studying their relationship over time. Finally, the individual company/companies are studied to arrive at a buy/sell/hold decision.

Exhibit 7.1: Newspaper Reports on the Stock Market

Indian Express, Friday, July 23, 1999

"JM Morgan Stanley has forecast that the BSE Sensex would touch the 5800 point mark in the next 12 months riding on the economic recovery of the country."

The Times of India, 2 Mar, 2003

"With abolition of dividend tax and long-term capital gains tax, the return on investments in equity would improve. And with strong indication of continuation of the soft interest rate regime (lowering the return on public provident fund (PPF) and other small savings by one percentage point), equity would become more attractive."

The Times of India, 22 May, 2003

"An appreciating rupee has cast its shadow on tech stocks and market observers feel that the going would get tougher for Indian software companies if the currency continues to strengthen against the dollar."

The Economic Times, 31 Dec, 2006

"It's a fact that the valuations of the market are above the past average, with the P/E multiple for the BSE Sensex (on a one year forward basis) at 17.9 times, which is 42% higher than the average P/E of 12.6 times in the last nine years. However, there is a strong case for these premium valuations. The quarterly earnings from corporate India and the overall economic growth have been strong."

The Hindu, Aug 02, 2007

"In a major shake-up on stock exchanges, the benchmark Sensex lost 615.22 points to end below the 15000-mark. The meltdown in the Indian stock prices on Wednesday was attributed to negative news flow on sub-prime mortgage – which is related to realty markets – worries from the U.S. While Asian markets witnessed a sharp fall in their indices, India's realty index was the worst hit, which was down by over 6.64 per cent and selling was seen in scrips across sectors."

Contd...

1 King (1966) found that about 50% of an individual stock's return could be accounted for by a "market factor" and approximately 10% by "industry factors". Rogalski and Vinso (1977) found bi-directional causality between money supply and stock returns. Solnik (1983) found a negative relation between interest rates and stock prices for nine countries. Gultekin (1983) found a negative relation between inflation and stock prices in twenty six countries including India. In India, Obaidullah & Mohanty (1994) found that the market factor was highly significant. Chakornipat et al (1994) found inflation is a significant determinant of stock returns.

The Financial Express, 5 June 2015

Weekly perspective on Markets from Dipen Shah, Head- Private Client Group Research, Kotak Securities.

Markets ended the week with a near-4% loss. Sentiments were weak due to the concerns over monsoons and Greece. Quarterly results have also not provided any cheer. Markets also awaited the non-farm payroll data in US, due later in the day.

Going ahead, the progress of monsoons will be closely watched, in addition to the reforms initiatives of the Government. Passage of important bills like GST are a pre-requisite for the markets to sustain and rise from current levels.

The BSE Sensex has lost 1,080.50 points in last four days after RBI took a cautious stance on economic recovery and IMD forecast monsoon to be "deficient" this year.

■ ECONOMIC ANALYSIS

The health and future prospects of the economy are an important part of fundamental analysis. When the economy is booming, most industry groups and companies normally do well; when the economy is in recession, most sectors and companies usually suffer. Economic prospects also influence investor sentiments, which in turn affect stock prices. In the long run, the economy will be influenced by the availability of capital and labour and their productivity. This in turn, is dependant on government policies and incentives given to various sectors of the economy to invest and advance technologically. The working population and consumption and savings pattern is also influenced by the size of population and the age distribution. In the short run, there are fluctuations in economic activity due to demand and supply, interest rates, inflation etc.

The long-term direction of the economy is planned and executed by the Planning Commission through its Five-year Plans. This is followed by the annual budgets presented by the Finance Minister and the monetary policy of the RBI. The plans have been based on the needs of the economy and the vision of the leaders at that point of time. From 1951-1990, the plans focussed on the role of the government in the planning and development process. Over the years, they covered various aspects of the economy including defence, industry, agriculture, irrigation projects, energy, transportation and communications, land rehabilitation, social services, community development, health, family planning etc. Building of dams for irrigation and power, setting up of steel plants, electricity generation and atomic energy, the green revolution, road building, transport corporations, nationalisation of banks, national highways, information technology, higher education by establishing the Indian Institutes of Technology, University Grants Commission for funding higher education, etc. have all been part of this planning process. In 1991, Dr. Manmohan Singh launched India's free market reforms that marked the beginning of liberalisation, privatisation and globalisation. Institutions in the financial sector were developed and there was growth in private capital formation.

In January 2015 The National Institution for Transforming India, NITI Aayog, replaced the planning commission². It is the premier policy 'Think Tank' of the Government of

² <http://niti.gov.in/content/overview>

India, providing both directional and policy inputs. While designing strategic and long term policies and programmes for the Government of India, NITI Aayog also provides relevant technical advice to the Centre and States. NITI Aayog acts as the quintessential platform of the Government of India to bring States to act together in national interest, and thereby fosters Cooperative Federalism. The Team India Hub leads the engagement of states with the Central government, while the Knowledge and Innovation Hub builds NITI's think-tank capabilities. NITI Aayog is also developing itself as a State of the Art Resource Centre, with the necessary resources, knowledge and skills, that will enable it to act with speed, promote research and innovation, provide strategic policy vision for the government, and deal with contingent issues.

Economic activity in the country is influenced by domestic and international factors. Domestic economic activity can be measured and analysed in terms of the GDP, and its components of consumption, savings and investment and foreign trade. Forecasts are based on the past performance and economic policies that are expected to shape the future. These include the fiscal policy, which signals government policy through taxes and government spending, and the monetary policy, which determines money supply and interest rates. International factors also impact the domestic economy through firms engaged in international trade. Economic conditions in the world determine domestic exports and exchange rates have an impact on exporters and importers.

Various studies have been conducted to determine the macroeconomic factors that influence stock prices. Although it is not possible to pinpoint the exact cause and effect relationship, analysts are interested in knowing the direction of the relationship with stock prices in general. Economic indicators may be *procyclic* (move in the same direction as the economy) or *countercyclic* (move in the opposite direction as the economy). For example, GDP is a procyclic indicator; if the economy is doing well, GDP is also increasing, whereas if the economy is in a recession this indicator will decrease. Unemployment is a countercyclic economic indicator; the unemployment rate increases in recession and decreases in a boom period. Economic indicators are also classified as leading, lagging, or coincident indicating their timing relative to the economy. *Leading indicators* change before the economy changes. They are considered most important for investors as they help predict the future direction of the economy. *Lagged indicators* change direction after the economy does, while *coincident indicators* move at the same time as the economy. Leading indicators in India include rainfall, capital investment, credit availability and rate of interest, money supply and confidence surveys. Concurrent or coincident indicators include growth in GNP, corporate profits, production index, stock index and money market rates. Lagging indicators would include inventory pile up, overdue debt, and unemployment.

■ KEY MACROECONOMIC VARIABLES

Key macroeconomic variables that can be studied in the Indian context include the following:

The Gross Domestic Product is the value of all the goods and services produced in an economy; it is considered the most comprehensive single measure of aggregate economic

performance of the economy as it encompasses all economic activities during the reference period. The rate of growth of GDP is compared with historical growth rates to indicate the general direction of the economy. Information on GDP and its growth rate is collected and disseminated by the Central Statistical Organisation (CSO) at various times of the year³.

Index of industrial production represents the general level of industrial activity in the economy for a given period of time as compared to a reference period. It is a short-term indicator for measuring industrial growth. The quick estimate of IIP for a month is available within six weeks, and is revised in the next two months⁴.

Savings and investment are necessary for increasing the amount of fixed capital available, which contributes to economic growth. Higher savings and investment will result in higher productive capacity and higher future production. Higher *savings rate* will lead to higher *investment rate* provided the savings are put to productive use. This could be through direct investment or through deposits with financial intermediaries such as banks.

Fiscal Deficit represents the shortfall between government receipts and expenditure, which is covered through foreign/domestic borrowing and printing of currency. A high fiscal deficit is not desirable as loans entail payment of interest and principal in future periods, while printing of currency to meet the deficit can lead to inflation. High government borrowing also drives up interest and crowds out private borrowing and investment.

Price Indices: There are two popular price indices in India, the wholesale price index or WPI and the consumer price index CPI, Earlier WPI was the preferred index as there was no CPI for the whole country and WPI was available on a weekly basis.

The new CPI with base year 2010 from 2011 and base year 2012 from 2015 is available in aggregate to measure retail inflation. It is the preferred index now as it includes prices of services such as education, health care, and rents, which are not included in WPI. It also provides rural and urban figures, and state wise data. It is possible that the two indices may not move in tandem; in January 2016 WPI was negative while CPI was positive.

The government set up a committee in 2014 to devise the Producer Price Index to replace the WPI. WPI includes taxes whereas PPI will not. The PPI will track changes at the producer level for both goods and services while CPI will track retail prices.

Core inflation: An inflation measure which excludes temporary price volatility as in the case of some commodities such as food items, energy products etc. Core inflation is calculated using the Consumer Price Index (CPI) by excluding such commodities. Core CPI =Headline CPI minus food and fuel components.

Rainfall is an important indicator, as adequate and timely rainfall should result in enough food crops and raw material for industries and also generation of hydro-electric power.

³ The Central Statistical Organisation (CSO) releases the quarterly estimates of GDP with a lag of 3 months for the first quarter and 2 months thereafter. Advance estimates of annual national income are released 2 months before the close of the year, revised estimates at the end of June (3 month lag) and quick estimates in January of the following year (10 months lag). The annual GDP estimates undergo revision for about two to three years, after the release of Quick Estimates before they are finalised.

⁴ Ministry of Statistics and Programme Implementation

On the other hand, drought/floods lead to shortage of food and raw material and also increased prices.

International developments are an important factor, which is reflected in our economic growth and stock markets, as we are integrated with international markets through trade and financial flows in the form of loans, foreign direct investment and portfolio investment⁵.

■ GOVERNMENT POLICIES AND PLANS

The Government Budget is a plan of the intended revenues and expenditures of the central and state governments. The annual budget of the Government of India reflects its economic policy priorities and outlines the method of financing the plan. When the Finance Minister presents the Union Budget to the Lok Sabha on the last day of February, it usually has an immediate effect on the nation's stock exchanges. The budget normally signals short and medium term plans; some budgets also signal long-term changes, such as Dr Manmohan Singh's budgets in the early 1990s, which paved the way for liberalisation and financial reforms. State government budgets, departmental expenditures, approvals for setting up of industrial areas, the housing policy etc. also give signals about the governments intentions and amount of expenditure in various sectors. *The Economic survey* is presented just before the Budget every year. It is a detailed report on the state of the economy and also recommends policies for future action. The highlights of the Economic Survey 2008-2009 are given in Exhibit 7.2.

Exhibit 7.2 : Highlights of the Economic Survey

Economic Growth in 2016-17 projected at 7-7.5 %2016-17 expected to be challenging from fiscal point of view; time is right for a review of medium-term fiscal framework . 2015-16 fiscal deficit, seen at 3.9 per cent of GDP, seems achievable Credibility and optimality argue for adhering to 3.5 per cent of GDP fiscal deficit target.
CPI inflation seen around 4.5 to 5 per cent in 2016-17, low inflation has taken hold, confidence in price stability has improved . Expect to meet 5 per cent inflation target by March 2017 . Prospect of lower oil prices over medium term likely to dampen inflationary expectations
2016/17 current account deficit seen around 1-1.5 per cent of GDP
Rupee's value must be fair, avoid strengthening; fair value can be achieved through monetary relaxation . India needs to prepare itself for a major currency readjustment in Asia in wake of a similar adjustment in China. Rupee's gradual depreciation can be allowed if capital inflows are weak.
Estimated capital requirement for banks around 1.8 trillion rupees by 2018-19. Proposes to make 700 billion rupees available via budgetary allocations during current and succeeding years in banks. Government could sell off certain non-financial companies to infuse capital in state-run banks . Corporate, bank balance sheets remain stretched, affecting prospects for reviving private investments. Underlying stressed assets in corporate sector must be sold or rehabilitated.
Tax revenue expected to be higher than budgeted levels in 2015-16. Proposes widening tax net from 5.5 per cent of earning individuals to more than 20 per cent. Favours review and phasing out of tax exemptions; easiest way to widen the tax base not to raise exemption thresholds.

Source: Economic Times Feb 26, 2016

⁵ For example, in March 2001, the sensex dipped following a decline in Nasdaq and warning of a slowdown in the US also affected the technical, media and telecom shares in particular; the sensex reached an 8 year low on the 17th of September 2001, due to the war between the US and Afghanistan.

Monetary Policy has an impact on liquidity and inflation. The Reserve Bank of India announces its Monetary and Credit Policy at the end of April every year. It reviews the policy bimonthly and announces revisions in rates as and when the situation arises. The objectives are to maintain price stability and ensure adequate flow of credit to the productive sectors of the economy. The policy also contains an economic overview and presents future forecasts. The RBI regulates the supply of money and the cost and availability of credit in the economy. It can increase or decrease the supply of currency and influence interest rates., carry out open market operations, control credit and vary the reserve requirements. Instruments of monetary policy include the bank rate, repo rate, open market operations, reserve requirements (SLR and CRR), selective credit control to certain sectors(e.g., housing bubble) or for purchase of certain commodities to discourage hoarding etc. change in the margins, ceilings on total credit (for example, ECBs) and moral suasion (convey policies through discussion or written communication).

The rates of interest affect the borrowing costs of and profitability of companies and the credit and purchasing power of individuals. The sovereign yield curve⁶ can sometimes give indications about future economic growth. Excerpts from the monetary policy 2008 are given in Exhibit 7.3

Exhibit 7.3: Excerpts from the Monetary Policy April 2016

Global financial markets have recouped the losses suffered in the turbulence at the beginning of the year.

In India, gross value added (GVA) in agriculture and allied activities in Q4 in the CSO's advance estimates is likely to be achieved, if not revised upwards. Value added in industry accelerated in H2, led by manufacturing which benefited from the sustained softness in input costs. By contrast, industrial production remained flat with manufacturing output shrinking since November. With improved perceptions on overall economic conditions and income, the Reserve Bank's Consumer Confidence Survey of March 2016 shows marginal improvement in consumer sentiments. The Reserve Bank's industrial outlook survey suggests that business expectations for Q1 of 2016-17 continue to be positive. The outlook for services in surveys is upbeat for Q1 of 2016-17.

Retail inflation measured by the consumer price index (CPI) dropped sharply in February after rising for six consecutive months.

On the basis of an assessment of the current and evolving macroeconomic situation, it has been decided to:

- Reduce the policy repo rate under the liquidity adjustment facility (LAF) by 25 basis points from 6.75 per cent to 6.5 per cent;
- Reduce the minimum daily maintenance of the cash reserve ratio (CRR) from 95 per cent of the requirement to 90 per cent with effect from the fortnight beginning April 16, 2016, while keeping the CRR unchanged at 4.0 per cent of net demand and time liabilities (NDTL);
- Continue to provide liquidity as required but progressively lower the average ex ante liquidity deficit in the system from one per cent of NDTL to a position closer to neutrality; and
- Narrow the policy rate corridor from +/-100 basis points (bps) to +/- 50 bps by reducing the MSF rate by 75 basis points and increasing the reverse repo rate by 25 basis points, with a view to ensuring finer alignment of the weighted average call rate (WACR) with the repo rate;

Consequently, the reverse repo rate under the LAF stands adjusted to 6.0 per cent, and the marginal standing facility (MSF) rate to 7.0 per cent. The Bank Rate which is aligned to the MSF rate also stands adjusted to 7.0 per cent.

⁶ The yield curve is dealt with at length in the chapter on systematic risk of bonds.

■ ARTICLES AND SURVEYS

Articles: According to Acharya (2006), the risks are fiscal stress from populist policies (Rural Employment Guarantee Scheme and Sixth Pay Commission); infrastructure bottlenecks (electricity, roads, water, sewage); labour market rigidities (strict labour laws regarding layoffs discourage permanent employment), weak performance of agriculture (need irrigation, balanced fertilizer subsidies, transportation, credit facilities). Agriculture accounts for 20% of GDP and supports 60% population, “better performance of this sector is essential for poverty alleviation and containment of rising regional and income inequalities”. Pace of economic reforms (pace of privatisation halted, petroleum price administration increased, caste-based reservation to mention a few things), weaknesses in human resource development programmes (Primary education, health), and the international economic environment (slowdown in the US).

Consumer surveys are conducted to get a feel of the general public opinion on the present and future economic scenario in a country. Surveys are conducted periodically and compared over time. MasterCard Worldwide Index of Consumer Confidence and Nielsen Global Consumer Confidence index conduct the survey in many countries including India. The ET-TNS Consumer Confidence Index⁷, a comprehensive study on India consists of two parts, the Present Situation Index (how things stand currently compared to six months ago) and the Future Expectations Index (how things will be six months hence). Each component is based on general business conditions in the respondent's line of work, availability of jobs and household income. Consumer indices are considered to be a leading indicator of the overall business cycle.

Expert opinions: The RBI conducts a Survey of Professional Forecasters⁸ covering component-wise detailed forecasts of GDP growth, inflation, savings, capital formation, consumption expenditure, export, import, interest rates, forex reserve, money supply, credit growth, stock market movements, corporate profit, etc., results of which are available on its website. Annual and quarterly and long-term forecasts are made and probabilities are also assigned. Excerpts of such a survey are presented in Exhibit 7.4.

Exhibit 7.4: Excerpts from a Survey of Professional Forecasters

The Reserve Bank has been conducting a quarterly Survey of Professional Forecasters since September 2007. Twenty Four professional forecasters participated in the survey in September 2016.

Forecasters expect real Gross Value Added at basic price (GVA) to increase by 7.6 per cent in 2016-17. 'Agriculture & Allied Activities' and 'Services' are expected to grow by 3.5 per cent and 8.8 per cent, respectively. 'Industry' growth forecast has been placed at 7.5 per cent In 2017-18.

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⁷ Launched in December '02, the 16th round of this quarterly survey polled 4,008 urban consumers across eight centres, four metros and one non-metro city from each region. The sample was spread across age groups and socio-economic categories.

⁸ Quarterly survey of professional forecasters was started for the quarter ending Sept. 2007, the report for end March 2008 is available at <http://rbi.org.in/scripts/PublicationsView.aspx?id=10261>

CPI headline inflation is expected to fall sharply to 4.5 per cent in Q3:2016-17 and thereafter may maintain the same level till Q2:2017-18 . The core CPI (defined as excluding food and fuel) inflation is expected to remain below 5.0 per cent till Q2 :2017-18. WPI inflation is expected to increase to 4.4 per cent in Q4:2016-17 and may decline thereafter.
Gross Saving Rate is projected at around 31.6 per cent of Gross National Disposable Income (GNDI) in 2016-17 and 32.1 in 2017-18
Forecasters expect Gross Fixed Capital Formation Rate at 29.5 per cent of GDP in 2016-17, which is expected to improve to 29.8 per cent of GDP in 2017-18
Money supply (M3) is expected to grow by 11.5 per cent in 2016-17 and 12.3per cent in 2017-18. Bank credit growth is expected at 11.5 per cent in 2016-17 which is expected to improve to 13.0 per cent in 2017-18 Central Government's gross fiscal deficit (GFD) is projected at 3.5 per cent of GDP in 2016-17 and is expected to moderate to 3.3 per cent of GDP in 2017-18.
The combined GFD of Central and State Governments is projected at 6.5 per cent of GDP in 2016-17 and is expected to improve to 6.0 per cent of GDP in 2017-18
Merchandise Exports is likely to be at 1.2 per cent in 2016-17 which indicates a downward revision from 2.6 per cent in the previous round. It is expected to improve to 6.1 per cent in 2017-18
Current Account Deficit is projected at 1.0 per cent and 1.2 per cent (of GDP) in 2016-17 and 2017-18, respectively.
Variation observed in the forecast of the Indian Rupee against the US\$ suggest Rupee to be volatile in the short-term. In terms of median of forecast, Indian Rupee is expected to move in the range of 67.00 to 67.50 per US\$ till Q2:2017-18
Long Term Forecasts The long-term real GVA growth expectations is at 8.35 per cent compared to 8.3 per cent in the previous round. The medium - term growth forecast for the next five years is persisted at 8.0 per cent. The average CPI inflation for the next five years is unchanged at 5.0 per cent, the long-term ten years inflation forecast

Business expectations or confidence surveys attempt to assess the prevailing business conditions as faced by firms. In India, the RBI, the National Council of Applied Economic Research (NCAER)⁹, FICCI and other industry associations carry out such surveys. These surveys are considered to be leading indicators of industrial growth trends¹⁰. The indicators are based on periodical surveys of unemployment, labour productivity, order book positions, etc. An example of the components that are considered in forming a confidence index can be seen in the RBI industrial confidence indicator in Table 7.1.

Table 7.1: Business Expectations

<i>Parameters</i>	<i>Assessment Period</i>		<i>Expectations Period</i>	
	<i>Q3:2015-16</i>	<i>Q4:2015-16</i>	<i>Q4:2015-16</i>	<i>Q1:2016-17</i>
Production	16	16.8	31.1	25
Order Books	11.5	12.1	29.1	21.2
Pending Orders	14.3	13.9	6.3	10.2
Capacity Utilisation	7.1	7.1	19.1	13.4

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⁹ Business Expectations Survey (BES) of NCAER is a subscription-based service

¹⁰ See Sunil K. Sinha Business Expectations Survey: Analysing Indian Data, National Council of Applied Economic Research. The NCEAR business confidence index was able to predict the upturns and downturn in the index of industrial production at least three to six months ahead.

Exports	5.7	3.3	16.9	13.7
Imports	6.1	4.7	7.7	5.8
Employment	5.8	4.1	8.6	7.1
Financial Situation	13.2	14.3	24.7	24.8
Availability of Finance	12.9	12.4	20	19.5
Cost of Finance	-5.4	-8.7	-5.5	-8.3
Cost of Raw Material	-26.4	-24.4	-27.3	-27.7
Selling Price	-1.4	-3.7	7.2	7.1
Profit Margin	-15.3	-16.7	-2	-3.6
Overall Business Situation	17.4	16.2	33.3	30.5
Salary	25.1	27.5	22.1	30.3
Business Expectation Index	103.6	103	114.2	110.9

Source: RBI

The 72nd round (Q3:2015-16) survey results were released on January 15 2016 on the RBI website. The survey results are those of the respondents and are not necessarily shared by the Reserve Bank of India. Net Response (NR) is the difference of percentage of the respondents reporting optimism and that reporting pessimism. The range is -100 to 100. Any value greater than zero indicates expansion/optimism and any value less than zero indicates contraction/pessimism i.e., $NR = (I - D)$; where, I is the percentage response of 'Increase/optimism', and D is the percentage response of 'Decrease/pessimism' and E is the percentage response as 'no change/Equal'; $I+D+E=100$. For example, increase in production is optimism whereas decrease in cost of raw material is optimism.

The Business Expectation Index (BEI) is a composite indicator calculated as weighted (share of GVA of different industry group) net response of nine business indicators. The nine indicators considered for computation of BEI are: (1) overall business situation, (2) production, (3) order books, (4) inventory of raw material, (5) inventory of finished goods, (6) profit margin, (7) employment, (8) exports and (9) capacity utilisation. It gives a single snapshot of business outlook in every quarter. BEI lies between 0 to 200, and 100 is the threshold separating expansion from contraction.

Other information that an analyst can look at are government policy announcements, fiscal and monetary indicators, debt servicing capacity and balance of payments. Some of these indicators are quantifiable, and their relationship with stock prices can be studied using regression analysis and graphs. However, it is important to realise that in market-driven economies the individual actions of the entire nation results in the final direction of the economy. Also, the direction of causality cannot always be established, for example, the level of employment is both a cause and effect of growth, similarly a buoyant stock index is a stimulator for further investment and also a result of investment and growth. It is not possible to capture the effect of so many simultaneous variables in mathematical relationships and predict an exact figure of growth. Indicators can only signal the direction of change; if majority of the signals point in the same direction, more confidence can be placed in the future forecast.

India has many strengths, which should help in achieving sustained growth in the future. These include a huge reservoir of skilled and educated manpower, entrepreneurial skills that can be seen from the extent of our small scale industries and huge consumer market that presents opportunity for producers, and ongoing process of reforms. However, there is need to work towards removal of weaknesses, which include lack of infrastructure, i.e. roads, electricity, water supply and there is also the need for more broad-based and inclusive growth.

Forecasts are made with the data that is available at a particular point of time. The accuracy of the data depends on the coverage, classification, frequency and method of collection. In India, many financial transactions are not covered as deals take place in the black market or parallel economy. The quality of information available depends on the sample size and method of data collection and verification. The classification of data by all collecting agencies is not uniform and varies according to the needs and convenience of the collecting agency. All information is not available at the same frequency, for example, stock prices are available daily, wholesale price index consumer price indices and production index monthly. Quarterly information on the GDP is provided with a lag of 2-3 months, while annual GDP estimates undergo periodical revision for about two to three years. Major sources of information include the CSO under the Ministry of Statistics and Programme Implementation¹¹, the RBI, SEBI, the long term plans, central and state government budgets, industry association reports and reports and articles in journals and newspapers. Data is compared with historical data to form a judgement whether it is considered favourable or not. Views of experts are also taken into consideration. An assessment of the performance of the economy and forecasts are then made. Condensed excerpts¹² from an assessment of the economy made by ICRA in May 2008 is given in Exhibit 7.5.

Exhibit 7.5: Assessment of the Economy based on an ICRA report in May 2016

Outlook for economic growth during FY2017 suggests economic recovery will remain uneven and gradual, notwithstanding the recent double-digit expansion in electricity generation, cement output, refinery production and fertilisers output. Consumption growth is poised to improve following an anticipated cyclical upturn in agriculture, once-in-a-decade pay revision for Central Government employees and enhanced pension for the defence services. These factors would boost capacity utilisation and economic growth in FY2017. However, they may be inadequate to trigger a broad-based expansion in capacities, with sluggish global growth expected to continue impeding recovery in export-oriented sectors.

Pay revision and the focus on fiscal consolidation have restricted the Union Government's budget for capital spending during FY2017. The pace of implementation of various capital expenditure plans of public sector undertakings will be keenly watched to gauge the robustness of growth impulses. On balance, we expect growth of gross value added (GVA) at basic prices to improve modestly to 7.7% in FY2017 from the 7.2% we have projected for FY2016.

India's current account deficit is expected to widen modestly to US\$25 billion in FY2017, from an estimated US\$20 billion in FY2016, but the anticipated capital inflows should cover the same comfortably. A favourable monsoon after a gap of two years would have a mixed impact on trade in various sectors, boosting agricultural exports and limiting imports of crude oil and coal, while enhancing the demand for gold. Any sustained rally in commodity prices, particularly in crude oil prices, would increase the import bill while simultaneously counteracting the risk posed by lower remittances. A meaningful recovery in merchandise exports is unlikely to set in during FY2017 given the sluggish outlook for global trade flows, while the services trade surplus is expected to report an improvement.

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¹¹ The Central Statistical Organisation is responsible for coordination of statistical activities in the country, and evolving and maintaining statistical standards. Its activities include National Income Accounting; conduct of Annual Survey of Industries, Economic Censuses and its follow up surveys, compilation of Index of Industrial Production, as well as Consumer Price Indices for Urban Non-Manual Employees, Human Development Statistics and Gender Statistics.

¹² The whole report consists of 64 pages and is available at the ICRA website.

Capacity utilisation declined to 70.6% in Q2 FY16 from 73.6% in Q2FY15 (Source: Order Books, Inventories and Capacity Utilisation Survey conducted by the Reserve Bank of India). New project announcements in Q3 FY16 stood at Rs. 1.2 trillion, concentrated in electricity, machinery, transport equipment , transport services and miscellaneous services. On a year -on-year (y-o-y) basis, new projects declined by 69.5% in Q3 FY16 , on account of an unfavourable base effect.

Low growth in bank credit to large industry and services (led by muted working capital requirement) offset by high growth in financing through commercial paper and bond issuance, resulted in aggregate credit growing by 11.6% in April -December 2015. Aggregate external commercial borrowings (ECB) volumes decline to USD 21.5 billion in April 2015-January 2016 from USD 23.5 billion in April 2014-January 2015, Domestic equity issuance eased by 6.5% to Rs. 551.2billion in April 2015-January 2016, dampened by lower disinvestment of the GoI's stake in various public sector enterprises, which accounts for one-third of the equity issuance so far in FY16 as compared to 42% in the corresponding portion of FY15. Net of disinvestment, domestic equity issuance rose by a moderate 6.2% in the same time period

GDP growth moderated to 7.3% in Q3 FY16 from 7.7% in Q2FY16,led by slowdown in growth of gross fixed capital formation to 2.8% from 7.6%.

Growth of gross value added (GVA) at basic prices eased to 7.1% in Q3 FY16 from 7.5% in Q2 FY16, led by a 1.0% y-o-y contraction in agriculture, forestry & fishing in Q3FY16 (2.0% growth in Q2FY16), in line with the weak kharif harvest following the unfavourable monsoon. Industrial expansion improved sharply to 9.0% in Q3FY16 from 6.4% in Q2FY16, led by manufacturing. Growth of the services sector remained steady at 9.4% in both these quarters.

Despite late sowing, lower coverage and unfavourable rainfall, Second Advance Estimates indicate an surprising uptick in rabi production of wheat (+8.4%), oilseeds (+5.4%) and pulses (+4.8%), although shortfalls are forecast for coarse cereals (-15.2%) and rice (-7.6%). Recent spells of unseasonably heavy rainfall may dampen yields. Rural sentiment expected to remain muted in the immediate term, although waning of unfavourable base effects to arrest contraction in sales of rural-focussed items such as tractors and motorcycles.

Contraction in industrial production for third month in a row in Jan 2016 is disconcerting, with one-off factors that impacted output in November 2015 (fewer working days) and December 2015 (Chennai floods) having dissipated. While merchandise exports have recorded a y-o-y decline for 15 months in a row, contraction in services exports in Nov 2015 -Jan 2016 poses fresh concern.

Lead indicators of trading activity have continued to display mixed trends in recent months, with some pickup in roads following decline in diesel prices.

Lack of fiscal space has restricted growth of capital spending at 3.9% in the GoI's Budget Estimates (BE) for 2016-17. Substantial portion of announced increase of Rs. 1.2 trillion

in Central Plan Outlay in 2016-17 to be funded through extra budgetary sources, progress on which will influence the pace of infrastructure augmentation and economic growth.

As can be seen, the majority of the economic forecasts gave a similar picture. This is because the major source of information is common and opinions are often influenced by consensus. In addition to looking at normal or expected changes, if a forecaster is able to factor in the impact of shocks such as the sub prime crisis or the oil price increase leading to inflation (as was experienced in 2008) the forecasts may be more accurate, even if they are different from the general consensus.

■ SUMMARY

Fundamental analysis attempts to ascertain the fair value of a stock through a study of the factors that influence it. One of the methods used for fundamental analysis is the E-I-C

analysis. The long-term economic policy is revealed in the Five-year Plans, the Central Government Budget and the monetary policy. Information on the past performance is available in the annual economic survey and periodically from the CSO and the RBI. In order to judge the future direction of the economy, we can look at the leading indicators, which include rainfall, capital investment, credit availability and rate of interest, money supply and confidence surveys.

■ MULTIPLE CHOICE QUESTIONS

1. Fundamental analysts
 - (a) Believe that prices reflect all available information
 - (b) Invest for a very long period
 - (c) Invest for very short periods
 - (d) None of the above
2. In the Indian context the following have been considered as leading indicators (mark all correct options)
 - (a) Inventory pileup
 - (b) Rainfall
 - (c) Confidence surveys
 - (d) None of the above
3. In the Indian context the following have been considered as lagging indicators
 - (a) Inventory pileup
 - (b) Growth in GNP
 - (c) Increasing unemployment
 - (d) None of the above
4. Which of the following measures might RBI take to control inflation (mark all correct options)
 - (a) Decrease CRR
 - (b) Increase SLR
 - (c) Increase repo rate
 - (d) All of the above
5. A depreciating rupee (all other thing remaining constant) is likely to result in
 - (a) Increase in imports
 - (b) Decrease in exports
 - (c) Increase in exports
 - (d) None of the above

6. In order to judge the future direction of the economy we can look at
 - (a) Leading indicators
 - (b) Lagging indicators
 - (c) Coincident indicators
 - (d) None of the above

■ QUESTIONS

1. What factors would determine economic growth in the long-term and in the short-term?
2. List two leading, coincident and lagging economic indicators in India.
3. Why is rainfall considered a leading economic indicator in India?
4. What are the factors that identify a slow down in the economy?
5. Why do international factors affect the Indian economy?
6. What measures is the RBI expected to take if the economy is in recession and why?
7. What measures should the RBI take if there is high inflation?
8. What measures do you expect the annual budget to incorporate if the economy is in recession?
9. What is the effect of a depreciating/appreciating rupee on exporters/importers in India?
10. How is the stock market related to the economic activity?
11. List two areas of strength and two areas of concern regarding economic growth in India.

■ PRACTICAL EXERCISES

1. Compare the forecasts for the economy from two or more sources. What are the similarities and differences?
2. Compare the forecasts for the previous year with the actual performance. What were the major differences, if any? What were the assumptions that were not as forecasted?
3. Compare the rate of inflation with the return on a stock market index of your choice over a ten year period. Do stock returns always beat inflation?

APPENDIX

The Sub Prime Crisis and Euro Debt Crisis

The Sub Prime Crisis

Sub prime refers to borrowers who are likely to default. The sub prime crisis was triggered when the US housing bubble burst in 2006-2007. However, the cause of the crisis was not limited to sub prime housing loans; it was the culmination of a host of imprudent practices.

1. Easy finance was available to borrowers in USA due to inflows from Asia and oil producing nations, leading to an era of consumerism based on debt financing.
2. The practice of giving rewards for getting business without responsibility for recovery of loans acted as an incentive for reckless lending and financial commitments.
3. There was a long term trend of rising prices in the housing sector in USA from 2000 to 2006; demand and prices spiraled as banks offered easy finance with very low or even zero owner's contribution in the form of a down payment. Instead of looking at the borrowers' ability to service their loans, lenders focused on rising housing prices¹³. Builders built properties in response to this demand, lenders undercut each other in order to finance buyers, and buyers bought homes they could not afford (sub prime customers) hoping to profit from resale, to pay installments from rentals, or to get cheaper refinance in future. However, rentals did not keep pace with prices, interest rates rose and real estate prices dropped. This led to default and foreclosures (bank sells the property to recover the loan). For the buyer, the installments paid were a loss and for lending institutions the loan against mortgages was higher than the sale value of the property, resulting in a loss. A vicious cycle of price declines and foreclosures followed, which aggravated the situation.
4. Mortgage backed securitisation (MBS)¹⁴ compounded the problem as lending institutions had sold these home loans, and put the money back into circulation, creating more sub prime loans while circumventing capital adequacy norms and distancing themselves from the risk of lending.
5. Tax incentives for financing housing for low income households, encouraged lending and purchase of MBS by institutions such as Fannie Mae and Freddie Mac.
6. The MBS and other loans were further bundled and resold as collateralised debt obligations (CDO), generating further cash for lending.
7. Buyers of securitised debt and other institutions also bought credit default swaps (CDS). This is an over the counter derivative contract somewhat akin to insurance, in which the buyer of the CDS receives a payment if the security defaults (default as defined in the agreement). However unlike insurance, the buyer need not own the

¹³ Ellis, L (2008): "The housing meltdown: why did it happen in the United States?", BIS Working Papers, no 259, September. <http://www.bis.org/publ/work259.pdf?noframes=1>

¹⁴ For the process of securitisation, see the appendix of the chapter on unsystematic risk.

security and need not incur a loss in order to receive the payment. A CDS can therefore be used for hedging and speculation. The parties selling the CDS were however not regulated, exposing the buyers of derivatives such as Citigroup, Merrill Lynch, Lehman Brothers, Bear Stearns and Morgan Stanley to risk of default. Institutions like AIG, which sold CDS did not anticipate such substantial erosion in value of securities (over 90% in some cases) did not have sufficient capital to meet their commitments.

8. Credit rating is very important for the sale of such derivative products; unfortunately, credit rating agencies assigned higher ratings than was justified. The unexpected default in these over rated securities led to huge losses for individuals and institutional investors.
9. The losses created a panic in financial markets; investors withdrew their funds from investments they perceived as risky, leading to further price declines.
10. Banks and financial institutions had to write off their losses, raising fears of failures and closures, prompting government to bail them out and announce stringent regulatory measures.
11. The effect of the sub prime crisis spread across the globe as institutions with exposure to sub prime loans had similar problems. Withdrawal of portfolio and other investments from overseas and domestic markets led to a slump in asset prices. Manufactures and exporters of goods and services were hit by the slowdown in global demand. This resulted in reduced economic activity and increased unemployment.

The EU Debt Crisis

The History of th European Union : The European Union is a geo-political entity covering a large portion of the European continent. It is the result of gradual integration since 1945 and is founded upon numerous treaties and has undergone expansions that have taken it from 6 member states in 1945 to 28, a majority of states in Europe¹⁵. The European Union (EU) was created by the Maastricht Treaty on November 1st 1993. The euro introduced on 1 January 1999,became the official currency of 11 Member States in two stages. It was initially used for cash-less payments and accounting and from 1 January 2002 for cash based transactions also in the form of banknotes and coins. The euro is not the currency of all EU Member States; Denmark and the United Kingdom have opted out, while some new members need to meet the conditions for adopting the single currency.

All EU Member States form part of Economic and Monetary Union (EMU) with close co-ordination of economic and fiscal policies and, for some countries a single monetary policy and a single currency. The Maastricht Treaty set out the objectives of EMU and the conditions Member States must meet in order to adopt the euro. These conditions include low and stable inflation, exchange rate stability and sound public finances. The monetary policy is the responsibility of the independent European Central Bank (ECB),

¹⁵ http://en.wikipedia.org/wiki/History_of_the_European_Union

and the central banks of the Member States that adopted the euro. However the Fiscal policy i.e. taxes and government expenditure and financial markets etc are managed by individual nations, under the Stability and Growth Pact (commonly agreed rules in order to achieve common economic goals).

The EU crisis had multi-dimensional roots¹⁶ and the causes of the crisis varied by country; some of which are listed below:

1. The global economy experienced slow growth after the U.S. financial crisis of 2008-2009, and many countries built up substantial debts as spending was not contained.
2. Ireland and Spain had sound public finances before the onset of the financial crisis. Their problem was high private debt i.e. household and corporate debt. This was due to historically low (real) interest rates since the beginning of the EMU in 1999. High private deficit-to-GDP was a problem in many countries including the U.S. and Iceland.
3. In addition to private debt accumulation, countries such as Greece, Portugal, and Italy accumulated huge public debt. Deficit as a percentage of GDP was highest in Greece, Portugal, Spain, and Ireland; deficit was higher than GDP in Greece.
4. Germany and the Netherlands were the major surplus countries. Financial institutions relocated the high savings of surplus countries such as Germany, to periphery deficit countries. (There is home bias in investment)
5. Interest rates in Spain and Ireland were irrationally lower than in Germany as they had higher private debt levels and therefore had higher default risks. (theoretically higher risk should demand higher reward)
6. In addition Greece, Portugal, Spain, Italy, and Ireland had declined substantially in competitiveness over the past decade. Wages rose faster than productivity for years, and their unit labour costs, were about 20% higher than their rivals. In some of the deficit countries wages were linked to inflation. Sharing a common currency, they could not make individual adjustments through devaluation. The option of wage cuts improves competitiveness, but increases the debt problems of households.
7. Under the Maastricht Treaty, members pledged to limit their deficit spending and debt levels. In the early 2000s, some members masked their deficits through securitising future government revenues, inconsistent accounting, off-balance-sheet transactions and complex currency and credit derivatives structures.¹⁷
8. With the onset of the financial crisis in USA, governments around the globe resorted to substantial stimulus measures, financial guarantees and support to the banking sector, which increased public debt even further in a relatively short period of time.

¹⁶ The Euro Crisis and Its Implications July 2012 Prof. Bodo Herzog DWS Global Financial Institute
https://www.deawm.com/assetdownload/5e15a9a4050241ccb9f05c5f34689338/20120709_DGFI_White-Paper_The_Euro_Crisis.pdf

¹⁷ Wikipedia

- Investors demanded higher bond yields in the indebted countries which also increased their debt burden.
9. The true picture was not revealed due to the inability of credit rating agencies to anticipate the crisis and the tendency to overreact after the crisis.
 10. The sovereign debt crisis turned into a crisis of confidence which impacted the economic outlook and creditworthiness of euro area banks due to the contagion¹⁸ effect. Ten banks needed a bailout from the ECB or IMF to repay or refinance their government debt.
 11. The crisis was not just a debt crisis, it was an economic crisis with low demand and high unemployment and associated misery for the public. It was also a political crisis that saw a change in power of eight governments¹⁹.

According to Reinhart and Rogoff (2013) some lessons learnt from the Euro crisis²⁰ are

1. Financial repression generally discourages financial excess, and it is often associated with reduced frequency of crises. This includes directed lending to government by captive domestic audiences, explicit or implicit caps on interest rates, regulation of cross-border capital movements, and generally a tighter connection between government and banks. Periods of monetary tightening and high real interest rates benefit savers, and periods of loose monetary policy benefit borrowers.
2. Public and private debt, domestic and external debt all add to risk and all are not accounted for.
3. There are five ways to reduce large debt-to-GDP ratios . Most historical episodes have involved some combination of economic growth, fiscal adjustment through austerity, explicit default or restructuring, financial repression and inflation.

In summary, the eurozone crisis resulted from a combination of complex factors, including the globalisation of finance; easy credit conditions during the 2002–2008 period that encouraged high-risk lending and borrowing practices; the financial crisis of 2007–08; international trade imbalances; real estate bubbles that have since burst; the Great Recession of 2008–2012; fiscal policy choices related to government revenues and expenses; and approaches used by states to bail out troubled banking industries and private bondholders, assuming private debt burdens or socialising losses.

¹⁸ When investors demand higher return for higher risk, it results in higher borrowing costs for the country in crisis, which leads to further fiscal strain, and demand for even higher yields and loss in investor confidence. This general loss of investor confidence causes selling off of bonds in all countries with similar weak finances – known as contagion.

¹⁹ Greece, Ireland, Italy, Portugal, Spain, Slovenia, Slovakia, and the Netherlands

²⁰ WP/13/266 © 2013 International Monetary Fund. Financial and Sovereign Debt Crises: Some Lessons Learned and Those Forgotten. Carmen M. Reinhart and Kenneth S. Rogoff.

CHAPTER - 8

Industry Analysis

LEARNING OBJECTIVES

At the end of this chapter, you will be able to:

- Understand the relationship between the economy and industry
- Describe the various factors that influence industries
- Discuss the implications of economic news on various industries
- Evaluate the future prospects of an industry

The economy analysis is followed by industry analysis, which involves defining the industry and examining its future prospects. For this, we need to study the relationship between the economy and the industry, past performance, whether demand for the product is sustainable, the nature of competition faced by firms in the industry, change in life styles and social values, and government policies and regulations.

■ CLASSIFICATION OF INDUSTRIES

Stocks have been found to move as a group, so we need to place them in their relevant industry groups. Product-based classification is a convenient and easy method of classification; establishments are classified on the basis of the value of the principal product manufactured. This method, however, has some drawbacks; a unit gets classified in only one industry group even though it may manufacture products belonging to different industrial activities. The other problem with such classification is that the size of the manufacturing unit, the technology and process of manufacturing and even the end products may be quite different. In such cases, the impact of changes in demand, cost of inputs, government regulations etc. would not be the same for all units in the industry. For example, if we consider the steel industry, the large industrial units and mini steel plants should not be clubbed together.

In India, the National Industrial Classification (NIC) 2008 is the standard classification followed for classifying economic activities. The activities are broadly divided into 17 sections such as agriculture, fishing, manufacturing etc. See Exhibit 8.1. The next level of classification is divisions for example in manufacturing, there are food and beverages, paper and paper products, rubber and plastic products etc. Within the paper industry, there are three classes; paper and paper products; corrugated paper, paper boards and containers; and other paper products which are further divided into sub classes. See Exhibit 8.2.

Exhibit 8.1: National Industrial Classification (NIC) BROAD STRUCTURE

Section A	Agriculture, forestry and fishing
Section B	Mining and quarrying
Section C	Manufacturing
Section D	Electricity, gas, steam and air conditioning supply
Section E	Water supply; sewerage, waste management and remediation activities
Section F	Construction
Section G	Wholesale and retail trade; repair of motor vehicles and motorcycles
Section H	Transportation and storage
Section I	Accommodation and Food service activities
Section J	Information and communication
Section K	Financial and insurance activities
Section L	Real estate activities
Section M	Professional, scientific and technical activities
Section N	Administrative and support service activities

Contd...

Section O	Public administration and defence; compulsory social security
Section P	Education
Section Q	Human health and social work activities
Section R	Arts, entertainment and recreation
Section S	Other service activities
Section T	Activities of households as employers; undifferentiated goods- and services producing activities of households for own use
Section U	Activities of extraterritorial organizations and bodies

Exhibit 8.2: Division 17 Manufacture of Paper and Paper Products

Group	Class	Sub Class	Description
170			Manufacture of paper and paper products
	1701		Manufacture of pulp, paper and paperboard
		17011	Manufacture of pulp
		17012	Manufacture of news print
		17013	Manufacture of paper and paper rolls not further processed
		17014	Manufacture of packing paper
		17015	Manufacture of other special purpose paper (excluding computer stationary)
		17016	Manufacture of paper board, straw board
		17017	Manufacture of hard board including false board and chip board
		17019	Manufacture of other primary paper materials including composite paper and paper board n.e.c.
	1702		Manufacture of corrugated paper and paperboard and containers of paper and paperboard
	1709		Manufacture of other articles of paper and paperboard

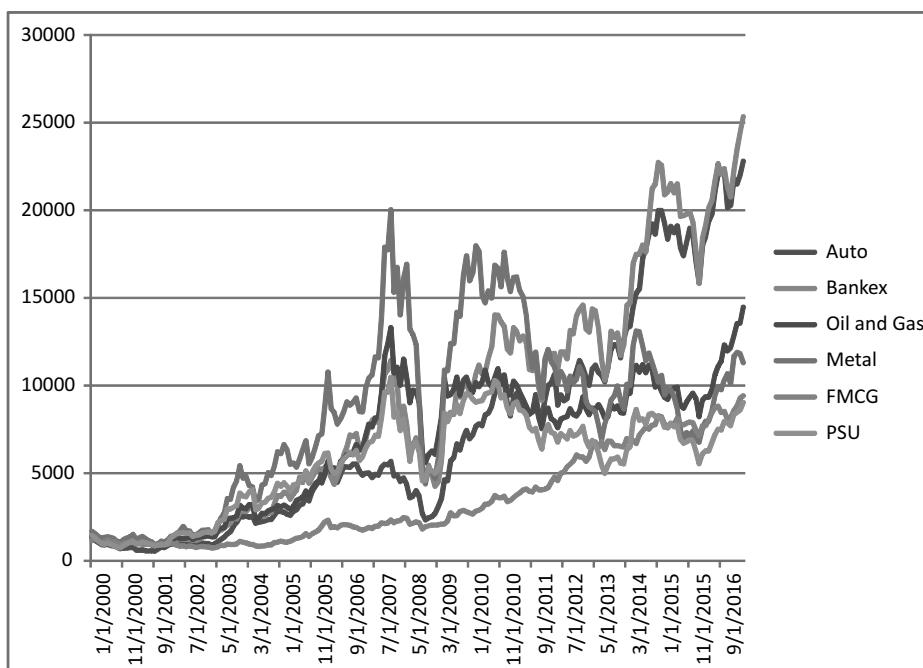
■ THE RELATIONSHIP BETWEEN THE ECONOMY AND INDUSTRIES

In some years, when the economy is expanding, most industries also do well and unemployment is low while in other years, when the economy is declining, most industries operate below capacity and unemployment is high. The business cycle refers to this fluctuation of economic activity about its long-term trend. Periods of economic expansion are called booms and periods of economic decline are called recessions. The Business Cycle Dating Committee at the National Bureau of Economic Research (NBER) defines recession as a period of a significant decline in economic activity spread across the economy, lasting more than a few months, normally visible in real GDP, real income, employment, industrial production, and wholesale-retail sales. The trough marks the end of the declining phase and the start of the rising phase of the business cycle. Economic activity is typically below normal in the early stages of an expansion, and it sometimes remains so, well into the expansion. The peak marks the end of the expansion phase and the beginning of the contraction phase. In the business cycle, recovery and prosperity are associated with increases in productivity, consumer

confidence, demand and prices. Periods of contraction are associated with unemployment and closure of unsuccessful enterprises.

Booms and recessions occur at irregular intervals and last for varying lengths of time. They occur because there is a major change in the economy. A boom could be due to a change in government policies or increased government spending, or easy credit availability. When consumers spend more, firms expand capacity to meet the additional demand causing the economy to expand. Recessions can be caused by a substantial cut in government spending or credit availability causing demand and production to fall. The recent sub-prime crisis in the US is an example of easy credit availability without sufficient checks leading to losses for banks and investors, and spiralling into job cuts and economic slowdown. We are yet to see whether this slowdown results in a recession or not.

If the economy is expected to grow, all companies are likely to benefit. However, some industries are likely to benefit more than others. Similarly if the economy is slowing down, certain industries are likely to suffer more than others. An investor needs to identify groups that are best suited to the future economic environment. When the economy is booming, the risk of investing in equity in equity is low and it may be advisable to buy stocks in industries that are expected to grow. On the other hand, if the economy is expected to contract, it may be advisable to invest in industries that are likely to survive the down turn, that cater to basic necessities such as food and utilities. The relative performance of six sector indices, which includes boom and slump periods is shown in Figure 8.1. As can be seen there is no clear pattern regarding the rise and fall of the various indices. More research is required to identify the causes of the relationship between various sectors and economic cycles in the Indian stock market.



Source: Data on Indices – BSE

Figure 8.1: Sectoral Index Movements Jan 2000-April 2017

We can also classify industries according to business cycles, as cyclical, defensive or growth oriented. *Cyclical* industries move up and down with the business cycle. Capital goods for example, would not be in demand during an economic slowdown. Similarly, purchase of luxury items and expenditure on travel for leisure, can be postponed are likely to reduce when incomes reduce. *Defensive* industries produce basic necessities which cannot be deferred even in a downswing, so their sales and profitability suffer less than cyclical industries. Food, shelter, basic clothing, electricity and water, are examples of non-cyclical industries. *Growth* industries are not affected by business cycles, they have abnormal growth expectations due to new technology or marketing that has created enormous demand potential. The telecom industry has great potential in India as market penetration is still low and wireless technology is capable of reaching remote villages, which was not possible earlier.

■ MODELS FOR INDUSTRY ANALYSIS

Various approaches and models are available for analysing the future prospects of an industry analysis; we will discuss the life cycle approach and two models, namely SWOT analysis and Porter's five forces model. These techniques can help an investor or businessman to determine the overall attractiveness of an industry. However, this does not imply that every firm in the industry will be equally profitable. Firms can achieve above industry averages through their unique strategies and actions.

■ STAGES OF THE LIFE CYCLE

One method of assessing the future potential of an industry is to study its life cycle. The four stages of an industry life cycle are: introduction, growth, maturity, and decline; growth in total sales is used to define these stages as can be seen in Figure 8.2. Sales grow slowly in the introduction phase, rise rapidly during the growth phase, level out at maturity and then decline gradually. *An investor can use the life cycle approach to identify growing industries and within the industry to identify firms that have a sustainable competitive advantage.*

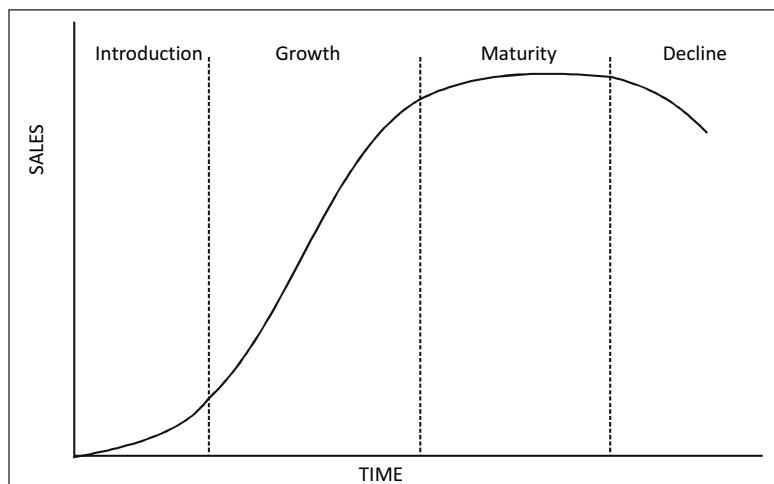


Figure 8.2: Industry Life Cycle

The *introduction or pioneering stage* is first stage for any new industry. A new product or service is introduced in the market. It may be a small entrepreneur with a new idea or an established company, which has developed a new product. The success of the product and the life of the industry is, however, not known at this stage. The firm has to create awareness for the product and the industry. This involves high expenses on account of research and development and marketing while sales are yet to pick up, so profits are usually low or negative at this stage. If the demand grows at an increasing rate, the industry will enter the growth stage. However, all new products may not be accepted in the market and all pioneering firms may not be able to deliver quality products or may fail in their marketing efforts. Investing at this stage is risky; if the firm succeeds the rewards are huge. However, if the firm fails, the entire investment can be wiped out. For example, mapping of the human genome and its application in healthcare is in the pioneering stage at present. There is huge potential in this area, as diseases and medicines have been found to act differently in different genotypes. In India, a few years back, low cost private airlines were pioneers; they offered a new type of service that was much cheaper than existing air travel and offered an alternative to travel by train. They reduced costs by eliminating services such as free meals and paper tickets and saved on commissions through Internet booking.

In the *growth stage*, demand and sales rise rapidly, and many competitors enter to take advantage of opportunities in the emerging industry. At this stage, the individual firms need to invest to increase capacity, increase efficiency and differentiate their products and services to attract and keep customers in the face of increased competition. Costs reduce due to economies of scale and firms grow rapidly. Investing at this time is safer, though returns will be lower than investment at the pioneering stage. Internet-based services are in the growth stage; the viability has already been proved and services conducted over the internet include ticketing, sales of products, stocks, banking, bill payment services etc. Mobile phone services are in the growth stage in India.

In the *maturity stage*, demand is almost satisfied and growth in sales is very slow. There is very intense competition, as there are many competitors with close substitutes. Companies that are able to sustain sales through price advantage, product differentiation or development of niche markets have an advantage. Cost control is also very important to maintain profits. Costs reduced in the growth stage due to economies of scale and at maturity the product is well established, so there may be less expenditure on marketing. Outsourcing operations or shifting manufacturing to countries with cheap labour may be some of the strategies that companies adopt to reduce costs. There are normally fewer large firms left at this stage. Investment is safe, but returns would be lower than in the growth stage. Fast moving consumer goods such as soaps, toothpaste, detergents etc. are in the maturity stage. In the garment and sportswear industry, companies such as Nike have manufacturing operations in China, India, Phillipines, Bangladesh etc. to reduce costs and to cater to overseas markets.

In the *decline stage*, industry sales and profit begin to decline and the industry may even die out. This may be due to a shift in consumer preferences, or due to development of a superior substitute or due to the closure of unviable firms. Some existing firms may develop new products or services that meet the changed demand, which would start a new industry.

It is not advisable to invest at this stage as the future of the industry is uncertain. For example, in the communications industry, pagers were introduced which allowed doctors, travelling executives, salesmen and tradesmen to receive text messages via a call centre at locations that did not have a phone connection. This product has been replaced mobile phones, which allow two way communication and are now only used in hospitals and large factories for internal communication. Audio and video tapes were replaced with CDs, electronic typewriters with limited editing capabilities were phased out when computers became cheaper and offered superior word processing capabilities.

The duration of the life cycle and of the various stages, depends on the nature of the industry. Some products may never decline; fast moving consumer goods will always be in demand, and competitors strive to differentiate their products to maintain a competitive edge. Some fashion items may have a very short life cycle, where all stages are completed within a year. Other products such as biotechnology, may have a long introduction stage because of the research and development requirement and the need to build customer acceptance. In others, the growth stage may be longer because of huge unfulfilled demand or due to frequent product improvements that increase the capabilities of the product. Cell phones for example, were earlier only used for communication; now they have inbuilt radios, music players, cameras, and can be used to access the internet. Certain external factors such as government intervention or international developments can also impact the product life cycle. In India, many industries got an opportunity to start operations and to grow after deregulation and liberalisation in the 1990s. The profitability of airlines all over the world was threatened with the spurt in oil prices in 2008. Social habits and fashions can also affect an industry; in the 1990s, cinema halls in Delhi lost customers to home entertainment, but were back in demand some years later, in the form of high end multiplexes. Creating new avenues for demand can also change the life cycle of a product; fairness products for men, which earlier only targeted women, will extend the growth stage.

■ PORTER'S 5 FORCES

*Porter's 5 forces*¹ provides a framework for industry analysis that determines the competitiveness and profitability of the industry. In a perfectly competitive market, all firms are able to earn normal profits, whereas in an oligopoly or monopoly, there is scope for higher profit. The competitive forces are as given below:

1. Threat of new entrants
2. Rivalry among existing firms
3. Threat of substitute products or services
4. Bargaining power of buyers
5. Bargaining power of suppliers

A profitable industry is always faced by the *threat of new entrants*, which will eventually decrease profitability. The number of competitors and their market share help in understanding

¹ Developed by Micheal E Porter of Harvard Business School.

the nature of the industry. Industries that are well protected are safer, as existing firms are not threatened by competition. The protection could be in the form of licensing or other government controls. It could be an advantage in terms of a patent, or size where high cost of land and machinery makes it difficult for new entrants. It could be in the form of access to limited resources for which some companies have exploration rights. Other barriers to entry include absolute cost advantages, economies of scale, access to distribution channels, geographic location advantages, learning curve advantages, etc. If an industry has entry barriers the existing firms are more secure. For example, government licensing of mobile telephone operators, geographical franchises, patents in the pharmaceutical industry.

Firms strive to have a competitive edge over their rivals; they compete on price, innovation, marketing, etc. The intensity of *competitive rivalry* depends upon the number and nature of competitors. Rivalry can be measured through the concentration ratio i.e. the market share held by a few of the largest players (5, 10 etc.) A high concentration ratio indicates that the industry is less competitive; competition is likely to be more intense if there are numerous equally balanced companies. Rivalry increases if there is slow industry growth, especially so for capital-intensive industries investment that need to increase sales to achieve economies of scale. Rivalry also increases if there is hardly any product differentiation and it is easy for customers to switch loyalties (low fixed cost of switching). For example, for prepaid mobile phone services, the cost of getting a new connection is now very low, making the competition more intense. On the other hand, if the handset is provided by the company, (as was the case with Reliance), there is a higher cost of switching. If the industry becomes too crowded, it can lead to intense competition, price wars, and company failures.

Substitute products constrain the ability of firms in an industry to raise prices and demand may reduce if the substitute becomes cheaper. For example, liquids can be packed in aluminium cans, glass bottles, plastic containers, polybags and paper-based tetra packs; dish TV poses a threat to local cable operators; outsourcing services overseas is a threat to local service providers etc. The threat depends upon the perceived level of product differentiation (does the accent of the call centre employee matter?), relative prices and performance of substitutes, buyer switching costs (eg. packaging machinery modifications, the fixed cost payable when switching to dish TV) and customer propensity to substitute.

Bargaining power of buyers is determined by the size, concentration of buyers and the extent to which they are informed. The bargaining power increases if buyers purchase large volumes relative to the seller sales, more so if the products are undifferentiated across sellers. Buyers are also likely to exert their power if the purchases form a significant portion of their total costs. The bargaining power of customers can put the firm under pressure with regard to volume discounts, customised quality modifications, credit policy etc. For example, supermarket chains and large government purchases for the army etc. can exert power over their suppliers. A large automobile manufacturer can exert power over tyre manufacturers, suppliers of upholstery etc.

The bargaining power of suppliers depends on the suppliers uniqueness and concentration. Supplier power increases if the input is unique, if there are few suppliers and if the industry

is not an important customer for suppliers. Suppliers can exert their power if their product is an important input to the buyers business. Powerful suppliers may threaten to stop supplies, modify specifications or charge excessively high prices for their unique resources. They may also pose a threat of forward integration. For example, Microsoft has power over makers of personal computers.

■ SWOT ANALYSIS

SWOT Analysis can be used to evaluate the Strengths, Weaknesses, Opportunities, and Threats involved in an industry, organisation, or project. It starts with defining an objective and identifying the internal and external factors that are favourable and unfavourable to achieving the stated objective. This can be diagrammatically shown as in Figure 8.3.

SWOT Analysis			
Internal	Strengths	Weaknesses	
External	Opportunities	Threats	

Figure 8.3: SWOT Analysis

An industry's internal strengths and weaknesses could be analysed in terms of the existence or lack of

- ◆ Competitive advantages – patents, reputation, size
- ◆ Technology and equipment – latest or outdated
- ◆ Human resources availability – skilled manpower
- ◆ Raw material availability
- ◆ Requirement of finance

The opportunities and threats could be analysed in terms of

- ◆ Market developments in terms of industry trends, global influences, lifestyle changes, new markets or niche markets.
- ◆ Technological developments and innovation leading to new processes and products
- ◆ Political attitude towards the industry – taxes, duties, priority for allocation of scarce resources
- ◆ Global and domestic economic factors such as trade restrictions, slowdown, exchange rates
- ◆ Environmental concerns
- ◆ New competing technologies and products

Strengths, weakness, opportunities and threats for some industries in India have been summarised in Table 8.1.

Table 8.1: SWOT Analysis for Industries in India

<i>Industry</i>	<i>Strengths</i>	<i>Weaknesses</i>	<i>Opportunities</i>	<i>Threats</i>
Cement	Growing demand from infrastructure and housing sector growing	Transportation cost leads to regional supply constraints	Increased demand as country develops, export potential	Coal shortage, possible price control, cost of transportation (petroleum prices)
Chemicals	World class products, dominate domestic market	Cost of power and credit high, capital intensive, infrastructure bottleneck for export	Many products patents expiring, Intellectual property rights can protect new R&D	Cheap imports from China etc.
Consumer durables	Strong distribution networks, established brands	Seasonal demand, low purchasing power	Huge potential market, increased sales with credit facilities	Cheap imports
Energy	Demand	Price of imported crude oil, price controls on finished products	Backward integration for oil exploration in India and abroad	Private players (for PSU's)
Food processing	Availability of raw material, Government support, domestic market	High working capital requirement, technology and equipment outdated	Global market	Global players, low salaries may lead to manpower shortage
Pharmaceuticals	Huge untapped domestic demand, low cost of manufacturing,	Fragmented and very competitive, price regulation by govt., low R&D	Many patents expiring(can produce), new products can be patented growing health care industry	Imports
Textiles	Raw material availability, skilled labour, domestic and export market	Low productivity, reservation for SSI, old technology	Growing global markets, high fashion market	Cheap imports, trade agreements, consumer resistance to child labour etc.

■ PAST PERFORMANCE

A study of the past performance can help reveal the strengths and weaknesses of an industry. We basically study the profitability of the industry by going into details of revenues and costs. If an industry is still in the pioneering stage, there is no past data, so an investor has to be more careful.

On the revenue side, we would like to examine who the existing customers are, whether they are growing and are expected to grow further. If the overall demand grows, all firms can grow, otherwise existing firms need to take away customers from each other to grow. We would also like to know if demand is cyclical. The bargaining power of the customers also needs to be assessed.

We look at the operating and net profit and details of cost. We can study the distribution of costs between fixed and variable expenses and the breakeven level of sales. The major breakup of costs into, labour, raw materials, etc. as this would reveal the major inputs and vulnerability of the industry to change in availability and prices of these items. In the case of major inputs, we would also like to know if there are many suppliers and their bargaining power. The industry norm on debt equity ratio, and working capital requirements in terms of inventory, credit purchases and sales will also impact profitability.

The trend in industry ratios can help identify the direction of the industry and its strengths and weaknesses. In the next chapter, we will also see how they are useful in judging the performance of individual companies.

Some of the key industry ratios are given in Table 8.2. As can be seen. There is a wide variation in all ratios across industries.

Table 8.2: Selected Industry Ratios in 2016

Industry Sets*	Debt/Equity	Current Ratio	Asset Turnover	Inventory Turnover	Debtors Turnover	RONW
Air Conditioners	0.52	2.07	5.70	4.57	5.74	11.56
Automobile Cars	0.47	1.34	2.37	14.35	24.14	12.26
Cement (North)	0.53	1.20	0.89	9.50	21.77	7.60
Cement Products	1.34	1.58	1.11	5.39	11.85	4.72
Chemical organic large	0.93	2.65	2.20	7.38	4.88	15.16
Computer Software Large	0.06	3.13	4.20	338.22	4.28	30.44
Mining Minerals	0.59	3.03	1.39	9.32	8.66	23.77
Paint & Varnish	0.09	1.25	3.73	7.93	11.61	28.85
Paper Large	1.58	1.55	0.72	5.26	8.78	7.70
Refineries	0.82	1.05	2.24	10.77	33.49	15.11

*predefined sets in the Capitaline Database

The trend in the ratios over time gives an idea about the general direction of an industry. The ratios for the cement industry are given in Table 8.3.

Table 8.3: Selected Ratios for the Cement Industry (North) over time

Year	Debt/Equity	Current Ratio	Asset Turnover	Inventory Turnover	Debtors Turnover	RONW
2008	0.54	1.06	1.27	10.42	32.08	34.70
2009	0.45	1.03	1.21	10.23	36.07	27.22

Contd...

2010	0.45	0.94	1.22	11.02	41.86	25.23
2011	0.50	1.03	1.02	8.76	31.89	14.42
2012	0.52	1.18	1.12	9.41	31.26	15.04
2013	0.51	1.23	1.09	9.28	26.62	15.42
2014	0.50	1.24	1.02	8.91	22.66	12.00
2015	0.55	1.23	0.98	9.25	22.44	8.33
2016	0.53	1.20	0.89	9.50	21.77	7.60

■ GOVERNMENT POLICY, CONTROLS AND REGULATIONS

Some industries are regulated by the government for social or political reasons. Price controls, quotas, and tariffs have a bearing on the profitability of an industry. For example, the pharmaceutical industry is regulated with respect to quality and prices. Pricing of petroleum products has social and political considerations. The telecom sector is controlled through licences. Certain industries such as liquor and tobacco, are viewed as socially undesirable, and are subject to sales restrictions and high duties. Luxury items such as bigger cars are also subjected to higher duties. The policy of the government in terms of tax concessions and cost of credit has a direct impact on the housing industry. The credit policy of the government also impacts sectors where sales are dependant on credit such as automobiles and consumer durables.

Reports on Industry analysis are available on payment from various agencies. Summaries of industry analysis for the cement industry industry prepared by CRISIL² is given in Exhibit 8.3

Exhibit 8.3: Automobiles-Cars and Utility Vehicles

Demonetisation limited the growth pace in FY17, higher cost of ownership to impact demand growth in FY18. The long-term picture is bright, given the current lower penetration levels and the likelihood of stable crude oil prices. Regulatory compliance will push the prices up impacting demand. Utilization rates to improve in FY17 & FY18 while margins are estimated to remain subdued owing to the rising steel prices and marketing expenses.

Cars and UVs sales are expected to increase at a good pace over the next five years, driven by expansion in the addressable market and relatively stable cost of ownership, as crude oil prices stabilize at lower levels. Rising affordability to provide additional kicker.

Indias automobile exports to show a strong growth in 2016-17 led by the export focus of global companies like GM, VW and Ford. Expansion into newer markets in Asia, North America and South America will provide the additional kicker. New entrants will rapidly gain market share in the export basket, as they step up exports of new models.

CRISIL Research expects better product mix (increase in share of compact and UVs) to increase realisations in FY17 and FY18. The price hikes with increase in raw material costs will also aid realisation growth.

Contd...

² For in depth analysis please refer to the details report by CRISIL, for which details are available on their website

Profitability of cars and UV manufacturers is sensitive to changes in raw material cost, as it constitutes bulk of net sales. In 2016-17, raw material prices are expected to rise, following an increase in steel prices. In FY18, prices are estimated to continue rise, even though the price rise is expected to be lower.

CRISIL Research expects better product mix (increase in share of compact and UVs) to increase realisations in FY17 and FY18. The price hikes with increase in raw material costs will also aid realisation growth.

Operating margins, which rose sharply in 2015-16, led by lower raw material cost, is expected to be range bound in 2016-17. Benefit of better realisations and utilization to be nulled on account of rising steel prices and marketing cost.

The industry's operating rates will continue to improve, led by a revival in both domestic and export demand. Also, players such as General Motors are expected to cut capacities in 2015-16 to improve utilisation rates.

Competition is expected to intensify in 2016-17 as new models flood the market, especially in the compact utility vehicle and small car segments. The increase in competition has made it necessary for players to constantly upgrade technology and develop new products. In FY18, too, feature rich, competitively priced launches are expected to keep the players on their toes.

Domestic passenger vehicle sales continued good growth in March 2017 and registered a 10% on-year growth, led by strong growth in passenger cars as well as Utility Vehicles. Exports too grew 15.4%, mainly fueled by export focus of global players like GM, VW, Ford and Nissan.

The infrastructure cess and additional luxury tax on passenger vehicles (excluding taxis) proposed in Union Budget 2016-17 will, in the near term, drive up prices and reduce demand. The focus on infrastructure development and rural income, however, will be structurally positive for the sector.

The Ministry of Road Transport and Highways, BS IV norms to be implemented throughout India by April 2017. Furthermore, India is planning to switch to BS VI norms by 2020, skipping BS V norms.

Domestic players include Fiat India Pvt Ltd, Ford India Ltd, General Motors India Pvt Ltd., Honda cars India Ltd., Hyundai Motors India Ltd, Mahindra & Mahindra Ltd, Maruti Suzuki India Ltd., Mercedes-Benz India Pvt Ltd, Nissan Motors India, Skoda Auto India Pvt Ltd, Tata Motors Ltd, Toyota Kirloskar Ltd, and Volkswagen Grp sales India

■ SUMMARY

Perfect competition implies that rates of return should be similar across firms and industries. However, some industries are known to be more profitable than others. Industry analysis helps identify the future potential of an industry through a study of the life cycle, competitiveness using Porter's five forces and SWOT analysis. In addition, the past performance and trends in ratio analysis can also shed light on the future prospects of the industry.

■ MULTIPLE CHOICE QUESTIONS

1. Which of the following would adversely impact the profitability of the automobile sector (mark each one that is correct)
 - (a) Increase in steel prices
 - (b) Increase in interest rates
 - (c) Increase in price of precious metals
 - (d) Increase in dearness allowance

2. Which of the following is likely to be a defensive industry in India (mark each one that is correct)
 - (a) Fashion garments
 - (b) Electricity generation
 - (c) Automobiles
 - (d) None of the above
3. Which of the following is not one of Porter's five forces
 - (a) Threat of new entrants
 - (b) Threat of substitute products
 - (c) Threat of financial failure
 - (d) Bargaining power of buyers
4. The following are not likely to be affected by a downturn in the business cycle (mark all correct options)
 - (a) Cyclical industries
 - (b) Growth industries
 - (c) Defensive industries
 - (d) None of the above
5. Fundamental Analysts make use of the following techniques (mark all correct options)
 - (a) Productivity cycle
 - (b) Process life cycle
 - (c) Cyclical industries
 - (d) None of the above

■ QUESTIONS

1. Explain "cyclical industry" with an example.
2. Explain the industry life cycle approach.
3. Which stage of the life cycle would you recommend for investment and why?
4. Explain how Porter's Five Forces help determine industry competitiveness.
5. Give an example for each of Porter's Five Forces.
6. How can SWOT analysis help determine the attractiveness of an industry?
7. Give one example each of an industry in the growth stage and in the stagnation stage.

■ PRACTICAL EXERCISES

1. Find out the market share of the five largest firms in a few industries of your choice and rank them according to market concentration.
2. Look up various sites that give free industry analysis and study the strengths and weaknesses of various industries.

CHAPTER - 9

Company Analysis

LEARNING OBJECTIVES

At the end of this chapter, you will be able to:

- Understand the various factors that contribute to a company's strengths and weaknesses
- Assess the reliability of annual reports and other financial statements
- Evaluate the operational and financial health of a company based on trends and ratio analysis.

In the previous chapters, we studied economy and industry analysis. If an industry is considered suitable for investment, the next step is to analyse the existing companies and select one of them. The aim is to identify the companies that are capable of creating and maintaining a competitive advantage. We can look at their operational efficiency, market share, strengths and weaknesses, and competitive advantages. For this, we study the qualitative factors such as the composition of the company's board members and key executives, its brand, patents etc. and quantitative factors such as analysis of financial trends and ratio analysis.

■ SWOT ANALYSIS

We used SWOT analysis in the previous chapter for industry analysis; it can also be used to evaluate an organisation or a project.

A company's internal strengths and weaknesses can be analysed in terms of the existence or lack of

- ◆ Competitive advantages – patents, age, reputation, size, location
- ◆ Financial resources – reserves, cost advantages/disadvantages, cash flows
- ◆ Human Resources – leadership, managerial and skilled manpower
- ◆ Experience in the business – marketing, production etc.
- ◆ Business processes, systems and procedures
- ◆ Innovation
- ◆ Location – with respect to resources, markets
- ◆ Price and quality, quality certifications
- ◆ Management values and company culture

The opportunities could be analysed in terms of

- ◆ Niche markets
- ◆ Competitors' weaknesses
- ◆ Technological developments and innovation leading to new processes and products
- ◆ Partnerships in production, marketing, distribution etc.
- ◆ Vertical integration

The threats could be analysed in terms of

- ◆ Environmental concerns
- ◆ Competitors advantages and actions
- ◆ New competing technologies and products
- ◆ Attrition of key personnel

Qualitative information can be obtained from published sources such as newspapers and journals and through interviews with key personnel. The director's report is available once a

year along with the annual report. It reveals what the management is planning and analysts can check if their plans announced in the past have been implemented. New appointments of key executives are also normally reported. Independence of directors and their active participation help protect shareholder's interests. Many companies offer their employees stock options; if managers in the company have invested their money in the company, it is a positive sign. Institutional ownership is also a positive sign.

■ SWOT ANALYSIS FOR ACC¹

Strengths and Weaknesses

- ◆ *Competitive advantages:* Established in 1936, reputed manufacturer of cement and ready mix concrete with 14 factories and a countrywide network of marketing offices.
- ◆ *Financial resources:* As will be seen later in the chapter, very comfortable financial position including cash flows.
- ◆ *Human Resources:* Mercer and Boston Consulting Group findings show significant job satisfaction at all levels.
- ◆ *Experience in the business and innovation:* A pioneer and trend-setter in cement and concrete technology.
- ◆ *Quality certifications:* All ACC cement plants have the ISO 9001 *Quality Systems Certification*.
- ◆ *Management values and company culture:* Has won several prizes for environment friendly measures taken at its plants and mines.
- ◆ ACC Help Centres in several cities to provide basic information and guidance to customers on various home building-related procedures.

Opportunities

- ◆ Technological developments and innovation leading to new processes and products.
- ◆ The Ready Mix Concrete is among the fastest growing industries in the country.
- ◆ The association with the Holcim Group is expected to create mutual synergies in ERP implementation logistics and supply chain management, product portfolio management, project management training, management of capital expenditure projects and quarry scheduling and optimization.

Threats

- ◆ Additional capacity creation in domestic cement plants may exceed projected demand after 2009
- ◆ Cement imports at cheaper prices
- ◆ Coal prices and availability
- ◆ Perception that cement companies form a cartel – possible government intervention.

¹ Source mainly <http://www.acclimated.com> and newspaper articles

■ FINANCIAL ANALYSIS

In order to get a picture of a company's future we also need to analyse trends in a company's performance and study its financial strength relative to competitors. Financial information is mainly available from the company's published financial statements². In order to make an assessment of the future prospects of the company, the data should be correct, complete, consistent over time and comparable with other companies.

Some companies publish a true and fair picture of the annual accounts while others may resort to window dressing³. The methods used to play with figures may be legal, with the approval of shareholders and the court, which will be mentioned in the audited report, or may amount to fraud, which is more difficult to detect. Some may want to show lower profits to save on taxes, others may want to show higher profits just before a share or debt issue. Sometimes the management may want to show higher profits to get the benefit of performance-linked bonuses, or show higher expenses to cover up money siphoned out of the company. One way of checking the *correctness* of the data is to check if the auditors have made any qualifying remarks in the annual report, or if the directors report mentions any unusual accounting entries. Ensuring compliance with the accounting standards is the responsibility of the management of the company. The auditors give their opinion about whether the financial statements have they been prepared in accordance with the accounting standards, are they free of material misstatement and whether they show a true and fair picture of the operating results, financial position and cash flows.

For example, some companies wrote off various expenses against share premium account instead of routing them through the profit and loss account. As a result, the share premium account was reduced but future profits would go up. Examples of such practices are given in Exhibit 9.1.

Exhibit 9.1: Excerpts from Tata Engineering press release 20th February, 2002

As a part of the overall restructuring plans, the Board of Directors of Tata Engineering today approved a proposal to set-off against the balance to the credit of the Securities Premium Account, an amount aggregating to Rs.1180 crores being carried in the Balance Sheet on account of Miscellaneous Expenditure (to the extent not written-off or adjusted), impairment in value of part of its fixed assets and diminution in value of certain financial investment. The Company currently has a balance of Rs.1702 crores in its Securities Premium Account which will stand reduced to Rs.522 crores with the proposed set-off.

Excerpts from Ashok Leyland Directors' Report 2002-2003:

Contd...

² The annual audited financial results, the quarterly unaudited financial results and the half-yearly unaudited financial results with limited review are to be published in a national newspaper and submitted to the stock exchange. Results are available on the BSE and NSE websites and also the company website. The Balance Sheet, Profit and Loss Accounts, Directors Report, Auditors Report, Cash Flow Statement quarterly and half yearly financial statements, Corporate Governance report, Shareholding pattern, etc., can also be retrieved from the Electronic Data Information Filing and Retrieval Systems(EDIFAR) set up by the National Informatics Centre (NIC) in association with SEBI. The site can be accessed at <http://sebfifar.nic.in> or www.sebi.gov.in.

³ For the various types of manipulations see Breton, Gaetan and Stolowy, Hervé, "A Framework for the Classification of Accounts Manipulations" (June 28, 2000). HEC Accounting & Management Control Working Paper No. 708/2000. Available at SSRN: <http://ssrn.com/abstract=263290> and Vishal Chhabria, Outlook Money August 23, 2006 <http://www.rediff.com/money/2006/aug/23firms.htm>.

Shareholders, at the Extraordinary General Meeting held on January 18, 2003, had approved the board's proposal to adjust against the Company's Securities (Share) Premium Account, a sum not exceeding Rs.160 Crores:

	Rs. crore
Miscellaneous Expenditure (to the extent not written off)	
• Compensation under Voluntary Retirement Scheme	57.191
• Debenture Issue/Loan Raising Expenses	0.499
• Premium on Prepayment of Borrowings	6.963
Diminution in value of	
• Plant and Machinery	81.619
• Investments	11.671
Capital work-in-progress written off	1.971
Total amount utilized out of Securities Premium account	159.914

For *complete* information, we can check if the company has given all the financial statements and annexures as required by law. We are basically looking at the income statement, balance sheet, cash flow, consolidation of accounts, and details of production and sales. If a company stops giving details as required, there may be reason to suspect foul play.

Consistency in the accounting treatment of items in various accounting periods is necessary to be able to judge the performance of the company over a period of time. We will see in later sections how a change in depreciation and inventory accounting can be used to change the profit and balance sheet figures. Changes in accounting treatment and its impact on the financial statements are reported in the audited accounts.

An investor is also concerned about the *comparability* of a company's accounts with peers or other alternative investments. For example, if two companies have identical sales and expenses, and one company writes off miscellaneous expenses on VRS over a period of five years while the other then writes it off against share premium account, the latter will show a higher profit on lower total capital. If the accounting treatment used by two companies is very different, the figures will have to be brought to a comparable level before taking any decisions.

The three important financial statements to be studied by any investor are the profit and loss account or income statement, the balance sheet and the cash flow statement. The *income statement* is a record of a company's revenues and expenses and profit over a given period of time. The *balance sheet* is a record of a company's assets and liabilities and shareholders capital on a given date. The assets are financed by and are always equal to the liabilities and shareholders capital. Liabilities are borrowed money that needs to be repaid at a future date, and shareholders' capital consists of the initial capital provided them and plough back of profits over the years. The *cash flow statement* records the company's cash inflows and outflows over a period of time.

The *notes to the accounts and supplementary schedules* contain additional information about the items in the balance sheet and income statement. They may also include disclosures

about the risks obligations not recorded in the balance sheet. For example, contingent liabilities include claims not acknowledged as debt, guarantees undertaken, letter of credit, bills discounted, disputed sales tax, excise duty, income tax, other disputed claims, estimated capital contracts remaining etc. These items do not form part of the main statements and are generally mentioned in the Notes to the Accounts. Changes in accounting principles are also mentioned in the notes to the accounts.

The *Director's report* gives details of the company's operations and future plans. They may include information on new products launched, energy savings achieved, new or improved technology initiatives, community involvement etc. Important facts such as a proposed merger, modernisation and expansion are also normally revealed in the report.

There is a wealth of information available in a company's financial statements along with the auditors report, notes to the accounts and the director's report. An investor should be aware of accounting policies and analyse performance over a period of time as trends reveal the future direction of the company and manipulation of accounts, if any, normally even out over time. The main areas that we can examine in the statements and reports are as follows:

■ THE INCOME STATEMENT

The income statement shows the profit earned over a given period of time. It gives details of revenues generated from sales, investments etc. and the expenses incurred to generate the income. The difference between revenues and expenses is the profit. We take the example of ACC Ltd. to illustrate the format of financial statements⁴ in Table 9.1.

Table 9.1: ACC Ltd.

<i>Income Statement</i>	<i>Rs Crore</i>				
	<i>Year ending</i>	<i>Mar-04</i>	<i>Mar-05</i>	<i>Dec-05</i>	<i>Dec-06</i>
Net sales		3284.48	3902.06	3220.7	5803.48
Other Income		148.53	101.12	97.92	132.88
		3433.01	4003.18	3318.62	5936.36
Cost of Goods Sold		1261.57	1541.14	1103.18	1587.99
Other Expenses		1637.52	1742.37	1581.85	2592.27
Depreciation		176.85	186.86	164.37	254.25
		3075.94	3470.37	2849.4	4434.51
EBIT		357.07	532.81	469.22	1501.85
Interest		92.91	88.19	63.76	52.03
EBT before exceptional items		264.16	444.62	405.46	1449.82
Exceptional items		-10.3	-0.5	278.66	169.68
EBT		253.86	444.12	684.12	1619.5
Taxes		-53.62	-65.73	-139.94	-387.66
EAT		200.24	378.39	544.18	1231.84
No of shares(crore)		17.13	17.82	18.12	18.66
EPS (Rs)		11.69	21.23	30.03	66.02

⁴ The statements have been condensed from the annual reports.

Revenues are important for investors; consistently increasing sales are a strength, and should normally lead to higher profitability. On the expenses side, we have the cost of goods sold, i.e. the cost directly related to the production of goods and services such as raw material and wages. We also have sales and administrative expenses, which include salaries, office expenses and depreciation and amortisation. Interest expenses are shown separately.

Various measures of profit are calculated, which give an insight into the company's performance. Gross profit is calculated as revenue minus the direct cost of goods sold, and represents the surplus available for meeting other expenses. Operating profit is gross profit minus depreciation, sales and administrative expenses i.e. the profit from its actual operations, which is available for meeting financial expenses and taxes. Net income is the profit after all expenses, including financial expenses. Profit after tax is also calculated to see what is available to the company for distribution to shareholders and for investment. Trends in these various measures of profit indicate the future direction of the company; increasing profits normally indicate increased efficiency. The performance should also be compared with competitors.

Areas that need special attention are:

Source of Income

Income can be generated from operations, investments and sale of assets. We need to separate the regular income from extra ordinary items and also examine the nature of other income. Temporary increases in income due to sale of assets and investments or hiving off of a division are not likely to be sustained every year. Also, if we have chosen to invest in the tyre industry, and find that a large percentage of a particular firm's revenues come from investments, we need to be aware that it is equivalent to partly buying shares in an investment company. In the case of ACC, the other income in 2004 was 56 % of earning before taxes (EBT), but reduced to 9% in 2006. The composition of other income has also undergone a change as can be seen in Table 9.2.

Table 9.2: ACC Ltd.

<i>Other Income</i>	<i>Rs Crore</i>				
	<i>Year ending</i>	<i>Mar-04</i>	<i>Mar-05</i>	<i>Dec-05</i>	<i>Dec-06</i>
Dividend from subsidiary		37.12	2.81	12.13	5.00
Dividend from MF				4.32	19.56
Sale of stores		10.72	10.45	6.33	14.77
Excess provisions written back		20.87	38.00	40.33	34.97
Lease rental		8.41	8.36	5.91	4.11
Gain on exchange		41.83	0	0	1.60
Profit on sale of investments		0.67	3.03	0.5	13.99
Profit on sale of fixed assets		4.38	12.14	7.87	1.36
Misc		24.53	26.33	20.53	37.52
Total		148.53	101.12	97.92	132.88
EBT before exceptional items		264.16	444.62	405.46	1449.82
Other income/EBT		56.23%	22.74%	24.15%	9.17%

In some cases, the other income is more important than the main business of the company. For example, we give below some figures extracted from the financial statements of Ceat Ltd. in 2006 and 2007. As can be seen in Table 9.3, other income was 40% of the total profit before tax in 2007, while in 2006 the company showed a profit only because of other income.

Table 9.3: Ceat Ltd.

	(Rs. Lakhs)	
	Mar-07	Mar-06
Other Income	24.44	22.63
Earning Before Tax	60.92	5.22
Other income/EBT	0.40	4.33

Matching of Revenues and Expenses

In accounting, the matching principle requires that expenses should be matched with revenues, irrespective of the date of payment.

If a company takes an advance payment for goods to be delivered in the next accounting period or provides services on credit, revenues should be recorded in the accounting period when goods are sold or services are rendered. Revenue recognition is a more complicated exercise for firms that undertake large turnkey projects or software development spread over a number of years. The example of NBCC to illustrate this is given in Exhibit 9.2.

Exhibit 9.2: Excerpt from the Auditors' report for NBCC year ending March 2004

Accounting policy relating to the value of work done (Para 2 of Schedule 20) is not in conformity with the Para 30(a) of AS-7 as laid down by the Institute of Chartered Accountants of India. It includes Rs. 2,36,78 thousands value of which was taken in respect of costs incurred in the year in connection with future activity on contracts. This has resulted in overstatement of WDV by Rs. 2,36,78 thousands, overstatement of expenses by Rs. 1,59,92 thousands and consequential overstatement of profit by Rs. 76,86 thousands.

Expenses are divided into revenue expenses and capital expenses. The revenue expenses include period specific expenses such as salaries, rent, office stationary, electricity etc., these are charged to the current period. Raw materials purchased and direct wages used to manufacture a product are added to inventory and expensed when the product is sold. Expenses that are expected to provide a benefit to the company over a longer period are capitalised and written off over the estimated period for which benefits accrue. A machine has an estimated useful life over which it is depreciated to match with the period when revenues are generated. Payment for patents, copyrights, brands and goodwill, and expenditure on product development or product promotion involve huge expenditure that is expected to provide benefits in the future. These are put on the assets side of the balance sheet and written off over a number of years through the profit and loss account based on some scientific basis. Since losses due to obsolescence, negligence, theft etc. do not contribute to future sales, they are to be written off in the period when they are incurred.

There is always some amount of subjectivity regarding the timing and number of years over which expenditure is to be written off. While companies may follow different practices in writing off expenses, there is also scope for manipulation. A company may capitalise expenses on advertisement, repairs and maintenance etc. to show higher profit in the current period. However, this will result in lower profits in future years when the expenses are written off. Similarly, a company may manipulate the accounts and not provide for known liabilities or expenses in order to show higher profit in the current period.

Consistency Principle

In order to achieve comparability of the financial statements of an enterprise through time, the accounting policies should be followed consistently from one period to another; a change in an accounting policy is made only in certain exceptional circumstances. The two areas that are to be closely watched for consistency are inventory valuation and depreciation. Normally, a change in the method of inventory valuation or depreciation, calls for further investigation.

There are different methods for valuation of inventory, namely First In, First Out (FIFO), Last In, First Out (LIFO), weighted average cost, etc. The accounting method has no relationship to the actual movement of physical inventory. In FIFO, raw materials and finished goods are accounted for as if what was received/produced first was issued first, and in LIFO the most recent purchases/production is issued first. In the short run, LIFO and FIFO may give a different picture of inventory and profit; if prices are rising, FIFO will show higher inventory and higher profits than LIFO and vice versa if prices are falling. In the long run, as long as the same method is consistently followed, all methods give a fair picture of profit and inventory. In case, there is a change in the method of valuation, the impact of such a change and reason for change should be mentioned in the accounts.

Manipulation of inventory values is also possible if indirect costs are wrongly shown as direct costs and added to inventory. In such a case, the value of inventory goes up, cost of goods sold decreases and profits increase.

There are two commonly used methods of accounting for depreciation, the straight line method and the written down value method (WDV). The straight line method assumes that depreciation is a function of time and the depreciable amount is calculated as the cost minus the estimated salvage value. Thereafter, an equal amount is written off every year over the estimated useful life. In the WDV method, a fixed rate of depreciation is used on the cost of the machine. The value of the asset is reduced by the amount of depreciation every year, and depreciation is calculated using the same rate of depreciation. As a result, the amount of depreciation is highest in the first year and keeps reducing every year thereafter. A change in the method of accounting will affect depreciation and profits, and the reason for change and impact on the accounts should be given.

Unaudited Results

Companies are required to disclose unaudited quarterly and half yearly results. While these help in making the working of the company more transparent throughout the year, we

need to be careful while using them. If the company's operations are seasonal in nature, we should not use quarterly results for projecting profit for the year. Short-term problems like strikes, or certain large orders in a particular quarter may lead to a sudden dip/spurt in profits, which will not be sustained in the next period. Manipulation is easier with unaudited figures, in case the company wishes to show a rosy picture, credit sales can be shown and written off in subsequent periods.

Earnings per Share

Basic earnings per share is calculated by dividing the net profit or loss for the period attributable to equity shareholders by the weighted average number of equity shares outstanding during the period. Basic earnings are the net profit or loss for the period after deducting preference dividends and any attributable tax thereto for the period.

Diluted Earnings per Share is calculated using the net profit or loss for the period attributable to equity shareholders and the weighted average number of shares outstanding during the period should be adjusted for the effects of all dilutive potential equity shares. A potential equity share is a financial instrument or other contract that entitles, or may entitle, its holder to equity shares. These include warrants convertible debt instruments and convertible preference shares. They also include employee stock options, and contractual arrangements such as the acquisition of a business, or shares issuable under a loan contract upon default of payment of principal or interest etc. The earnings are to be adjusted as if all the potential equity shares have been issued. For example, if preference shares are to be converted, the preference dividend will not be deducted. Similarly, if there is convertible debt, the interest paid will not be deducted when calculating net profit and taxes adjusted accordingly.

■ BALANCE SHEET

The balance sheet has three main components namely, assets, liabilities and equity. Each of these can reveal strengths and weaknesses of a company. One of the forms of presenting a balance sheet is given in Table 9.4.

Table 9.4: ACC Ltd.

<i>Balance Sheet Rs. Crore</i>				
<i>As on 31st of</i>	<i>Mar-04</i>	<i>Mar-05</i>	<i>Dec-05</i>	<i>Dec-06</i>
Sources of funds				
Share Capital	177.94	179.23	185.54	187.76
Reserves and Surplus	1175.79	1418.45	1951.21	2955.16
Loans	1352.7	1407.73	1071.42	771.16
Stockist's Deposits	90.02	101.34	104.75	144.82
Deferred Tax liabilities	275.23	295.46	300.38	320.72
Current Liabilities and provisions	851.17	1022.35	1230.05	1527.01
	3922.85	4424.56	4843.35	5906.63

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Application of funds				
Fixed Assets	2472.07	2863.45	3122.03	3395.91
Investments	375.74	326.39	293.75	503.54
Current Assets, Loans & Advances	1040.12	1213.71	1427.57	2006.24
Misc. Expenses not written off	34.92	20.71	6.41	0.94
Total assets	3922.85	4424.56	4843.35	5906.63

Assets

Assets are further divided into current assets and long-term assets. *Long-term assets* include fixed assets such as land, buildings, machinery and equipment. These are used for production and other business activities. *Current assets* are likely to be sold or used up within one year. They include cash, inventory and accounts receivable. Companies should have adequate cash to meet daily requirements and contingencies. However, if too much cash is kept idle, it means investor's money is not being put to the best use. Inventory includes raw material, work in progress and finished goods. Again, inventory should be sufficient to maintain smooth production and sales, while excessive inventory points to inefficiency. If finished goods inventory increases faster than sales, it needs further investigation. Accounts receivable represent sales made on credit for which payment is yet to be received. Credit sales may be necessary for business and the number of days of credit depends on industry norms. If the collection period is longer than the industry average or the past averages for the company it is a signals problems. It is possible that the company is pushing sales through higher credit, but can have problems in the future if customers do not pay.

Liabilities

Liabilities can also be divided into current and long-term liabilities. *Current liabilities* are to be paid within a year, such as working capital loans, and payments to suppliers and service providers. Just like current assets, every industry has certain norms regarding the level of current liabilities, if a particular company is far above the norms, or shows increasing liabilities over time, the liquidity position needs examination. *Long-term liabilities* include bank loans, public deposits, and debentures. The debt should be at a level that can be paid from the operational cash flows of the company.

Owners Equity

Equity is what shareholders own, and is equal to total assets minus total liabilities. It consists of two parts, the capital brought in by the shareholders when equity was issued by the company and retained earnings or plough back of profits earned by the company.

Areas that need special attention are:

Historical Costs

Assets shown in the balance sheet should be valued at depreciated cost or market price whichever is lower. However, historical costs may not always be meaningful; assets such as

land may be highly undervalued, while inoperative plant and machinery may be overvalued. Revaluation of assets may be useful provided it is done with the intention of showing a correct picture and not for manipulation of accounts. For example, Air India and Indian Airlines revalued their assets before merger, as historical cost was no longer relevant. Vijaya Bank revalued its assets to improve capital adequacy ratio; although this helps in making the balance sheet reflect the current values of assets, it does not really increase the bank's capital.

Intangible assets such as patents, trademarks, brands and goodwill etc., are not shown on the balance sheet unless the company values them. However, these intangibles are valued and paid for in the case of mergers and acquisitions. This needs to be kept in mind when figures are being compared over time and across companies.

Inventory Valuation and Depreciation

The method of inventory valuation and method of depreciation have an impact on the balance sheet as has already been discussed. If inventory is higher, cost of goods sold is lower and profit is higher. On the other hand, if depreciation is higher, the value of the asset in the balance sheet is lower and profit is also lower. Sometimes dead inventory and useless machinery and equipment are not written off, which does not give a true picture of the assets of the company.

■ CASH FLOW STATEMENT

The cash flow statement shows the actual cash flows that took place during the year. It is different from the income statement, which is prepared on the basis of accrual accounting. In accrual accounting, the company records revenues and expenses when transactions occur, not when cash is exchanged. As a result, it is possible for a company to have high profit and yet have a poor cash position. Such a situation may occur if a large percentage of sales are on credit. At a later stage, if the money is not recovered, the company would have problems in spite of reporting a good profit. Since the cash flow statement shows how much actual cash a company has generated, it is considered by some to be more dependable. It is also normally difficult to manipulate because cash is generated from real activities. The aim of studying the cash flow is to see if the company is able to pay for its operations, repay debt, pay dividends and invest for further growth.

The cash flow statement normally has three sections: cash generated from operations, cash from investing/sale long-term assets, and cash from financing. *Cash Flows from Operations* show the net inflows from sales of goods and services after deduction of the cash flows required to produce them. Net positive cash flows that grow over time are desirable; cash flows may, however, be negative for companies in the pioneering stage. If book profits go up, the cash flow should also go up, otherwise details of sales and expenses need to be investigated. *Cash Flows from Investment* report the cash outflows on capital expenditure and other investments and inflows from sale of assets. This includes tangible and intangible fixed assets, research and development costs, shares, warrants or debt instruments and investments in joint ventures. It also includes cash advances and loans made to third parties, futures contracts, forward contracts, option contracts and swap contracts except when held for

dealing or trading purposes, or the payments are classified as financing activities. *Cash Flow From Financing Activities* report the cash inflows and outflows equity and debt. This includes cash inflows on account of new equity and debt issues and long and short-term loans. Cash outflows on account of payment of dividends, share buyback, redemption of debentures and bank loans.

The cash flows may be reported using the direct method, where major classes of cash receipts and payments are shown or by the indirect method, whereby net profit or loss is adjusted for non-cash items, deferrals and accruals, and investment or financing activities. The three sections of the cash flow and their summary for ACC Ltd⁵. using the indirect method are given in Tables 9.5A,B,C and D.

Table 9.5A: ACC Ltd.

	(Rs Crore)			
	Mar 04	Mar 05	Mar 06	Dec 06
A. Cash flow from operating activities				
1. Net Profit / (Loss) before Tax and Exceptional Items	264.16	444.6	405.46	1449.8
Adjustments for:				
2. Depreciation	176.85	186.9	164.37	254.25
3. (Profit) / Loss on Sale of Fixed Assets	-4.38	-12.14	-7.87	-1.36
4. Dividend and interest income	-56.86	-11.37	-19.72	-49.26
5. Interest Expense	112.17	96.32	66.19	75.19
6. Inventory / Stores Write off			3.03	6.74
7. Net Value of Discarded Capital Assets	6.17	7.4	5.13	17.62
8. Miscellaneous Expenditure written off	30.33	19.42	6.34	6.08
9. Profit on Sale of Investment	-0.67	-3.03	-0.5	-13.99
10. Provision for Gratuity, Leave Encashment, Pensions etc.	10.95	10.02	8.84	32.71
11. Provision for Doubtful advance (Net)		9	-2.36	8.3
12. Provision for Bad and Doubtful Debts	6.3	11.53	-5.34	0.04
13. Others	-15.39	8.03	20.13	15.61
Operating cash flow before working capital changes	529.63	766.7	643.7	1801.7
14. Trade receivables	-6.46	-19.7	-10.58	-15.66
15. Inventories	-33.5	-165.4	-64.63	-61.14
16. Assets Held for Disposal	0.18	1.48	0.07	1.27
17. Other receivables	-57.76	-15.86	-12.58	-24.85
18. Trade payables	95.29	74.73	143.84	132.25
19. Compensation- Voluntary Retirement Scheme	-10.33	-15.51	-9.72	-24.21
Cash generated from operations	517.05	626.5	690.11	1809.4
20. Direct Taxes - Refund / (Paid) - (Net)	-38.76	-28.51	-46.27	-387.7
Net Cash flow from operating activities	478.29	598	643.84	1421.6

⁵ Condensed from the annual reports

Table 9.5B: ACC Ltd.

	(Rs Crore)			
	Mar 04	Mar 05	Mar 06	Dec 06
B. Cash flow from investing activities				
21. Loans to Companies and Public Bodies	1.95	2.05	-3.13	2.00
22. Purchase of Fixed Assets	-238.39	-600	-334.8	-536.61
23. Sale of Fixed Assets	11.91	15.69	10.26	167.36
24. Sale of Refractory / Cement Business	-	-	257.48	37.3
25. Purchase of Investments	948.34	1280	-1458	-2788.9
26. Sale/Redemption of Investments	700.29	1332	1327	2593.0
27. Interest received	19.53	8.36	2.69	17.16
28. Dividend received	37.6	3.24	17.29	26
Net cash used in investing activities	-415.45	-518.6	-181.2	-482.7

Table 9.5C: ACC Ltd.

	(Rs Crore)			
	Mar 04	Mar 05	Mar 06	Dec 06
C. Cash flow from financing activities				
29. Interest paid	-118.52	-100.8	-80.57	-89.6
30. Proceeds from / for issue of Share Capital	158.51	29.02	14.36	19.04
31. Proceeds / (Repayment) of Short term Borrowings	-24.98	64.96	-62.52	-9.08
32. Proceeds from Long term Borrowings			61.61	47.65
33. Repayment of Long term Borrowings			-209.3	-224.02
34. Dividend paid	-42.22	-71.15	-125.1	-146.71
35. Dividend tax paid	-5.48	-9.08	-17.53	-20.7
Net cash used in financing activities	-32.69	-87.04	-419	-423.42

Table 9.5D: ACC Ltd.

	(Rs Crore)			
<i>Summary of Cash Flows</i>	Mar 04	Mar 05	Mar 06	Dec 06
Net Cash flow from operating activities	478.29	598	643.84	1421.6
Net cash used in investing activities	-415.45	-518.6	-181.23	-482.7
Net cash used in financing activities	-32.69	-87.04	-419.04	-423.4
Net increase/(decrease) in cash and cash equivalents	30.15	-7.65	43.57	515.56
Opening Balance	34.82	64.97	57.32	102.79
Taken over / transferred on Amalgamation/Sale			1.90	1.82
Closing Balance	64.97	57.32	102.79	620.17

The areas to watch in the cash flow statement are negative or decreasing cash flows from operations, and the reason for the same. If it is due to additional money locked up in inventories or sales on credit, more than in proportion to the increased scale of operations,

it may be a cause for worry. If book profits are increasing, while cash flows are decreasing or negative, the company may be facing problems or may be showing inter divisional sales. On the other hand, if cash flow is affected due to investment in fixed assets or research and development, it will lead to better returns in future. In the case of ACC, there is no reason to worry as cash flows from operations are steadily rising and have been used mainly to finance investment in fixed assets, payment of dividends and repayment of loans.

■ CONSOLIDATED FINANCIAL STATEMENTS

If a company has a major interest in another undertaking, simply showing the investment value in shares in the balance sheet and dividends as other income may not reveal the whole picture. In the case of a subsidiary⁶, the parent company needs to present consolidated financial statements including all subsidiaries. Consolidated financial statements are the financial statements of a group presented as those of a single enterprise. In the case of a joint venture⁷, the appropriate proportion of assets, liabilities, income and expenses of a jointly controlled entity are reported as separate line items in the venturer's financial statements. In the case of an associate⁸ company, the consolidated financial statements include its share of results of such an associate.

As an equity holder or potential investor it is worth looking at the consolidated figures. However consolidated accounts of highly diversified companies cannot be used for peer analysis. Ideally, if available we should look at the standalone results of the parent and subsidiaries.

■ ANALYSING FINANCIAL STATEMENTS

Investors and lenders are interested in the future prospects the company. Historical financial information can be used to judge the past performance and to forecast the future. For this, we study trends in the financial statements and financial ratios.

Common Size Statement

One of the techniques employed to study the trends in the financial statements is to create a common size statement. A common size statement simply expresses all values as a percentage of net sales in the case of the income statement and as a percentage of total assets or total liabilities in the case of the balance sheet. Common size statements allow the analyst to

⁶ A subsidiary is an enterprise that is controlled by another enterprise (known as the parent). Control exists when the parent owns, directly or indirectly through subsidiaries, more than one-half of the voting power of an enterprise. Control also exists when an enterprise controls the composition of the board of directors.

⁷ A joint venture is a contractual arrangement whereby two or more parties undertake an economic activity, which is subject to joint control.

⁸ An associate is an enterprise in which the investor has significant influence i.e. the power to participate in the financial and/or operating policy decisions of the investee but not control over those policies. If an investor holds, directly or indirectly through subsidiaries, 20% or more of the voting power of the investee, it is presumed that the investor has significant influence, unless it can be clearly demonstrated that this is not the case.

observe trends in the components of each statement, which may otherwise not be noticed because of changes in absolute values. The adjusted income statement and common size statements for ACC Ltd. are presented in Tables 9.6A, B and C.

Table 9.6A: ACC Ltd.

	(Rs Crore)			
	Income Statement			
Year ending	Mar-04	Mar-05	Dec-05	Dec-06
Net sales	3284.48	3902.06	3220.7	5803.48
Other Income	148.53	101.12	97.92	132.88
Total Income	3433.01	4003.18	3318.62	5936.36
Cost of Goods Sold	1261.57	1541.14	1103.18	1587.99
Other Expenses	1637.52	1742.37	1581.85	2592.27
Depreciation	176.85	186.86	164.37	254.25
	3075.94	3470.37	2849.4	4434.51
EBIT	357.07	532.81	469.22	1501.85
Interest	92.91	88.19	63.76	52.03
EBT	264.16	444.62	405.46	1449.82
Taxes	-53.62	-65.73	-97.74	-387.66
EAT*	210.54	378.89	307.72	1062.16

*Exceptional items removed from income and taxes for forecasting (will not tally with the unadjusted figures shown earlier)

Table 9.6B: ACC Ltd.

	Common Size Income Statement (%)			
Year ending	Mar-04	Mar-05	Dec-05	Dec-06
Net sales	100.00	100.00	100.00	100.00
Other Income	4.52	2.59	3.04	<u>2.29</u>
Total Income	104.52	102.59	103.04	102.29
Manufacturing & Other Exp	88.27	84.15	83.37	72.03
Depreciation	5.38	4.79	5.10	<u>4.38</u>
	93.65	88.94	88.47	76.41
EBIT	10.87	13.65	14.57	25.88
Interest	2.83	2.26	1.98	0.90
EBT	8.04	11.39	12.59	24.98
Taxes	-1.63	-1.68	-3.03	-6.68
EAT	6.41	9.71	9.55	18.30

Table 9.6C: ACC Ltd.

Common Size Balance Sheet (%)					
As on 31st of	Mar-04	Mar-05	Dec-05	Dec-06	
Equity	4.54	4.05	3.83	3.18	
Reserves and Surplus	29.97	32.06	40.29	50.03	↑
Loans	34.48	31.82	22.12	13.06	↓
Stockist's Deposits	2.29	2.29	2.16	2.45	
Deferred Tax liabilities	7.02	6.68	6.20	5.43	
Current Liabilities and provisions	21.70	23.11	25.40	25.85	
	100.00	100.00	100.00	100.00	
Fixed assets	63.02	64.72	64.46	57.49	↓
Investments	9.58	7.38	6.07	8.52	
Current Assets, Loans & Advances	26.51	27.43	29.34	33.97	↑
Misc. exp not written off	0.89	0.47	0.13	0.02	
Total assets	100.00	100.00	100.00	100.00	

The trend in the income statement and balance sheet has been highlighted with arrows in the last column. As can be seen, there has been a dramatic decrease in the manufacturing and other expenses in 2006. The analyst will need to find out whether this was due to an increase in prices or operating efficiencies or a combination of both. The analyst may also extrapolate the figures if the trend is expected to continue; if there is no definite trend an average of the past can also be used to forecast the future.

We can also compare financial data over time by using an index number trend series. For example, we can express the growth of sales, expenses etc. over time by taking a suitable base year, and setting its values equal to 100%. This is illustrated for the sales of ACC Ltd. in Table 9.7.

Table 9.7: ACC Ltd.

Year ending	Mar-04	Mar-05	Dec-05	Dec-06
Net sales (Rs Crore)	3284.48	3902.06	3220.7	5803.48
Trend	100%	118.8%	98.1%	176.7%

This analysis immediately highlights the magnitude of positive and negative changes. However, we need to choose an appropriate “normal” base year and keep in mind, the effects of inflation over time. In the case of ACC, for example, the figures show a dip in sales for the year ended December 2005, which needs to be interpreted with caution. This was a 9-month period, being compared with a 12-month base year. The huge increase in sales in 2006 also needs to be investigated further, to find out the increase due to price and quantity.

Ratio Analysis

Financial ratios use figures from the financial statements to highlight certain aspects of a company's performance. The ratios can be grouped according to the information provided by them. One way of classifying ratios is as follows⁹:

Liquidity ratios give an idea about the short term solvency of a company:

$$\text{Current Ratio} = \frac{\text{Current Assets}}{\text{Current Liabilities}}$$

$$\text{Quick Ratio} = \frac{\text{Current Assets} - \text{Inventory}}{\text{Current Liabilities}}$$

$$\text{Cash Ratio} = \frac{\text{Cash}}{\text{Current Liabilities}}$$

Leverage ratios show the extent of debt in the company's capital structure:

$$\text{Debt/Equity Ratio (D/E)} = \frac{\text{Long Term Debt}}{\text{Total Equity}}$$

$$\text{Equity Multiplier} = \frac{\text{Total Assets}}{\text{Total Equity}}$$

Coverage Ratios show the ability to discharge financial obligations:

$$\text{Interest Coverage Ratio} = \frac{\text{EBIT}}{\text{Interest}}$$

$$\text{Cash Coverage (Interest) Ratio} = \frac{\text{EBIT} + \text{Depreciation}}{\text{Interest}}$$

$$\text{Debt Coverage Ratio} = \frac{\text{EBIT}}{\text{Interest} + \text{Proportional Loan Repayment}/(1 - \text{tax rate})}$$

Asset Utilization Ratios (Operational Ratios) show the efficiency of asset utilisation:

$$\text{Inventory Turnover Ratio} = \frac{\text{Cost of Goods Sold}}{\text{Inventory}}$$

$$\text{Receivables Turnover Ratio} = \frac{\text{Sales}}{\text{Accounts receivable}}$$

$$\text{Total Asset Turnover Ratio} = \frac{\text{Sales}}{\text{Total assets}}$$

Profitability Ratios as the name implies, show returns on sales or investment

$$\text{Profit Margin Ratio} = \frac{\text{Net Income}}{\text{Sales}}$$

$$\text{Return on Assets (ROA)} = \frac{\text{Net Income}}{\text{Total Assets}}$$

⁹ This is not an exhaustive list of ratios.

$$\text{Return on Equity (ROE)} = \frac{\text{Net Income}}{\text{Total Equity}}$$

Market Value Ratios

$$\text{Price Earnings Ratio (P/E)} = \frac{\text{Market Price per Share}}{\text{Earnings per Share}}$$

$$\text{Book to Market Ratio} = \frac{\text{Book Value per Share}}{\text{Market Price per Share}}$$

These groups of ratios are of interest to various stakeholders in the company. Lenders, such as bankers and debenture holders would be interested in the ability of the company to service their debt, and would look at leverage and coverage ratios. Liquidity ratios would be of interest to short-term creditors. Equity shareholders, who plan to invest over a long period would study all ratios, and may be more concerned about the operational, profitability, and market value ratios.

DuPont Analysis

Dupont Analysis is a ratio analysis technique that helps identify the strengths and weaknesses of a company. It breaks down the return on equity (ROE) into three components that measure the profitability of sales, efficiency in usage of assets and financial leverage. The ratios help determine the strengths/weaknesses of the company and point to areas that need further analysis.

$$\text{Return on Equity} = \text{ROE} = \frac{\text{Net Income}}{\text{Total Equity}}$$

Multiply the numerator and denominator by total assets to get

$$\begin{aligned}\text{ROE} &= \frac{\text{Net Income}}{\text{Total Assets}} \times \frac{\text{Total Assets}}{\text{Total Equity}} \\ &= \text{ROA} \times \text{Equity Multiplier}\end{aligned}$$

Also,

$$\text{Return on Assets} = \text{ROA} = \frac{\text{Net Income}}{\text{Total Assets}}$$

Multiply the numerator and denominator by sales to get

$$\begin{aligned}\text{ROA} &= \frac{\text{Net Income}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Total Assets}} \\ &= \text{Profit Margin Ratio} \times \text{Asset Turnover Ratio}\end{aligned}$$

Therefore,

$$\begin{aligned}\text{Return on Equity} &= \text{ROE} = \text{ROA} \times \text{Equity Multiplier} \\ &= \text{Profit Margin Ratio} \times \text{Asset Turnover ratio} \times \text{Equity Multiplier}\end{aligned}$$

Ratio analysis and Du Pont analysis are illustrated with the example of ACC Ltd. Some additional details and assumptions regarding loan repayment are provided in Tables 9.8, 9.9 and 9.10.

Table 9.8: ACC Ltd.

	(Rs. Crore)			
	Mar-04	Mar-05	Dec-05	Dec-06
Inventories	378.01	542.38	600.95	624.13
Sundry Debtors	182.37	190.54	199.17	213.96
Cash & Bank Balances	64.97	57.32	102.79	620.17
Other Current Assets	3.43	4.39	31.49	16.13
Loans and Advances	411.34	419.08	486.76	531.85
Current Assets, Loans and Advances	1040.12	1213.71	1,421.16	2,006.24
No of Shares (crore)	17.13	17.82	18.12	18.66
EPS (Rs)	12.29	21.26	16.98	56.92
Market Price of Share	254.65	360.55	534.1	1086.55
Assume loan repayment of Rs 250 crore per annum for calculation of debt coverage ratio.				

Table 9.9: Ratio Analysis for ACC Ltd.

Liquidity Ratios¹⁰				
Current Ratio = Current Assets/Current Liabilities	1.22	1.19	1.16	1.31
Quick Ratio = (Current Assets- Inventory)/Current Liabilities	0.78	0.66	0.67	0.91
Cash Ratio = Cash / Current Liabilities	0.08	0.06	0.08	0.41
Leverage Ratios				
Debt/ Equity Ratio (D/E) = Total Debt/Total Equity	1.00	0.88	0.50	0.25
Equity Multiplier = Total Assets/Total Equity	2.90	2.77	2.27	1.88
Coverage Ratios				
Interest Coverage Ratio = EBIT/Interest	3.84	6.04	7.36	28.87
Cash Coverage (Interest) Ratio = (EBIT +Depreciation)/Interest	5.75	8.16	9.94	33.75
Debt Coverage Ratio = EBIT/ {Interest + Loan Repayment/(1 - tax rate)}	0.88	1.40	1.31	4.35
Asset Utilization Ratios				
Inventory Turnover Ratio = Cost of Goods Sold/Inventory	3.34	2.84	1.84	2.54

Contd...

¹⁰ Deferred tax liability is ignored for calculation of current ratio

Receivables Turnover Ratio = Sales/ Accounts receivable	18.01	20.48	16.17	27.12
Total Asset Turnover ratio = Sales/Total assets	0.84	0.88	0.66	0.98
Profitability Ratios				
Profit Margin ratio = Net Income/ Sales	0.06	0.10	0.10	0.18
Return on Assets (ROA) = Net Income/ Total Assets	0.05	0.09	0.06	0.18
Return on Equity (ROE) = Net Income/ Total Equity	0.16	0.24	0.14	0.34
Market Value Ratios				
Price Earnings Ratio (P/E) = Market Price per Share/ EPS	20.72	16.96	31.45	19.09
Book to Market Ratio = Book Value per Share/ Market Price per Share	5.32	4.43	4.00	2.89

At first glance, the majority of the ratios for ACC have shown a favourable trend over the years. Liquidity and coverage ratios increased, which would be very comforting for short and long-term lenders. Profitability ratios increased and leverage ratios decreased, indicating that the company reduced its dependence on debt; this was possible due to plough back of profits reflected in increased reserves and surpluses. Two out of three asset utilisation ratios improved, however inventory turnover ratio deteriorated; this was on account of increase in inventory of coal and stores and spares. Increased inventory of coal was probably necessary as the cement industry is facing shortages of coal, if we exclude the coal stocks, the inventory turnover ratio would be 3.51 in 2006, which is an improvement over previous periods. The P/E ratio also declined over the four year period, and more so if compared with the previous year; however, this was on account of increased earnings rather than decrease in price of the share. Over the four-year period, EPS increased 4.63 times whereas price increased 4.26 times. We also need to be careful when comparing ratios with the previous year, as that was a 9-month period; as a resulted EPS was understated, inflating the P/E figure for December 2005.

Table 9.10: Du Pont Analysis for ACC Ltd.

Year ending	Mar-04	Mar-05	Dec-05	(Rs. Crore) Dec-06
PAT i.e. net income	210.54	378.89	345.52	1062.16
Equity and Reserves	1353.73	1597.68	2136.75	3142.92
Total assets	3922.85	4424.56	4843.35	5906.63
Sales	3284.48	3902.06	3220.70	5803.48
Return on equity(ROE) = Net income/Equity & Reserves	0.16	0.24	0.16	0.34

Contd...

$ROE = ROA * \text{Equity multiplier}$				
Return on Assets(ROA) = Net income/Total assets	0.05	0.09	0.07	0.18
Equity multiplier = Total Assets/Total Equity	2.90	2.77	2.27	1.88
$ROA = \text{Profit Margin Ratio} * \text{Total Asset Turnover}$				
Profit Margin Ratio = Net income/Sales	0.06	0.10	0.11	0.18
Total Asset Turnover = Sales/Total Assets	0.84	0.88	0.66	0.98
$ROE = \text{Profit Margin Ratio} * \text{Asset Turnover} * \text{Equity Multiplier.}$				
	0.16	0.24	0.16	0.34

Dupont analysis of ACC over the four-year period reveals that ROE has gone up from 16% to 34 %. This was mainly due to increase in the profit margin ratio. The asset utilisation ratio has also gone up and leverage, which represents risk has been brought down. The increase in profit margin ratio needs investigation; was it due to increase in operating efficiency, or increase in sales prices etc. In 2005, there was a fall in the return on equity; this also needs further investigation. Asset utilisation seems to have declined in the year ending December 2005. However, we must keep in mind that this was a 9-month period and figures need to be adjusted to be compared with a 12 month period. All ratios improved in 2006, mainly because of increased profit in 2006. Although this coincided with the reorganisation of the company, when unrelated divisions were hived off, further analysis of the volumes and turnover of cement revealed that the average price of cement increased by 31% in 2006. The decline in P/E ratio in 2006 was not due to decline in share price, but because EPS increased more than the increase in price.

As can be seen from the analysis of ACC Ltd. information provided by ratios is of little use when studied in isolation. They are normally compared with the past performance of the company, predetermined standards, industry averages, or with peer group ratios. Ratios should be studied over a period of time, especially in the case of cyclical companies. Care also need to be exercised when selecting a base year for comparison, or when using industry averages or another company as a standard as the size, age, products, technology and accounting practices should be similar for meaningful comparisons¹¹. The reasons for changes in ratios also need to be investigated. We must also keep in mind that ratios are based on past data, so forecasts will need to build in changes based on future plans of the organisation and also take into account the future economic conditions.

■ SUMMARY

Company fundamentals are evaluated by studying the qualitative and quantitative aspects. This includes undertaking of a SWOT analysis; understanding the financial reports and their reliability; and analysis of financial statements using trend analysis and ratio analysis.

¹¹ Peer group comparisons are normally more meaningful than comparisons with the entire industry.

SOLVED EXAMPLES

1. The following excerpts are available from the annual accounts of Mangalore Chemicals and Fertilizers Ltd.

<i>For the year ended 31 March 2014</i>	<i>(Rs Crore)</i>
Earnings before interest and depreciation	224.76
Depreciation	28.76
Interest	102.45
Taxes	22.61
Profit after tax	70.93
Dividend and dividend distribution tax	14.22
<i>As on 31 March 2014</i>	<i>(Rs Crore)</i>
Equity & Reserves	635.85
Long term borrowing (repayable over 7 years)	226.85
Other liabilities and provisions	129.66
Current Liabilities and provisions	1641.52
Total	<u>2633.88</u>
Fixed Assets	625.94
Other assets	274.96
Current Assets	1732.98
Total	<u>2633.88</u>

Calculate three ratios that are relevant for a bond holder .

Ans: Debt/Equity ratio = 226.85/224.76 = 1.009

Interest coverage ratio = EBIT/interest = 224.76/102.45 = 2.19

Debt service coverage ratio = EBIT/(interest+ annual installment for Long term borrowing/(1-tax rate))

First calculate the installment to be repaid = 226.85/7 =32.41

Then the tax rate =22.61/93.54 = 0.2417

Debt service coverage ratio = 224.76/((102.45+(226.85/7))/(1-22.61/93.54)) =1.548

2. The following information was collected for ACC Ltd.

ACC Ltd. (excerpts from Annual Accounts)

<i>Balance sheet as at 31 December 2015</i>	<i>(Rs Crore)</i>
Share Capital	187.95
Reserves and Surplus	8255.09
	<u>8443.04</u>
Fixed Assets	7655.94
Non Current Assets	181 4 .23
Inventories	1188.6

Non current Liabilities	589.02	Trade receivables	484.35
Current Liabilities	3808.76	Other current Assets	1697.7
Total Liabilities	12840.82	Total Assets	12840.82

Face value per share = Rs 10

Profit and Loss Account for the year ended 31 December 2015 (Rs Crore)

Revenue	11916 .18
Expenditure	11132.21
Profit before tax	783.97
Profit after tax	591.57

Calculate EPS, ROE, ROA, Profit Margin Ratio and Equity Multiplier. What do you observe?

$$Ans: EPS = 591.57/187.95 = 3.147$$

$$ROE = 591.57/8443.04 = 0.07$$

$$ROA = 591.59/12840.82 = 0.046$$

$$\text{Profit Margin Ratio} = 591.57/11916.18 = 0.049$$

$$\text{Equity Multiplier} = 12840.82/8443.04 = 1.52$$

Profitability ratios are very low, even after leverage the return on equity is only 7%.

3. Given below are excerpts from the accounts for Bajaj Auto Ltd. for the Year ending 31 March 2016. Calculate P/E ratio and perform Du Pont analysis.

<i>Income Statement</i>	<i>Rs Crore</i>
Revenue	22688
Raw Material	15057
Employee costs	918
Other Expenses	1933
Operating Profit	4780
Depreciation	307
Interest	1
Other Income	913
Profit before tax	5385
Taxes	1733
Profit	3652
Balance Sheet	
Equity	289
Reserves	12003

Contd...

Debt	162
Deferred tax liability	316
Total Liabilities	12770
Fixed Assets	2077
Investments	9513
Deferred tax assets	127
Inventory	719
Sundry debtors	718
Other current assets	1786
Less Sundry creditors	(2027)
Less other liabilities	(1003)
Cash	860
Total Assets	12770

Market capitalization was Rs 82104 crores

Ans: P/E ratio = 82104/3652 = 22.48

Du Pont Analysis helps study the return on equity by seeing the contribution of profit margin,

Return on Equity = ROE = net income /total equity = 3652/(289+12003)=29.71%

■ QUESTIONS

1. List two qualitative aspects of a company that are studied by analysts.
2. Give two examples of pertinent information given in the notes of the balance sheet that an investor should take note of.
3. Briefly discuss any two items from the annual accounts which require special attention during company analysis.
4. During periods of high inflation which method of inventory valuation, LIFO or FIFO will result in lower taxation?
5. During inflationary conditions a company using FIFO will report higher/lower profit and higher/lower inventory value than if it had used LIFO. Explain why.
6. What is book value of a share? How is it different from market price?
7. What is financial leverage?
8. What should an investor keep in mind when studying the trends in the income statement?
9. Why is it important to study the cash flow statement in addition to the income statement and balance sheet?
10. How does Du Pont analysis help in analysing the returns to an equity holder?
11. What is diluted EPS?

■ MULTIPLE CHOICE QUESTIONS

1. In inflationary conditions accounting for inventory with
 - (a) FIFO will show lower inventory and lower profit than LIFO
 - (b) FIFO will show lower inventory and higher profit than LIFO
 - (c) FIFO will show higher inventory and higher profit than LIFO
 - (d) FIFO will show higher inventory and lower profit than LIFO
2. Along term investor would normally be more interested in
 - (a) Basic EPS
 - (b) Diluted EPS
 - (c) Cannot say
3. In Dupont analysis Equity Multiplier refers to
 - (a) Long term debt /Equity
 - (b) Total debt/Total Equity
 - (c) Total assets/Total Equity
 - (d) None of the above
4. Cash flows from Investment do not include
 - (a) Loans to third parties
 - (b) New equity issued
 - (c) Research and development costs
 - (d) Sale of assets
5. A common size income statement refers to
 - (a) Statements that are prepared in the same format for all companies in an industry
 - (b) Income is expressed as a percentage of total assets
 - (c) Values are expressed as a percentage of total income
 - (d) Values are expressed as a percentage of net sales

■ PROBLEMS

1. The following figures are available for ABC Ltd.

Balance sheet as on 31st March 2006

<i>Liabilities</i>	<i>(Rupees)</i>	<i>Assets</i>	<i>(Rupees)</i>
Equity Share Capital	12,00,000	Net Fixed Assets	6,00,000
10% Debentures (2011)	2,50,000	Cash	3,00,000
Creditors	1,80,000	Debtors	2,70,000

B/P	2,50,000	Stock	8,30,000
Other Current Liabilities	1,20,000		
	20,00,000		20,00,000

Excerpts from Income statement for the year ending 31st March, 2006

(Rupees)

Sales	28,00,000
Raw Materials	8,50,000
Wages	4,50,000
Factory overheads	2,20,000
Selling and Distribution Expenses	2,00,000
Administrative and General Expenses	1,75,000

Other information

Tax rate 40%

Dividend declared Rs 1/share

Current price of share Rs 20

Calculate ratios relevant from the point of view of a shareholder and a bondholder.

2. Two companies, ABC Ltd. and XYZ Ltd. have identical values of cash from operations Rs.200,000. The only difference between the two companies is their financing. At the beginning of the year, ABC Ltd. issued zero-coupon bonds with a face value of Rs 3,00,000 maturing in four years. XYZ Ltd. issued 8% bonds for Rs 2,50,000 also maturing in four years.
 - (a) How much did ABC receive for its bonds?
 - (b) What interest would ABC have paid over the four years of the bond's life?
 - (c) What adjustments should be made if we want to compare the cash flows of the two companies in the first year?
3. You have been supplied data for X company and its industry averages:
 - (a) Determine the indicated ratios for X Co. Ltd.
 - (b) Indicate the company's strengths and weaknesses as shown by your analysis.

B/S as at March 31

<i>Liabilities</i>	<i>Amt Rs.</i>	<i>Assets</i>	<i>Amt. Rs.</i>
Equity Share Capital	12,00,000	Net Fixed Assets	6,05,000
10% Debentures	2,30,000	Cash	2,20,000
Creditors	1,65,000	Debtors	2,75,000
B/P	2,20,000	Stock	8,25,000

Other Current Liabilities	1,10,000	
	19,25,000	
		19,25,000

Statement of profit for the year ending 31st March, current year

Sales	Rs. 27,50,000
Less: Cost of goods sold:	
Materials	10,45,000
Wages	6,60,000
Factory overheads	3,24,500
Gross Profit	20,29,500
Less: Selling and Distribution Expenses	7,20,500
Less: Administrative and General Expenses	3,07,000
Earnings before interest and taxes	2,75,000
Less: Interest	1,38,500
Earnings before taxes	23,000
Less: Taxes (0.35)	1,15,500
Net Profit	40,425
	75,075

<i>Ratios</i>	<i>Industry</i>
Current Assets/Current Liabilities	2.4
Sales/Debtors	8.0
Sales/Stock	9.8
Sales/Total Assets	2.0
Net Profit/Sales (%)	3.3
Net Profit/Total Assets (%)	6.6
Net Profit/Net Worth (%)	12.7
Total Debt/Total Assets (%)	63.5

4. The following information is available for ABC Ltd. Calculate all relevant ratios as a potential bondholder.

	(Rs Lacs)
Sales	500
Operating Expenses	250
Depreciation	68
6% bond due in 5 years	200
10% bond due in 10 years	100

Equity and retained earnings	600
Current Liabilities	100
	<hr/>
	1000
Fixed Assets	800
Cash and bank balances	10
Other current assets	190
	<hr/>
	1000

Income tax 50%

Sinking Fund Rs. 50 lac per annum

5. Two companies have the following data on 1st Jan, 1992

	<i>A</i>	<i>B</i>
Current share price	Rs 20	Rs 40
Current ratio	3.2	1.5
Fixed cost/Total operating cost	0.4	0.8
EPS in 1991	1.0	4.0
Expected growth in EPS and DPS	0.15	0.12
Estimated dividend 1992	0.2	0.8
Assets/Equity	1.2	2.0
Shares (million)	5	40
Estimated share price end 1992 (equal probability)	19 or 25	30 or 50

- (a) List the reasons which may account for higher P/E ratio for A
- (b) Which would you prefer to buy for 1 year holding & why?

■ PRACTICAL EXERCISES

Take financial data for a company for 3-5 years from the NSE or BSE site, or any financial database. Use common size statements and ratio analysis to judge the financial health of the company.

APPENDIX 1

Accounting fraud at Satyam and Enron

Creative Accounting Practices at Satyam Computers Limited¹

Satyam Computer Services Limited was formed in 1987, it went public in 1991 and in 2001 it was listed on NYSE. It was one of the fastest growing IT Companies, operating in 65 countries around the world, and had won several awards including the Golden Peacock Award for the best governed company in 2008. Unfortunately, the Satyam scam was the greatest scam in the history of the corporate world of the India.

The fraud was not detected for a very long time as the financial statements revealed spectacular results. Net sales grew from Rs 2541 crore in 2003-04 to Rs 8137 crore in 2007-08 and net profits grew from Rs 774 crores to Rs 2085 crores in the same period. The market responded very favourably to these results and the share price rose from Rs 138 in 2003 to Rs 526 in five years.

On December 16, 2008 Satyam Computers announced buying of a 100 per cent stake in two companies owned by the Chairman Mr. Ramalinga Raju's sons—Maytas Properties and Maytas Infra. The deal fell through as it was opposed by investors and share prices on the NYSE fell by 55%. On December 23, The World Bank declared Satyam ineligible for contracts for providing improper benefits to Bank staff and for failing to maintain documentation to support fees charged for its subcontractors. As a result stock prices fell further and four independent directors also resigned.

On January 7, 2009, Ramalinga Raju resigned and confessed to a Rs.7,136 crore fraud committed by him and his aides at the company. He also disclosed that the company's accounts had been manipulated for many years. The company had overstated assets, underreported liabilities and overstated income in keeping with analyst expectations. The Balance Sheet on September 30, 2008 had inflated cash and bank balances of Rs.5,040 crore, accrued interest of Rs. 376 crore and understated liability of Rs. 1,230 crore. The company had run out of cash to pay salaries when he made his confession.

A number of techniques were used to manipulate the accounts. Numerous bank statements were created, balance sheet inflated, income statement inflated with interest income from the fake bank accounts. They also created 6,000 fake salary accounts and siphoned off the money credited in these accounts. Fake customer identities and fake invoices against their names were generated to inflate revenue. Board resolutions were also faked to obtain loans for the company.

¹ Summarised and adapted from Creative Accounting Practices at Satyam Computers Limited: A Case Study of India's Enron, Madan Lal Bhasin International Journal of Business and Social Research, vol6, No 6, 2016 <http://www.thejournalofbusiness.org/index.php/site/article/view/948> and Corporate Accounting Fraud: A Case Study of Satyam Computers Limited Madan Lal Bhasin, Open Journal of Accounting, 2013, 2, 26-38, <http://dx.doi.org/10.4236/ojacct.2013.22006> Published Online April 2013 (<http://www.scirp.org/journal/ojacct>)

The Satyam scam took nearly two years and over 100 experts to assess the total damage of the scam . They found 356 investment companies were used to divert funds from Satyam in the form of inter-corporate investments, advances and loans . This money was used to purchase thousands of acres of land, across Andhra Pradesh. The scam started to reveal itself after the failed attempt to buy the two infrastructure companies in December 2008.

The special CBI court held Raju and nine other officials guilty of cheating, including two former partners at PricewaterhouseCoopers. PwC were the company's auditors from June 2000 onwards. While they could have been misled by the company, some items should have been investigated further, such as a huge amount of non interest bearing deposits. Also while verifying bank balances, they relied wholly on the (forged) fixed deposit receipts and bank statements provided by the 'Chairman's office'. The forensic audit reveals differences running into hundreds of crores between the fake and real statements as captured by the computerised accounting systems. The internal auditor and the statutory auditors, chose to place their faith in the 'Chairman's office' rather than the company's information systems. The auditors should have independently verify with the banks in which Satyam claimed to have deposits. The Satyam fraud involved the manipulation of balance sheets and income statements over a number of years, without the auditors ever discovering the fraud. There has been speculation that the auditors were highly over paid for this purpose.

The factors that contributed to the fraud were greed, ambitious corporate growth, deceptive reporting practices—lack of transparency, excessive interest in maintaining stock prices, executive incentives, stock market expectations, nature of accounting rules, ESOPs issued to those who prepared fake bills, high risk deals that went sour, audit failures (internal and external), aggressiveness of investment and commercial banks, rating agencies and investors and weak independent directors and audit committee.

Immediately after the revelation about the accounting fraud, the government appointed a new board of directors for Satyam to try to save the company. Several companies bid in April 2009, and Tech Mahindra, bought 51 % shares in Satyam for Rs. 58 per share. The stock that was Rs. 542 in 2008 had crashed to Rs. 6.30 on the day of confession on January 9, 2009.

The main victims, were employees of Satyam, they faced non-payment of salaries, project cancellations, layoffs and equally-bleak prospects of outside employment opportunities. Clients of Satyam reviewed their contracts and preferred to go with other competitors. Shareholders lost their valuable investments, bankers recalled facilities and the Indian Government was worried about its image of the nation and IT-sector affecting faith to invest, or to do business in the country.

The Satyam Computer Services' scandal brought to light the importance of ethics and its relevance to corporate culture. It also brought to light the creative accounting that companies may resort to. The reality being that analysts, audit committee members and independent directors have to rely on what the management presents to them.

The Enron Scandal²

Enron was formed in 1985 by Kenneth Lay after the merger of Houston Natural Gas and Inner North. The company owned the largest network of natural gas pipelines in Texas. At that time pipeline companies entered into long term contracts with producers and bulk buyers/ distributors at given prices which led to stability in supply and prices. Thereafter gas prices were deregulated, which led to increased supply, lower prices and volatility in gas prices.

A shift from the core business of gas pipelines was initiated by Jeffery Skilling in 1988. In the early 1990s the company diversified into trading of natural gas; it entered into long term fixed price contracts for gas and hedged the risks of price volatility through financial derivatives including swaps, forwards and futures. It further diversified into financial trading and market making for electricity, coal, steel, paper, fiber optic cables etc. By 2001 it had undertaken projects nationally and internationally to construct and manage plants that produced the products that it traded in financially.

The company grew at a phenomenal rate from 1993 to 2000; Revenues from domestic pipelines doubled from \$1466 to \$2965 million, Domestic trading revenues went up eleven times from \$6624 to \$ 77081 million and international revenues increased twenty six times from \$914 to \$22898 million.

However all businesses were not as profitable as shown in the accounts. Accounting required valuation of complex long term contracts across international borders. This involved mark to market accounting based on present value of future contracts which may or may not be realised. The company also used special purpose entities to fund off balance sheet borrowings, and did not disclose its interest in these entities as was required by accounting rules.

In October 2001 the company recognised losses that were incurred in the water and broadband business in earlier years by writing down of assets to the tune of \$811 million and also sold an electrical plant at a loss of \$1.1 billion. Enron 's stock price, which achieved a high of \$ 90.75 per share in mid-2000, plummeted to less than \$1 by the end of November 2001. Dynergy a competitor offered to purchase the company, however the deal failed, and on December 2, 2001, Enron filed for bankruptcy. Enron's \$63.4 billion in assets made it the largest corporate bankruptcy in U.S. history till that date.

The fraud remained hidden for many years with the use of accounting loopholes, special purpose entities, and poor financial reporting. The company mislead the board of directors and audit committee and the auditors ignored these problems while they received significant auditing and consulting fees.

Analysts and fund managers too were not able to see through the fraud; 60% of Enron's share were institutionally held before the meltdown. Sell side analysts had recommended

² Summarised and adapted from The Fall of Enron, Paul M. Healy and Krishna G. Palepu Journal of Economic Perspectives— Volume 17, Number 2— Spring 2003— Pages 3– 26 <http://www.webcitation.org/5tZ0YEF6T?url=http://www-personal.umich.edu/~kathrynd/JEP.FallofEnron.pdf>

“buy” even in October 2001, which could be due to their proximity to some or all of the following: the Enron management, investment bankers or institutional investors.

Many executives at Enron were sentenced to prison. Enron’s auditor, Arthur Andersen, was found guilty in a United States District Court of illegally destroying documents relevant to the SEC investigation. Although the ruling was subsequently overturned by the Supreme Court, the company had lost the majority of its customers and had ceased operating.

Enron employees and shareholders lost billions of dollars in pensions and stock prices. New regulations and legislation were enacted to expand the accuracy of financial reporting for public companies.

CHAPTER - 10

Valuation

LEARNING OBJECTIVES

- Appreciate the intricacies of valuation
- Estimate the fair value of a share using discounted cash flow models
- Calculate the intrinsic value of a share using relative valuation
- Understand the process of forecasting a company's earnings
- Determine whether a share is over or undervalued.

Valuation is required for many decisions including mergers and acquisitions and portfolio management. Excerpts regarding valuations in the stock market are given in Exhibit 10.1. As can be seen, the price that an acquirer is willing to pay need not be the same as price in the stock market. Some reports make projections of future earnings, some compare prices and ratios with other companies, some with historical ratios etc.

Fundamental analysis assumes that the price in the stock market may not reflect a stock's real or intrinsic value. It also assumes that price will move towards the intrinsic value in the long run¹. The aim of the analyst is to identify stocks that are over or under priced. Stocks that are underpriced should be bought and stocks that are overpriced should be sold or short-sold. Another way of identifying whether a stock should be purchased or not is to estimate the return over a given future period and compare it with the required return. Fundamental analysis is suitable for those who want to buy and hold a stock; technical analysis may be more suitable for those interested in quick buy and sell decisions.

Exhibit 10.1: Reports on Stock Valuation

The Financial Express, April 13, 2004

"Citigroup intends to acquire the outstanding shares of e-Serve at Rs 800 per share, a 27 percent premium to its closing price of Rs 630 on April 8."

5Paisa.com, April 16, 2001

The current price of Rs 45 discounts its nine month annualized EPS of Rs 3 by 15 times. Although this may look a bit expensive as compared to other oil companies one has to look into the fact that RPL enjoys some inherent advantages and thus deserves a premium discounting. We feel that the company is worth a buy at the current price of Rs 45.

The Financial Express August 12, 2008

Among the PSBs, the highest decrease in price/book value ratio was seen in the case of Indian Bank (1.90 to 0.98) followed by State Bank of B&J(1.68 to 0.90) and State Bank of Travancore (1.72 to 0.93).

Dalal Street, October 22, 2007

Tech Mahindra is expected to report an EPS of Rs 58.97, 78.36 and 91.08 for FY08, 09 and 10 respectively. The stock trades at 17x FY09E EPS. Revised target price of Rs.1330 is based on 17x FY09E EPS.

The Times of India, November 1, 2008

"Bharti Airtel has lost 38% in the last one year and is trading at 11 times FY10 estimated earnings. This is below its historic price to earnings multiple band of 14-24 times."

We will study some models and techniques available for forecasting earnings and valuing the shares of a company. We will also discuss the practical issues involved and the limitations of each approach. The two major approaches discussed in this chapter are the discounted cash flow approach and the relative valuation approach. In the discounted cash flow approach we need to forecast the future cash flows and calculate the present value by using an appropriate discount rate. In the relative valuation approach, we look at ratios involving the share price such as P/E ratio and price to book value. We can compare with other companies, and with

¹ However, the long run is not defined in terms of months or years.

industry or market ratios to identify undervalued stocks. We can also forecast the earnings or book value and multiply by the relevant ratios to arrive at an estimated fair price.

■ DISCOUNTED CASH FLOW APPROACH

The present value of an asset should be equal to the present value of future cash flows. Assuming that all cash flows are received at the end of each period, the present value is calculated as

$$PV = \sum_{t=1}^T \frac{C_t}{(1+r)^t}$$

Dividend Discount Models

The cash flows received by a portfolio investor are the periodical dividends and selling price of the share at the end of the holding period. If we are given the dividends and the selling price of the share at the end of the holding period, we can simply calculate the present value as follows:

$$PV = \sum_{t=1}^T \frac{D_t}{(1+r)^t} + \frac{P_t}{(1+r)^t}$$

For example, for a holding period of one year, if expected dividend is Rs 5, selling price at the end of the period is Rs 115, and discount rate is 10%, the fair value of the stock can be calculated as

$$PV = 5/1.10 + 115/1.10 = 109.09$$

If the stock is available for less than or equal to Rs 109.09, it should be purchased. Alternatively, if it can be sold for more than this price, it should be sold.

Similarly, for a holding period of two years, if expected dividends are Rs 5 and Rs 6 for the two years, selling price at the end of two years Rs 125, and discount rate 10% the fair value of the stock can be calculated as

$$PV = 5/1.10 + 6/(1.10)^2 + 125/(1.10)^2 = 112.81$$

However, if the future dividends and selling price in the future are not known and need to be estimated, we can make use of the dividend discount model (DDM) to do so. We normally take the previous year's dividend as the starting point and use it to forecast future dividends. The fair value at present and any time in the future can also be estimated from the future dividends.

- Constant dividend model:** If we assume that absolute value of dividend paid remains the same for an infinite period, as would be in the case of a preference share, the intrinsic value would be the infinite sum of a geometric series of the expected dividend.

$$PV = \sum_{t=1}^{\infty} \frac{D_t}{(1+r)^t}$$

$$\text{If } t = \text{infinity}, PV = \frac{D}{r}$$

For example, if the dividend per share is Rs 5 and discount rate is 10% the present value of the share = $5/0.10 =$ Rs 50

2. **Constant growth model:** Assumes dividends grow at a constant rate for an infinite period. The intrinsic value would be the infinite sum of a geometric series starting with the dividend projected for the current year.

The projected dividend for the current year is last year's dividend $\times (1 + \text{growth rate})$

$$D_1 = D_0 (1 + g)$$

$$PV = \sum_{t=1}^{\infty} \frac{(D_0 \times (1+g)^t)}{(1+r)^t}$$

We know that the sum of an infinite GP² is $\frac{a}{(1+r)}$

in this series of cash flows $a = \frac{D_0 \times (1+g)}{(1+r)}$ and $r = \frac{(1+g)}{(1+r)}$

We simplify to get the following

$$\text{If } t = \text{infinity}, PV = \frac{D_1}{r - g}$$

This summation of the geometric progression can be applied only if the required return is greater than the growth rate³. If we have a higher growth rate than the discount rate and sum the series till infinity, the present value will be infinite.

If the market price is given and we want to estimate the implied discount rate (or expected return) we can rearrange the formula for calculation of present value as follows:

$$PV \times (r - g) = D_1$$

$$\text{and } r = g + D_1/PV$$

Let us take a simple example where the previous year's dividend was Rs 5 and assume it grows at 5% per annum. The present value = $5(1.05)/(0.10-0.05) = 5.25/.05 =$ Rs 105.

In this case, if the market price is 110 and we want to estimate the implied discount rate

$$r = g + D_1/PV = 0.05 + (5 \times 1.05)/110 = .0973 \text{ i.e., } 9.73\%$$

The investor can decide if this return is considered suitable for investment in the stock.

This model can be applied to companies that have a history of fairly constant growth rates and dividend payout ratio. However, we need to confirm that the company is not expected to go into the decline stage of the industry life cycle, in the foreseeable future.

² Proof in appendix of chapter 4.

³ See the formula, if $g > r$, the denominator will be negative.

3. ***Two stage growth model:*** Assumes dividends grow at a higher rate for a few years and at a constant rate thereafter till infinity. The intrinsic value would be the present value of sum of the discounted dividends for the high growth period plus the present value of sum of an infinite geometric series starting with the first year of lower growth. Since the infinite series is calculated at a future date, it also has to be discounted to the present.

For high growth period $D_n = D_0 (1 + g_1)^n$ for $n = 1$ to n

For lower growth period $D_{t-n} = D_n (1 + g_2)^{t-n}$ for remaining $t-n$ periods

$$PV = \frac{\sum(D_0 \times (1 + g_1)^n)}{(1 + r)^n} + \frac{\sum(D_0 \times (1 + g_1)^n \times (1 + g_2)^{t-n})}{(1 + r)^t}$$

$$\text{For } t = \text{infinity, } PV = \frac{\sum(D_0 \times (1 - g_1)^n)}{(1 + r)^n} + \frac{D_n (1 + g_2)}{(r - g_n)(1 + r)^n}$$

The two-stage growth model can be applied to companies that are in the growth stage or have recently implemented some new technology leading to high growth, and are expected to stabilise at a lower constant rate of growth after a few years. More than two growth rates, or a combination of fixed dividends for some years followed by an assumed growth rate can also be built in as may be appropriate. The shift from high growth rate to lower growth may be gradual; this can also be built into the model.

We take an example to illustrate the two-stage model.

The last dividend declared was Rs. 2 per share. For the next two years, the expected growth rate is 15% p.a. and thereafter 9% p.a. The required rate of return is 10% p.a. What is the intrinsic value of the share?

$$D_1 = D_0 (1 + g_1) = 2 (1 + 0.15) = 2.30 \text{ and}$$

$$D_2 = D_0 (1 + g_1)^2 = 2(1 + 0.15)^2 = 2.645$$

$$PV = 2.30/(1 + 0.10) + 2.645/(1 + 0.10)^2 + 2.645(1 + 0.09)/((0.10 - 0.09) \times (1 + 0.10)^2) = 2.09 + 2.18 + 238.55 = 242.55$$

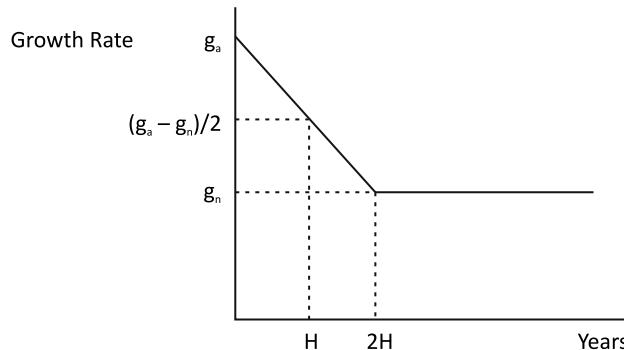
We take the cash flows for the first two years and discount them for one year and two years respectively. For the remaining period till infinity, we use the sum of the geometric progression as if we were calculating the value at the beginning of the third year. The beginning of the third year is the same as the end of the second year⁴, so we discount for two years (not three years) to arrive at the present value.

The same logic can be applied to a three stage or N stage model depending on the growth rates assumed.

4. ***The H Model:*** The assumption of a sudden decline in growth rates in the two stage growth model can be modified to incorporate a gradual decline till the steady normal long term rate is achieved. We can also view this as an approximation of the the ordinary two stage growth model if we look at the dotted lines in the figure below. The model

⁴ Midnight of end of second year, and beginning of third year are separated by an instant.

introduced by Fuller and Hsia⁵ uses simple arithmetic and can also be used to estimate the implied discount rate from the market price.



The present value is estimated in two parts as if the normal rate (g_n) is applicable for the whole period is calculated for the whole period and the approximate value of higher growth period of $2H$ years is added as the second term⁶.

$$PV = D_0 \times (1 + g_n)/(r - g_n) + (D_0 \times H \times (g_a - g_n))/(r - g_n)$$

Where,

PV = Value of the firm at present

D_0 = Dividend in year 0

r = Discount rate or cost of equity

g_a = Higher growth rate initially

g_n = Normal growth rate after $2H$ years till infinity

The model assumes a linear decline in the growth rate, constant payout ratio and constant discount rate in both phases of growth. This model would be suitable for firms where the present abnormally high growth is expected to decline as they lose their competitive advantage over time but are expected to continue to grow thereafter at a normal rate.

We take a simple numerical example to illustrate the H model

The last dividend declared was Rs 2 per share and company is growing at 15% p.a. The growth rate is expected to linearly decline to 9% in 6 years and remain at that level for ever. The required rate of return is 10%. What is the intrinsic value of the share?

$$PV = 2 * (1 + 0.09) / (0.10 - 0.09) + (2 * (6/2) * (0.15 - 0.09)) / (0.10 - 0.09) = \text{Rs } 254$$

The H model can also be built into the 2 or 3 stage model with a constant growth for some time, followed by a linear decline and then constant growth thereafter.

⁵ Fuller, R J and Hsia, C (1984), 'A simplified common stock valuation model', Financial Analysts Journal, Vol. 40, September-October, pages 49–56.

⁶ The diagram is for illustration of the concept only, the area depicted cannot be used to derive the formula for present value.

Practical Considerations in using the DDM

The present value of a share depends upon the dividend forecasts and the discount rate. Since these are subjective inputs, the present value will vary depending on the assumptions made by each individual. Various combinations of returns and discount rates are given in Table 10.1 to illustrate the degree of variation that is possible with a slight change in assumptions.

Table 10.1: Present Value of Dividend of Rs 10 Growing at a Constant Rate till Infinity

Discount rate	Growth Rate					
	0%	5%	6%	7%	8%	9%
10%	100	200	250	333	500	1000
11%	91	167	200	250	333	500
12%	83	143	167	200	250	333
13%	77	125	143	167	200	250
14%	71	111	125	143	167	200
15%	67	100	111	125	143	167

As can be seen, the present value of the stock is higher with higher growth rate of dividends and lower required rate of return or discount rates.

It is interesting to note that a growth rate of 5% discounted at 10%, will result in double the intrinsic value of the share as compared to no growth. Similarly, increase in the discount rate by just 1% from 10% to 11% in the case of 9% growth rate results in half the present value.

This highlights the importance of making realistic assumptions and also allows us to visualise the range of values that could result from a slight change in assumptions. We should also be aware that analysts may come up with very different valuations, even if their assumptions are only marginally different.

According to a survey conducted by Lintner⁷, firms plan their future dividend payments keeping in mind the long-term sustainable earnings. This implies that dividends may be smoothed over time and also that dividends are unlikely to be reduced. Past data and future prospects of the firm in question need to be studied in order to forecast the future dividends. Since dividends are related to the long-term earning prospects, we need to forecast earnings and assume a pay out ratio. The growth of dividends will need to be estimated through the retained earnings and plough back, to prevent under valuation of companies with lower payout ratios. Chan et.al⁸, studied historical data for persistence and predictability in growth. They found no persistence in long-term earnings growth beyond chance, and low predictability even with a wide variety of predictor variables.

⁷ Lintner, J. (1956). Distribution of incomes of corporations among dividends, retained earnings and taxes. American Economic Review, 46:97-113.

⁸ Louis K.C. Chan, Jason Karceski, and Josef Lakonishok, The Level and Persistence of Growth Rates, *Journal of Finance*, Volume 58: Issue 2 Pages: 643-684

Present Value of Cash Flows

We can also value a company on the expected future operating cash flows or free cash flows. Operating cash flows are estimated from the projected earnings before interest and taxes, and free cash flows are estimated from earnings after tax, dividends and investment. We will need to forecast the earnings, working capital and equipment requirements to calculate the cash flows and discount them to the present using an appropriate discount rate. Forecasting earnings is discussed in more detail in the next section.

Regarding the choice of an appropriate discount rate, we should use a rate that reflects the risk of the cash flows. The weighted average cost of capital can be used to discount the operating cash flows and required return on equity for the free cash flows and dividend discount models. The required rate of return on equity can be calculated using the CAPM⁹. We can also assume the market uses an appropriate discount rate and calculate the implied discount rate by using the market price of the share in place of PV in the model. Similarly, we can use the market price and specify all other parameters to calculate the growth rate implied by the market.

■ FORECASTING EARNINGS

Examination of the historical profits and past growth is a logical starting point for future forecasts. This can be done in a number of ways. We can take a simple average, a geometric average or use time series models such as regression analysis. The choice of the method to be used will vary depending on the circumstances. For example, a company in the pioneering stage will have very high growth rates, which may reduce after some time. In such cases, the trend in the annual growth rate may be a more reliable starting point than an average. In case there is a history of negative earnings, the cause of losses and detailed study of the future prospects will be needed. There may be need to build in the effect of business cycles, as huge profits may need to be averaged out keeping in mind lean periods in the future.

For projections based on historical data, we also need to exclude extraordinary events, such as income on account of sale of assets, loss in sales due to a cyclone etc., as has already been discussed in the chapter on company analysis. If we take the example of ACC¹⁰, the earnings before tax in 2006 was Rs 1619.5 crores, and Rs.1449.8 crores after excluding extraordinary income.

Estimating Future Earnings

In the previous chapter, we studied the efficiency of the firm using DuPont Analysis to break down the return on equity (ROE) into three components that measure the profitability of sales, efficiency in usage of assets and financial leverage. The determinants of earnings can be understood using a simple model; it can also be used to estimate the future earnings of the company.

⁹ $ER_i = R_f + (ER_m - R_f)\beta_i$

¹⁰ Details of the income statements with and without extraordinary income are available in Chapter 9.

If we look at the income statement of a company, we have sales, earning before income and taxes (EBIT), earnings before tax (EBT) and earnings after tax (EAT). The EAT of the company depends upon the assets put to productive use, the productivity of the assets, the interest paid on borrowed resources, the leverage that helps magnify earnings and taxes paid. This is represented in a simplified model:

To start with we define the variables used in the model:

$$\text{ROA} = \text{return on assets} = \text{EBIT}/\text{Assets}$$

$\text{INT} = \text{effective rate of interest} = \text{Total interest paid}/(\text{Debt} + \text{other liabilities})$ This assumption is necessary to simplify the model as we need to account for total liabilities and assets.

$$\text{LIA} = (\text{Debt} + \text{other liabilities})$$

$$\text{E} = \text{equity and reserves}$$

$$\text{T} = \text{effective tax rate}$$

Then we derive the model:

$$\begin{aligned}\text{EBT} &= \text{EBIT} - \text{Interest paid} \\ &= \text{ROA} \times \text{Assets} - \text{INT} \times \text{LIA} \\ &= \text{ROA} \times (\text{LIA} + \text{E}) - \text{INT} \times \text{LIA} \\ &= \text{ROA} \times \text{LIA} + \text{ROA} \times \text{E} - \text{INT} \times \text{LIA} \\ &= \text{ROA} \times \text{E} + \text{LIA}(\text{ROA} - \text{INT})\end{aligned}$$

Multiply the whole expression by E/E to get

$$\text{Earnings before tax} = \text{EBT} = \{\text{ROA} + (\text{ROA} - \text{INT}) \times (\text{LIA}/\text{E})\}\text{E}$$

Adjusting for taxes, we get

$$\text{Earnings after tax} = \text{EAT} = (1 - \text{T}) \times \{\text{ROA} + (\text{ROA} - \text{INT}) \times (\text{LIA}/\text{E})\}\text{E}$$

To get the earnings per share for calculating P/E ratio etc., we simply divide by the number of equity shares.

We illustrate the model in Table 10.2 with the example of ACC Ltd., using naïve assumptions for making the next years projections. Since most of the ratios were relatively constant for the first three years and they changed only in 2006, we take an average for 2005 and 2006.

Table 10.2: ACC Ltd.

Year ending	Mar-04	Mar-05	Dec-05	Dec-06	Projected	Basis
ROA = EBIT /Assets	0.09	0.12	0.10	0.25	0.18	Average 05-06
INT = effective int rate	0.04	0.03	0.02	0.02	0.02	Average 05-06
T = tax rate	0.20	0.15	0.24	0.27	0.25	Average 05-06
LIA/E	2.03	2.07	2.14	0.88	1.51	Average 05-06
E = equity(Rs. Crore)	1353.73	1597.68	2136.75	3142.92	3142.92	Dec-06

Contd...

No of shares (Crore)	17.13	17.82	18.12	18.66	18.66	Dec-06
EPS =	$((1 - T) * (R + (R - I) * L/E) * E) / \text{No of shares}$					
As on Dec 06	$((1 - .27) * (.25 + (.25 - .02) * 0.88) * 3142.92) / 18.66 =$				56.92	
Projected EPS	$((1 - .25) * (.18 + (.18 - .02) * 1.51) * 3142.92) / 18.66 =$				51.36	

Instead of a simple average of the last two years, we could have looked for additional information over the years as given in Table 10.3. This will help us study the reasons for increase in return on assets and then decided on the rate of return to be used for the next year's forecast. A closer look at the annual reports of the company reveals that the company undertook a major reorganization in 2005 and 2006; unrelated businesses were hived off, productive capacity was increased, and energy-saving measures were introduced. As a result, the company was able to increase production and sales, reduce manufacturing costs and prices of cement were also increased. This additional information reveals that we should not have averaged the last two years' figures and should base further projections on 2006 alone.

Table 10.3: ACC Ltd.

Year ending	Mar-04	Mar-05	Dec-05	Dec-06
EBIT/Sales	0.11	0.14	0.15	0.26
Manufacturing cost/sales	0.88	0.84	0.83	0.72
Sales/Assets	0.84	0.88	0.66	0.98
Lakh MT sold			126.00	183.00
Cement sale (Rs Cr)			2783	5310
Price/MT			2208.73	2901.639

The projections could also have been based on other assumptions, including the increase in assets due to profits ploughed back into the business or to be financed through new equity. If we assume the new investment has a higher return on investment it will raise average return percentages for the whole company. Return on existing investment can also be increased through cost savings or increased selling price, as was the case in ACC in 2006. Historical growth of other similar firms can be used to confirm if the forecasts are reasonable. All assumptions used in forecasts need to be justified and recorded to ensure that they are as objective as possible and to allow modification if required.

The advantage of using an earnings model instead of forecasting each item in the income statement is that we can do a quick "what if" analysis. If assets are increased by raising new equity, all other things assumed to remain the same, just put in the new figures for equity and assumed liability/equity ratio to see the effect on earnings. If interest rates go down, or if sales price can be increased, resulting in increased return on assets the effect can be estimated via the model.

One such application is to estimate the growth in earnings by using the retention ratio. The retention ratio = 1 – dividend/EAT. If 40% of earnings are distributed and 60% are

retained, the retention ratio=RR=0.6. The amount ploughed back will get added to equity and generate additional revenue next year.

If we assume that all other things remain the same (productivity of assets, debt equity ratio, taxes, etc.) the next year's EAT growth can be derived as follows:

$$\text{Plough back} = \text{RR} \times \text{EAT} = \text{Increase in equity}$$

$$\text{Increase in income} = \text{Increase in equity} \times \text{ROE} = (\text{RR} \times \text{EAT}) \times \text{ROE}$$

$$\text{Rate of growth of income} = \text{Increase in income/EAT} = \{(\text{RR} \times \text{EAT}) \times \text{ROE}\}/\text{EAT}$$

$$\text{i.e., } \text{Growth of income} = \text{RR} \times \text{ROE}$$

Since all ratios are assumed to remain the same, and EBIT is based on the return on assets, Growth of EBIT = RR×ROA

In the case of ACC, the proposed dividend plus dividend distribution tax was 30% of EAT, so retention ratio was 0.7. The expected growth in EBIT = RR×ROA = 0.7×0.25= 0.1775, and expected growth in EAT= RR×ROE = 0.7×0.34 = 0.24

Market Size and Market Share

It is also possible to estimate the earnings of a company starting with an estimate for the industry as a whole. The next step is to estimate the company's share and multiply sales by the profit margins for each product or product line. This will provide a quick estimate of profits, which can be used to confirm or cross-check the figures arrived at by other methods.

■ RELATIVE VALUATION

Forecasting earnings and dividends over a long period require an in-depth analysis of the company and its operations and also many assumptions regarding the future. For estimates in the near future, a company can also be valued with the help of ratio analysis. These ratios can be used to forecast future prices; they can also be compared with historical ratios, with market ratios and other firms in the industry to identify overvalued or under valued companies. Some of the ratios used for valuation are discussed in this section; we discuss the P/E ratio in detail and extend the same logic to other ratios.

The Price Earnings (P/E) Model

When we use the P/E model to estimate the intrinsic value of a share we take the EPS and multiply by the appropriate P/E ratio to get price. We compare this with the market price and decide whether it should be bought or sold. Similarly, if we need to estimate the price at a future date, we estimate the future earnings per share (EPS) and multiply by the appropriate P/E ratio to get the expected price.

$$V = \text{EPS} \times (\text{P/E})$$

For example, if the forecasted EPS after one year is Rs. 50 and P/E ratio to be used is 20,

$$V = 50 \times 20 = \text{Rs.}1000$$

The appropriate P/E ratio to be used can be based on a historical ratio or an estimated future ratio. The basis of calculation of the P/E ratio needs further discussion as stock prices change every day and earnings estimates are available every quarter. The question arises as to which price and which earnings figure should be used for calculating the P/E ratio? The current price, average price over a year, median, and average of high and low price can be used. Similarly for earnings, it could be the earnings in the last audited balance sheet or the trailing 12 month i.e., last four quarterly results, or projected earnings for the next 12 months. Current P/E is calculated as the latest price divided by the earnings for the trailing 12 months.

If we continue with the example of ACC, let us see the range of P/E ratios available to us using EPS of 56.92 for the year ending December 2006, and prices during March 2006 to April 2007¹¹ and future prices based on projected EPS of 51.36. These can be compared with actual prices between April 2007 and March 2008 as shown in Table 10.4.

Table 10.4: Price during March 2006 to April 2007

Prices				P/E ratios			
Maximim	Minimum	Average	(Hi+Low)/2	Maximim	Minimum	Average	(Hi+Low)/2
1176.85	695.4	925.12	936.12	20.67	12.21677	16.25	16.44
Projected price using EPS of Rs. 51.36				1061.90	627.47	834.76	844.69
Actual prices April 2007- March 2008				1289.8	704.3	947.04	997.05

EPS should ideally be calculated after payment of preference dividends. The number of shares used to calculate the EPS can also undergo a change, in which case the weighted average number of shares outstanding in the period under consideration will be used. In case, the company has already committed to issuing new shares through convertible debentures or warrants, prospective investors would be interested in the diluted EPS.

Historical ratios can be used if we expect the company and the market as a whole to remain stable in future. If there is an expectation of a boom or slump, we will need to modify the P/E to be used accordingly. A look at the P/E ratios for the market as a whole and for some sectors is given in Table 10.5. The range of P/E ratios P/E ratios over the years illustrates that there is no single correct ratio that can be proposed by an analyst. As can be seen, IT industry as a whole was overvalued in 1999, also the range of P/E ratios varies between industries. The increase in P/E ratios from 1999 to 2007 for all the indices and the sudden drop from 2007 to 2008 after the US sub-prime crisis shows the need to anticipate future P/E ratios keeping in mind the economy and industry when future prices are to be estimated.

¹¹ Assuming annual results are available in three months.

Table 10.5: Price/Earnings Ratios as at the end of December

BSE Indices	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Mean	Max	Min
SENSEX	27.09	17.64	12.95	12.38	16.92	16.39	18.41	23.37	28.28	13.16	18.7	28.3	12.4
FMCG	39.81	31.13	24.15	18.63	21.19	21.23	32.87	30.46	30.08	23.14	27.3	39.8	18.6
HEALTH CARE	48.35	30.36	20.97	15.85	23.74	31.05	35.2	30.44	25.94	19.93	28.2	48.4	15.8
IT	176.5	73	28.01	28.94	31.27	31.84	37.4	36.89	23.23	10.1	47.7	176.5	10.1

Source: Prowess Database

When we compare P/E ratios with the past for buy sell decisions, the reference point needs to be chosen very carefully. For example, the P/E ratio for the healthcare sector at the end of December 2008 was 19.93. If we compare this with the past 5 years it seems undervalued, but it was not the minimum over 9 years. On the other hand, the P/E ratio for the Sensex at 13.16 is closer to the minimum of 12.4. The IT industry seems to be at its lowest; however, we would need to go into further detail for 2008, and assess the impact of Satyam Computer's fraud on sector valuations. If we are not very sure about the P/E to be used, we can use a range of P/E ratios.

The reason for change in P/E ratio will also need to be investigated. A low P/E may mean that future prospects are not too bright; it may not necessarily be an under priced share. A high P/E ratio may mean that the market feels earnings are going to rise in the future, or that the risk is low so the discount rate is low. If earnings are growing, we would expect the company to have a higher P/E ratio, some analysts calculate the P/E/G ratio i.e., divide the P/E ratio by earnings growth rate and then make comparisons. A company that raises new equity will have an immediate increase in the number of shares, however the increased earnings will follow after the additional funds raised are invested and start generating revenue. In this period, the EPS will go down, but this is not a disturbing trend.

Other Ratios

Using the price to cash flow ratio, price to sales ratio, or price to book value ratio is similar to using P/E ratio. We need to estimate the cash flow, sales or book value and multiply by the respective ratio to arrive at a price. We can also compare ratios with historical ratios, industry ratios and market ratios. The ratio to be used will depend on the requirements from case to case.

The price/cash flow ratio may be preferred over the P/E ratio as earnings may not give a true picture of the company's health due to amounts receivable and payable. Also, earnings figures are easier to manipulate than cash flows.

The price/sales ratio may be used if it is felt that earnings and cash flows are influenced by accounting practices. It can also be used in the case of a new company that has yet to report positive earnings and cash flows.

The price/book value ratio may be preferred in cases where price can be related to the net worth of a company. In cases, where book value of assets is outdated the current value of

assets may be used to update the net worth; outdated or unutilised assets may need to be excluded.

The ratio to be used will also depend on the industry being studied. Sometimes, an emerging industry may not have positive earnings or positive book values. Start-up Internet companies were valued based on the number of persons visiting the site; for shopping malls we can look at the footfalls to judge the earning potential; for biotech stocks the number of patents may be used as a measure of value. However, such indicators can only capture part of the whole picture¹².

When making comparisons with the peer group or industry ratios to judge if a company is over or undervalued we need to ensure that the ratios are comparable. If we are using the P/E ratio to identify undervalued firms in an industry or comparing with market P/E ratios, we can make meaningful comparisons only if the EPS etc are calculated in the same way, and the accounting standards used are also the same¹³. We will need to keep in mind all the precautions related to accounts discussed in the chapter on company analysis. While comparing companies, we also need to ensure that the companies are comparable in terms of size, leverage etc. We can then rank companies according to the selected ratios and see if they are relatively over or undervalued.

It is also useful to compare industry ratios with the market as a whole. It is possible that an entire sector or industry is overvalued (as was the case with the IT industry in 1999). In such a situation, a stock that is undervalued as compared to the industry may not be undervalued when compared to a stock in another sector.

■ CHOICE OF THE MODEL TO BE USED

We need to understand the business and the reason for valuation when we undertake such an exercise. The method of valuation will depend on the type of company being studied, purpose of valuation and the amount of information available.

Purpose of valuation: Valuation will be different in case of a company that is viewed in isolation versus the same company being valued with the intention of a takeover. In the first case, the potential future earnings will be based on the existing strengths and weaknesses and management policies; in the latter, the valuation will depend on the expected synergies and changes planned in strategies and policies after takeover.

A portfolio investor may not have the time and resources to conduct an in-depth study for each investment, whereas a large stakeholder will ensure this is done. For a large investor with a majority stake in the company, it is important to see the long-term prospects of the company and therefore the discounted cash flow method would be appropriate. For an investor with a one-year holding period, the expected price after one year is more relevant and can be assessed with less effort using relative valuation.

¹² A new approach to valuing biotech stocks, Knowledge @Wharton <http://knowledge.wharton.upenn.edu/article.cfm?articleid=454>

¹³ See Chapter 9 where these aspects are discussed in detail.

For a company that is likely to be liquidated, the sale value of assets minus liabilities would be used for valuation. In such cases, the earnings and cash flows from operations may not be relevant. For example, the sick cloth mills in Mumbai were making losses, but had very valuable land that did not show in the book value. Similarly, patents, mining rights etc. will need to be valued in terms of their future potential.

Availability of information: Large, established, listed companies are easier to analyse due to the availability of historical data. It is more difficult to value a startup in a new industry, as it has no history or peer group to compare with. Detailed information and analysis that is sought by an investor planning to take control of a company will not be available to a small investor. Relative valuation and the dividend discount model may be less demanding than detailed forecasts of earnings and cash flows. On the other hand, relative valuation cannot be used for unlisted companies that do not have a market price.

Using analysts forecasts: Another source of information is the analysis and recommendations given in newspapers, journals, television etc. Analysts are in the business of writing reports for private and/or public circulation. They are likely to collect and incorporate all macroeconomic and microeconomic information that may be available. Some private information regarding a particular company may also be available to them. They are also likely to keep in mind all the precautions mentioned earlier. However, analyst reports may not be available for all stocks; only for the favoured and popular stocks.

Some analysts may have a vested interest in giving a favourable report on a stock (see Exhibit 10.2). On the other hand, one study found that the analysts on average have a pessimistic bias in Asian-Pacific markets¹⁴. There may be a tendency for analyst's forecasts to be similar, as was seen in the economy forecasts. It is advisable to see several reports, judge their credibility and study other fundamental factors before making a final valuation.

Exhibit 10.2: Stupid Theories in Bull Market for Price Justification

Excerpts from *Dalal Street Business - Indian Investor*, Wednesday, January 23, 2008 (reproduced with permission)
<http://www.dalalstreet.biz>

In 1991, as Harshad Mehta rigged up stocks like ACC, the price was justified by the replacement cost theory. Under this, it was argued that ACC's value should be at least the same as the cost, time and effort needed to create another ACC. After Mehta's game was over, this theory has been confined to the dustbins of history, at least as far as Indian stock markets are concerned.

In 99-00, Ketan Parekh and associates formed cartels and strategically painted such a rosy picture for low quality companies like HFCL, Padmini Technologies, etc and began discounting their never realized future earnings higher than Infosys and other IT stocks.

In 2006-2007, desperate analysts working for **Macquarie research justified the valuations for Rolta by comparing it with L&T**. Similarly, the bigger scam is in the widespread disease on Dalal Street of **Land Bank Valuations**. This theory is being used to justify the huge valuations of real estate companies as well as a lot of other companies, which own a huge amount of land. The logic being that the price of land and real estate has been rising at a rapid rate and so these companies are sitting on a potential goldmine. The stock market is just trying to price in the market value of their land holdings into the stock price.

Contd...

¹⁴ Black, Ervin L. and Carnes, Thomas A.,Analysts' Forecasts in Asian-Pacific Markets: The Relationship among Macroeconomic Factors, Accounting Systems, Bias and Accuracy. Journal of International Financial Management & Accounting, Vol. 17, No. 3, pp. 208-227, October 2006.

Desperate analysts started taking into account large amount of property owned by the SBI. It was felt that the SBI has a lot of assets like property and flats in the posh areas of metropolitan India, whose market value had not been factored into the stock price. This is good in theory but in practice, the SBI will never SELL its Chairman's Bungalow or its officers apartments to boost stock price. **Kindly beware of Land Bank Valuations** if you are a value investor as most of companies who want to push their stock prices to the roof, who are barely transparent in operations nor have a sound business model for their company. In 2008, **CLSA analyst is factoring in Rs 552/share for Reliance SEZ** [Land is not yet acquired and they valuing the SEZ here] and has pegged the stock price at Rs 5,207.

Cashflows vs ratio analysis: The drawback of all the discounted cash flow models is the subjective element in forecasting the future cash flows and the discount rate to be used. In case of negative cash flows or non-dividend paying companies, we may be able to use applied valuation. On the other hand, relative valuation cannot take into account future details that can be built into forecasting. If time and resources permit, more than one approach may be used and if there is divergence in the buy/sell signals, the assumptions can be reviewed.

As market and company specific various variables are subject to change over time, forecasts need to be updated; this is applicable to analyst reports, and independent studies, cash flow-based reports and relative valuation. For example, the sub-prime crisis in the US had a marketwide impact on the Indian stock market, making all previous forecasts obsolete.

■ USING FUNDAMENTAL ANALYSIS FOR INVESTMENT STRATEGIES

Investors can use fundamental analysis to study the direction of the economy, the promising/declining industries, and the strengths and weaknesses of some companies in order to decide if they should be bought/sold.

Companies can be classified according to the way in which they are expected to perform in some given circumstances. *Cyclical* companies prosper when the economy is booming while sales and profits suffer when there is a downturn. Examples of cyclical companies include automobiles, luxury vacations, etc. *Non-cyclical or defensive* companies have steady fortunes irrespective of the stage of the business cycle. These include essential items such as food, medicines etc.

Investors may choose stocks according to their requirements of current income and growth in the value of investments. Accordingly, stocks can be classified as growth stocks and income stocks. *Growth stocks* plough back their earnings instead of distributing regular dividends. Companies that have opportunities for expansion and growth can do this, and their stock prices are expected to increase in the future. On the other hand, some established companies that pay out regular and high dividends to shareholders would be classified as *income stocks*. Their prices are likely to be more steady and not increase as much as the growth stocks.

Some investors may prefer *blue chip* companies with a proven track record, that are less risky and therefore, may be priced higher than others. Others who are willing to undertake high risks for potentially high rewards may go for the opposite. Over time, some of these small, unknown companies may grow into blue chip companies.

Some investors try to buy companies that are otherwise good, but cheap because they are currently out of favour. They identify such companies by comparing current and the historical P/E ratios or price to book (P/B) values. Some look for companies that have a high growth potential; they study the business strategies and products of companies and study return on equity.

Potential return on stocks can also be compared with bonds and other money market instruments. If a downturn is expected, investment can be moved away from stocks into bonds.

Fundamental analysis is criticised by those who believe in technical analysis and the efficient market hypothesis. As we will see in later chapters, technical analysts base their buy and sell decisions on historical price and volume trends and patterns. The efficient market hypothesis on the other hand states that it is impossible to consistently outperform the market as it incorporates all new information very quickly.

■ SUMMARY

There are many different methods available for valuation and the choice will depend on the future of the company keeping in mind diverse influences including industry prospects and stage of the economic cycle. Companies can be valued using the discounted cash flow approach, which includes the dividend discount model. Various multiples such as P/E ratio or P/B ratio are also used to arrive at a valuation. The choice of the model also depends on the purpose of valuation and the availability of information. An analyst may choose to build a detailed model to forecast future revenues, expenses and profits, or use a simple model and data from past averages. Alternatively, we can use forecasts of other analysts and modify them according to our assumptions. Though valuation is considered to be a quantitative exercise, the inputs can be highly subjective. As a result, every analyst can have a unique forecast; it is also possible for an analyst to have a figure in mind and justify the inputs to arrive at the same.

■ SOLVED EXAMPLES

1. A company paid a dividend of Rs 15 in the previous year. The dividends in the future are expected to grow perpetually at the rate of 7%. Find out the share's price today if the market capitalization rate is 12%?

Ans: $\text{Price} = \frac{\text{Dividend}}{\text{r} - \text{g}} = \frac{15}{0.12 - 0.07} = \text{Rs } 321$

2. A company is currently paying a dividend of Rs 10 per share. The dividend is expected to grow at 8% annual rate for two years, then at 10% rate for the next three years, after which it is expected to grow at a 12% rate for ever. What price investors should be ready to give this share now and after four years if the capitalization rate is 14%?

Ans: Fair price is the present value of future cash flows

Present value of cash flows for the next 5 years are

$$10 * 1.08 / 1.14 = 9.47$$

$$10 * 1.08^2 / 1.14^2 = 8.98$$

$$10 * 1.08^2 * 1.1 / 1.14^3 = 8.66$$

$$10 * 1.08^2 * 1.1^2 / 1.14^4 = 8.36$$

$$10 * 1.08^2 * 1.1^3 / 1.14^5 = 8.06$$

The dividend for the 6th year is $10 * 1.08^2 * 1.1^3 * 1.12$ and will grow at 12% for ever.

The present value of this infinite series at the beginning of the 6th year

$$= 10 * 1.08^2 * 1.1^3 * 1.12 / (0.14 - 0.12)$$

And to get present value today we need to further discount for 5 years

(beginning of 6th year is same as end of 5th year) the value

$$= 10 * 1.08^2 * 1.1^3 * 1.12 / ((0.14 - 0.12) * 1.14^5) = 451.53$$

Fair price = $9.47 + 8.98 + 8.66 + 8.36 + 8.06 + 451.53 = \text{Rs } 495.06$

3. A company paid dividend of Rs 5 per share in the immediately preceding period. Dividend is expected to grow at 8% for one year, then at 15% rate for the next two years, after which it is expected to grow at a 5% rate for ever. What is the fair price of the share after 2 years if required return is 10% ?

Ans: The fair price will be the present value of cash flows after 2 years i.e. 3rd year onwards

Dividend year 3 = $5 * 1.08 * 1.15^2$ and PV beginning of 3rd year = $5 * 1.08 * 1.15^2 / 1.10 = 6.49$

Dividend in year 4 = $5 * 1.08 * 1.15^2 * 1.05$ it will grow for ever at 5% thereafter

The present value of this infinite series at the beginning of the 3rd year

$$= 5 * 1.08 * 1.15^2 * 1.05 / (0.10 - 0.05)$$

And to get present value today we need to further discount for 2 years

(beginning of 3rd year is same as end of 2nd year) the value

$$= 5 * 1.08 * 1.15^2 * 1.05 / ((0.10 - 0.05) * 1.1^2) = 123.94$$

Fair price of the share after 2 years = $6.49 + 123.94 = \text{Rs } 130.43$

4. Dividend in the immediate preceding period was Rs 5 and was growing at 25% which is expected to linearly decline over the next 10 years and stabilise at 10%. If required return is 15% what should be paid for this share today?

Ans: Apply the H model as there is a linear decline

$$PV = D_0 \times (1 + g_n) / (r - g_n) + (D_0 \times H \times (g_a - g_n)) / (r - g_n)$$

$$= 5 \times 1.1 / (0.15 - 0.10) + ((5 \times 10/2) \times (0.25 - 0.10)) / (0.15 - 0.10) = 185$$

5. Dividend of Rs 5 in the previous year is expected to grow at 10% for two years and then linearly decline over two years to 5% and remain constant thereafter. If the discount rate is 10% what should be paid for the share?

Ans: This is a combination of the 2 stage model and the H model

PV of the first two years dividends are

$$5 \times 1.1/1.1 = 5$$

$$5 \times 1.1^2/1.1^2 = 5$$

For the third year till infinity we use the H model

PV at the beginning of the third year

$$= (5 \times 1.1^2/1.1^2) / (0.10 - 0.05) + ((5 \times 1.1^2) \times 2/2) / (0.10 - 0.05)$$

To bring this to PV today we discount for 2 years ie divide by 1.1^2

$$= (5 \times 1.1^2/1.1^2) / (0.10 - 0.05) + ((5 \times 1.1^2) \times 2/2) / ((0.10 - 0.05) \times 1.1^2) = 110$$

$$\text{Fair price} = 5 + 5 + 110 = 120$$

■ QUESTIONS

1. Some firms reported negative earnings in the previous year. The reasons found on investigation were as follows:
 - (a) Strike by employees
 - (b) Down turn in the economy
 - (c) Cheaper imports from China
 - (d) Increase in crude prices worldwide
 - (e) New investment in plant and machinery with borrowed funds.

How would you deal with each of these causes in making forecasts for future periods?
2. Assume you are trying to value a company using relative valuation techniques but the company has no earnings. Which techniques could you use?
3. Describe three possibilities for dividend growth, and the type of companies where such growth may be observed.
4. Indicate the likely direction of change in a stock's P/E ratio if (i) dividend payout decreases, (ii) required rate of return increases.
5. How would a 5 for 4 stock split affect the market price and book value of a share?

■ MULTIPLE CHOICE QUESTIONS

1. A stock is priced at Rs 100, pays dividend of Rs 2 every year and it is expected to continue to do so for as long as can be foreseen. If required return on the stock is 10% per annum its fair value today is

(a) Rs 200	(b) Rs 90.9
(c) Rs 20	(d) Rs 102

2. A stock with face value of Rs 10 paid a dividend of 20% in the previous year. The company and its dividends are expected to grow at the rate of 10 % for a very long time. If an investor requires a return of 15 % at what price should he purchase the share?
 - (a) Less than or equal to Rs 20
 - (b) Less than or equal to Rs 22
 - (c) Less than or equal to Rs 44
 - (d) Less than or equal to Rs 220
3. A company has return on equity of 20 % on equity plus reserves of Rs 100 crore. All other things remaining the same if a company increases the retention ratio from 30% to 50% the increase in EPS is likely to be

(a) 10%	(b) 20%
(c) 30%	(d) 50%
4. A company paid dividend of Rs 2 on its stock in December 2006 . The EPS for the year ending March 2007 was Rs 5 and the forecast was Rs 10 in March 2008. Market price of the share was Rs 100 in December 2006, Rs 110 end of March 2007 and 125 at the end of April 2007. What was the P/E ratio at the end of April 2007?

(a) 50	(b) 20
(c) 61	(d) 12.5
5. Which of the following statements are true
 - (a) defensive companies grow faster than non-cyclical companies during a downturn in the economy
 - (b) blue chip companies are the same as non cyclical companies
 - (c) cyclical companies are expected prosper when the economy is booming
 - (d) non cyclical companies are expected to suffer when the economy is booming
6. Are the following true or false
 - (a) DDM can be used for companies that do not pay regular dividends.
 - (b) DDM will lead to undervaluation in a bear market and vice versa in a bull market.
 - (c) DDM is likely to undervalue stock

■ PROBLEMS

1. A bond with Rs. 1000 par value has 3 years to maturity, annual coupon of 10% and yield to maturity of 8%. If you hold the bond for one year, receive one coupon and sell the bond at a price suitable for yield to maturity of 7%, what is your holding period yield?
2. XYZ Ltd. paid a dividend of Rs 3 in March 2005. Dividend for the next year is expected to be 3.50 and it is expected to grow at 10% per annum thereafter. If required rate

of return is 15%, what is the expected fair price of the stock be just after dividend in March 2006?

3. ABC Ltd. had return on equity of 20%, EPS of Rs. 100 per share and paid dividend of Rs 40 per share. Assume all other things remain the same what is the expected growth rate in EPS?
4. The following information is available for XYZ Ltd.

Excerpts from the Income Statement and Balance Sheet

(Rs. Lakhs)

Sales	2500
Manufacturing and other expenses	1200
Depreciation	300
Interest	100
Dividend and dividend distribution tax	350
Equity and reserves	2000
Debt	800
Other creditors	200
Number of equity shares	100

Tax rate 50%

- (a) Calculate the following: earning per share, dividend pay out ratio and expected growth rate in earnings.
- (b) What would the projected earnings after tax be if the liability/equity ratio increased from 1:2 to 1:1, all other things remaining same?
5. On 15 Jan 1990, XYZ Ltd.'s share was trading at Rs. 20. For the year ended 31 March, 1989, EPS was 1.5. Reported earnings for the 12 months ended 31 Dec. 1989 were Rs 2 per share. Experts forecast EPS for the year ending 31 March 1990 at 2.5. What is the P/E ratio on 15 Jan 1990?
6. The following data is available for XYZ Ltd. Forecasted dividends per share for the next three years are Rs 1.60, Rs 1.90 and Rs 2.10, and are expected to grow at a constant rate of 5% thereafter. The risk-free rate is 4% and the market risk premium ($r_m - r_f$) is 5%. The beta of the firm is 1.2.
 - (a) What is the required return on the share?
 - (b) Use the answer in a) above as discount rate and calculate the fair price that should be paid for the share.
7. What should be paid for share that paid a dividend of Rs 2 last year, is expected to grow at 10% for 2 years and 5% thereafter, if you plan to hold the share for 1 year, and if you plan to hold the share for 3 years, if the required return is 10%?

8. A firm paid Rs. 2 dividend per share last year. Dividend is expected to grow at the rate of 10% for 2 years and then fall to 6%, which will be maintained indefinitely. If the required rate of return is 14%, what is the value of the stock?
9. A share is available for Rs. 110 today. The last dividend declared was Rs. 2 per share. For the next two years, the expected dividend is Rs. 3 and Rs 4 and projected price at the end of two years is Rs. 120. The required rate of return is 10% p.a., is it worth buying the share.

■ PRACTICAL EXERCISES

1. Download the Profit and Loss and Balance Sheet data for a company for 10 years from a data base such as prowess or capitaline. Calculate the growth rate in EPS (or any other variable/variables of your choice) for the first 5 years using
 - (a) arithmetic averages
 - (b) geometric average
 - (c) regressionForecast EPS for the next five years. Compare the forecasts with the actual.
2. Collect share price and EBT for 5 companies in a particular industry for 5 years and calculate the daily P/E ratios. For each year tabulate the range, the mean, median and average of the high/low of P/E ratios. What do you observe?
3. Repeat the above exercise with quarterly results. Calculate the trailing one year EPS to compute the daily P/E ratios. Do you find any difference in the results?
4. Download share price, earnings/share, book value/share, sales/share, pay out ratios or any other variables of your choice over a 10-year period. Study the relationship between share prices and these variables using graphs and regression.

PART IV

Price Analysis and Strategy

- Chapter 11 Technical Analysis
- Chapter 12 Market Efficiency

CHAPTER - 11

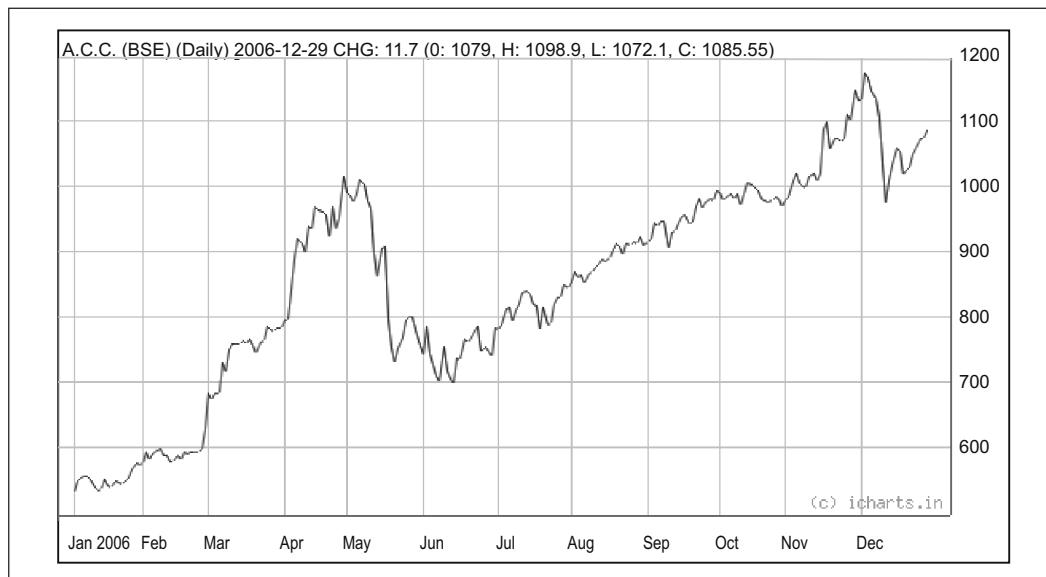
Technical Analysis

LEARNING OBJECTIVES

At the end of this chapter, you will be able to:

- Describe the various tools of technical analysis
- Plot technical charts using software available
- Identify trends and patterns and indicators in charts
- Understand stock market news reports
- Interpret technical signals and decide whether to use them or not

As was seen in an earlier chapter, fundamental analysis attempts to measure the objective value of an equity share or other instruments by studying the economic, industry and company information. The analyst uses this information to forecast the earnings and growth of the company to arrive at a “fair” present value and form a judgement whether it is over-valued or under-valued. However, stock prices do not simply reflect fundamental strengths and weaknesses. A look at Figure 11.1 shows the fluctuations in the adjusted¹ price of ACC during 2006. Since fundamental analysis of ACC did not forecast such wide fluctuations, it is worth taking a look at the alternate method of stock selection, namely technical analysis.



Source: iCharts.in

Figure 11.1: ACC Limited. (December 29, 2006)

Technical analysis is the study of past price and volume data to forecast future price movements. It assumes that the market discounts everything, i.e., all relevant information including fundamental factors have already been built into the price at any given point of time, and focuses only on the market forces of demand and supply. It also assumes that prices move in trends and that history repeats itself. Technical analysts believe that traders act with a herd mentality as prices rise and fall. Although their individual actions may be based on facts or rumours, or on emotions such as greed or panic, their collective reaction to market situations is consistent. This results in price trends and patterns that are repeated over time, which can be used to forecast future prices.

Fundamental analysis and technical analysis can be used to complement each other. The significance of technical trends and patterns can be assessed better if an investor has knowledge of underlying factors, such as interest rates and inflation, wars and political stability, government policies and other influences on industry and company variables.

¹ Adjusted for bonus/stock splits etc.

Fundamental analysis can also be used to decide *what* to buy or sell from a long-term perspective, while technical analysis can signal the timing, when to buy or sell depending on the time horizon and objectives of investors and speculators.

Japanese rice traders were probably the first to use technical analysis as early as the 18th century, while stock market charting started in the late 19th century, when Charles H. Dow wrote a series of articles for the *Wall Street Journal*. Since then, a large variety of technical tools and techniques have been developed with an increasing dependence on computer-aided analysis. In this chapter, we introduce the reader to many of the concepts related to technical analysis. It is, however, important to realise that it is not possible enumerate all the techniques, nor discuss all the intricacies and finer details in a single chapter².

Just as fundamental analysis is studied at the economy, industry and company level, technical analysis is applied at the market level, represented by stock indices, and at the company level using its share prices. Stock charting and analysis can also be done over different time spans ranging from a few hours to a number of years, depending on the investment horizon. Analysts normally use a combination of trends, patterns and indicators, based on their past experience, to forecast the future. The accuracy of the forecast depends on the experience and skill of the technical analyst. Forecasts are made with greater confidence when many technical signals signal the same price expectation.

■ MARKET ANALYSIS

The overall direction of the market is an appropriate starting point for technical analysis because stocks generally tend to move together in response to the pervasive market forces. Market movements can be studied with the help of price, volume and other indicators. Current data for indicators discussed in this chapter can be found in leading economic dailies and financial sites on the internet.

■ PRICE-BASED INDICATORS

Price Trends

According to the Dow theory, market trends can be classified as primary, secondary and minor trends. Primary trends are long-term trends, secondary trends are short-term upward and downward movements that help maintain the long-term trend, and minor trends are day-to-day fluctuations. Figure 11.2 shows the primary and secondary trends in the BSE SENSEX.

As can be seen, prices do not move up or down in straight lines. The upward primary trend (bull trend) has a series of successive upward secondary movements (rallies). For the trend to continue upward, each successive rally should be higher than the previous rally and even the successive declines (reactions) between rallies should end above the previous declines. Similarly, in a downward primary trend (bear trend), each successive rally should be lower

² Gregory L Morris, author of 'Candlestick Charting Explained' has created a CD with 480 indicators and trading systems.

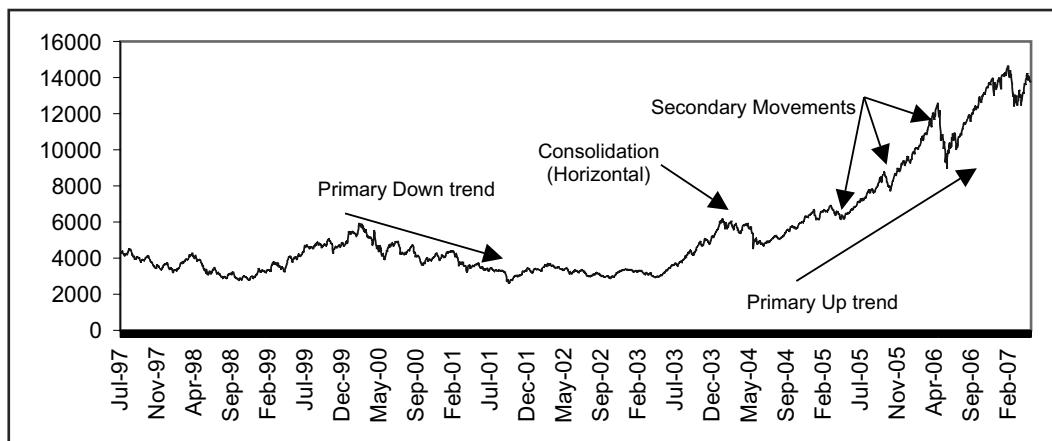


Figure 11.2: BSE Sensex

than the previous rally and each decline should be lower than previous lows. Also, rallies in bull markets are longer and reactions are shorter while reactions in bear markets are longer and rallies are shorter.

Bull markets normally start with improvement in business conditions and improved earnings. Initially, prices increase due to increased business confidence; however, prices advance further based on speculation. Similarly, bear markets start in response to disappointment when actual results are not consistent with the inflated prices during the boom and prices get depressed further due to distress sales.

Knowledge of the underlying primary trends helps in understanding and forecasting the nature of future rallies and reactions. Even more important is the ability to recognise when a trend is going to end and prices are going to move in the opposite direction, so that stocks can be purchased near the bottom and sold near the top.

Advances and declines: A popular index consisting of 30 or 50 shares may not give a true picture of the movement of the market as a whole. For this reason, it is desirable to see whether majority of the share prices are rising (advancing) or falling (declining). The advances and declines are compared to measure the dispersion (breadth) of the market. The index cannot continue to rise if majority of stocks continue to decline and vice versa. Increasing divergence between the index movement and the cumulative difference between advances and declines could signal a market trend reversal. Advance/decline ratio for the entire market and advances and declines of the most active stocks i.e., Sensex and S&P CNX Nifty are studied, as they account for a significant percentage of market capitalisation³.

New highs and lows: A rising market should be accompanied by an increasing number of shares attaining new highs and fewer new lows. Similarly, the number of new lows should

³ In March 2006, the 30 share Sensex and 50 share S&P CNX Nifty accounted for 47% and 56.5% of the BSE and NSE market capitalisation respectively.

increase in a falling market. Again, increasing divergence between the index movement and the moving average of number of highs minus lows could signal a reversal.

Circuit filters: The number of stocks hitting the upper and lower circuit filters on the BSE and NSE also indicate the direction of the market. Circuit filters ranging between 2 to 20 per cent are set by BSE and NSE for each stock. If price changes reach the limits set, trading in that share is suspended. However, circuit filters are not applied on individual stocks with F&O trading or on stocks included in indexes on which F&O trading is allowed.

Table 11.1: Market Movements on 9.11.2006

Advances & Declines						
	BSE				NSE	
	A	B1	B2	Others	Total BSE	Total
Advances	113	380	495	481	1469	544
Declines	82	253	310	371	1016	383
Unchanged	3	15	36	33	87	35
Total	198	648	841	885	2572	962
New Highs and Lows Recorded						
	A	B1	B2	Others	Total BSE	NSE
Higns (52-Week)	9	10	21	48	79	29
Lows (52-Week)	12	8	1	4	13	6
All Time high (Since 1993)	7	7	10	27	51	19
All Time Low (Since 1993)	5				5	3
Stocks in Circuit Filters						
					BSE	NSE
Upper circuit					74	24
Lower Circuit					21	1

Adapted from: Economic Times 10th November 2006.

As can be seen from Table 11.1, on 9th Nov 2006, the advances were higher than declines, more stocks reached new highs as compared to new lows and also the number of stocks in the upper circuit filter were higher than the number in the lower circuit filter i.e., all three indicators were bullish. Divergence between trends in these indicators and the price trend could signal a reversal.

■ VOLUME-BASED INDICATORS

With price charts: According to the Dow Theory, in a rising market, volumes also increase with price rises and fall when price decreases. In a falling market, volumes should increase with price declines and decrease when prices rise. Price charts normally show volumes in the lower portion to facilitate this type of analysis (see Figure 11.2). Indicators such as on balance volume (OBV), which is described in a later section are also used.

Table 11.2: Market Turnover

Date	Turnover in Rs. Crore, Shares and Trades in Lakhs									
	BSE			NSE			BSE+NSE			
	Turnover	Shares	Trades	Turnover	Shares	Trades	Turnover	Shares	Trades	
03/11/2006	4034	2186	14.58	7347	3224	31.52	11381	5410	46.1	
06/11/2006	4265	2567	15.32	7753	3667	33.57	12018	6234	48.89	
07/11/2006	4738	2682	16.57	9067	4010	35.85	13805	6692	52.42	
08/11/2006	4340	2212	15.61	8573	3471	34.7	12913	5683	50.31	
09/11/2006	4236	2538	14.86	7837	3648	33.55	12073	6186	48.41	

Source: Economic Times 10/11/2006

As can be seen from Table 11.2, volumes increased from 3rd to 7th November but declined thereafter. When seen in combination with the market indicators in Table 11.1, lower volumes do not confirm the bullish signals suggesting that the market may be consolidating.

Small investor volumes: Small investors are not normally well-informed about the right time to invest. It takes them time to absorb the good/bad news and normally by the time enter/exit the larger investors are ready to do the opposite. In the US market, information on volumes in the odd lot market are an indicator of the activity of small investors. When odd lot volumes go up in a rising market it would indicate a future decline, and vice versa when volumes go up in a declining market. Since a majority of shares in India are traded in the dematerialised form, where lot size is one, buying and selling of odd lots is no longer important.

■ OTHER INDICATORS

Futures: The value of index futures reflects the market sentiment and can be used to forecast market movements. If futures are priced higher than the underlying index it is a bullish indicator and vice versa. On November 9th 2006, November and December futures closed at Rs.3801.25 and 3805.25 respectively, while the index closed at Rs. 3796.4.

Institutional activity: Institutional investors and mutual funds are expected to know the market better than informed small investors. Therefore, if mutual funds have increasing cash balances, we can infer that it is not the right time to invest and may expect the market to decline. On the other hand, if mutual funds are buying stocks we can expect the market to move up. Similarly, if subscriptions to mutual funds are on the increase it is an indicator of the small investor sentiment, indicating a forthcoming decline. In the Indian context, the net purchases/sales of foreign institutional investors (FIIs) would indicate expectations of a rising/falling market. As can be seen from Table 11.3, FIIs and mutual funds together are net purchasers of equity from 2nd to 7th November 2006, which is a bullish signal.

Table 11.3: Institutional Activity (Equity) as on 9/11/2006

Date	(Rs. Crore)						
	Foreign Institutional Investors			Mutual Funds			FII +MF
	Purchases	Sales	Net	Purchases	Sales	Net	Net
02/11/2006	1444.4	1305.2	139.2	521.83	375.77	146.06	285.26
03/11/2006	1683.1	1455.7	227.4	525.32	447.67	77.65	305.05
06/11/2006	1907.4	1484.6	422.8	575.52	411.22	164.3	587.1
07/11/2006	2099.7	1764.2	335.5	521.41	536.39	-14.98	320.52
Total 2006	389639	357569	32070	112803	98999	13804	45874
Per day (approx)	1754	1610	144	508	446	62	207

Adapted from: Economic Times 10th November 2006.

Bond market sentiments: If yield spreads between high grade bonds and other bonds decrease, it indicates high confidence and can be taken as a bullish signal and vice versa. In India, we can look at the spreads between government and corporate bonds.

■ TRENDS, PATTERNS AND INDICATORS

Price Charting

Trends, patterns and indicators can be studied with respect to the market, industry, and individual securities. Price trends and patterns are identified with the help of charts. They can be constructed in a number of ways depending on the preference of the analyst. Four of the most commonly used charts are described below. Figures 11.3, 11.4, and 11.5 show a line, bar and candle stick chart for ACC and point and figure chart for the BSE SENSEX. These charts can be plotted using free software available at some internet sites⁴. However, it is important to ensure that prices are adjusted for bonus issues and stock splits⁵.

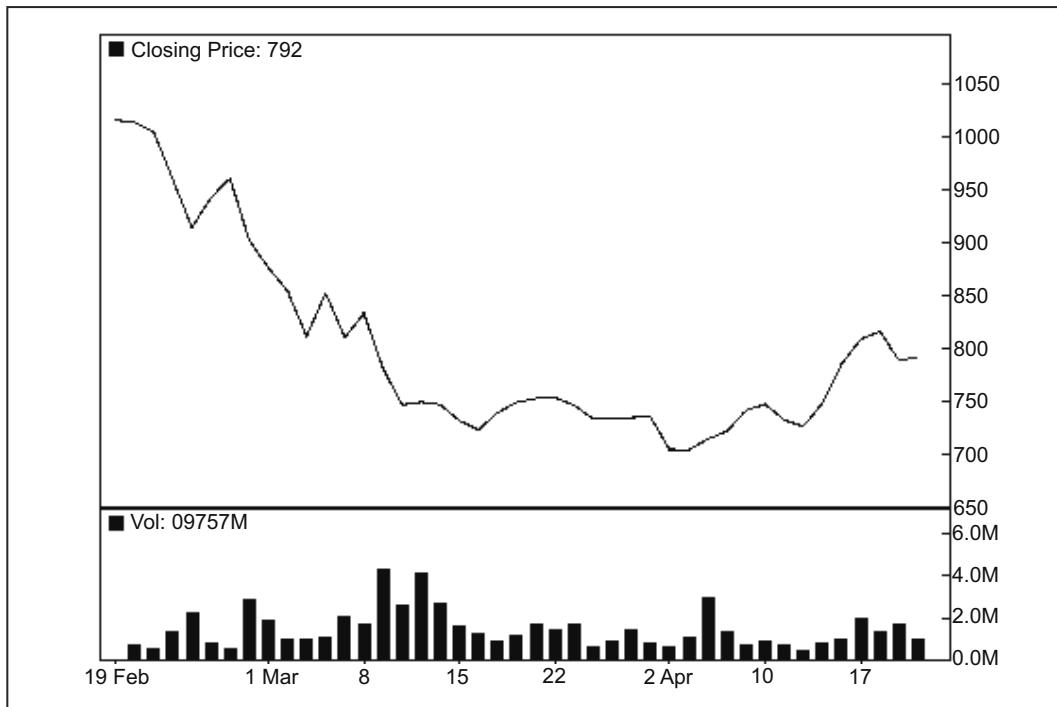
Line charts use a line to join data points such as daily/weekly/monthly closing prices, moving averages of price, momentum etc.

Bar charts use vertical bars to represent various prices for each day/week/month. The bar shows the highest and lowest price and can have a single horizontal line cutting the bar to represent closing price, or two horizontal lines, one to the left to show opening and one to the right to show closing price.

Candlestick charts show the same details as bar charts, but have a different visual impact (compare Figure 11.4 and 11.5). The opening and closing prices are used to create a box (body) within the bar (shadow) which depicts the high and low price. If closing is higher than opening (*up day*) the box is left empty, if closing is lower than opening (*down day*) it is depicted by a black box.

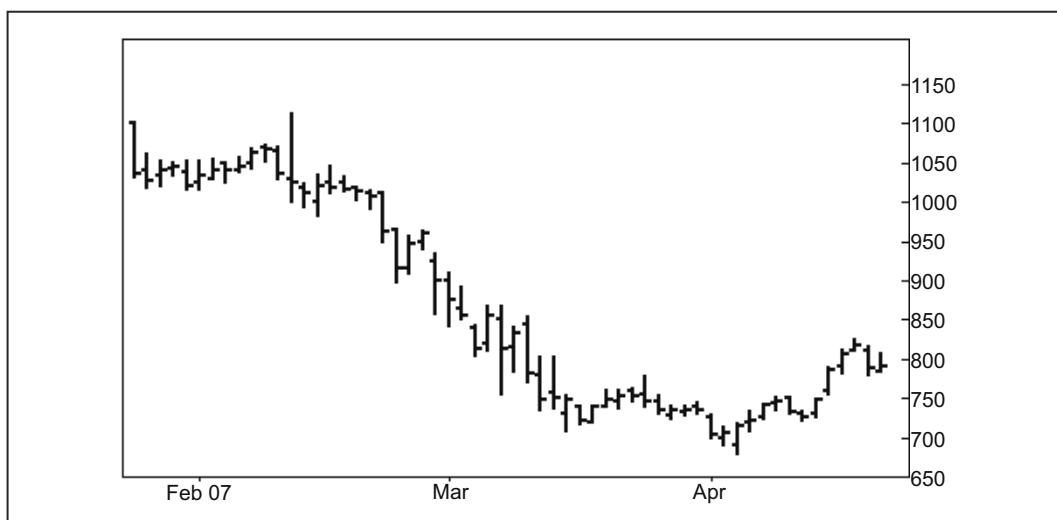
⁴ The readymade charts depicted in this chapter are from iCharts.in and StockCharts.com; patterns and trends have been marked on them after downloading.

⁵ If a price chart has a steep vertical drop, please check for bonus/stock split information. For many stocks, this information is available at indiainfoonline.com. Charts at iCharts.in are already adjusted for capital changes.



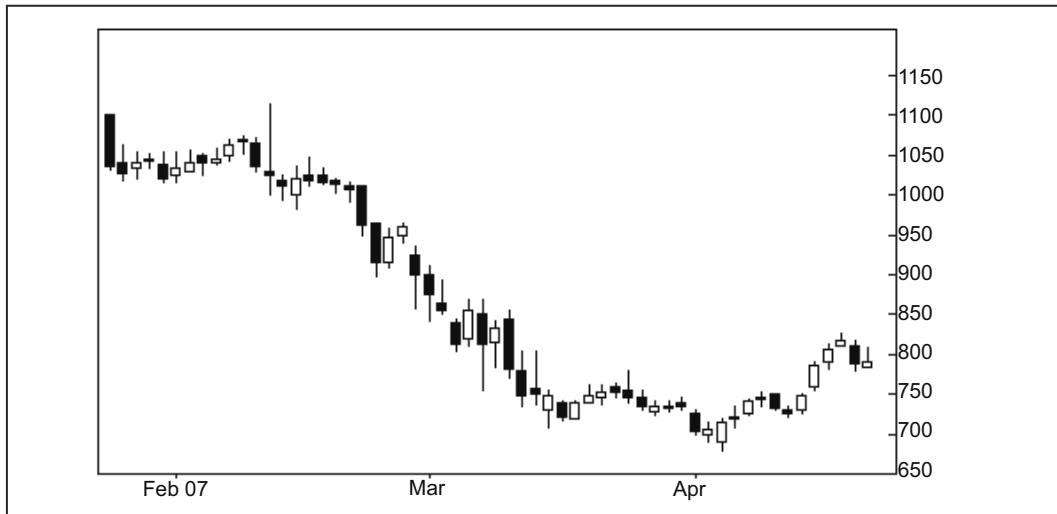
Source: iCharts.in

Figure 11.3: ACC Limited. Daily Price and Volume (April 20, 2007).



Source: iCharts.in

Figure 11.4: ACC Limited. Daily Bar Chart (April 20, 2007).



Source: iCharts.in

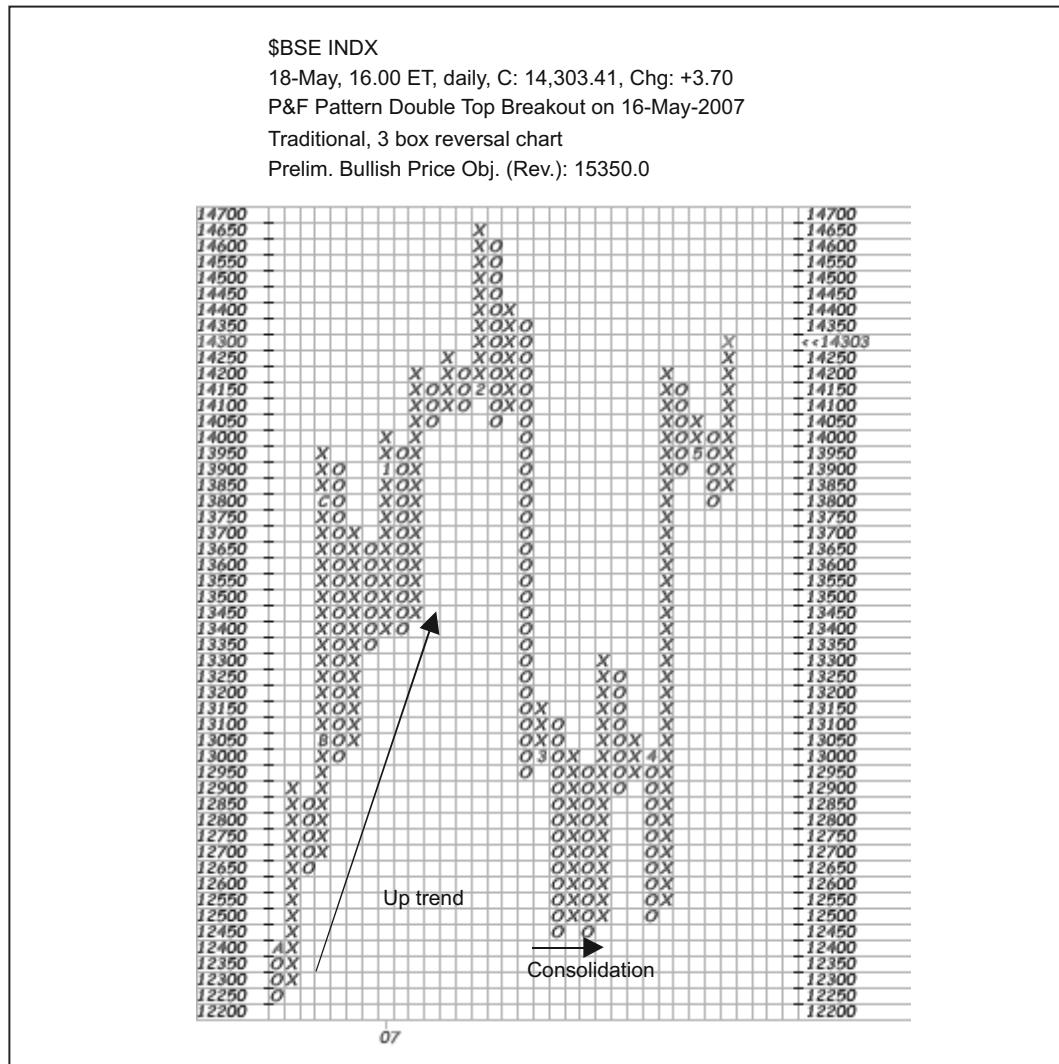
Figure 11.5: ACC Limited. Candlestick Charts (April 20, 2007).

Point and figure charts have no time scale, only registering changes when significant price⁶ increase or decrease occurs. A column of Xs is used to show rising prices, while a column of Os shows falling prices. Additional Xs or Os are added only when the price changes by more than a predefined amount known as the *box size* (defined by the chartist depending on the price and volatility). For example, if the *box size* is equal to Rs. 50, one X would be added to the stack of Xs if the price increases between Rs 50 and 100, and two Xs would be added if price increases between 100 and 150. New columns are added only when price changes direction by more than a predefined *reversal amount*; if the reversal amount is 3, the price reversal required is at least Rs 150 from the previous figure plotted,

(reversal amount multiplied by box size= reversal distance). While prices are rising, the chart will show a growing stack of Xs, and when prices are declining there will be a descending column of Os. When the price changes direction by more than the reversal distance a new column moving in the opposite direction is added. Since there is no time dimension each column can represent any number of days, depending on the time taken before reversal. Some charts insert a number or alphabet in place of one of the Xs or Os to indicate the month so there is some idea of time (see Figure 11.6 1-9 represents Jan to Sept and a-c represents Oct-Dec). The chart can be made more or less sensitive to price changes to discern between long and short-term trends by varying box and reversal sizes. The advantage of these charts is that they ignore minor movements and help identify trends, support and resistance.

Plotting a point and figure chart is best understood by plotting a chart by hand with a small numerical example. We use closing prices of the NIFTY index shown in Table 11.4 using box size of Rs. 10, and reversal amount 3.

⁶ Closing price are used for long-term charts, while daily high and low price may be used for short-term charts.



Source: StockCharts.com

Figure 11.6: BSE Index, Point and Figure Chart (May 18, 2007).

Table 11.4: Plotting a Point and Figure Chart

Date	Closing Price	Round down	Movement +/-	No. of boxes	Action
13-Apr-07	3917.35	3910			
16-Apr-07	4013.35	4010	100	10	10 Xs upward
17-Apr-07	3984.95	3980	-30	-3	New column Os, 3 down
18-Apr-07	4011.60	4010	+30	3	New column Xs, 3 up
19-Apr-07	3997.65	3990	-20	-2	Less than reversal amount 3 nothing
20-Apr-07	4083.55	4080	+70	7	Add 7 Xs upward

Contd...

23-Apr-07	4085.10	4080	0	0	Less than box size, nothing
24-Apr-07	4141.80	4140	+60	6	Add 6 Xs upward
25-Apr-07	4167.30	4160	+20	2	Add 2 Xs upward
26-Apr-07	4177.85	4170	+10	1	Add 1 X upward
27-Apr-07	4083.5	4080	-90	-9	New column of Os, 9 down
30-Apr-07	4087.9	4080	0	0	Less than box size, nothing

The columns would be plotted as in Figure 11.7.

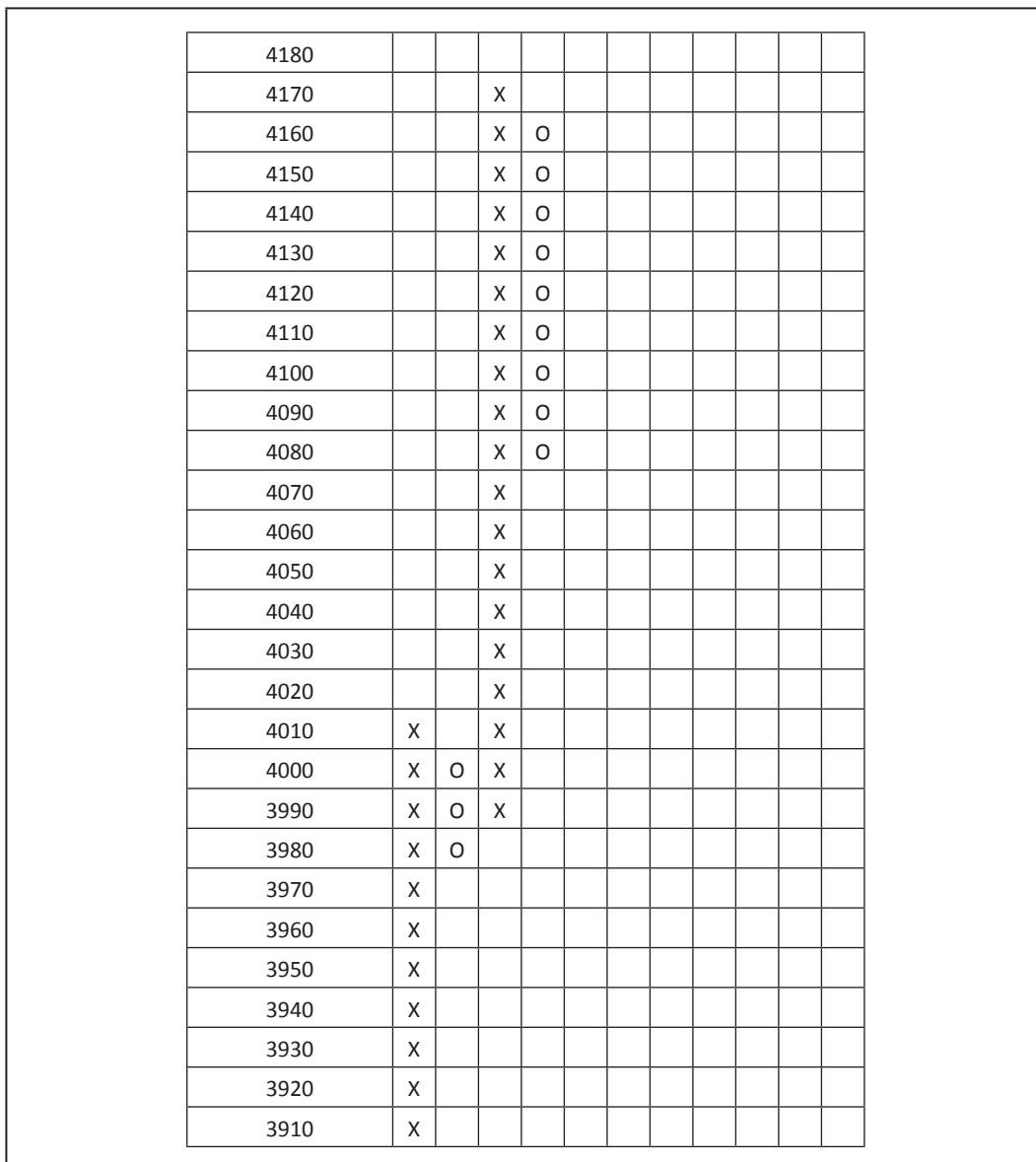


Figure 11.7: NIFTY. Point and Figure Chart.

Interpreting the Charts

Trends and patterns can be observed in line charts, bar charts, candlestick charts and point and figure charts.

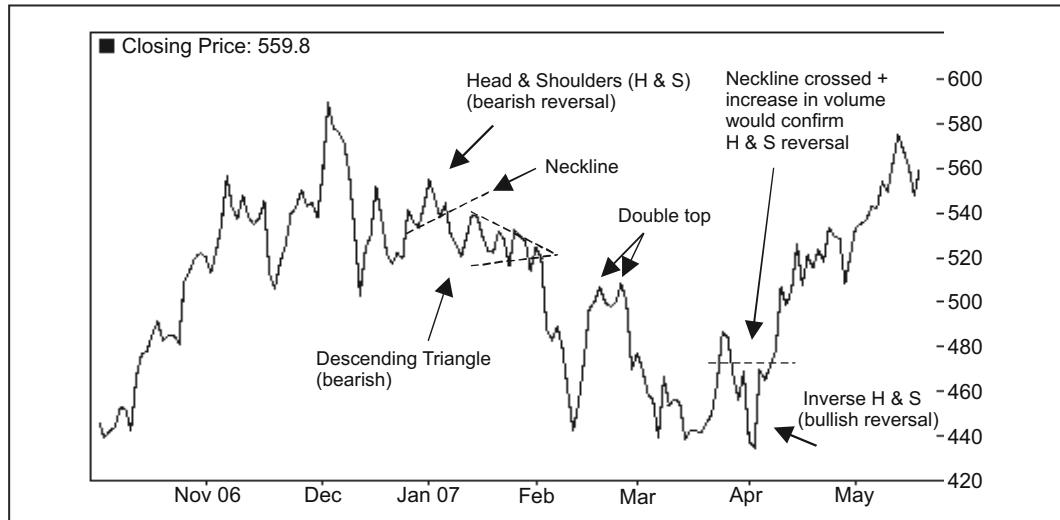
Trends: Primary, secondary and minor trends have already been discussed in the section on market analysis. Sometimes the secondary price movements seem to move in a *channel*, constrained by an upper or lower limit, known as the *resistance* and *support* levels. Resistance is the level where many sellers step in and do not allow price to rise further. Support is the level where many buyers prevent price from falling further. When prices move horizontally between support and resistance lines, the area is known as a *congestion or consolidation*. When a support or resistance level is penetrated it is known as a *breakout*. If this attracts many buyers or sellers, it may create new resistance and support levels; otherwise, if price falls back to the old levels it is termed as a false breakout. High volumes are used to confirm breakouts. Support and resistance can also be observed in upward and downward trend lines. The greater the length of time and the greater the volume traded, the stronger the resistance and support level.

*Patterns*⁷ have been identified over the years and classified as reversal patterns and bullish or bearish patterns. They suggest that the current up-trend/down-trend may reverse direction, or the market may drift sideways before moving in either direction. Some common reversal patterns include head and shoulders⁸ and double or triple tops and bottoms. Ascending triangles (flat on top rising from below) and rounded bottoms are considered to be bullish, while descending triangles and rounded tops are said to be bearish. A cup and handle is considered to be bullish if prices breakout above the handle. A gap in a bar chart (when the low of a day is higher than high of the previous day) is indicative of a large increase in prices and is considered to be a bullish signal. Patterns such as symmetrical triangles, rectangles, flags and pennants (like flags with small horizontal triangles) are consolidation patterns, which could be bullish or bearish depending on the direction of the breakout which should be accompanied by increased volumes. They may also represent continuation patterns, where prices follow the earlier trend when the pattern is completed. Some of these patterns have been marked in Figures 11.8, 11.9 and 11.10.

It is important to remember that all patterns must be viewed in the context of previous trends and formations and that patterns may fail i.e., prices may not always proceed as expected after formation of the pattern. Identification of patterns and their interpretation is also an art, and depends on the perception of the analyst, therefore all analysts may not interpret a particular situation in the same way.

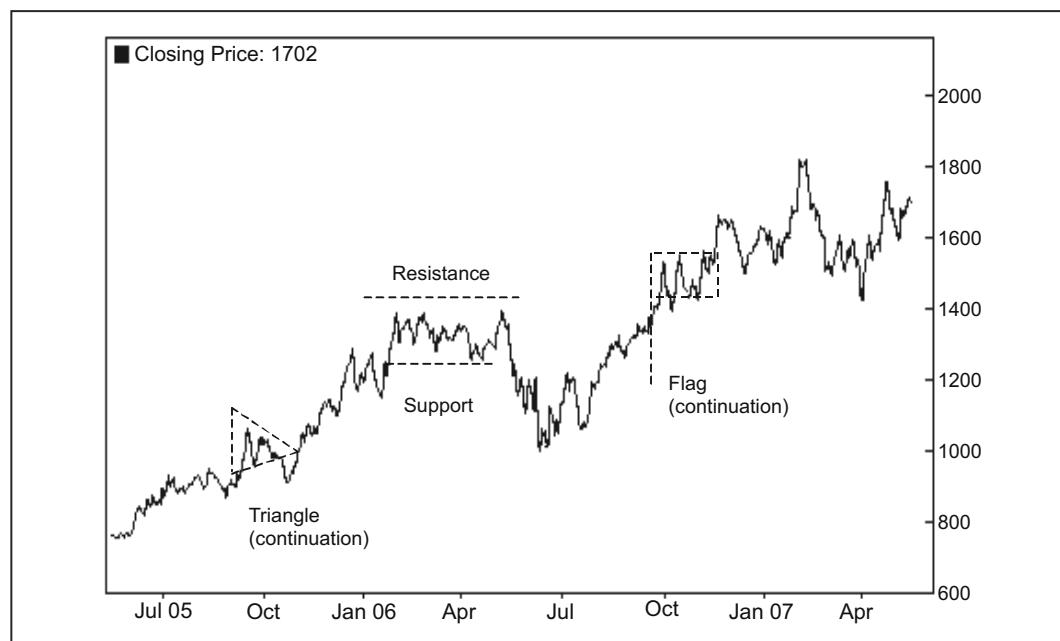
⁷ If a large number of market participants buy /sell stocks according to observed patterns, they will ensure the forecasts come true.

⁸ Details of the head and shoulders pattern is given in the appendix. Those interested in other patterns may refer to books on technical analysis.



Source: iCharts.in

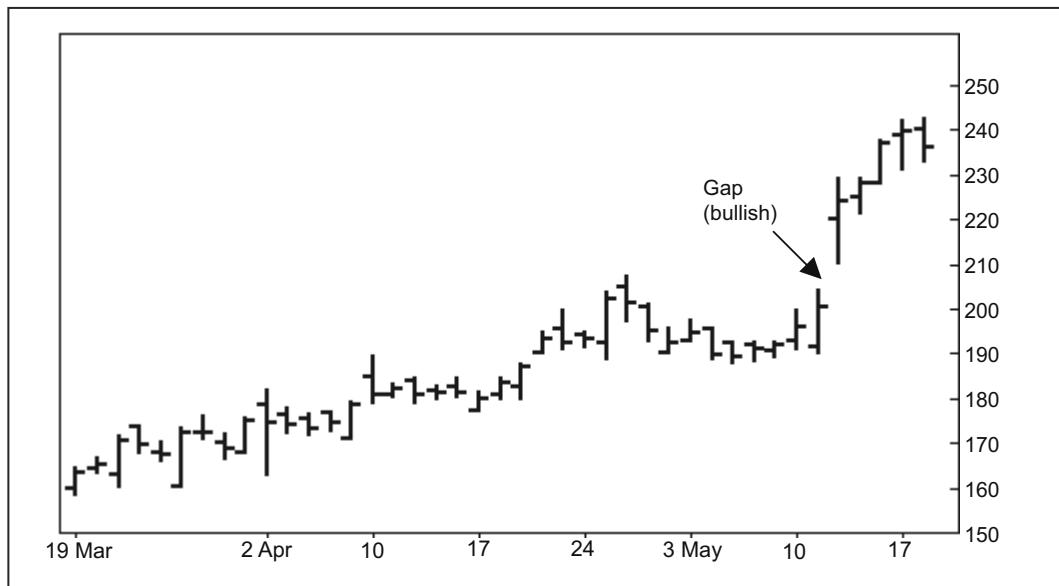
Figure 11.8: Sterlite Industries (India) Limited. (May 18, 2007)



Source: iCharts.in

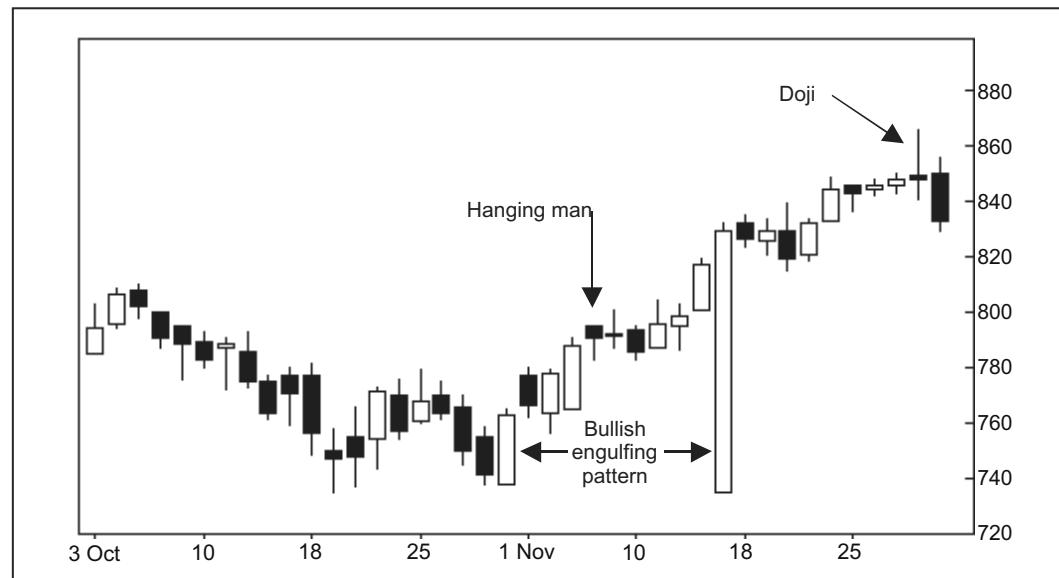
Figure 11.9: Housing Development Finance Corporation Ltd. (May 18, 2007)

Candlestick charts have their own special methods of interpretation. Some of these are marked in Figures 11.11, 11.12 and 11.13. Candlesticks can be used to interpret market sentiments when studied in isolation or in combination. Large empty candle sticks, with or without



Source: iCharts.in

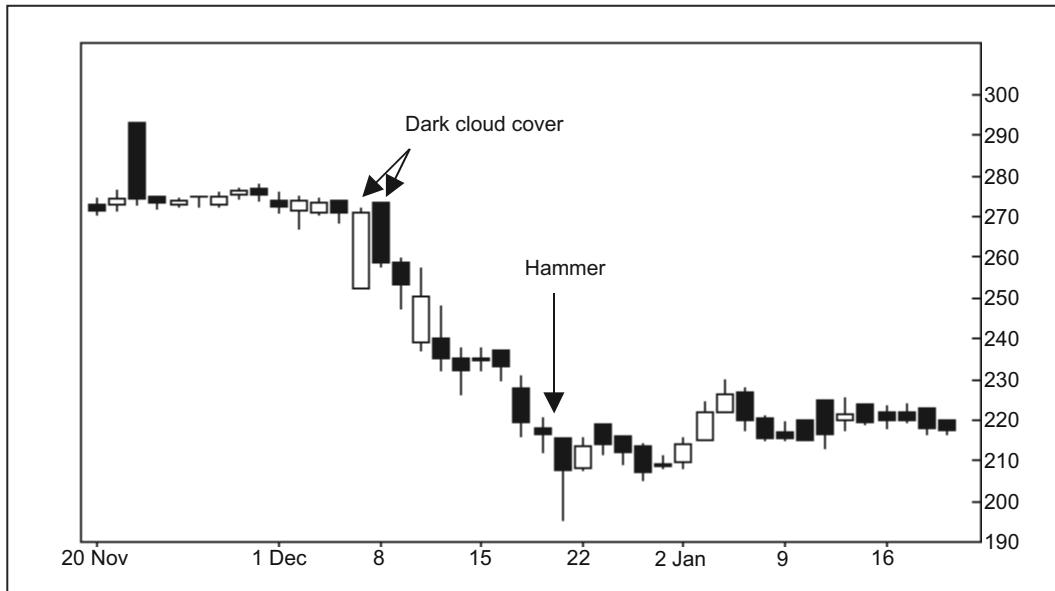
Figure 11.10: Matrix Laboratories Limited. (May 18, 2007)



Source: iCharts.in

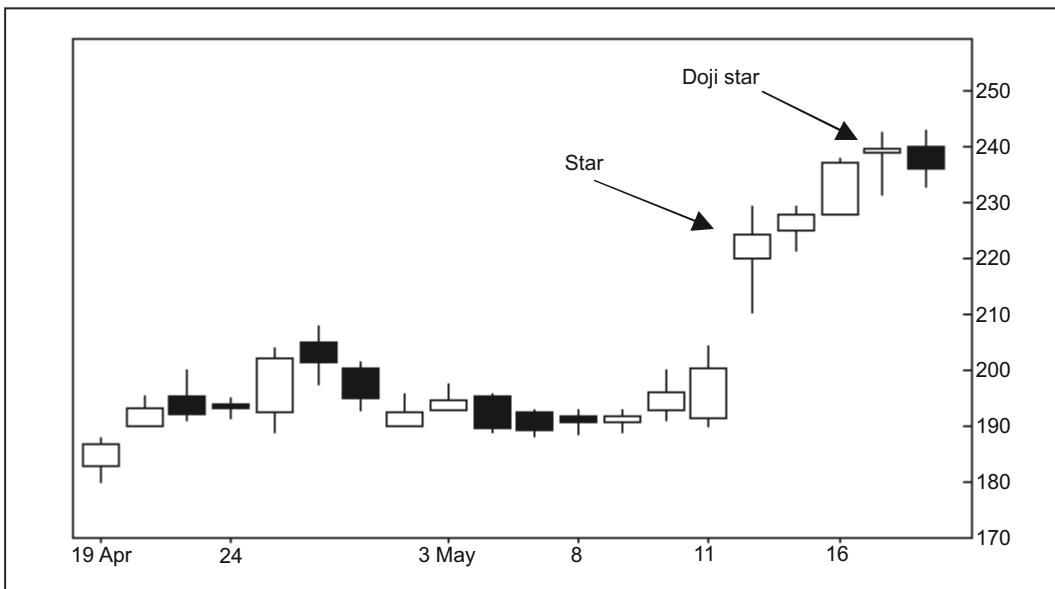
Figure 11.11: Reliance Industries Ltd. (November 30, 2005)

shadows indicate buying pressure as closing price was much higher than opening price. Black candles indicate selling pressure and very small bodies known as *doji* represent consolidation. A candlestick with a long lower shadow, hardly any upper shadow and small real body occurring in a downtrend signals a possible reversal and is known as a *hammer*. The same



Source: iCharts.in

Figure 11.12: Matrix Laboratories Limited. (January 19, 2007)



Source: iCharts.in

Figure 11.13: Matrix Laboratories Limited. (May 18, 2007)

shape as hammer, but in an uptrend is considered as a possible bearish reversal and is known as *hanging man*.

Some of the combinations of candlesticks that signal a bullish/bearish market or indicate a trend reversal are: An *engulfing pattern* occurs when the body of a candlestick totally covers or engulfs the prior day's real body. When a white body engulfs it is considered bullish

and vice versa for black. A *dark-cloud cover*, a bearish signal, occurs in an up trend, the first day has a long white body and the second day has a black body starting above the upper shadow of the prior candlestick, closing well into the previous day's body. The opposite of the dark-cloud cover is *piercing pattern*, which occurs within a downtrend and is considered bullish. The first candlestick has a black body, and the second has a long white body. A *star* is equivalent to a gap on a bar chart where the body of the star does not overlap the prior day's body.

Indicators

Indicators are calculations⁹ based on the price and the volume of a security to measure trends, volatility and momentum (rate of acceleration). They are normally plotted and studied along with the price chart in order to confirm trends and to give buy and sell signals. Leading indicators precede price movements and can be used to forecast prices; lagging indicators follow price movements and can be used to confirm trends. Indicators are used to form buy and sell signals through crossovers and divergence. Crossovers occur when the price line cuts and crosses the moving average, or when two different moving averages cross each other. Divergence takes place when the direction of the price trend and the direction of the indicator trend move in opposite directions. This signals that the direction of the price trend is not likely to continue.

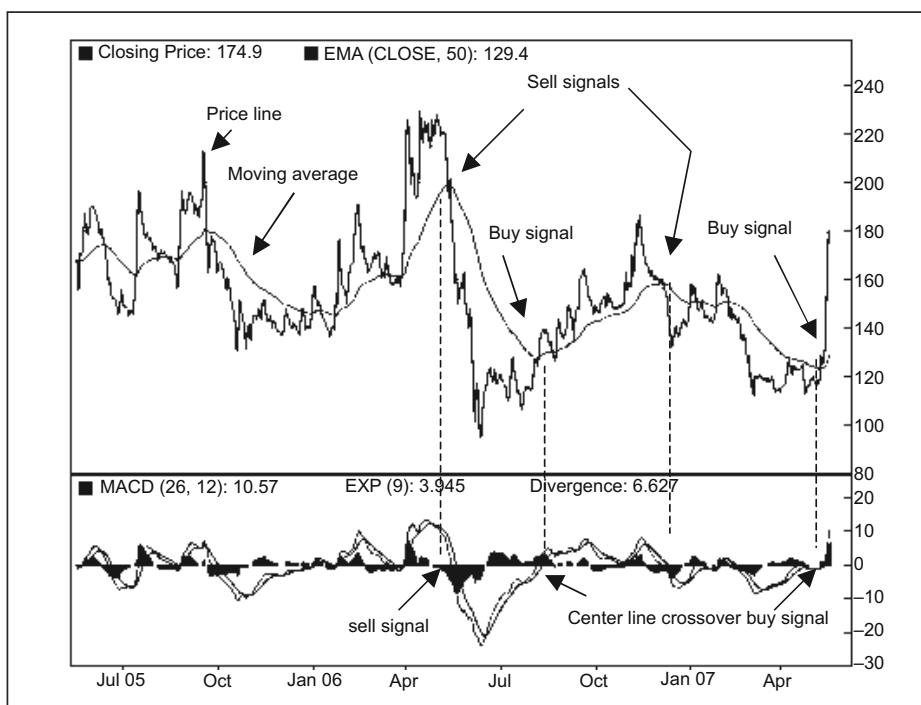
Moving averages create an average price for a stock or index over a period of time. Simple arithmetic averages and exponential moving averages are used. However, it is useful to remember that they follow price changes with a lag. Plotting moving averages along with price helps compare current price with past averages. When price is above the moving average, conditions are bullish and vice versa. Similarly, the price line cutting the moving average from below is a buy signal and cutting from above is a sell signal. Also, the price line may slope upward or downward towards the moving average line over time, which is interpreted the same way. Moving averages can be computed for any period of time to reflect short, medium or long-term trends. Moving averages are also studied in relation to one another. A short-term average crossing above a long-term one is a buy signal and vice versa. Buy and sell signals have been marked in Figure 11.14. As can be observed the price did rise and fall as indicated by the buy and sell signals. However, the magnitude and duration of change can vary.

On balance volume (OBV) measures cumulative positive and negative volume flow. It adds the volume when the closing price is higher than the previous day and subtracts the volume when the closing price is lower. The cumulative total of the volume additions and subtractions forms the OBV line which is compared with the price chart. A rising OBV line indicates that increased volumes accompanied increased prices which is a bullish sign and would confirm an uptrend in price. However, if prices are increasing while the volume line is dropping, a negative divergence is present, indicating that the price trend may not continue. When prices are falling, a rising OBV could signal a future upward reversal, while a falling OBV would confirm the trend. In a consolidation phase, a rising OBV would signal an upward breakout and vice versa.

⁹ Formulae are inbuilt in charting software.

Momentum measures the rate of change of a security's price. The faster the price rise, the larger the increase in momentum. There are various types of momentum indicators including MACD, RSI, stochastics and ROC, which are briefly described below.

Moving average convergence divergence (MACD) uses two moving averages; the longer moving average is subtracted from the shorter moving average which helps to measure momentum and plotted as a line. This is a combination of a lagging and leading indicator. It is derived from moving averages, which are lagging indicators, but their subtraction creates momentum, which is a leading indicator. The most commonly used moving averages are the 26-day and 12-day exponential moving averages (EMAs), shorter moving averages produce faster indicators and vice versa. Usually, a 9-day EMA of MACD is plotted along side to act as a trigger line. A bullish crossover occurs when MACD moves above its 9-day EMA, and a bearish crossover occurs when MACD moves below its 9-day EMA. A histogram is used to represent the difference between MACD and its 9-day EMA. The histogram is positive (bullish) when MACD is above its 9-day EMA and negative (bearish) when MACD is below its 9-day EMA. The MACD fluctuates above and below the zero centre line, bullish crossovers occur when the faster moving average crosses the slower moving average. These buy and sell signals can be seen in Figure 11.14.



Source: iCharts.in

Figure 11.14: Shaw Wallace. (May 22, 2007).

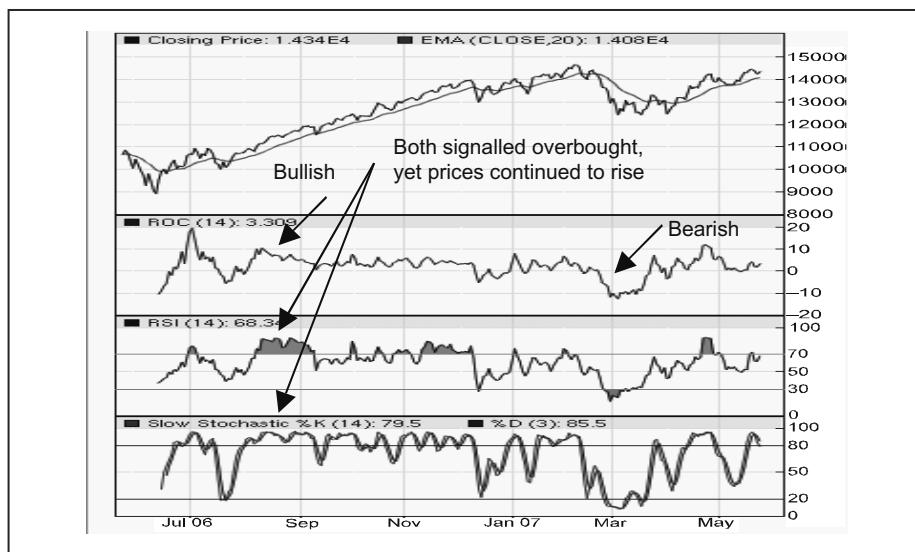
Rate of change (ROC) like MACD, is a centered oscillator that fluctuates above and below zero. It measures the percentage price change over a given time period. When the indicator is above 0, the percentage price change is bullish in the short-term and vice versa.

Momentum oscillators have an upper and lower bound, such as relative strength index (RSI) and stochastics. These indicators react very quickly to short-term changes in price, indicating overbought and oversold areas which suggest sell and buy opportunities respectively. The advantage of momentum oscillators over the centered oscillators is that they have a set upper and lower limit that is not specific to a security, which helps users to identify overbought and oversold conditions.

Relative Strength Index compares the average price change of the advancing periods with the average change of the declining periods¹⁰. The standard calculation for RSI uses 14 trading days as the basis. It is plotted in a range between 0 and 100. A reading above 70 indicates that the share is overbought and below 30 is oversold.

The stochastic oscillator contains two lines, %K¹¹ and %D which is its moving average. It is generally calculated using the past 14 days with 3 day moving average and is plotted within a range of 0 and 100. A reading above 80 indicates that the share is overbought and below 20 is oversold.

Also, as can be seen from Figure 11.15 the momentum indicators are giving signals of bullishness and bearishness. However, overbought is not necessarily a sell signal, and oversold is not necessarily a buy signal; these are only indicators of possible opportunities. In a strong up trend, an oscillator can cross the upper band giving an overbought signal, and yet the price can continue to increase. The analyst should, therefore, look at the broader picture for multiple signals from volume, trend, moving averages, patterns etc.



Source: iCharts.in

Figure 11.15: BSE Sensex. (May 25, 2007).

¹⁰ $RSI = 100 - 100/(1+RS)$, where $RS = \text{Average of } x \text{ days' up closing price} / \text{Average of } x \text{ days' down price}$. x is normally = 14 days, and averages can be EMA.

¹¹ $\%K = 100[(C - L_{14})/(H_{14} - L_{14})]$, where C = the latest closing price, L_{14} = the low of last 14 days, H_{14} = the highest price in last 14 days.

$\%D = 3\text{day moving average of \%K}$

Charts can be drawn in several time frames, hourly, daily, weekly or monthly; longer time frames help filter out random movements, while shorter time frames may help in the timing of buy and sell decisions. Charts can also be examined over periods ranging from one day to several years. The signals generated in charts with different time frames and length of period may also differ. This can be seen from the daily and weekly charts for ACC (Figure 11.16 and 11.17) over a one year from April 2006-May 2007. The weekly chart is smoother than the daily chart and number of buy sell signals generated using EMA of 20days is also lower.



Source: iCharts.in

Figure 11.16: ACC Limited. Weekly Prices as on May 25, 2007.



Source: iCharts.in

Figure 11.17: ACC Limited. Daily Prices as on May 25, 2007.

■ TECHNICAL ANALYSIS, FUNDAMENTAL ANALYSIS AND THE EFFICIENT MARKET HYPOTHESIS

Fundamental analysis uses EIC analysis to value companies. It is based on analysis of the past performance and future forecasts for the economy, industry and the company. It assumes that the company will attain this “intrinsic” value in the “long run” and attempts to identify stocks that are temporarily under or overpriced. If the intrinsic value is higher than the market price, it gives a buy/hold signal and if lower than the market price it gives a sell signal. However, frequent price fluctuations that are observed in the stock market cannot be explained by fundamental analysis.

Technical analysis develops trading rules based on past price and volume data for the market and for individual stocks. It assumes that market prices are based on demand and supply, which in turn are governed by a number of factors, both rational and irrational including psychological factors that are not accounted for in the EIC analysis. It also assumes that prices move in trends and display patterns that can be used to forecast future price movements. However, since the signals from patterns and trends need to be interpreted by the analyst, it can lead to subjectivity.¹²

The EMH is concerned with the precision with which the market prices securities. In efficient markets, prices of securities should reflect all information that is relevant and available. It assumes that there are a large number of informed and rational participants and stock prices adjust rapidly to reflect the effect of new information. According to the efficient market hypothesis, it is impossible to beat the market and technical analysis cannot be effective. Technical analysts on the other hand claim that human behaviour is not rational and claim that they can forecast the future prices based on this behaviour.

There is a large body of research on whether technical analysis aids in earning excess returns or not, and results of these studies are mixed. According to Fama (1970), a survey of early studies from the 1950s-70s, shows that after trading costs are considered, buy and hold is superior to many technical strategies. In a more recent survey of technical analysis from 1988-2004, Park and Irwin (2006) reported that out of 95 modern studies, 56 studies found positive results, 20 studies obtained negative results, and 19 studies had mixed results. These modern studies also showed that technical trading rules were profitable in U.S. stock markets only till the late 1980s, in foreign exchange markets, at least until the early 1990s and in the futures markets until the mid-1980s. However, they felt that most empirical studies are subject to various problems in their testing procedures.

■ SUMMARY

Technical analysis is the study of past price and volume data to forecast future price movements. Overall market movements and individual stocks are studied. Price and volume data is studied or plotted to reveal trends and patterns. Indicators based on price and

¹² <http://www-bcs.mit.edu/gaz/> an MIT site shows how the eye is fooled by shapes and shades, a caution for chartists.

volume are also calculated to generate signals regarding future price movements. There are numerous techniques available and analysts often use a combination of these to confirm signals regarding the future direction of the market.

■ OBJECTIVE QUESTIONS

Mark the Following as True or False:

1. Technical analysis is the study of past price and volume data to forecast future price movements
2. Fundamental and technical analysis cannot be used together
3. According to Dow theory for a primary bull trend each successive rally should be higher than the previous one
4. A point and figure chart has time on the x axis
5. Advances and declines are compared to measure the breadth of the market
6. Circuit filters are applied on all listed stocks
7. Forecasts based on chart patterns is subjective
8. Moving average cross- overs lag behind price changes
9. One of the measures of momentum is MACD
10. A daily price chart is likely to have fewer number of moving average crossovers than a monthly price chart

■ QUESTIONS

1. What is the significance of the three types of price movements in the Dow Theory?
2. What do you understand by the breadth of the market?
3. What is the importance of volume traded in technical analysis?
4. What is the difference between a bar chart and a candle stick chart.
5. What is the difference between a line chart and a point and figure chart?
6. What are support and resistance levels?
7. Are moving averages a leading or lagging indicator?
8. Name two leading indicators in technical analysis.
9. Give two examples of divergence that give buy/sell signals in technical analysis.
10. What is the difference between technical analysis and fundamental analysis?
11. What are the assumptions of technical analysis?
12. What is the difference in the assumptions of technical analysis and the efficient market hypothesis?

■ PRACTICAL EXERCISES

1. Collect data on the various market wide price and volume indicators from newspapers and websites. What do you observe?
2. Plot charts for market indices and 4-5 stocks using one of the free internet sites and identify trends and patterns. Do the patterns always result in the expected future price movements?
3. Plot the price line and various moving averages of your choice (10, 25, 200 DMA). How many buy/sell signals do you get?

CASE STUDY

Gaurav Garg, a budding financial analyst, had studied fundamental analysis, technical analysis and the efficient market hypothesis at college. He wanted to find out for himself whether it is better to buy a stock and hold it over a period of time or whether it is better to trade frequently based on some technical trading rules.

He had studied that some of the technical signals studied gave indications about the possible future movements of the market or individual stocks, others gave definite buy and sell signals. He decided to study the effect of using moving average crossovers as they did not involve any subjective decisions on his part and also because he felt they could be easily programmed using a spread sheet.

The aim of his study is to compare the results of buying and selling using moving average crossovers gives better results than buy and hold. For this, he decided to use the following methodology:

- 1 The SENSEX would be used as it is the most popular market index.
- 2 The risk free rate assumed for the study is 5.00% p.a.
- 3 Return is calculated as = $\text{Log normal}(\text{price}_t / \text{price}_{t-1})$
- 4 Since, log normal returns are used he can simply add up daily returns to get total return.
- 5 Closing prices will be used to generate buy/sell signals, therefore actual buy/sell will take place the following day. Eg, if $\text{price}_{t-1} > 10\text{DMA}_{t-1}$ use it as a buy signal for day t.
- 6 He will use the double or out strategy because short selling is not allowed in India. Start with a buy and hold position. For a buy signal borrow at risk free rate and invest so return becomes $2R_t - R_f$. For a sell signal sell the stock and invest in risk free deposits, so return is R_f .
- 7 Compare return with buy and hold to see additional profit. For a buy signal = $(2R_t - R_f) - R_t = R_t - R_f$ For a sell signal = $R_f - R_t$.
- 8 To start with he decided to use a 10 day moving average. He plans to use 2 more moving averages one greater and one smaller than 10 DMA, say 5 day and 20 day and see effect on profit before transaction costs.

The index values obtained from the BSE site are given in Exhibit 1

Exhibit 1: Closing values of the SENSEX

Date	Price	Date	Price	Date	Price	Date	Price
01-08-2006	10,751.66	07-09-2006	11,853.85	16-10-2006	12,928.18	22-11-2006	13,706.53
02-08-2006	10,876.19	08-09-2006	11,918.65	17-10-2006	12,883.83	23-11-2006	13,680.83
03-08-2006	10,923.16	11-09-2006	11,550.69	18-10-2006	12,858.48	24-11-2006	13,703.33
04-08-2006	10,866.51	12-09-2006	11,660.79	19-10-2006	12,723.59	27-11-2006	13,773.59
07-08-2006	10,812.64	13-09-2006	11,893.79	20-10-2006	12,709.40	28-11-2006	13,601.95

Contd...

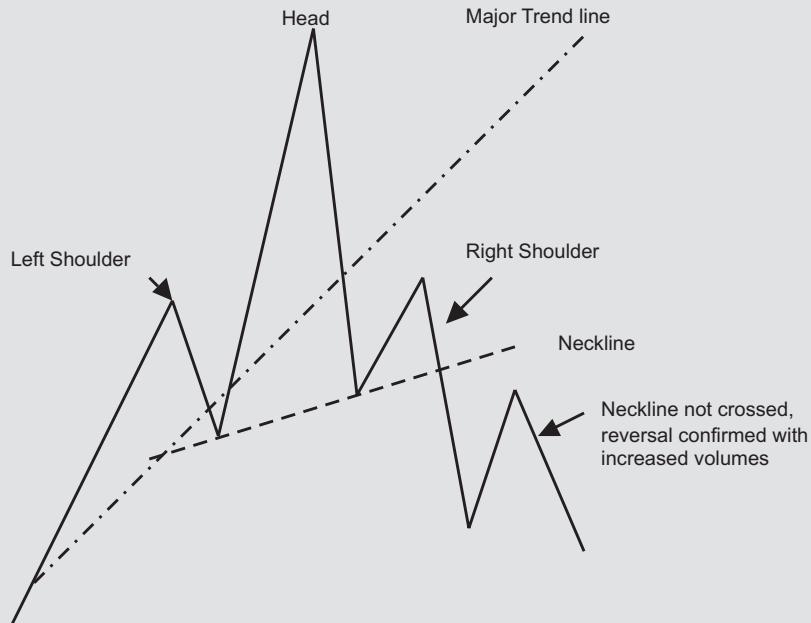
08-08-2006	11,014.97	14-09-2006	11,973.02	21-10-2006	12,736.82	29-11-2006	13,616.73
09-08-2006	11,145.18	15-09-2006	12,009.59	23-10-2006	12,623.28	30-11-2006	13,696.31
10-08-2006	11,149.17	18-09-2006	12,071.30	26-10-2006	12,698.41	01-12-2006	13,844.78
11-08-2006	11,192.46	19-09-2006	11,970.47	27-10-2006	12,906.81	04-12-2006	13,874.33
14-08-2006	11,312.99	20-09-2006	12,109.14	30-10-2006	13,024.26	05-12-2006	13,937.65
16-08-2006	11,448.31	21-09-2006	12,274.27	31-10-2006	12,961.90	06-12-2006	13,949.00
17-08-2006	11,477.48	22-09-2006	12,236.78	01-11-2006	13,033.04	07-12-2006	13,972.03
18-08-2006	11,465.72	25-09-2006	12,173.91	02-11-2006	13,091.12	08-12-2006	13,799.49
21-08-2006	11,511.68	26-09-2006	12,321.19	03-11-2006	13,130.79	11-12-2006	13,399.43
22-08-2006	11,502.62	27-09-2006	12,366.91	06-11-2006	13,186.89	12-12-2006	12,995.02
23-08-2006	11,406.65	28-09-2006	12,380.74	07-11-2006	13,156.66	13-12-2006	13,181.34
24-08-2006	11,531.95	29-09-2006	12,454.42	08-11-2006	13,072.51	14-12-2006	13,487.16
25-08-2006	11,572.20	03-10-2006	12,366.39	09-11-2006	13,137.49	15-12-2006	13,614.52
28-08-2006	11,619.52	04-10-2006	12,204.01	10-11-2006	13,282.91	18-12-2006	13,731.09
29-08-2006	11,706.85	05-10-2006	12,389.41	13-11-2006	13,399.00	19-12-2006	13,382.01
30-08-2006	11,723.92	06-10-2006	12,372.81	14-11-2006	13,425.50	20-12-2006	13,340.21
31-08-2006	11,699.05	09-10-2006	12,365.83	15-11-2006	13,469.37	21-12-2006	13,384.86
01-09-2006	11,778.02	10-10-2006	12,363.77	16-11-2006	13,505.89	22-12-2006	13,471.74
04-09-2006	11,914.21	11-10-2006	12,353.49	17-11-2006	13,429.48	26-12-2006	13,708.34
05-09-2006	11,904.60	12-10-2006	12,537.98	20-11-2006	13,430.71	27-12-2006	13,859.69
06-09-2006	11,933.21	13-10-2006	12,736.42	21-11-2006	13,616.77	28-12-2006	13,846.34

He is interested in examining the following:

1. Plot the price line and moving average line and see how many times a buy/sell signal is generated with a 5, 10 and 20 day moving average.
2. Is it more profitable to buy and hold the SENSEX or to buy and hold using the moving average cross over rule. Is the result same for the three moving averages?
3. What will be the result if a transaction cost of 1% is applied?

APPENDIX

Head and Shoulders Pattern



Points to note:

- ◆ Head is higher than shoulders
- ◆ Major trend line breached by right side of head
- ◆ Neckline upward or horizontal
- ◆ Volumes should be high when price cuts neck line (breaking neckline) - first sell signal
- ◆ Volumes should be high when next upward movement fails to cross neckline - confirmed sell signal.

However:

- ◆ Sometimes there are two heads and /or two shoulders on either side
- ◆ Sometimes the pattern fails if the price crosses back above the neck
- ◆ Variations of head and shoulders
- ◆ Triple and double tops where the support level is used in place of the neckline.

CHAPTER - 12

Market Efficiency

LEARNING OBJECTIVES

At the end of this chapter, you will be able to:

- Understand the concept of market efficiency
- List the factors that contribute to an efficient market
- State the three forms of the efficient market hypothesis (EMH) and their implications
- Describe briefly the tests for each of the forms of the EMH
- Discuss the evidence related to the EMH
- Discuss the implications of the EMH for investors

There are three main theories regarding the movement of prices in the stock market. In fundamental analysis, we study the economy, industry and company and attempt to identify undervalued/overvalued shares for buy/sell decisions. Technical analysis, on the other hand, presumes that all fundamental information is already built into share prices, which fluctuate due to demand and supply; technical analysts study historical price and volume patterns in order to forecast future prices. Another approach is that of the efficient market hypothesis, which is discussed in detail in this chapter.

Market efficiency is concerned with the precision with which the market prices securities. For the market to be efficient, prices of securities should reflect all information that is relevant and available. There should be a large number of informed and rational participants, as this makes the markets liquid. Security prices should adjust rapidly to reflect the effect of new information and changes in expected returns should be related only to changes in the risk free rate and level of risk associated with the security. There should be no significant difference in the performance of knowledgeable investors and others. In other words, we are talking about the *informational efficiency* of the market.

Efficient markets are desirable as prices reflect the true value of the security. This should reduce the possibility of manipulation of prices, and should also help prevent market bubbles and crashes. If prices do fully reflect all current information, it is not worth spending time and money to try and forecast prices or identify undervalued securities. On the other hand, if prices do not fully reflect information, it would be worth finding that information to earn abnormal profits. Reality lies somewhere in between.

■ THE EFFICIENT MARKET HYPOTHESIS

The origins of the Efficient Market Hypothesis (EMH) can be traced back to *Samuelson* (1965) in his article “Proof that properly anticipated prices fluctuate randomly” and *Fama* (1970) who summarized that “prices reflect all available information” and gave a structure to the various information sets available¹. The hypothesis defines the degrees of efficiency of the market in terms of the type of information that security prices should reflect.

The weak form of the EMH states that current prices already fully reflect all the information available in the historical sequence of prices, rates of return, and trading volume data. This implies that a study price trends and patterns in order to predict future price changes would be useless. This is a direct repudiation of price charting and other forms of technical analysis.

The semi-strong form of the EMH states that current security prices reflect all public information, including the information already considered in the weak form. This implies that in addition to price and volume data, information about the economy, annual reports, dividend and bonus share announcements and other information published in newspapers and journals is quickly absorbed and reflected in prices, and therefore not useful for forecasting future price changes. When new information is received, prices will adjust upward for good news and downward for bad news, but this should take place very quickly, so that it is difficult for an analyst to get consistently superior returns. If the market

¹ See *Andrew Low* (1997) for an excellent essay on the EMH

is weak form efficient, it would refute the claims of fundamental analysts who claim to identify undervalued shares based on E-I-C analysis.

The strong form of the EMH states that stock prices fully reflect all information from public and private sources. All information includes the information considered in the semi strong form, i.e., historical price and volume information, publicly available information and insider information. This also requires that information is available free of cost to all investors at the same time. It implies that large institutional investors who are presumed to have superior information, and even insiders, should not be able to take advantage of this information to get consistently superior returns. Although such efficiency is difficult to achieve, it gives a reference point for defining the maximum efficiency.

■ TESTS OF THE EFFICIENT MARKET HYPOTHESIS

Tests of the Weak Form of EMH

There are two approaches that can be followed for tests of the weak form of EMH. The first approach is of strict model tests to see if prices/returns are statistically related over time. The second approach consists of tests of mechanical trading rules to see if they can be put to practical use to give consistently higher returns as compared to a buy and hold policy.

Simulation studies: Charts were drawn by *Ball and Officer* (1978) using random numbers and compared with stock price charts. Both showed similar trends and patterns that are used by technical analysts to forecast prices. This implies that stock prices are random. If prices are random, they should follow a normal distribution. In practice, the distributions have been found to be more peaked, with fatter tails and skewed to the right. Expected price change has a positive trend, and prices are random around the trend.

1. *Tests of serial correlation:* The correlation between successive prices and prices with a time lag are studied. Daily stock returns are weakly correlated but this relationship cannot be exploited to make profits due to low correlations and high transaction costs involved in daily transactions i.e., most studies support the weak form EMH. However, since outliers can greatly influence the results of correlation, some analysts prefer to use runs tests.
2. The runs test, is a non-parametric test used to test and detect randomness. The number of runs is computed as a sequence of the price changes of the same sign (+, -, 0). When the expected number of runs is significantly different from the observed number of runs, the test rejects the null hypothesis that returns are random².
3. Filter tests that compare trading rules to a buy and hold policy are an indirect way of testing the weak form of the EMH. For example, trading rules for buy and sell could be based on some predetermined percentage changes in price. The aim of these tests is to determine if mechanical trading rules can be used profitably. Most filter rules did not give higher profits than a buy and hold strategy, after taking into account the transaction costs.

² *Poshakwale* (1996) found lower runs than expected and significant serial correlation on the first, ninth and tenth lags. He also found significantly higher returns on Fridays and negative returns on Mondays.

4. *Momentum and reversal effect:* If stock prices on consecutive days were correlated positively traders would buy if prices were up on the previous day, this is known as momentum and is one of the technical trading strategies. On the other hand, some analysts believe in a reversal effect over time; poor returns are followed by good return, which is again followed by poor return. If these strategies work, it will disprove the theory³.

Overall, weak form EMH test results in US markets support the hypothesis⁴, but there are studies to the contrary as well. Studies in India prior to 1990 indicate that majority of the researchers found the stock market efficient in the weak form⁵. However, studies after 1990 do not fully support the hypothesis.

Tests of the Semi-strong Form of EMH

There are two types of tests that can be conducted to test the semi-strong form of the EMH. Time series analysis and cross-sectional analysis of returns based on public information and event studies to examine how quickly stock prices adjust to new public information. Returns may be compared with past returns of the same security, expected return as per the market model or with required return as per the CAPM. The aim of these tests is to see if returns are predictable and offer opportunities for profit-making.

Variables tested include dividend yield, default spreads (yield differentials based on credit rating), term structure yield spreads, quarterly earnings reports, and calendar effects such as the January effect (found higher returns in January) and Monday effect (found negative returns on Monday)⁶. Cross-sectional returns are used to test if various securities have equal risk adjusted returns. Studies rank stocks based on size, P/E ratios etc. and compare their risk adjusted returns. These are joint tests of market efficiency and an asset pricing model (such as CAPM). Studies have examined P/E ratios (low P/E gives higher return), the size effect (smaller size gives higher return), book value to market value (B/M) ratio (higher ratio higher returns), cash flow yield (positive relation)⁷. Abnormal returns could occur because

³ *Fama & French (1988b)* found large negative autocorrelations for return horizons beyond a year are consistent with the mean reversion hypothesis. *Poterba and Summers (1988)* found positive autocorrelation over short horizons and negative autocorrelation over longer horizons. *Conrad and Kaul (1998)* contrarian strategy works for very short (weekly and monthly) and for long (3-5 years) holding periods whereas a momentum strategy works for 3-12 month horizons. In India, *Madhusoodanan (1997)* found evidence of a winner-loser effect over a one-year investment horizon, *Sehgal and Balakrishnan (2002 and 2004)* momentum short-term returns and a reversal in long-term returns.

⁴ *Fama (1970)* in his survey article concluded that the stock market was mostly efficient.

⁵ *Barua et al (1994)* report the overwhelming preponderance of evidence in favour of weak form efficiency in India and only a few studies to the contrary from 1977-1992.

⁶ *Rozeff & Kinney (1976)* detected a January seasonal effect. *French (1980)* and *Gibbons and Hess (1981)* noted that stock returns on Monday are lower than other days and often negative. *Officer (1975)* found evidence of seasonality in Australian capital markets. *Chaudhury (1991)* found that in India, average return on Monday and Tuesday is negative, and highest average returns are obtained on Friday.

⁷ *Earnings yield of Basu (1977 and 1983)*, size effect *Banz (1981)*, *Reinganum (1981a)* size and P/E ratios, *Benzion & Shalit (1975)* size and leverage, *Sharpe and Sosin (1976)* the group with lowest dividend yield had highest average excess return, *Bhandari (1988)* positive relation with debt equity ratio, *Polk & Jesus (2001)* negative relationship with leverage, *Brown, Kleidon and Marsh (1983)* size effect is linear in the log of size, but not stable through time, *Blume and Stambaugh (1983)* size effect were biased due to the use of closing

markets are inefficient or because the asset pricing model used may not correctly define the market forces. Firm size has also emerged as a significant variable in a number of Indian studies⁸. Some studies have also shown that small size may give higher return because risk associated with smaller firms is higher. These inefficiencies are known as anomalies, which are inconsistent with the EMH.

Event studies include stock splits, initial public offer (IPO) underpricing, unexpected world events and economic news, news of mergers and acquisitions. Changes in corporate tax rates, exemption of dividends from taxable income, corporate events such as mergers and collaborations can change expected future cash flows resulting in price changes.⁹ An inefficient market may over react or under react to bad/good news, however we need to know whether this pattern can be exploited to earn abnormal profits. Majority of the event studies found that such news was reflected very quickly in security prices¹⁰, it was also found that information that is easily understood is absorbed in prices more quickly.

Tests of the Strong Form of EMH

The strong form of EMH is tested through analysis of the activities of company insiders, recommendations of security analysts, and earnings of mutual funds. Company insiders did have higher returns, but analyst recommendations were found to be accurate roughly 50% of the time. Tests that examined risk-adjusted returns of mutual funds, showed that most funds do not outperform the market¹¹.

prices mainly due January, Rosenberg, Reid and Lanstein (1985) found book to market ratio could predict stock returns. Fama and French (1992) size and book to market equity. Davis (1994) and Davis, Fama and French (2000) confirmed the influence of book to market ratio and size over various time periods from 1929-1997, Lakonishok, Shleifer and Vishny (1994) accounting ratios such as sales per share and cash flow. Japanese studies by Kato and Schallheim (1985) report a size effect and Chan, Hamao and Lakonishok (1991) reveal a significant relationship between returns and size, earnings yield, cash flow yield, dividend yield and book to market. Pandey and Chee (2001) found that size, beta, E/P ratio, dividend yield and B/M ratio play a significant role in Malaysia. Capaul, Rowley and Sharpe (1993) also found a B/M effect in European and Japanese stock markets. Fama and French (1998) found that value stocks (ie high B/M, high E/P, high cash flow/P) had higher return than growth stocks for twelve out of thirteen non-US markets including emerging markets.

⁸ Mohanty (2002) prominent size effect, leverage, E/P ratio and price to BV ratio, Kumar & Sehgal (2004) strong size effect and weak value effect with E/P.

⁹ Dodd (1976) found that shareholders of companies receiving takeover offers have benefited from the announcement.

¹⁰ Fama, Fisher and Jensen (1969) found markets were efficient in their response to new information on stock splits. Harris & Gurel (1986) found that immediately after an addition to the S&P list is announced, prices increase by more than 3% which was reversed after 2 weeks. Rao (1997) examined the effect of macroeconomic events in India and found mixed and inconclusive evidence regarding the semi strong form of efficiency. Obaidullah (1990), found that the market was able to anticipate the “good news” in half yearly earnings announcements, but confirmed the presence of “learning lags” i.e. market was not efficient in the semi strong form. Obaidullah (1992) found that almost the entire adjustment occurs before the announcement of bonus issues.

¹¹ Officer (1980) concluded that large funds are not able to outperform the market in Australia.

■ ARE MARKETS EFFICIENT?

The presence of anomalies casts a doubt on the EMH as they suggest that information alone does not move stock prices. Some authors have tried to explain the anomalies in terms of behavioural theory. One interpretation of the anomalies could be that the differentials could be due to over and under-reaction¹². Some attribute under-reaction to conservatism as investors are slow to change their beliefs in the face of new evidence, and over reaction to a belief that history will repeat itself. Others attribute the under and over reaction to the over confidence of private information leading to negative long run correlation and excess volatility and biased self attribution leading to positive short lag correlation. Another view is that under-reaction occurs as investors are slow to change their beliefs in the face of new evidence, and over-reaction to a belief that history will repeat itself. Another model explains the under reaction and overreaction as “news watchers” who take gradually to react to information (under react), and “momentum traders” who profit from this slow reaction and profit from it, but overreact.

Some researchers explain that under-valued shares offer higher returns due to the fact that investors are not aware of the non glamorous stocks, and because their time horizons are shorter than required to get return from value stocks, which makes them prefer glamourous stocks¹³. Others feel that these differentials could be spurious and may be found due to repeatedly searching the same data base i.e., due to data snooping biases¹⁴. These include the selection of stocks and method of portfolio formation, which may overstate the significance of certain influences. Another view is that noise traders who trade on the basis of imperfect information cause prices to deviate from their equilibrium values¹⁵.

Extreme fluctuations or volatility of security prices and the presence of bubbles and crashes cannot be explained by the EMH. Prices fluctuate due to fundamental factors, imbalances between demand and supply, and the expectations and behaviour of speculators and investors¹⁶.

Grossman (1976) and *Grossman & Stiglitz (1980)* argue that informationally efficient markets are an impossibility. If markets are informationally perfectly efficient, the return to gathering information would be nil, there would be little reason to trade, and markets would collapse. According to *Russel and Torbey (2008)*, EMH fails to depict operations in the real world as there are various anomalies and inconsistencies.

¹² *DeBondt and Thaler (1985, 1987)* and *Chopra Lakonishok and Ritter (1992)*. *Daniel Hishleifer and Subrahmanyam (1998)*, *Barberis, Schleifer and Vishny (1998)*, *Hong & Stein (1999)*.

¹³ *Lakonishok, Schleifer and Vishny (1994)*.

¹⁴ *Lo and MacKinlay (1990)*.

¹⁵ *Shleifer and Summers (1990)*.

¹⁶ *Christie (1982)* found financial leverage and volatility are related. *French, Schwert and Stambaugh (1987)* and *Bollerslev, Engle and Wooldridge (1988)* found a positive relationship between expected risk premiums and volatility. *Schwert (1989)* found unusually high volatility during the great depression, which was difficult to explain. There was correlation between aggregate leverage and volatility but it explained a very small portion of stock movements. In India, *Broca (1995)* found that many of the volatility changes, which either signal the onset/decline of volatility manias broadly correlate with the release of extraordinary information.

Overall, stock markets have been found to be efficient mostly in the weak form and to some extent in the semi-strong form. In India, the test results have been mixed; according to *Gupta (1985)* in a developing country like India the notion of an efficient capital market is suspect because of high transaction costs, non-availability of freely available information, disinterested share holders, ignorance of shareholders, and mob speculation. There is also the problem that tests are conducted using different indices and varying number of stocks over various time periods, using daily/weekly/monthly data based on the convenience of the researcher, which may lead to different conclusions¹⁷. From a practical point of view, however, EMH serves as a useful benchmark for relative efficiency; we can test the market to see if efficiency has improved over time.

Implications of Market Efficiency for Investors

If markets are efficient in the weak form, this is directly against technical analysts who claim that they can develop systems to detect trends and patterns in prices. Technical analysis refute the results of the tests of EMH because they use a combination of technical signals. They say that tests conducted so far are too simple, and cannot replicate their complicated decision-making techniques. Complex trading rules may not be mathematically programmable, and also successful trading rules may be kept a secret by the users. However, if markets are only weak form efficient, fundamental analysis can be used to identify under/overvalued stocks.

Fundamental analysis involves determining an investment's intrinsic values based on EIC analysis. If markets are efficient in the semi-strong form, the price of the share would have built in all the information and fundamental analysts would not be able to identify under/over valued shares. Fundamentalists argue that while all past data may be built into prices, analysts also need to estimate future values and those with superior skills can make better forecasts.

If markets are efficient in the strong form and no one can outperform the market, then there would be no need for portfolio managers and advisors and everyone would simply buy and hold a diversified portfolio in keeping with their risk and return preferences. An easy way of doing this would be to buy and hold an index fund.

■ SUMMARY

The three forms of the efficient market hypothesis define the levels of information that should be reflected in the market price of securities. If the market is efficient, no one should be able to consistently outperform a buy-and-hold strategy. Tests of efficiency show that the market is efficient in the weak form and to some extent in the semi-strong form. There are, however, many anomalies, volatility etc., which cannot be explained by the EMH, and which have been explained on the basis of behavioural theory. All these theories and hypotheses help us to understand the securities market. However, we cannot expect the market to follow any of them in isolation as there are many variables affecting security valuation. We need to take into account fundamental and psychological factors, including speculation, fads and noise trading.

¹⁷ *Singh (2008c)* found betas varied considerably with the interval used.

■ OBJECTIVE QUESTIONS

Mark the Following as True or False:

1. The semi strong form of EMH is a repudiation of technical analysis
2. The weak form of EMH refutes the claims of fundamental analysts
3. Tests of serial correlation are tests of the semi strong form of EMH
4. Event studies such as stock splits and economic news are tests of the semi strong form of EMH
5. EMH cannot explain the volatility of stock prices
6. Evidence of insider trading indicates that the market is efficient in the semi strong form
7. EMH assumes that there is perfect competition in the market
8. Markets in the developed countries are strong form efficient while markets in developing countries are inefficient
9. If markets are strong form efficient there would be no need for portfolio managers and advisors
10. If markets are efficient in the strong form analysts will not be able to identify undervalued or over valued stocks

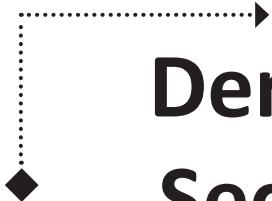
■ QUESTIONS

1. What are the factors that contribute to an efficient market?
2. Briefly describe the three forms of the EMH.
3. Describe one test each for the three forms of the EMH.
4. What are the implications of the three forms of the EMH?
5. Discuss the results of the tests described in Question 3 above.
6. Discuss any two anomalies related to the EMH.
7. What are the implications of the results of tests of EMH for investors?

■ PRACTICAL EXERCISES

1. Download the daily prices for any share index or share of your choice and calculate daily return. Plot returns and see if they approximate a normal distribution.
2. Download the daily prices for any share index or share of your choice and calculate daily return. Calculate the coefficient of correlation between successive returns. What do you observe?

PART V



Derivative Securities

Chapter 13

Options and Futures

CHAPTER - 13

Options and Futures

LEARNING OBJECTIVES

At the end of this chapter, you will be able to:

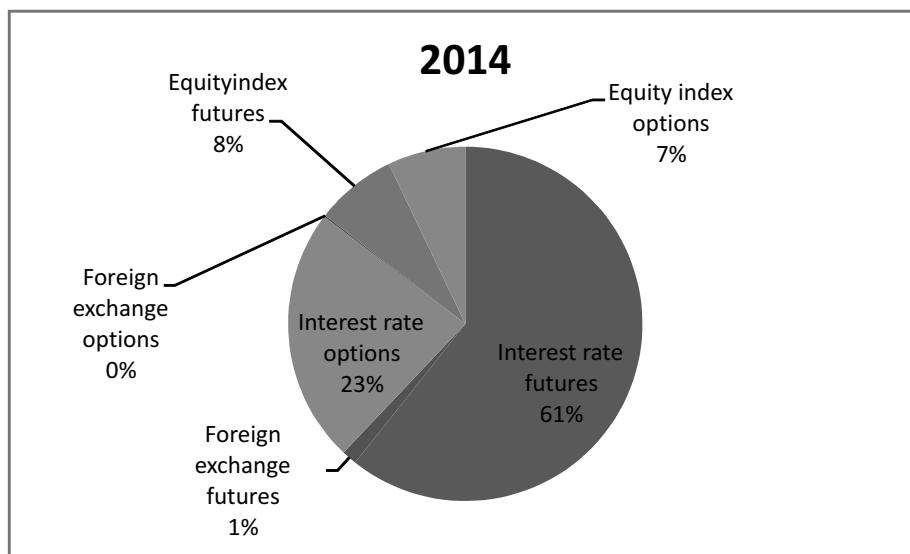
- Understand the features of options and futures
- Evaluate the payoffs from options and their combinations
- Use the Black Scholes model to calculate option prices
- Discuss the effect of various factors on option prices
- Evaluate special options such as rights, warrants and convertible debentures.
- Calculate the theoretical price of a futures contract
- Appreciate the role of futures in portfolio management
- Discuss the advantages/disadvantages of using derivatives

Derivatives are financial instruments that derive their value from other assets known as underlying assets. The underlying asset can be real assets (wheat, spices, oil, aluminium, gold), financial assets (equity shares, bonds), stock market indices, exchange rates etc. Derivatives include futures, options, warrants, convertible bonds, swaps, mortgage derivatives and securitised assets. In this chapter, we will discuss capital market-related futures and options and show how they can be used for risk management and profit enhancement.

A *futures contract* is an agreement between two parties in which the buyer agrees to take delivery and seller agrees to deliver a specified asset at a specified price and date in the future. In an *options contract*, the seller of the option grants the buyer of the option the right to buy or sell a specified asset, at a given price during a given period or on a specific future date.

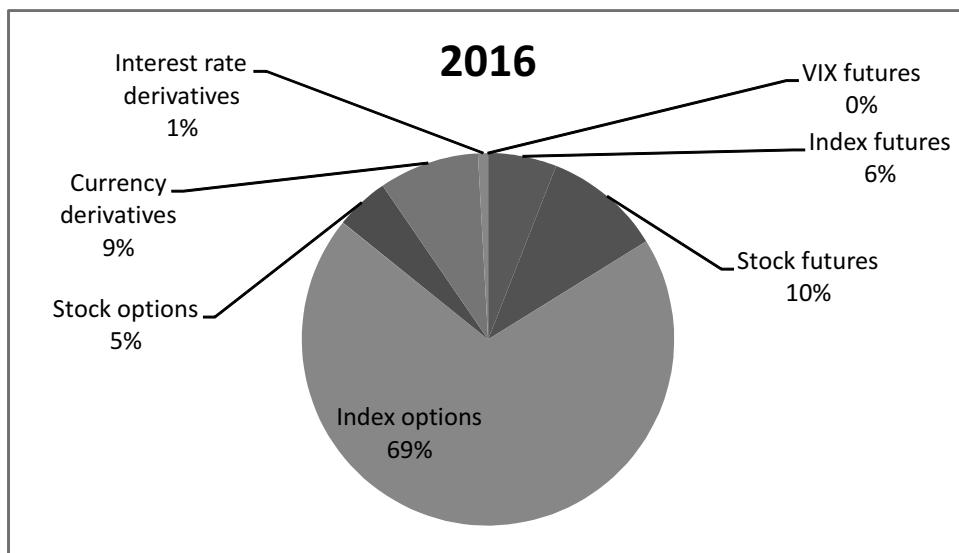
■ THE HISTORY OF FUTURES AND OPTIONS TRADING

Derivatives contracts can be privately negotiated and traded between two parties (over the counter or OTC derivatives), or they can be standardised contracts, which are traded on an organised exchange, where the exchange acts as the intermediary, and guarantees performance of the contract. Standardised commodity futures contracts began in Chicago in the middle of the nineteenth century, while the first financial derivatives (call options on equity shares) were first traded on the Chicago Board of Exchange in April 1973. In India, the NSE introduced index futures in June 2000, index options in June 2001, stock options in July 2001 and stock futures in November 2001. Derivatives in debt instruments (interest rate futures) were introduced on the NSE in 2003, and currency futures in August 2008. The composition of the world derivatives market and Indian Derivatives market can be seen from Figure 13.1and 13.2.



Source: Bank of International Settlements

Figure 13.1: Turnover in Global Exchange Traded Derivatives (US\$ 1450 trillion)



Source: SEBI

Figure 13.2: Turnover in the Indian Financial Derivatives Market (Rs 766 trillion)

■ OPTIONS

An option is a contract which gives the buyer (holder) the right, but not the obligation, to buy or sell the underlying asset at a given price on or before a given future date, the *expiration date*. To have this right, the buyer of the option pays an *option premium* or price to the seller (writer) of the option. The option writer is obliged to sell or buy the specified asset at the *exercise price/strike price* if the buyer exercises the option. When an option is exercised, it can be settled with the payment and delivery of the underlying asset or it can be settled by net cash payment. When the option is settled in cash, the price of the underlying asset on the exercise date is known as the *settlement price*.

The right to buy the underlying asset is a *call option* and the right to sell the underlying asset is a *put option*. An option is basically an insurance against the risk of loss with the opportunity to avail of profits if future price movements are as anticipated. The buyer of a call option feels prices are going to move up, if the share price exceeds the exercise price, he will exercise the option to buy the share. The holder of a put option on the other hand, feels the share is overpriced and expects prices to fall. He will exercise his put option to sell the share if the price falls below the exercise price. The premium paid is the price for peace of mind, just like any other insurance premium.

American options can be exercised at any time up to the expiration date whereas *European options* can be exercised only on the expiration date. In this chapter, we will discuss European options unless specifically mentioned otherwise.

In the money option: A call option is in the money when the spot price of the underlying share is higher than the exercise price. If the spot price is much higher than the strike price

it is deep in-the-money. Similarly, a put option is in the money if the spot price is below the exercise price. This is also known as the intrinsic value of the option. Only options that have intrinsic value are exercised, others expire worthless.

At the money option: Put and call options are at the money when the current stock price equals the exercise price.

Out of the money option: A call option is out of the money when the current stock price is lower than the strike price, and a put is out of money if spot price is above the exercise price.

For example, if you own a call option with an exercise price of Rs 100 and the price of the underlying share is Rs 120, the option is in the money and has an intrinsic value of Rs 20. If the share is called at Rs 100 and sold at Rs 120 a profit of Rs 20 can be earned. On the other hand, if the share was quoting at 80 it is not worth using the call option to buy it for Rs 100. However, until the option expires, there is always a possibility that prices will rise in the future, and an option that is out of the money may become in the money.

Similarly for a put option, if the exercise price is Rs 100 and the underlying share is quoting at Rs 75, it has an intrinsic value of Rs 25 because you can sell the share worth Rs 75 at Rs 100. On the other hand, if the price of the share is Rs 125 the put option will not be exercised, because it is not worth selling something at lower than its market price.

■ DERIVATIVES TRADING ON THE NSE

Derivatives can be bought and sold through trading members of the NSE. Traders in exchange-traded derivatives do not interact directly; the clearing corporation acts as an intermediary and ensures that there is a buyer and a seller for every open contract. It also guarantees that the assigned writer will fulfil his obligation if the option is exercised.

To start with, futures and options contracts on the NSE had a maximum of 3-month trading cycle; the near month (one month), the next month (two months) and the far month (three months). Contracts expire on the last Thursday of the expiry month. If the last Thursday is a trading holiday, the contracts expire on the previous trading day. New contracts are introduced on the trading day following the expiry of the near month contracts. A minimum of five strike prices are offered for every option; two in the money, two out of the money and one at the money. The strike price interval is Rs 10 for index options and can vary between Rs 2.5 -100 for options on individual stocks. Premiums for options and futures are quoted in steps of 5 paise. The BSE introduced weekly options¹ in September 2004 on 4 stocks and the BSE Sensex. These options are introduced on Monday of every week, have a maturity of 1 week and 2 weeks, and expire on Friday of the expiring week. In January 2008, SEBI allowed the launch of long duration options on Sensex and Nifty indices, with tenures up to three years.

All the futures and options contracts traded on the NSE are settled in cash at the expiry

¹ In Nov 2007, SEBI decided to allow new derivative products in future. These include smaller size of contracts on equity indices, options with longer life, volatility index and F&O contracts, options on futures, bond indices and F&O contracts, exchange-traded currency futures and options, and exchange-traded products to cater to different investment strategies.

or exercise of the respective contracts. Options on individual securities available at the NSE are American options and options on indices such as the S&P CNX Nifty and CNX IT are European options.

We can get an idea about transactions in options from Table 13.1 which shows transactions on the NSE on the 9th of November, 2006.

1. The first entry “NIFTY (100)” indicates that the underlying asset is the S&P CNX Nifty index with a contract size of 100. The contract size for derivatives is fixed by the exchange to get a contract value of at least Rs. 2 lakh. The contract size is also called the *multiplier* as it gives the ratio of the settlement price to the price quoted in the market.
2. For individual shares we can see that the contract size depends on the price of the share; the contract size for ACC was 375 shares (closing price on 9th November was 997.65) and for Allahabad Bank 4,900 shares (closing price was 93.85).
3. The first entry under NIFTY (100) is CE-3300.00-Nov. C indicates that the option is a call option, E that it is a *European option*, which can be exercised *only on the expiration date*, 3300.00 is the exercise price and November 2006 is the expiration month; the last Thursday of the month is the 30th which is the expiration date. The NIFTY index closed at 3796.4 on 9th November, i.e., the call option was in-the-money.
4. The *notional amount or nominal value* of an option is the exercise price × multiplier, in this case it is $3300 \times 100 = 3,30,000$.
5. The last entry under NIFTY (100), PE-3800.00-Jan, is a put option, a European option that can be exercised at Rs. 3800.00 on the 25th of January 2007. Since, the index closed at 3796.4, the put option was in-the-money.
6. The first entry under ACC (375), CA-1000.00-Nov, is an *American* call option, which can be exercised *any time up to the 30th of November 2006*.
7. Similarly, the last entry under ACC (375), PA-1000.00-Nov., is an American put option that can be exercised anytime up to the last Thursday of November.
8. The premium payable for purchasing these options is shown in the next four columns; figures are given for the opening, high, low and closing premiums on 9th Nov 2006.
9. The sixth column indicates the *open interest* i.e., the number of options contracts that are held by buyers and sellers and are yet to be exercised or closed. The seventh column indicates the number of contracts traded on that day.

Table 13.1: Excerpts from the Derivatives Options Trading at NSE on 9-11-2006

Contracts Type-Strike Price-Expiry	Premium				Open Int. (‘000)	No. of Contracts
	Open	High	Low	Close		
NIFTY(100)						
CE-3300-Nov	495	495	495	495	2	78
CE-3400-Nov	395	420	391	401.95	20	158

Contd...

CE-3750-Nov	104	112.5	86	103.1	3402	1260
CE-3800-Nov	65	76.8	56.25	71.8	14893	3611
CE-3830-Nov	48.35	55	45.5	55	26	35
PE-3300-Nov	2.05	3	2	2.8	75	396
PE-3350-Nov	4.45	4.5	4	4.3	150	123
PE-3600-Nov	20.1	26	17.3	20.75	2597	1583
PE-3800-Nov	63	84.45	62.3	72.85	15747	2046
PE-3850-Nov	95	112	85	98.55	2475	452
PE-3900-Nov	120.25	144	115	126.25	158	79
CE-3500-Dec	320	359.3	320	343.4	20	155
CE-3700-Dec	184	199	178	178	128	382
CE-3750-Dec	150	167	149	163.15	42	53
CE-3800-Dec	103	129.7	103	122.2	1219	441
PE-3500-Dec	39	41	35	40.05	1245	745
PE-3600-Dec	60	66	57.25	60.6	362	721
PE-3700-Dec	84.9	94.85	82.6	88.3	734	678
PE-3750-Dec	99	103	95.3	97.75	105	176
PE-3800-Dec	124	130	111.5	121.5	955	171
CE-3800-Jan	163	166	161	161	218	71
PE-3600-Jan	90	93.9	90	93.9	14	86
PE-3700-Jan	120	127.5	120	127.5	20	43
PE-3800-Jan	157	160	157	160	202	73
ACC(375)						
CA-1000-Nov	28	30	22	25.65	57	61
CA-1020-Nov	17.5	20	17	18	10	47
CA-1040-Nov	12	12	9	9.1	5	20
CA-1060-Nov	6.95	6.95	6.95	6.95	1	6
PA-1000-Nov	15.9	21.85	15.9	19.7	11	14
ALLAHABAD BANK (4900)						
CA-90-Nov	3.25	5.1	3.25	5.1	13	127
CA-95-Nov	1.2	2.6	1.2	2.55	17	245
CA-100-Nov	0.7	1.45	0.7	1.4	6	142
PA-90-Nov	2.5	2.5	1	1	17	83

Source: NSE Archives

The pricing of put and call options is shown in Figure 13.3.

An option's premium is the sum of its intrinsic value and time value. Time value is the amount option buyers are willing to pay for the possibility that the option may become profitable/or more profitable before expiration due to favourable changes in the price of the underlying stock. The time value component of the option premium can change in

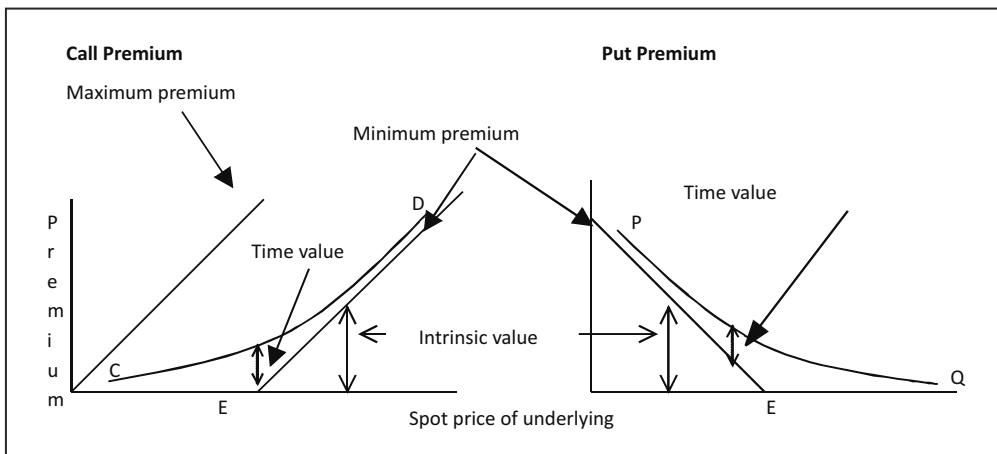


Figure: 13.3: Pricing of Put and Call Options.

response to a change in the volatility of the underlying, the time to expiry, interest rate fluctuations, dividend payments and the effect of supply and demand for the option. An option loses its time value as it approaches expiration, and only the intrinsic value remains at expiration. Time value is also normally higher when stock price is close to the exercise price. When prices are much higher, time value for calls is low because the probability of further upward movements may be restricted; for put options the probability of the high price falling below exercise price is also limited. Similarly, when prices are far below exercise price, time value on calls is limited as prices may not rise enough to cross the exercise price, and for put options the probability of prices falling further is also limited.

■ WHY BUY AND SELL OPTIONS?

Derivatives can be used as an insurance against risk and can also be used to make profits through speculation and arbitrage. Hedgers try to eliminate or reduce the risk to which they are already exposed. Speculators take risks to profit from price changes in the underlying. Arbitrageurs make risk less profit from price differential in two markets by simultaneously operating in both.

Derivatives also offer the advantage of very high leverage, as a small premium amount gives exposure to the underlying asset of much greater value. This can result in very high profits and losses depending on the underlying price movements. For example, if you had Bought a November Rs 1,030 call option on ACC for Rs 10 when ACC was quoting at Rs. 1,000. If the price of ACC on expiration goes up to Rs. 1,050 the profit earned is Rs 10 on an investment of Rs 10 i.e., 100%, whereas if the share had been bought, the profit would have been Rs. 50 on an investment of Rs. 1,000 i.e., 0.5%. On the other hand, if the price falls by Rs 50, the call option is not exercised the loss is limited to the premium paid i.e., Rs 10 or 0.1%.

Some of the motivations for buying and selling options are discussed in this section.

Purchase a call option on a share instead of buying the share. If prices rise, enjoy unlimited profit potential and buy the share at the exercise price. If prices fall, the loss is limited to the premium paid. However, the call holder does not have voting rights and the right to dividend etc.

When share prices seem to have peaked, sell the share to book profits and simultaneously buy a call in case prices rise further.

A call can also be purchased for speculation; if prices are expected to rise, make profit by selling the option at a higher price.

Buy a put to protect against decline in value of shares held. This acts as an insurance if the stock drops, and the holder continues to enjoy the profit potential if prices rise. Puts can also be purchased without owning the underlying asset when prices are expected to fall in order to sell the put at a profit.

Sell a call option if prices are not expected to rise above the exercise price (i.e., call option will not be exercised) and earn premium. When the option seller owns the underlying shares it is known as writing a *covered call*, as the share can be delivered if the option is exercised. Writing a call without owning the underlying is known as a *naked call*, this is considered very risky as losses can be unlimited.

Sell a put option when prices are not expected to decline below exercise price (i.e., put option not exercised) to earn premium. The downside risk is limited to the exercise price.

To buy a stock at lower price than existing today, sell a put option at the desired price. If it is exercised, the share gets bought at the desired price, otherwise the premium is earned.

The above discussion shows that buyers of options limit their losses to the premium paid, with possibility of higher gains, whereas the sellers of options limit their gains to the premiums earned and expose themselves to higher risks. In such a situation, it is natural to question why anyone would write an options contract.

A trade takes place only when people with opposite view points meet. Additional income can be earned from option premiums based on expected market movements, which are different from the buyer's expectations. Option writing, however, is a specialized job, suited to knowledgeable investors who understand the risks involved and have the financial capacity to meet margin requirements and payments in case the options are exercised. The risks of option-writing can be diversified by selling options on different stocks and can be limited by holding spread positions in the same stock (spread positions are explained in a later section).

Payoffs

The payoffs from European options depend on the underlying stock price at expiration. If the stock price at expiration is S and exercise/strike price is E , cost of buying the call option is C , and put option is P , the payoff is calculated as follows:

For the buyer of a call:

if $S < E$, the call will not be exercised so the payoff is $0 - C$

if $S > E$, the call will be exercised and payoff is $S - E - C$,

Therefore the payoff = Max [0, $S - E$] – C

For the buyer of a put:

if $S > E$, the put will not be will be exercised and payoff is $0 - P$

if $S < E$, the put will be exercised so the payoff is $E - S - P$

Therefore, the payoff = Max [0, $E - S$] – P

For the seller of puts and calls the payoff = -(payoff for the buyer)

The payoffs from options can be easily understood with the help of numerical examples and graphs. Take the example of ACC from Table 13.2. Exercise price 1000, call premium approx 26 and put premium 20. We can calculate the payoffs for option buyers and sellers by assuming spot prices for ACC ranging from 900-1100.

Table 13.2: Payoffs for ACC Put and Call Options

	Call option			Put option		
	For Buyer If $S > E$, Profit = $S - E - C$ If $S < C$ Loss = C		For Buyer If $S < E$, Profit = $-E - S - P$ If $S > C$ Loss = P			
Share price		Buyer	Seller		Buyer	Seller
900	not exercised	-26	26	exercised	80	-80
920	not exercised	-26	26	exercised	60	-60
940	not exercised	-26	26	exercised	40	-40
960	not exercised	-26	26	exercised	20	-20
980	not exercised	-26	26	exercised	0	0
1000	optional	-26	26	optional	-20	20
1020	exercised	-6	6	not exercised	-20	20
1026	exercised	0	0	not exercised	-20	20
1040	exercised	14	-14	not exercised	-20	20
1060	exercised	34	-34	not exercised	-20	20
1080	exercised	54	-54	not exercised	-20	20
1100	exercised	74	-74	not exercised	-20	20

As can be seen from the payoff table, when a call or put option is not exercised, the sellers profit is equal to the premium received. When the option is exercised, the premium is reduced from the loss.

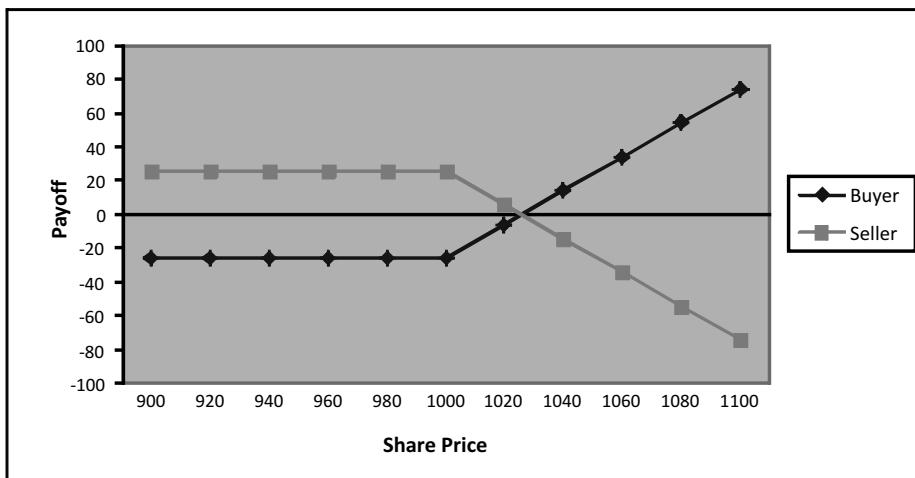


Figure 13.4: ACC Call Option

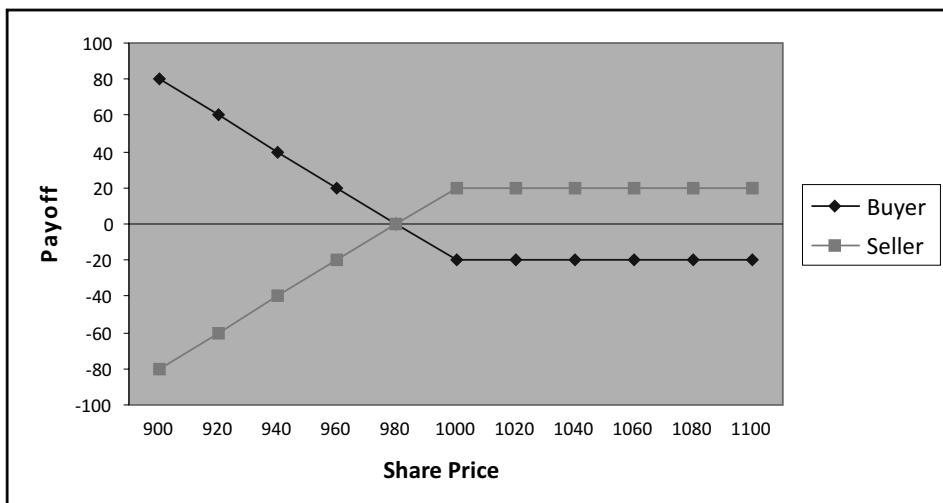


Figure 13.5: ACC Put Option

The charts depicting payoffs for call and put options and Figure 13.4 and 13.5 reveal that options are a zero – sum game. The payoffs for buyers and sellers of options are a mirror image – symmetrical and opposite in sign. While drawing the graph, it is worth noting that the turning point of the payoffs is always at the exercise price.

Shares and options can be bought individually or in combinations for hedging and profit making. Some of the most common combinations are discussed here and payoff diagrams are given in Figures 13.6 to 13.9.

A Position in a Share and an Option

We use the example of ACC to illustrate the payoffs, the share price of ACC on 9th November 2006 was approximately Rs. 998.

Long share long put: Own a stock and buy a put (payoff resembles a long call) can be seen in Figure 13.6.

Short stock short put: Short sell a stock and sell a put (payoff resembles a short call) is shown in Figure 13.7.

Long stock short call: Own a stock and sell a call i.e., write a covered call, Figure 13.8 (resembles short put). If the ACC share is bought (or was owned) on 9th November 2006 at approx Rs 1,000 with the intention to sell it at 1,040 in the next one or two months and make profit of 40. Sell a Nov 1,040 call for Rs 9, if the call is exercised the gain is 49, if not exercised, Rs 9 extra was earned on the call.

Short stock long call: Short sell a stock and buy a call option (payoff resembles a long put) as can be seen in Figure 13.9.



Figure 13.6: ACC Long Stock Long Put

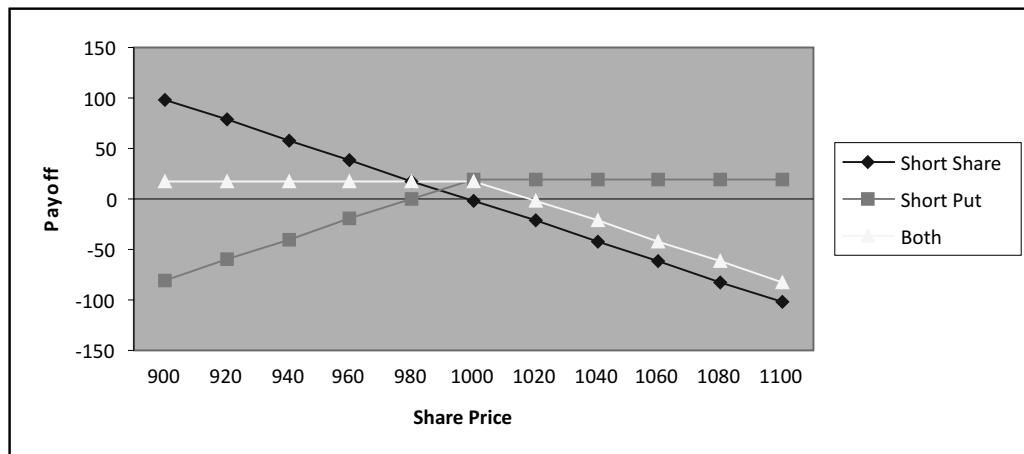
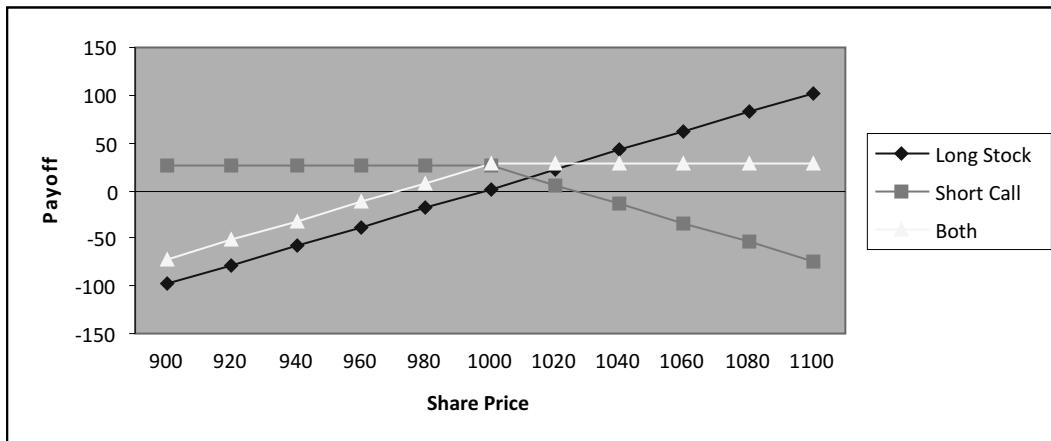
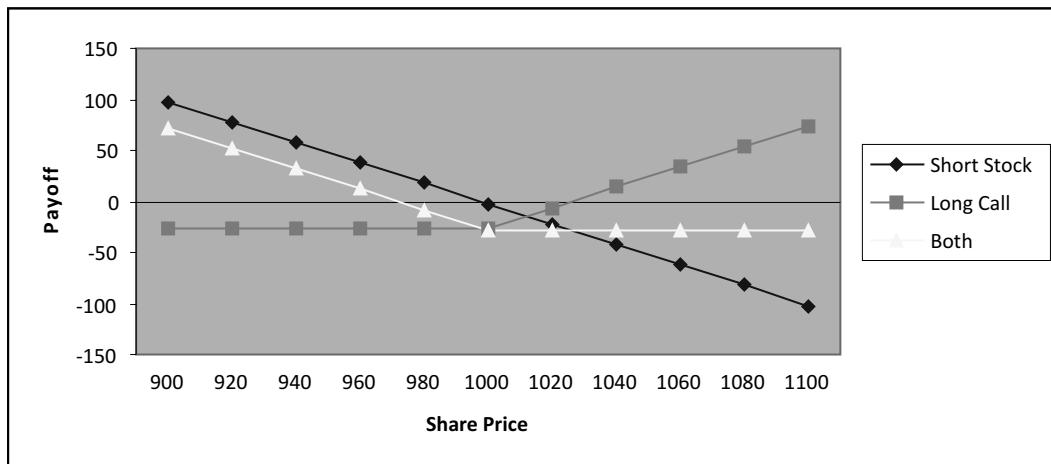


Figure 13.7: ACC Short Stock Short Put

**Figure 13.8:** ACC Long Stock Short Call (write a covered call)**Figure 13.9:** ACC Short Stock Long Call

Option Spreads

Buy an option and sell another option on the same stock. For a price/vertical spread choose same expiry month, but different exercise prices. Bullish price spreads are used when prices are expected to rise; buy the call/put with lower exercise price and sell the one with higher strike price. For bearish spreads when prices are expected to fall do just the opposite. For time/horizontal/calender spreads, the exercise price is the same but expiry months are different. More advanced spreads, such as diagonal spreads are a combination of time spreads with different exercise prices.

Bull spreads using ACC call options and put options are depicted in Fig 13.10. When share price is below Rs. 1000, both options are not exercised, the net premium paid out = $-26 + 9 = -17$. When only one option is exercised between 1000 and 1,040, the profit/loss = share price $- 1000 - 17$, and break-even is at 1017. When share price crosses 1,040 both calls are exercised and profit = $1040 - 1000 - 17 = +23$. Here the maximum risk is -17 and

maximum reward is 23. Risk return combinations need to be studied along with expected market movements when option spreads are used.

Pay Off Table for Figure 13.10					
Share Price	Buy Call 1000/26		Sell Call 1040/9		Total Payoff
900	-26	Not Exercised	9	Not Exercised	-17
920	-26	Not Exercised	9	Not Exercised	-17
940	-26	Not Exercised	9	Not Exercised	-17
960	-26	Not Exercised	9	Not Exercised	-17
980	-26	Not Exercised	9	Not Exercised	-17
1000	-26	Optional	9	Not Exercised	-17
1020	-6	Exercised	9	Not Exercised	3
1040	14	Exercised	9	Optional	23
1060	34	Exercised	-11	Exercised	23
1080	54	Exercised	-31	Exercised	23
1100	74	Exercised	-51	Exercised	23
1120	94	Exercised	-71	Exercised	23
1140	114	Exercised	-91	Exercised	23
1160	134	Exercised	-111	Exercised	23
1180	154	Exercised	-131	Exercised	23
1200	174	Exercised	-151	Exercised	23
Net loss in premiums =Rs 17 , BE=17 + 1000=1017					

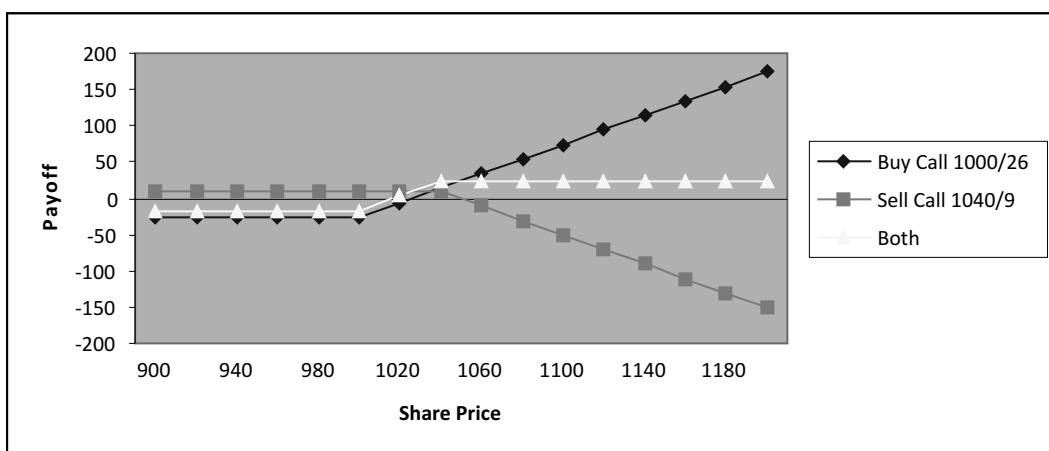


Figure 13.10: ACC Bull Spread with Calls – Buy Low Sell High

A bull spread with put options is depicted in Figure 13.11. As can be seen, when the share price is below 1000, both put options are exercised, the profit/loss = $+1000 - 1040 - 20 + 48 = -12$. When the share price is between 1000 and 1040 profit/loss = $+1000 - \text{share price} - 20 + 48$, and break even is at 1012. When price is above 1040 no put option is exercised and profit is the net premium = $+48 - 20 = 28$.

Pay Off Table for Figure 13.11					
	Buy Put 1000/20		Sell Put 1040/48		Total Payoff
900	80	Exercised	-92	Exercised	-12
920	60	Exercised	-72	Exercised	-12
940	40	Exercised	-52	Exercised	-12
960	20	Exercised	-32	Exercised	-12
980	0	Exercised	-12	Exercised	-12
1000	-20	Optional	8	Exercised	-12
1020	-20	Not Exercised	28	Exercised	8
1040	-20	Not Exercised	48	Optional	28
1060	-20	Not Exercised	48	Not Exercised	28
1080	-20	Not Exercised	48	Not Exercised	28
1100	-20	Not Exercised	48	Not Exercised	28
1120	-20	Not Exercised	48	Not Exercised	28
1140	-20	Not Exercised	48	Not Exercised	28
1160	-20	Not Exercised	48	Not Exercised	28
1180	-20	Not Exercised	48	Not Exercised	28
1200	-20	Not Exercised	48	Not Exercised	28
Gain in premiums=Rs 28, BE point=1040-28=1012					

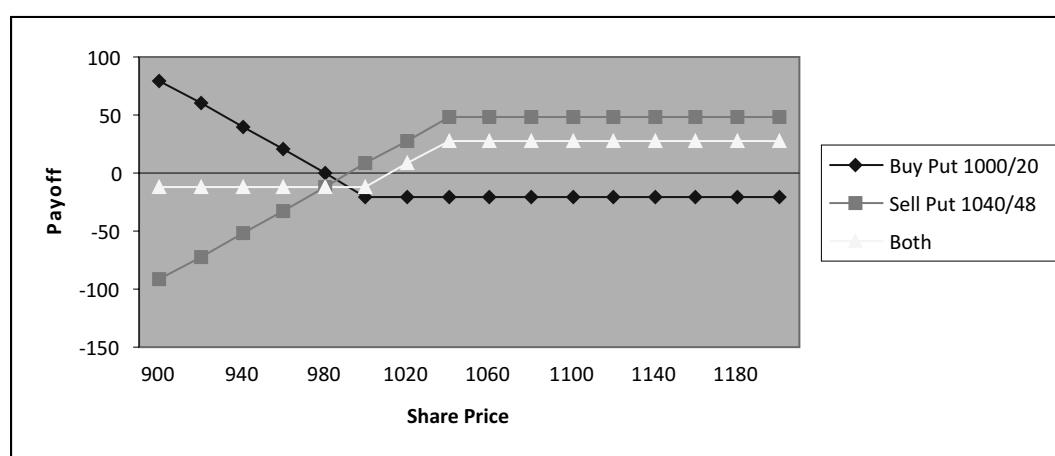
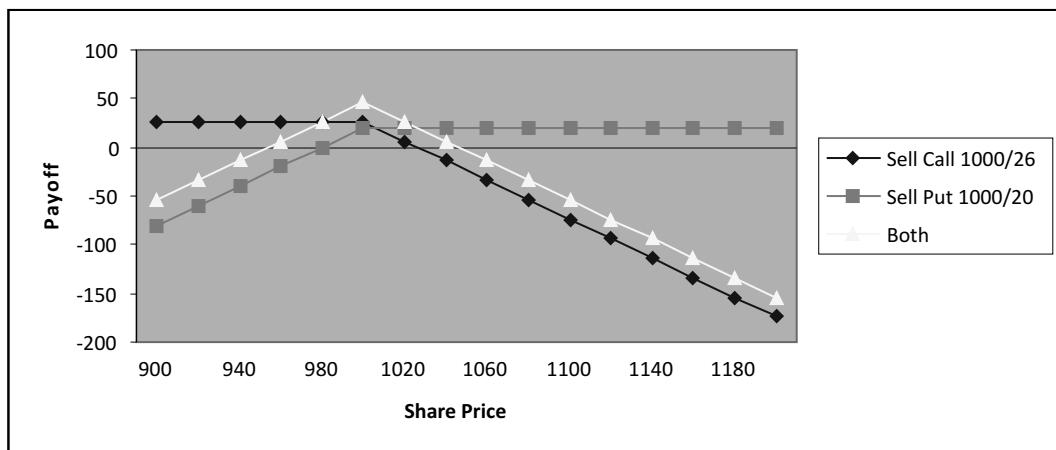


Figure 13.11: ACC Bull Spread with Puts – Buy Low Sell High

Other Combinations

Straddle top/straddle write: Sell a call and a put on the same share with the same exercise price and expiration date. These are used when prices are expected to fluctuate in a narrow range near the exercise price. For a straddle bottom/straddle purchase, buy a call and a put, when prices are expected to fluctuate widely in both directions. Straddle top and bottom are shown in Figure 13.12 and 13.13.

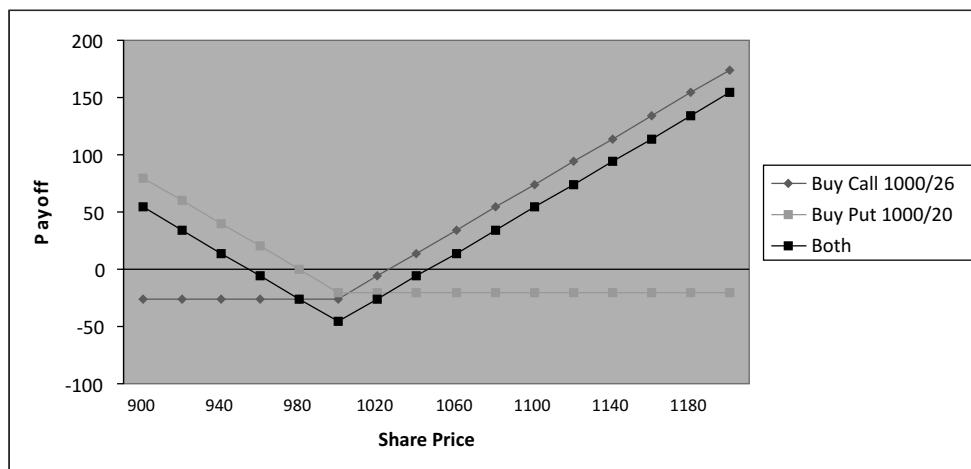
Pay Off Table for Figure 13.12			
Share Price	Sell Call 1000/26	Sell Put 1000/20	Total Payoff
900	26	-80	-54
920	26	-60	-34
940	26	-40	-14
960	26	-20	6
980	26	0	26
1000	26	20	46
1020	6	20	26
1040	-14	20	6
1060	-34	20	-14
1080	-54	20	-34
1100	-74	20	-54
1120	-94	20	-74
1140	-114	20	-94
1160	-134	20	-114
1180	-154	20	-134
1200	-174	20	-154

**Figure 13.12:** ACC Straddle Top – Sell Call Sell Put

Payoff Table for Figure 13.13			
Share Price	Buy Call 1000/26	Buy Put 1000/20	Total Payoff
900	-26	80	54
920	-26	60	34
940	-26	40	14
960	-26	20	-6

Contd...

980	-26	0	-26
1000	-26	-20	-46
1020	-6	-20	-26
1040	14	-20	-6
1060	34	-20	14
1080	54	-20	34
1100	74	-20	54
1120	94	-20	74
1140	114	-20	94
1160	134	-20	114
1180	154	-20	134
1200	174	-20	154

**Figure 13.13: ACC Straddle Bottom – Buy Call Buy Put**

Strips and straps: For a strip, purchase (Figure 13.14) two puts and one call having the same expiration and exercise price (like a straddle bottom, with double the profit potential on the lower side). For a strap, buy two calls and one put having the same expiration and strike price (like a strip with double the profit potential when prices fluctuate on the higher side).

Payoff Table for Figure 13.14			
Share Price	Buy Call 1000/26	Buy Two Puts 1000/20	Total Payoff
900	-26	160	134
920	-26	120	94
940	-26	80	54
960	-26	40	14
980	-26	0	-26
1000	-26	-40	-66

Contd...

1020	-6	-40	-46
1040	14	-40	-26
1060	34	-40	-6
1080	54	-40	14
1100	74	-40	34
1120	94	-40	54
1140	114	-40	74
1160	134	-40	94
1180	154	-40	114
1200	174	-40	134

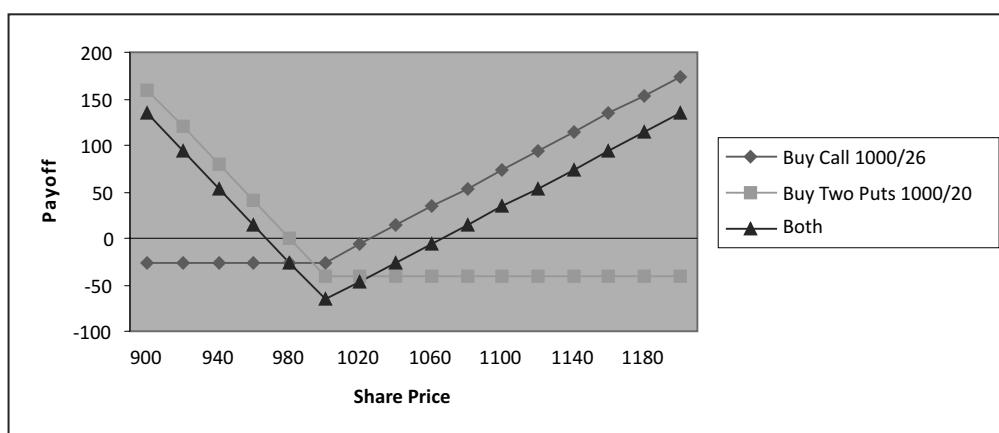


Figure 13.14: ACC Strip – Buy Call Buy Two Puts

Strangle: Buy a call and a put with different exercise prices (a long strangle), or sell a call and a put with different exercise prices (a short strangle). A long strangle is illustrated in Figure 13.15.

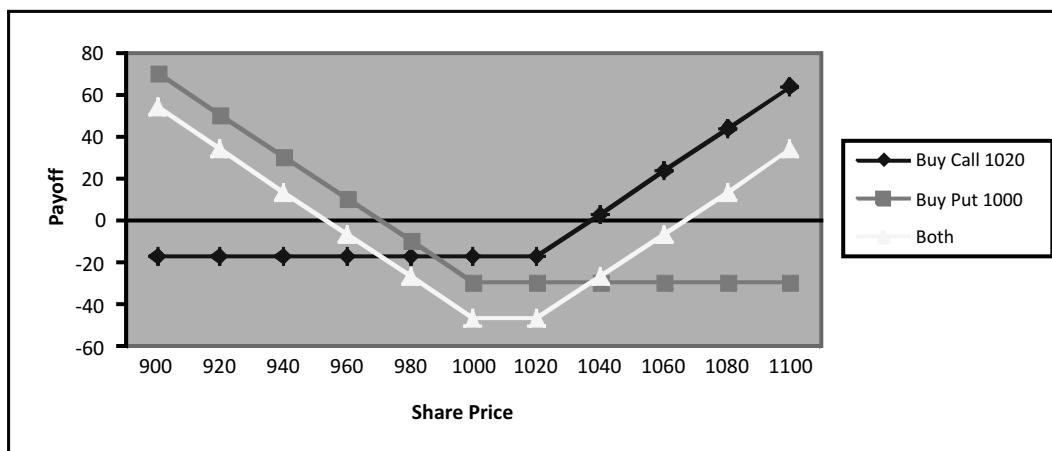


Figure 13.15: Strangle Buy 1 Call and 1 Put

Butterflies involve four trading positions with three different exercise prices. Long butterfly – buy 1 call with low exercise price, and one with higher exercise price, sell 2 calls with exercise exactly midway between these two (Figure 13.16). Alternatively, purchase 2 puts and sell 2 puts with exercise price exactly midway. For a short butterfly, do just the opposite with either calls or puts.

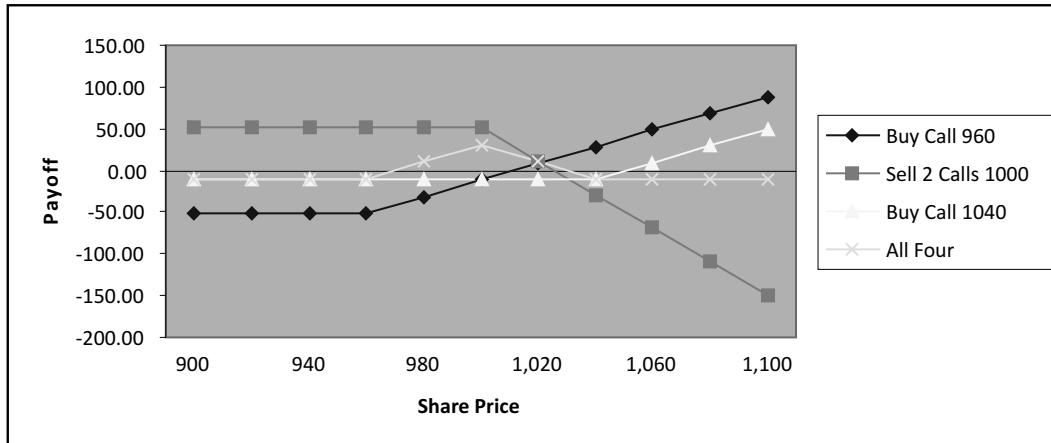


Figure 13.16: Butterfly Spread – Buy 2 Calls Sell 2 Calls

Iron butterfly: Contains four options with a combination of puts and calls. It is equivalent to a regular butterfly spread which contains either puts or calls at three strike prices. A long iron butterfly is a combination of a bull and a bear spread with calls and puts respectively. This can be seen in Figure 13.16.

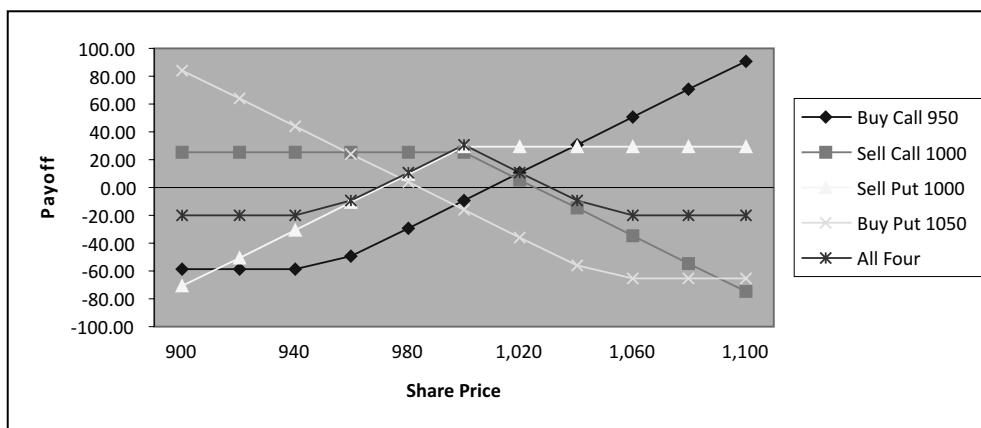


Figure 13.17: Iron Butterfly

Box spreads: Any combination of options that has a constant payoff at expiration. For example, a long butterfly made with calls combined with a short butterfly made with puts, or a bull spread with calls combined with a bear spread with puts will have a constant payoff. In practice, the profit if any is wiped out by commissions.

Time spreads involve the purchase and sale of options with the same exercise price in two different expiration months, either both calls or puts. A long call/put time spread involves

selling near and buying far. A short time spread or put time spread is simply the reverse i.e., buy near and sell far. The maximum risk of purchasing a time spread is the net premium paid. The cost of holding a long position is reduced by the premium collected from the option sold. The maximum value depends on the value of the later month option when the near option expires. One of the risks of time spreads is that the option sold may get exercised and assigned. Also, one option in the position expires before the other, which needs to be kept in mind.

■ OPTION PRICING

Black Scholes Model

The Black Scholes model can be used to calculate the price of European call and put options and American call options². The Black and Scholes model is based on the following assumptions. If the assumptions are violated the calculated price of the option may not be accurate.

1. There are no transaction costs or taxes.
2. The risk free rate is known and constant and we can borrow and lend at this rate.
3. The market is efficient; no one can predict the future direction of stock prices.
4. There are no dividends or takeovers during the period under consideration.
5. The volatility of the underlying share is known and constant.
6. Share prices follow a log normal distribution. In other words, the continuously compounded rate of return follows a normal distribution.

The options price for a call, can be computed as per the following Black Scholes formula:

$$C = S N(d_1) - E e^{-rt} N(d_2)$$

where:

$$d_1 = \frac{\ln(S/E) + (r + 0.5\sigma^2)t}{\sigma\sqrt{t}}$$

$$d_2 = \frac{\ln(S/E) + (r - 0.5\sigma^2)t}{\sigma\sqrt{t}}$$

Also, $d_2 = d_1 - \sigma\sqrt{t}$ (so we can calculate d_1 and derive d_2)

C = current option value

E = exercise price/strike price of the option

S = current price of the underlying share

² It is better to sell an American call option rather than to exercise it before maturity, because of the time value.

r = continuously compounded risk free interest rate (in decimals)

t = time to expiration (in years)

σ = standard deviation of continuously compounded annual return of the underlying share³

\ln = natural logarithm of a number with base $e = 2.7183$.

$N(d)$ is the value of the cumulative normal distribution at d (see from the standard normal distribution tables)

the price for a put is calculated as:

$$P = E \times e^{-rt} \times N(-d_2) - S \times N(-d_1)$$

The value of a put can also be calculated using put call parity wherein

$$C + E \times e^{-rt} = S + P$$

It can be shown that the outcomes of both sides of the equation are equal on expiration, therefore the value at present should also be the same, otherwise arbitrage is possible.

Adjustment for dividends receivable before expiration would be as follows:

$$C + D + E e^{-rt} = S + P$$

A numerical example to illustrate the calculation of the value of a call and put option is given below:

Calculate the fair price of a 3 month (91 days) call and put option with exercise price of 120 for a stock quoting at Rs 100. Assume interest rate of 10% and standard deviation of 0.8

$$S = 100, E = 120, t = 0.25 \text{ years}, i = 0.10, \sigma = 0.8$$

$$\begin{aligned} d_1 &= [\ln(S/E) + (r + \sigma^2/2) t] / \sigma t^{0.5} \\ &= [\ln(100/120) + (.10 + 0.8 \times 0.8/2) \cdot .25] / 0.8 \times .25^{0.5} \\ &= -0.194 \text{ and } N(d_1) = 0.42297 \text{ (calculations are more accurate with the use of a scientific calculator or computer spreadsheet. When reading tables we will have to round off the figures to two decimal places i.e., } d_1 = -0.19 \text{ and } N(d_1) = 0.4246)^4 \end{aligned}$$

$$\begin{aligned} \text{Also } d_2 &= d_1 - \sigma t^{0.5} \\ &= -0.194 - 0.8 \times .25^{0.5} \\ &= -0.5937 \text{ and } N(d_2) = 0.2763 \text{ (with tables the figures would be} \end{aligned}$$

³ The following steps are followed to calculate the standard deviation of continuously compounded return

1. Calculate weekly price relatives
2. Calculate the natural logs of the price relatives- this gives the continuously compounded weekly return
3. Calculate standard deviation of continuously compounded weekly returns
4. Annual standard deviation = weekly $\sigma \times 52^{0.5}$ (52 weeks in a year)

⁴ Ensure that the table used are cumulative standard normal. In case, cumulative tables are not available, add 0.5 to get the cumulative area under the curve.

$$d_2 = -0.59 \text{ and } N(d_2) = 0.2776$$

$$\begin{aligned} C &= S N(d_1) - E e^{-rt} N(d_2) \\ &= 100 \times 0.42297 - 120 \times 2.7183^{(-0.1 \times .25)} \times 0.2776 = 9.95 \end{aligned}$$

We calculate the price of the put option using put call parity

$$C + E e^{-rt} = S + P$$

$$9.95 + 117.04 = 100 + P$$

$$P = 26.99$$

Option prices are determined by the interaction of a number of factors. Quantifiable factors include the underlying stock price, exercise price, volatility of the underlying stock, interest rate, time to expiration, and cash dividends payable before expiration for European options. Non-quantifiable factors include the estimates of future performance of the underlying asset, and the effect of supply and demand in the options market and in the market for the underlying asset. Option pricing models integrate the quantifiable factors to arrive at a fair (theoretical) price. The actual price is determined by the market through competitive bids and offers. We can study the effect of a change in the quantifiable factors by considering each one separately while holding the others constant⁵. The effect of an increase in each factor is summarised in Table 13.3.

Table 13.3: Effect of an Increase in Factors on Option Premium

Factors	Call Premium	Put Premium
Stock price		-
Exercise price	-	
Share volatility		
Interest rate		-
Time to expiration		-
Dividends	-	

Stock price: The value of a call option will move in the direction of the underlying share price because it gives the owner the right to claim the stock. If the stock is out of the money, an increase in price will bring it closer to the exercise price. If it is in the money, the increase in price gives the owner of the call a more valuable asset. On the other hand, the value of a put option moves in the opposite direction because when prices increase, a more valuable share has to be given in exchange for a fixed exercise price.

Exercise price: When the exercise price increases, the call holder has to pay more for exercising the same option, resulting in lower premium. The put holder, however, can get more money for the same share, which makes the put option more valuable.

Share volatility: More volatility means increased magnitude of price movements in both directions, which increases the possibility of gains for both the call and put holders.

⁵ You can solve question no. 1 a) using any options calculation software to confirm the direction of change.

Interest rate: Holders of call options can earn interest on the money kept aside for exercising the option, so higher interest rate goes in their favour. On the other hand, since put holders receive the exercise money later, they lose the opportunity to earn higher interest.

Time to expiration: There are two factors that come into play when the time to expiration increases. More time means more probability of prices moving in either direction (just like increased volatility), i.e., more chances of making money for both put and call holders. More time also means that holders of call options can earn interest on the money kept aside for exercising the option for a longer time, which goes in their favour. On the other hand, put holders lose the opportunity to earn interest for a longer period. In the case of put options, the positive effect of possible reduction in price normally overshadows the negative effect of loss of interest. However, for put options that are very deep in the money, the second effect may dominate⁶. The time effect can be observed in Table 13.1. The NIFTY (100) CE-3800- Nov. had a closing price of Rs. 71.80 while 3800-Dec was Rs.122.20 and 3800-Jan was Rs.161.

Dividends: Ex-dividend price is normally lower than cum-dividend price, therefore dividend payable before expiration would reduce the share value resulting in lower call premium and higher put premium⁷. Options are, however, protected against erosion in value due to bonus issues and capital reorganization such as stock splits⁸.

The effect of a decrease in each of the factors discussed above would be in the opposite direction.

Sensitivity of Option Prices using the Black Scholes Model

Options calculators can be used to calculate the option values. The sensitivity of option prices to various factors can also be calculated. These are known as the *Greeks*:

Delta measures the sensitivity of the option premium to the price of the underlying security. It is positive for calls and negative for puts. If a call is deep in the money, change in call premium is likely to follow the price of the underlying share, therefore delta will be close to one. If it is deeply out of the money delta will tend to be close to zero.

Gamma measures the sensitivity of delta to change in the underlying share price.

Theta measures the effect of time decay in the option price. This is normally negative, as time to expiration keeps reducing.

⁶ Solve question no 1 (b) using any options calculation software to observe the negative effect and compare with solution with part (a).

⁷ ONGC announced a dividend of Rs. 20 per share to be disbursed on 30th December 2004, stock price on 28th Dec (the record date) fell by approximately Rs. 24 to Rs. 824.75, and the 800-Dec call option premium reduced by Rs. 17.

⁸ Titan rights issue of convertible debentures 1:20 was adjusted by the stock exchange based on the last cum rights (24th February 2006) price Rs 799.65 and debenture value of Rs. 350. Gain per share was calculated as $(799.65 - 350)/21 = 21.4119$. Adjustment factor for the exercise price was $(799.65 - 21.4119) / 799.65 = 0.973223$. Old exercise price/futures rate was multiplied by this factor and market lot (multiplier) was divided by this factor. Changes were incorporated from the ex- rights date, February 27, 2006

Vega measures the sensitivity of the option premium to the volatility of the underlying share. *Rho* measures the sensitivity of the option price to change in interest rates.

■ SPECIAL TYPES OF OPTIONS: RIGHTS, WARRANTS AND CONVERTIBLE DEBENTURES

Rights : Existing shareholders have a pre-emptive right to maintain their share of ownership in a company. When a company issues new shares, warrants or convertible debentures, they are given the first right to subscribe to the issue in proportion to their existing holding⁹ by paying the price fixed by the company. The price is normally lower than the existing market price, to ensure that the issue is fully subscribed. Each share entitles the shareholder to one right. If the company has one lakh shares and proposes to issue another one lakh, each share holder will be entitled to subscribe to one new share for each right (1:1 rights issue). If the proposed number of shares is only twenty thousand, then one share can be subscribed for every five rights (1:5 rights issue). If a shareholder does not want to subscribe to new shares, the rights can be sold. Rights that are not used or sold are offered proportionately to other interested shareholders. Sometimes, when stock prices decline or are expected to decline, existing shareholders may not subscribe to the rights issue¹⁰.

The theoretical value of a right = $(\text{share price} - \text{exercise price}) / (\text{number of rights required per share} + 1)$. For example, in February 2006, Titan offered one share at Rs 350 for every twenty shares held (1:20), when the market price was close to Rs 800. The value of each right = $(800 - 350) / (20 + 1) = \text{Rs.}21.43$.

Since the new shares are normally priced below the market price, the market price of shares is likely to fall after the issue and should theoretically be equal to the weighted average price of shares¹¹ = $(800 \times 20 + 350 \times 1) / 21 = 778.57$. The actual price also depends on the market sentiment. If the shareholder does not exercise or sell his right, he stands to lose Rs $(800 - 778.57) = 21.43$ per share, which is the same as the calculated value of the right. In practice, if the right is sold, the realised price will be lower than the theoretical price, so that the buyer also benefits; otherwise he can buy shares in the market after the rights issue.

A Warrant: Is the right to purchase a share from the company at a given exercise price during a specified future period. The difference between regular call options and warrants is that warrants are issued by the company and will result in an increase in the number of shares issued when exercised. Also, ordinary options have a life of three months in India, as specified by the stock exchange, whereas warrants are exercisable in the future during a period specified by the company. The valuation of a warrant is exactly the same as a call option. Warrants are often added as sweeteners for debt, preference shares, or equity. If a company plans a share issue in future, it can borrow money at cheaper rates today and give the option to buy a share at a cheap price in the future. However, warrants need not

⁹ Shareholders can waive their pre-emptive right through a special resolution.

¹⁰ In October 2008, the Hindalco rights offer devolved on the underwriters as the stock price fell to almost 80% of the offer price of Rs 98.

¹¹ Titan closing price ex rights on 27th February 2006 was Rs 780.40

be tied to the debt portion and can be traded separately. Preferential warrants may also be offered to promoters to increase their stake in the company¹².

A Convertible Bond/Debenture: Is debt with a convertibility clause. If a company plans a share issue in future, it can borrow money at cheaper rates today and convert the debt into shares in the future. The convertibility clause acts as a sweetener for the debt portion and allows the company to have a public issue at a low cost. Unlike warrants, the option is tied to the debt and both are traded together. When the option is exercised, there is no additional inflow of money to the company.

Convertible debentures consist of a debt portion and a call option. The debt portion is valued at present value depending on the interest rates prevailing in the economy, while the call option is valued like any other call option. The combined picture can be easily understood with the help of a numerical example and a diagram (see Figure 13.18).

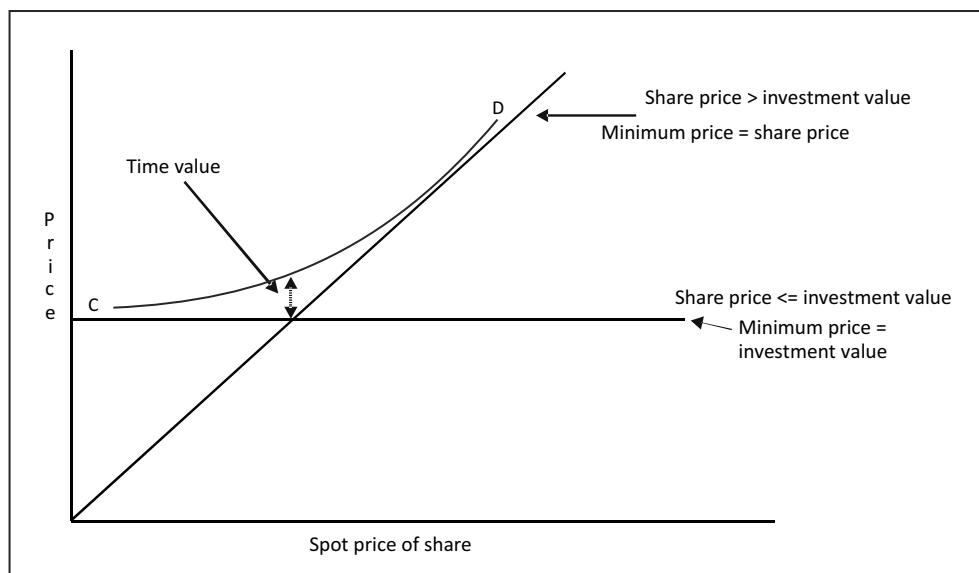


Figure 13.18: Convertible Debenture Value

ABC Ltd. issued fully convertible 5% debentures of face value Rs. 600 which can be converted into one share of the company after 2 years. If current share price is 800, and interest rates for non-convertible debentures is 10%, the valuation would be as follows:

The price of the underlying share multiplied by the number of shares per debenture is the expected value of the debenture at the time of conversion or conversion value. The conversion value is directly proportional to the share price and is similar to intrinsic value of call options. The current conversion value = $800 \times 1 = \text{Rs. } 800$.

The present value of the pure debt = $30/(1 + 0.10) + 630/(1 + 0.10)^2 = 547.93$. This is the minimum price at which the debenture will quote and is also known as the investment value. The downside of the debenture value is protected at this level. However, this value

¹² For example, Reliance Industries Ltd. issued preferential warrants to its promoters in March 2007.

can also change over time. If share price falls very sharply, it may be perceived as higher risk for the company, and the bond value will also decline. Also, increase in interest rates in the economy will reduce the investment value.

The convertible debenture also has time value just like call options. The time value is maximum near the intersection of the conversion value and investment value.

Sometimes, when companies need a combination of debt and equity, they issue partly convertible debentures (PCDs). The convertible (CD) and non-convertible (NCD) parts can be traded separately¹³. The conversion price can be revised downwards at the time of conversion¹⁴.

Convertible debentures and warrants were very popular in India during the 1990s as the prevailing interest rate was 15%. Many companies raised cheaper debt with such sweeteners. Subscribers to the issue were willing to provide cheap credit to the company for a short while to take advantage of the allotment of shares at prices cheaper than the market price. However, most issues had compulsory conversion at a predetermined date, so the valuation is essentially guided by the stock price; there is no floor price based on the pure debt value. The disadvantage of convertible debentures in India is lack of an active secondary market. There is also a possibility that share prices may decline, wiping out the advantages of conversion into a share¹⁵.

■ FUTURES

A *forward contract* is an agreement between a buyer and a seller to exchange a specified asset at an agreed price at a fixed future date. *Futures contracts* are standardised forward contracts that are traded on recognised exchanges. Since they are tradable and the exchange acts as the counter party to each contract, they are more liquid and less risky than forward contracts. A long position in futures (purchase) can be closed by selling futures, while a short position (sale) can be closed by buying futures on the exchange and settling the net difference in cash. On the settlement date, contracts can also be settled by making payment and taking physical delivery of the underlying asset. In India, futures on the stock exchange are only settled in cash¹⁶.

¹³ The Titan rights issue of PCDs of Rs 600 consisted of Rs 350 to be converted into one share on allotment and Rs 250 in 6.75% debentures redeemable after five years. The company also arranged for buyback of the NCD portion (khokha buyback), which investors could opt for at the time of application.

¹⁴ The Samtel 7% preferential PCD issue to ICICI Ventures in April 2004, convertible on May 15, 2005 had a maximum price of Rs 85 per share, which could be revised downwards based on financial results for 2005 as per SEBI norms.

¹⁵ The Tata Investment Company had launched a 1:5 rights issue of zero coupon convertible bonds, with detachable warrants having a face value of Rs 650 at par. The bonds were compulsorily convertible into two equity shares; one at Rs 300 on August 1, 2009 and one at Rs 350 within 18 months of the allotment date. The warrants could be exercised in 2011 at a price of Rs 400. The stock of TIC fell by nearly 16% from the record date of September 17, 2008 to Rs 322 on October 16. As a result most public shareholders stayed away from the issue and it devolved on the promoters.

¹⁶ On expiration, the final settlement price is the weighted average price/value of the underlying index/security in the last half hour.

In the capital market, futures contracts are available on individual stocks (stock futures) and on various indices such as Nifty, Bank Nifty and CNXIT (index futures). Futures on fixed income securities or interest rate futures were offered on Notional 91 day T – Bills and Notional 10 year bonds. However, interest rate futures did not take off and were traded on the NSE only for a limited period from June–August, 2003.

We can get an idea about transactions in futures from Table 13.4 which shows transactions on the NSE on the 9th of November, 2006.

Table 13.4: Excerpts from the Derivatives Futures Trading at NSE on 9-11-2006

Contracts	Price (Rs)				Open Int. ('000)	No. of Contracts.
	Open	High	Low	Close		
November						
ABB	3454.00	3542.70	3445.00	3495.65	311	4476
ACC	1010.00	1014.90	1001.25	1005.05	3210	4631
Bank Nifty	5598.00	5660.00	5598.00	5650.50	141	1520
CNXIT	4899.00	4914.00	4875.00	4895.70	16	105
NIFTY	3794.40	3818.80	3772.20	3801.25	26217	228227
December						
ABB	3384.00	3508.00	3384.00	3506.50	2000	8
ACC	1009.00	1023.50	1009.00	1009.10	9375	5
Bank Nifty	5650.00	5650.00	5650.00	5650.00	0.3	1
NIFTY	3797.00	3820.15	3776.35	3805.25	1158	4229
January						
NIFTY	3800.00	3824.00	3781.00	3805.25	108	193

Source: NSE Archives

1. The stock futures and index futures traded on that day are shown in the table. Indices are highlighted in bold print, for example, the Bank Nifty and CNXIT.
2. The futures are listed month-wise for the next three months November, December and January. As was the case with options, futures contracts expire on the last Thursday of each month.
3. The first entry is for the company ABB, the open, high low and closing prices are reported in rupees. Prices ranged between Rs. 3442.70 and 3542.70, opening at Rs 3454 and closing higher at 3495.65. This gives an idea of the range and movement of prices during the day.
4. The open interest represents the number of futures contracts that are held by buyers and sellers and are yet to be closed. The next column indicates the number of contracts traded on that day.

■ FUTURES PRICING/VALUATION

The theoretical price of a futures contract is the current price of the underlying asset plus the cost of carry. Cost of carry can easily be explained with the example of a physical asset. If the seller promises to deliver a house at a fixed price after one month, his cost of carry would include the interest forgone on the money invested, the salary payable to the caretaker, insurance premium payable, etc. On the other hand, his cost of carry would be reduced by the rent earned during that period. Similarly, for a stock or an index, the cost of carry would be the interest forgone on money invested and the benefit would be dividends received before settlement.

$$\text{Futures price} = \text{Asset price today} \times (1 + \text{interest rate} \times \text{time}) - \text{present value of dividend}$$

If the ACC stock price is Rs 1000, interest rate 8% per annum, present value of dividend expected Rs.10 and time to settlement 3 months, the theoretical futures price = $1000(1 + .08 \times 3/12) - 10 = \text{Rs } 1010$. For large indices such as the S&P 500, if it is possible to assume that dividends are received continuously throughout the year, the calculation can be simplified as

$$\text{Futures price} = \text{Spot price} \times (1 + (\text{interest rate} - \text{dividend rate}) \times \text{time}).$$

However, for a small index like the Nifty or Sensex, the calculation is similar to that of individual stocks.

Since fixed income instruments do not have dividends, interest rate futures are simply priced to include the interest for the intervening period. The futures price of a deep discount bond or T-bill can be calculated as follows:

$$\text{Futures price} = \text{Spot price} \times (1 + r)^t$$

The difference between the futures price and the stock price is known as the *basis*. The basis may increase or decrease during the life of the contract depending on the future expectations regarding the underlying asset. As the futures contract approaches the settlement date, the uncertainty reduces and on the settlement date, the spot and futures price converge. Under normal market conditions, futures contracts are priced above the spot price (*contango*). It is also possible for the futures price to be below the spot price (*backwardation*). This could happen when the cost of carry is negative, or when the underlying asset is currently in short supply but increased supplies are expected in future (for example, agricultural commodities). For stock and index futures, backwardation is normally due to market expectations. For example, Nifty futures for the near month contract quoted below the spot index from 26th May to 27th June 2006 and from 11th-26th of December 2006. Reliance stock futures, however, showed a mixed picture during May-June 2006 and quoted above the spot price throughout December 2006.

■ WHY BUY AND SELL FUTURES?

Futures help the buyer and seller to lock in a price to be paid at a future date. They are purchased when prices are expected to increase and sold when prices are expected to decrease.

They can be used for hedging, speculation, arbitrage, cash flow management and asset allocation. We can understand these concepts with small numerical examples. To simplify the analysis, we ignore the effect of margins, commissions and taxes.

Hedging: An investor has a long position in shares of ACC priced at Rs 1000 today. He sells one month ACC futures at Rs 1005. At the time of settlement if the price of shares is higher, say 1100, he will pay the net difference in cash i.e., Rs 95, which is compensated by an equivalent increase in the price of shares held. On the other hand, if the price of shares is lower, he will get the net difference from the seller, but will also lose on the value of shares held as they become cheaper by the same amount. Similarly, a short position in a share can be hedged by purchase of futures. It is very important to note that hedging does not improve the financial outcome, it just reduces the uncertainty.

A *perfect hedge* is possible when futures are available for the stock/bond that is to be hedged. However, if index futures are used to hedge a single stock or portfolio of stocks only the systematic risk can be hedged. In such cases, the spot price of the asset, and the price of the futures do not converge on expiration and the difference is known as the *basis risk*. Such positions are known as a *cross hedge*. Basis risk can also arise due to mismatch between the expiration date of the futures the actual selling date of the asset. If index futures are purchased, the *hedge ratio* will depend on the beta of the stock.

Arbitrage: When the theoretical price of futures is lower than the actual futures price in the market, it is possible to sell futures and buy the underlying asset to make risk free profit. If the ACC share is purchased at Rs 1000 and held for one month, the interest forgone at 6% p.a. is Rs 5. Assuming dividend of Rs 3 is expected during the month, the theoretical futures price should be approximately $Rs\ 1000 + 5 - 3 = 1002$. If futures can be sold at 105 1005, there is arbitrage opportunity of $1005 - 1002 = Rs\ 3$. If the price at settlement is 1010, the loss of Rs 5 in futures is compensated by increase in the share price and vice versa if price is 995. Similarly, if the futures are underpriced, buy futures and short sell shares (if allowed by law)¹⁷.

Arbitrage with index futures, also known as basis trading or program trading involves buying/short selling stocks in the same proportion as the index and selling/buying index futures. This needs huge capital investment and can be risky if there is a tracking error (shares purchased do not exactly mirror the index), or if expected dividends are not received (lower rate or mismatch in timing). There is also the risk that huge purchases/sales of stocks will push up/depress prices, which will reduce profits for the arbitrager.

Speculation: Futures can be bought and sold without any corresponding positions in the underlying asset in the hope of making a profit based on expected future price movements. Speculation can result in huge profits if expectations are realised, and can also result in huge

¹⁷ In July 2008, futures were quoting far below spot prices. For example, on 4th ONGC was 876.5, while July futures were 844. Theoretically, even if we assume 2% per month interest charges, the futures are underpriced by Rs 16. FIIs borrowed shares, sold them, and bought futures to lock in profits. At the end of the cycle, the futures will be settled at the spot price, which is used to buy back the shares.

losses if prices move in the opposite direction¹⁸. It is, therefore, necessary to have controls, which define or limit the type of and the extent of exposure within manageable limits¹⁹.

Asset management and cash flow management: A buyer is expecting some cash after a month and wants to buy shares of ACC which are priced at Rs 1000 today. If he feels prices will increase substantially, he can buy one month futures priced at Rs 1005 and lock in the future price, which is only marginally higher than today.

A mutual fund has huge cash receipts received from fresh subscriptions. Buy futures now and gradually replace with stocks as huge investments may push up the market and take longer to implement.

Changing allocation of funds between stocks can be done through purchase and sale of stock futures. Allocation of funds between stocks and bonds can also be changed by sale and purchase of stock and bond futures. Index futures can be used as a substitute for short term investment in an index fund. The advantage is the leverage, and disadvantage is the loss of dividends, which are earned only on actual investment in stocks.

The beta of a portfolio can be adjusted upwards/downwards with the purchase/sale of index futures. Exposure to a particular industry or stock can also be increased/decreased through purchase/sale of stock futures.

Yield enhancement: An investor who wants to invest money in a risk free asset for three months can buy a 10 year government bond (interest is normally higher than a 3 month instrument) and simultaneously sell a three month futures on the same bond. Selling futures locks in the price of the bond three months later and in effect creates a synthetic three month T-bill with a higher return than an ordinary T-bill.

American markets also offer options on index futures; the holder of the option is delivered a futures contract when a call is exercised and delivers a contract when a put is exercised.

■ FUTURES VS. OPTIONS

It is useful at this stage to compare the risk and return from futures and options. For the buyer of an option, the maximum risk is the premium paid. The potential gain for the owner of a call option is unlimited, while potential gain for the owner of a put is limited to the exercise price minus premium paid. Option-writers are just the opposite, maximum gain is premium received, while maximum loss on a call is unlimited, and for a put is limited to exercise price minus premium received. Since the option-writer is obliged to perform if an option is exercised, he also has to deposit margin money with the exchange.

Unlike options, where only the option writer is exposed to risk, both buyers and sellers of futures are exposed to the risk of price movements in the underlying asset. Although no premiums are payable, both are obliged to perform and have to deposit margins with the exchange.

¹⁸ In 1995, Nick Leeson, a trader at Barings Bank made huge unauthorized investments in index futures and incurred losses to the tune of USD 1.3 billion which ruined the bank.

¹⁹ See latest SEBI guidelines on this.

Options and futures can be used to hedge a position in a stock. A single position in futures, selling stock futures is sufficient to neutralise a long position in a stock; we can also neutralise a long position in a stock by buying a put and selling a call. Thus, a combination of options can be used to create a synthetic futures contract. However, futures cannot be used to create the same effect as an options contract.

■ MARGINS, COMMISSIONS AND TAXES

So far, we examined the payoffs from options and futures without accounting for margins, commissions and taxes.

Margins are imposed by the exchange to ensure performance of the contract by buyers and sellers of futures contracts and by option writers. Option buyers are not required to pay margins as they are not obliged to perform. The initial margin is deposited when entering into a transaction. Normally, this margin is calculated to cover price movements more than 99% of the time. Usually, three standard deviations are used for this measurement and this technique is also called value at risk (VAR). Daily losses are met by depositing of further margins, while daily profits are credited to the client's account (known as mark to market). Margins on the NSE are computed using SPAN²⁰ and gross exposure margin²¹. Margins are collected on-line, real time on a portfolio basis at the client level. Members are required to collect the margin upfront from the client and report the same to the exchange.

Brokerage is negotiable and depends on the broker client relationship, frequency and size of trades. SEBI has fixed the maximum commission on options at 2.5% of the option premium or Rs. 100 which ever is higher²². The maximum commission on futures is 2.5% of the contract value.

■ ♦ FUTURES VS. PURCHASE OF SHARES IN THE CASH MARKET

Advantages of futures: Purchases in the cash segment involve payment of the whole amount, whereas in futures just the margin is payable. Leverage enables the traders to make a larger profit or loss with a comparatively small amount of capital. Although the maximum brokerage allowed by SEBI is 2.5% in both segments, the brokerage actually charged in futures is lower than in the cash segment. If short selling is not permitted in the cash segment, futures can be sold and squared off at any time till expiry.

Advantages of shares: The price of the shares in the cash segment is normally lower than the futures price. The cash segment allows for purchase of small lots, starting from just one share, but futures are bought and sold in multiples of the prescribed lot size. Dividends are payable only to shareholders. Futures, are taxed at 33% on profit, whereas for equity is taxed at 10% for short-term capital gains if sold within a year, and there is no tax on long-term

²⁰ SPAN® is a registered trademark of the Chicago Mercantile Exchange, used by NSE under License. It is the maximum possible loss over a time frame of 1 day. It takes into account the worst-case loss by valuing the portfolio under 16 scenarios of changes in the value of the index and volatility.

²¹ 3% for index futures and 5% for individual stock futures.

²² Prior to January 07, brokerage was payable on the nominal value of the contract.

capital gains, if sold after a year on a recognised stock exchange after payment of STT²³. The BSE has provided a Basket Trading System²⁴ to provide investors the facility of creating Sensex linked portfolios. They can buy/sell all 30 scrips of Sensex in the proportion of their respective weights in the Sensex. They can also create customised baskets by deleting certain scrips from the Sensex and even alter the weights of securities in such baskets as per their own requirements. This allows traders to take advantage of arbitrage opportunities in the cash and futures market.

■ SUMMARY

Two types of derivatives, namely options and futures, have been discussed in this chapter. They provide an opportunity to hedge risk and to speculate at a given price and within a fixed time frame. Their valuation depends on various underlying factors. Since the upfront payment is normally a small percentage of the underlying security, and benefits/losses are equivalent to the underlying, there is high leverage. Investors can combine securities and derivatives in various ways depending on their anticipations of the future and to suit their requirements.

■ SOLVED EXAMPLES

1. A Portfolio of Rs 10 lakhs has beta of 1.1, the manager of this portfolio wants to reduce beta to 1. He is thinking of two possible ways to do this. a) Sell part of the portfolio and invest in risk free government securities and b) Sell stock index futures. The spot index is at 1100 and futures at 1130. Futures contracts are available in multiples of 50.

Ans:

- (a) To sell part of the portfolio and invest in government securities the amount is calculated as follows

Desired beta = w (proportion in portfolio)* Beta of portfolio + $(1-w)$ * beta of risk free asset(which = 0)

$$1=1.1*w \text{ therefore } w = 1/1.1=0.9091$$

And proportion in risk free asset= $1-w = 0.0909$

$$0.0909*\text{Rs 10 lakhs} = \text{Rs 0.909 lakhs} = \text{Rs 90,900}$$

He would need to sell part of his portfolio and buy Rs 90,900 worth of government securities. (assuming no transaction charges)

- (b) To reduce beta through the use of index futures the value of stock index futures to be sold is calculated as

²³ STT is 0.1% on the value of transactions of delivery-based purchase of an equity share in a company or a unit of an equity oriented fund, and 0.0133% on the value of transactions of derivatives, entered in a recognised stock exchange.

²⁴ Introduced by the Exchange w.e.f., August 14, 2000.

Value of portfolio (Portfolio beta-desired beta) = 10 lakhs *(1.1-1) = 10 lakhs * 0.1 = Rs 100,000

He has to sell Rs 100,000 worth of index futures

Value of one futures contract = index * multiplier = 1100 * 50 = Rs 55000

Therefore number of contracts to be sold = 100,000 / 55,000 = 1.81 say 2 contracts

2. In the above question if the manager wanted to increase beta to 1.25 what are the two options available to the manager?

Ans:

- Short sell government securities (assuming this is possible) and invest in the portfolio.

Value to be short sold is calculated as follows

Desired beta = existing beta * w (proportion in portfolio) + (1-w) * beta of government security (beta=0)

$$1.25 = w * 1.1 \text{ therefore } w = 1.25 / 1.1 = 1.1364$$

And (1-w) the proportion of government securities = -0.1364 i.e. they need to be short sell

0.1364 * Rs 10 lakhs = Rs 1.364 lakhs or Rs 1,36,400 and invest the proceeds in the risky portfolio.

- He can buy index futures to increase beta and the calculation will be as follows

Value of portfolio (Portfolio beta-desired beta) = 10 lakhs *(1.25-1.1) = 10 lakhs * 0.15 = Rs 1,50,000

He has to buy Rs 1,50,000 worth of index futures

Value of one futures contract = index * multiplier = 1100 * 50 = Rs 55000

Therefore number of contracts to be bought = 150,000 / 55,000 = 2.72 say 3 contracts

3. Spot value of Sensex is Rs 25000, time to expiration is 80 days, risk free rate is 6% and the contract multiplier is 100. What is the fair value of the futures contract?

Ans:

$$F = S_0 * e^{rt}$$

First calculate $r = \ln(1+R_f) = \ln(1+0.06) = 0.0582$

$$F = 25000 * e^{(0.0582 * 80 / 365)}$$

$$= 2500 * 1.01284 = \text{Rs } 25320.95$$

4. From the following calculate the price for a call option using Black and Scholes model

Underlying Stock Price	900
Exercise Price	1000
Risk Free Rate	0.05
Days to Expiry	80
Historical Volatility	0.22

Ans:

Time to Expiry (Years)	0.219178
$[\ln(S/E)$	-0.10536
$(r + \sigma^2 / 2) * t$	0.016263
$\sigma * t^{1/2}$	0.102996
$d_1 = [\ln(S/E) + (r + \sigma^2 / 2) * t] / \sigma * t^{1/2}$	-0.86506
$d_2 = [\ln(S/E) + (r - \sigma^2 / 2) * t] / \sigma * t^{1/2}$	-0.96805
$N(d_1)$	0.193504
$N(d_2)$	0.166509
$E * e^{-rt}$	989.1009
$N(-d_1)$	0.806496
$N(-d_2)$	0.833491

Value of Call Option	$C = S * N(d_1) - E * e^{-rt} * N(d_2)$	9.459272
Value of Put Option	$P = E * e^{-rt} * N(-d_2) - S * N(-d_1)$	98.5602
Value of Put Option (put call parity)	$C + E * e^{-rt} = S + P$	98.5602

5. A stock is currently priced at Rs 900. A put option with exercise price of Rs 1000 is available for Rs 120

What is the intrinsic value and time value ?

Ans: Intrinsic value = higher of 1000-900 or zero

Intrinsic value = 1000-900=Rs 100

Time value = option price-intrinsic value=120-100=Rs 20

6. A stock is currently priced at Rs 900. A call option with exercise price of 1000 is available for Rs 10. What is the intrinsic value and time value?

Intrinsic value is higher of 900-1000 or zero.

Intrinsic value= 0

Time value = call price-intrinsic value =10-0 = Rs 10.

■ MULTIPLE CHOICE QUESTIONS

- An investor who is holding shares of XYZ Ltd. And is worried that the prices may fall when he plans to sell them at a later date can protect himself by
 - Buying a call option
 - Selling a call option
 - Selling a put option
 - Buying a put option

2. An investor who is holding shares of XYZ Ltd and is worried that prices may fall when he plans to sell the shares at a later date can protect himself by
 - (a) Buying futures
 - (b) Selling futures
 - (c) Buying a call option
 - (d) Selling a call option
3. Which of the following need to maintain margins with the exchange?(mark all correct options)
 - (a) Buyers of call options
 - (b) Sellers of call options
 - (c) Buyers of put options
 - (d) Sellers of put options
 - (e) Buyers of futures
 - (f) Sellers of futures
4. An investor who buys a call on a share and sells a call with a higher exercise price on the same expiration date is most probably expecting prices to
 - (a) Rise
 - (b) Fall
 - (c) Move within a narrow range
 - (d) None of the above
5. An investor who sells a call and a put on a share with the same exercise price and expiration date is most probably expecting prices to
 - (a) Rise
 - (b) Fall
 - (c) Move within a narrow range
 - (d) None of the above
6. State if the following are True or False with reasons:
 - (a) Buyers of call options have limited losses.
 - (b) Sellers of call options have limited losses.
 - (c) Sellers of put options have limited losses.
 - (d) A put option has intrinsic value when market price of the share is higher than strike price.
 - (e) The basis for a futures contract is zero at expiration.

■ QUESTIONS

1. Compare forward contracts and futures contracts
2. Compare futures and options contracts.
3. Do derivative securities increase market efficiency?
4. What are the potential risks and returns in
 - (a) buying a call
 - (b) writing a call
 - (c) buying a put
 - (d) writing a put
5. What are the potential risks and returns in
 - (a) Having a long/short position in a spread
 - (b) Having a long/short position in a straddle
 - (c) Having a long/short position in a strangle
 - (d) Having a long/short position in a butterfly
6. Give two examples of how derivatives can be used in portfolio management.
7. What is the relationship between the prices of puts and calls?
8. What is the difference between a warrant and a call option?
9. What are the major differences between warrants and convertible debentures? Explain with the help of diagrams.
10. Futures markets allow investors to transfer risk. Comment.
11. “Futures are a zero sum game” Comment.
12. Out-of-the-money options have no value. True or false with reasons.
13. Explain the concept of leverage with derivatives.
14. Is it in general more risky to sell a call option or a put option?
15. What do the terms delta, theta, vega, rho, and gamma indicate?
16. What would an investor receive when he exercises an option on a futures contract?

■ PROBLEMS

1. (a) The current price of a share is Rs 100, exercise price of a 60 day call and put option is Rs 100, interest rate is 10% and standard deviation of return is 50%. Use an options calculator to calculate the premium for a put and call option. Calculate the effect of the following changes, one at a time, keeping all others constant. Summarise the effect of various factors on put and call premiums.

Share price Rs 80

	120
Exercise Price	Rs 100
	140
Interest Rate	8%
	12%
Time to expiry	30 days
	90 days

- (b) Repeat the above exercise with a starting share price of Rs 30 and exercise price of Rs 30. What do you observe?
2. Mr X bought a three month put option on ABC Ltd. for Rs 6. At that time the share was priced at Rs 46 and the exercise price was Rs 50. Calculate the absolute and annualised profit/loss if the share price at expiration is
- (a) Rs 40
 - (b) Rs 50
 - (c) Rs 60
3. Stock ABC is currently priced at Rs 1000. A put option with exercise price of Rs 980 is available for Rs 42. What is the intrinsic value and time value?
4. Stock XYZ is currently priced at Rs 900. A put option with exercise price of Rs 1000 is available for Rs 110. What is the intrinsic value and time value?
5. Stock PQR is currently trading at Rs 1200. A call option with exercise price of Rs 1000 is available for Rs 216. What is the intrinsic value and time value?
6. ABC Ltd. is trading at Rs 250 today. A three month call option with a strike price of Rs 300 is available for Rs 11. The risk-free rate of interest is 12%, calculate the price of a similar put option.
7. A stock trading at Rs 100, calculate the fair price of a three month call and put option with exercise price of Rs 120, if the volatility of historical returns is 50% and risk free rate is 12%.
8. Mr X is holding a share portfolio worth Rs 10 lakhs with a beta of 1.2. He wants to reduce the portfolio to 1.1. (a) What percentage of the portfolio does he need to sell and invest in T-Bills? (b) What is the value of stock index futures should he buy or sell?
9. Mr X bought a futures contract for Allahabad Bank at Rs 95. Calculate his profit three months later on expiration if the settlement price was (a) Rs 110, (b) Rs 90.
10. Shares of ICICI Bank are available at Rs 800. What is the fair value of the three month futures contract, if money can be borrowed at 12% per annum and Rs 30 dividend is expected at the end of two months?

11. A convertible bond with par value Rs.1000 has current market price of Rs. 900. It is convertible into 10 shares that are currently available at Rs 80 in the market. Explain the possible reasons for it being priced at Rs. 900.
12. ABC Ltd. issued 5 year 12% non-convertible debentures and 7% convertible debentures at Rs 500 each with the option to convert the same into a share after three years. At that time, the share was quoted at Rs 600. What are the advantages and disadvantages of investing in each of the debentures?
13. An investor buys a September call option with exercise price of Rs 30 for Rs 10, and sells a September call option for the same stock with an exercise price of Rs. 40 for Rs 4. Draw a rough sketch to show the payoffs, and calculate the maximum profit, maximum loss and breakeven point.

■ PRACTICAL EXERCISES

1. Look up the page dealing with options in any newspaper and explain your observations.
 - (a) Compare the premium of one, two and three month put and call options for some stocks/index of your choice.
 - (a) Compare the premium for various exercise prices for put and call options for any stock/index of your choice.
2. Look up the page dealing with futures in any newspaper. Compare the prices for 1, 2, 3 month futures on the same stock/index. Do this for a number of stocks. What is the implied interest rate?
3. Calculate the volatility for 5 stocks that have quotes for 1, 2 and 3 month call and put options. Use the Black and Scholes option calculator to calculate the theoretical value for these options and compare with the actual values. For a larger project, compare accuracy for at the money, deep in the money, and deep out of the money options. This can also be done to compare pricing of stocks with high volatility and low volatility.

CASE STUDY

A financial advisor is studying the options market in order to advise clients on the strategies available in the Indian stock Market. To start with he takes a look at the index options available on the Nifty. This is based on the S&P CNX Nifty, a diversified index comprising of 50 stocks across 22 sectors, which accounted for 56.5% of the NSE market capitalisation in March 2006.

Nifty options have a contract size of 100. All index options are European options; they expire on the last Thursday of the month i.e. 29th November, 27th December and 31st January. The value of the Nifty is currently Rs. 3796.4 and estimated annual volatility based on past data is 24%. and risk free rate is 6%. The put and call options available are given in Exhibit 1.

Exhibit 1: Option Premiums on Nifty as on Nov. 9, 2006

Exercise Price	Calls			Puts		
	November	December	January	November	December	January
3500	302	343.4		11.5	40.05	
3700	139.3	178		41.2	88.3	127.5
3750	103.1	163.15		56.15	97.75	
3800	71.8	122.2	161	72.82	121.5	160
3900	27.15			126.25		

The questions that clients are likely to ask include the following:

1. Are any options in the money ?
2. Are any options out of the money?
3. Why is the call premium for Nov/3500 higher than Nov/3900 while the put premium for the Nov/3500 is lower than Nov/3900 ?
4. Why are the call and put premiums for Dec/3500 higher than Nov/3500 ?
5. Are the call and put premiums as expected according to the Black and Scholes model?
6. If an investor is holding a basket of shares representing the Nifty , and he plans to sell them in sometime in the next two months. Are there any advantages/ disadvantages of selling a Nov/3500 call option ? Are there any advantages /disadvantages in buying a Nov/3500 put option ?
7. If an investor does not want to sell his shares in the near future which call option might he prefer to write - Nov/3500 or Nov/3900 and why?
8. An investor is planning to buy shares representing the Nifty in future. Are there any advantages/disadvantages in buying
9. If you expect the market expected to go up in the near future, construct a bullish spread with December calls at 3700 and 3800 and a bullish spread with the same exercise price and expiration puts and compare the maximum profit, loss and breakeven.
10. Construct a straddle top and bottom using Dec/3800 calls and puts. Which is advisable?

PART VI



Investment Analysis and Management

- | | |
|------------|--|
| Chapter 14 | Portfolio Analysis |
| Chapter 15 | Portfolio Planning and Management |
| Chapter 16 | Asset Pricing Models: Required Return Analysis |
| Chapter 17 | Mutual Funds and Performance Analysis |

CHAPTER - 14

Portfolio Analysis

LEARNING OBJECTIVES

At the end of this chapter, you will be able to:

- Understand how portfolio risk and return are calculated
- Appreciate the advantages of diversification
- Apply the Markowitz technique for efficient diversification
- Determine portfolio risk using the Markowitz technique
- Separate risk into systematic and unsystematic risk
- Calculate portfolio risk using the Market Model.

In the chapter on risk and return, we saw that higher return normally goes hand in hand with higher risk. We also learnt that there is no single investment that is “best” for all investors in all circumstances. In practice, individuals normally hold a portfolio of assets with the aim of reducing risk. The traditional approach to portfolio diversification advocates diversification within across asset classes such as stocks, bonds, gold, real estate etc. Within an asset class such as stocks, further diversification can be done across industries. Diversification reduces unsystematic risk in two ways: first the absolute amount invested in each asset is lower than if the entire amount is put into a single asset, so the risk from each asset is limited. The second reason is that specific asset returns may be positive or negative in a particular period, and the average impact is likely to cancel out in large portfolios.

The decision to include a specific stock is based on fundamental analysis including the market, its competitors and the company’s financial statements to estimate the returns and risk. The choice of asset classes, industries and stocks and proportion of each to include in a portfolio are based on the judgement of the analyst. Since the technique cannot be quantified, every analyst/investor will come up with a different solution. It is also difficult to collect vast amounts of data for all the assets and form a judgement on each before taking a decision. On the other hand, modern portfolio theory uses quantifiable measures of risk and return, and provides a method by which all investors can identify an optimum portfolio. In this chapter, we will be studying modern portfolio theory, which is based on Markowitz diversification.

■ RISK AND RETURN

Modern portfolio theory proposes a method for diversification and optimisation of portfolios. It assumes that investors are risk-averse and that they take rational decisions based on risk and return.

The expected return of a portfolio is simply calculated as the weighted average expected return of the assets:

$$R_p = \sum(X_i R_i) \text{ for } i = 1 \text{ to } n \quad (1)$$

Where X_i are the fractions of the portfolio held in each asset and R_i are their expected returns. Historical returns are normally used to estimate returns.

We use standard deviation to measure risk, i.e., the probability of deviation from expected returns. Unlike return, we cannot take the weighted average of individual standard deviations. Portfolio variance and standard deviation are calculated as follows:

$$\text{Variance} = \sigma_p^2 = (\sum \sum X_i X_j r_{ij} \sigma_i \sigma_j) \quad (2)$$

$$\text{Standard Deviation} = \sigma_p = \sqrt{\sum \sum X_i X_j \rho_{ij} \sigma_i \sigma_j} \text{ for } i=1 \text{ to } n \text{ and } j = 1 \text{ to } n \quad (3)$$

where σ_i and σ_j are the standard deviations of each pair of assets and ρ_{ij} is the correlation between them.

For two assets, A and B, the return and standard deviation would be

$$\text{Portfolio Return} = R_p = X_A R_A + X_B R_B$$

Portfolio Standard Deviation =

$$\sigma_p = \sqrt{X_A X_A \rho_{AA} \sigma_A \sigma_A + X_B X_B \rho_{BB} \sigma_B \sigma_B + X_A X_B \rho_{AB} \sigma_A \sigma_B + X_B X_A \rho_{BA} \sigma_B \sigma_A}$$

Since correlation between A and A = 1 and A combined with B is the same as B combined with A.

$$\text{Portfolio Standard Deviation} = \sqrt{X^2 A \sigma_A^2 + X^2 B \sigma_B^2 + 2X_A X_B \underbrace{\rho_{AB} \sigma_A \sigma_B}_{\text{covariance}}}$$

In terms of covariance¹, the portfolio risk can be expressed as

$$\sigma_p^2 = \Sigma \Sigma X_i X_j \sigma_{ij} \text{ and}$$

$$\sigma_p = (\Sigma \Sigma X_i X_j \sigma_{ij})^{0.5} \text{ for } i = 1 \text{ to } n \text{ and } j = 1 \text{ to } n$$

where σ_{ij} is the covariance between each pair of assets.

We take a hypothetical example specially designed to illustrate certain effects of combining assets.

	A	B
Return %	10	12
Standard deviation	2	6
Correlation	-1	
Proportion	0.75	0.25

Since return of B is only 20% higher than A, while its standard deviation is three times that of A, it may seem pointless to combine A with B. However, we proceed with the example as it has been designed to prove a point.

$$\text{Portfolio Return} = R_p = X_A R_A + X_B R_B = .75 \times 10 + .25 \times 12 = 10.5$$

$$\begin{aligned} \text{Portfolio Standard Deviation} &= \sigma_p = (X_A^2 \sigma_A^2 + X_B^2 \sigma_B^2 + 2X_A X_B \rho_{AB} \sigma_A \sigma_B)^{0.5} \\ &= (.75 \times .75 \times 2 \times 2 + .25 \times .25 \times 6 \times 6 + 2 \times .75 \times .25 \\ &\quad \times -1 \times 2 \times 6)^{0.5} = 0 \end{aligned}$$

Combining 25% of the *more risky security B decreased the risk of the portfolio even below that of A alone*. We not only get higher return than A alone, but lower risk as well.

Markowitz showed that diversification of a portfolio does not depend on the number of assets but on the type of securities which are combined². The key to efficient diversification involves combining assets with negative or low covariance or correlation among them to reduce risk without sacrificing return. Since the two assets in the above example are perfectly negatively correlated, it is theoretically possible to completely eliminate the risk of the portfolio. Although perfect negative correlation is not found in the real world, it is possible to create portfolios with higher return and lower risk than individual assets.

¹ Covariance between two securities A and B = $\{\Sigma(\text{Return A} - \text{Expected return A}) \times (\text{Return B} - \text{Expected return B})\}/\text{number of observations}$. The coefficient of correlation $\rho_{AB} = \text{cov}_{AB}/(\sigma_A \times \sigma_B)$

² See Markowitz 1952 and 1976, he won the 1990 Nobel Prize in Economics for this work.

If we look at the formula used for calculation of portfolio risk for two assets

$$\begin{aligned}\sigma_p &= (X_A^2 \sigma_A^2 + X_B^2 \sigma_B^2 + 2X_A X_B \rho_{AB} \sigma_A \sigma_B)^{0.5} \\ &= (X_A^2 \sigma_A^2 + X_B^2 \sigma_B^2 + 2X_A X_B \sigma_{AB})^{0.5}\end{aligned}$$

we can see the following:

1. Portfolio risk depends on the proportion invested in each security, their individual risks and their correlation or covariance.
2. If the two assets are independent, correlation will be zero and the third term will be zero.
3. If the two assets move together correlation is positive, the third term will be positive and portfolio risk will increase. If correlation is negative, the portfolio risk will reduce.
4. Risk can be totally eliminated only if the third term is negative and equal to the first two terms.

The proportion of investment required in each security for elimination of risk can be calculated as follows if we take correlation = -1 and portfolio risk= 0 and solve

$$X_A \sqrt{X_A^2 \sigma_A^2 + X_B^2 \sigma_B^2 - 2X_A X_B \sigma_A \sigma_B} = 0$$

$$X_A \sigma_A - X_B \sigma_B = 0$$

$$\text{we also know that } X_A + X_B = 1$$

$$\text{Therefore, } X_A \sigma_A - (1 - X_A) \sigma_B = 0$$

$$X_A = \sigma_B / (\sigma_A + \sigma_B) \text{ and } X_B = \sigma_A / (\sigma_A + \sigma_B)$$

$$\text{In the earlier example, } X_A = 6/(6 + 2) = 0.75 \text{ and } X_B = 2/(6 + 2) = 0.25$$

As was mentioned earlier, the example we used was designed to prove a point. Let us see what happens if we change the correlation and keep the proportion of A and B the same and also keep correlation constant and change the proportions invested. Results are presented in Table 14.1 and plotted in Figure 14.1.

Table 14.1: Portfolio Return and Risk with Varying Correlations and Proportions

Portfolios	1	2	3	4	5	6	7
Proportion of A	100%	75%	67%	50%	33%	25%	0%
Proportion of B	0%	25%	33%	50%	67%	75%	100%
Portfolio return %	10	10.5	10.67	11	11.33	11.5	12
Portfolio risk							
If correlation = +1	2.00	3.00	3.33	4.00	4.67	5.00	6.00
If correlation = 0	2.00	2.12	2.40	3.16	4.06	4.53	6.00
If correlation = -1	2.00	0.00	0.67	2.00	3.33	4.00	6.00
Return on A = 10% and on B = 12%							
Standard deviation of returns for A = 2, and B = 6							

We can make the following observations from Table 14.1.

1. For every given proportion of A and B, risk is highest when correlation is +1 and lowest when correlation is -1 .
2. When correlation is $+1$ the risk increases as the proportion of B the more risky asset increases.
3. When correlation is -1 the risk decreases below that of A alone to zero and then increases as the proportion of B the more risky asset increases.

Though it is not possible to show all combinations and correlations, we can generalise that as long as the correlation between the assets is lower than the ratio of the standard deviations, with the smaller standard deviation in the numerator, portfolio risk can be below the smaller standard deviations.

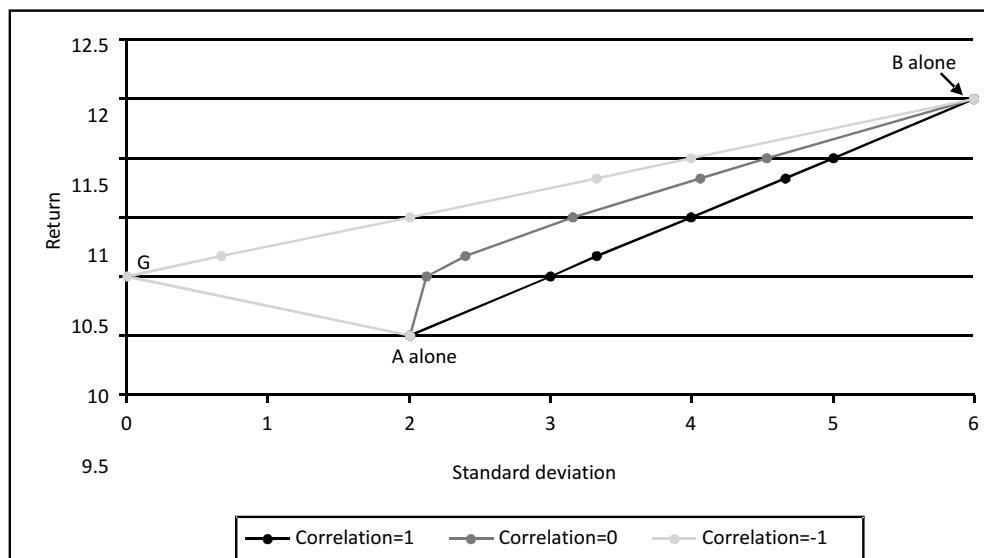


Figure 14.1: Portfolio Risk and Return

In Figure 14.1, the extremes of correlation values from $+1$ to -1 allow us to describe the boundary within which all possible combinations of two assets lie irrespective of the correlation. When there is perfect positive correlation there is a linear relation between risk and return, and it is not possible to reduce risk below that of A alone. As highly negative correlations are rare in reality, the boundary would be close to the area between 0 and $+1$ correlation. For a given correlation, we can expect a curve above or below the one depicted by zero correlation.

Combining More than Two Assets

So far, we had taken portfolios with only two assets. The calculation of portfolio variance with two assets was calculated with 2 squared terms for A and B respectively and one term for A and B combined as shown below the two standard deviations. The minimum variance portfolio can be calculated as follows:

Proportion in A = $W_A = \sigma_B(\sigma_B - \rho_B \sigma_A) / (\sigma_A^2 + \sigma_B^2 - 2\rho_{AB}\sigma_A\sigma_B)$

For example

Stock	Expected return %	Standard deviation
A	10	5
B	14	10
Correlation between A and B	0.4	

Proportion in A = $W_A = \sigma_B(\sigma_B - \rho_B \sigma_A) / (\sigma_A^2 + \sigma_B^2 - 2\rho_{AB}\sigma_A\sigma_B) = 10*(10-0.4*5) / (10*10 + 5*5 + 2*0.4*10*5) = 16/17 = 0.9411$

and Portfolio standard deviation =

$$(0.9411*0.9411*5*5+0.0589*0.0589*10*10+2*0.9411*0.0589*0.4*10*5)^{0.5} = 4.97$$

Portfolio standard deviation is below that of A

$$\sigma_p^2 = \underbrace{X_A^2 \sigma_A^2 + X_B^2 \sigma_B^2}_{\text{1 such term for each asset}} + \underbrace{2X_A X_B \rho_{AB} \sigma_A \sigma_B}_{\text{1 such term for each pair of assets}}$$

When we combine more than two assets, the number of terms required for calculation of portfolio standard deviation does not increase in the same proportion. The number of terms is = N(number of squared terms = number of assets) + ${}^N C_2$ (combinations of assets taken 2 at a time). For example, for three assets the number of squared terms will be 3 and the number of terms with correlation/covariance will be $({}^3 C_2) = (3 \times 2) / (2 \times 1) = 3$. For four assets, the number of squared terms will be 4 and number of correlation/covariance terms will be $({}^4 C_2) = (4 \times 3) / (2 \times 1) = 6$.

Another way of determining the number of terms that will appear in the calculation when the number of assets is not too large, is to draw a square matrix equal to the order of the number of assets. For 4 assets, we draw a 4×4 matrix as given below. The cells in the diagonal represent the squared terms and the rest of the cells represent combinations of assets two at a time. Since the cells above and below the diagonal are identical for the terms with correlation/covariance, we need to count the number of cells either in the upper half or the lower half. Mathematically, this is $(N^2-N)/2$, for 4 assets it becomes $(16-4)/2=6$.

Asset	A	B	C	D
A	AA	AB	AC	AD
B	AB	BB	BC	BD
C	AC	BC	CC	CD
D	AD	BD	CD	DD

We take an example of a three asset portfolio to show how return and risk are calculated.

	A	B	C
Return	10	12	14
Standard deviation	4	5	8
Proportion in portfolio	0.5	0.3	0.2
Correlation			
A	1	0.5	0.7
B		1	0.4
C			1

$$\text{Portfolio return} = 0.5 \times 10 + 0.3 \times 12 + 0.2 \times 14 = 11.4$$

$$\begin{aligned}\text{Portfolio risk} &= \sigma_p = (X_A^2 \sigma_A^2 + X_B^2 \sigma_B^2 + X_C^2 \sigma_C^2 + 2X_AX_B \rho_{AB} \sigma_A \sigma_B + \\ &\quad 2X_AX_C \rho_{AC} \sigma_A \sigma_C + 2X_BX_C \rho_{BC} \sigma_B \sigma_C)^{0.5} \\ &= (0.5^{12} \times 4^2 + 0.3^{12} \times 5^2 + 0.2^{12} \times 8^2 + 2 \times 0.5 \times 0.3 \\ &\quad \times 0.5 \times 4 \times 5 + 2 \times 0.5 \times 0.2 \times 0.7 \times 4 \times 8 + 2 \times 0.3 \times \\ &\quad 0.2 \times 0.4 \times 5 \times 8)^{0.5} = 4.267\end{aligned}$$

Such a calculation would be required for each combination of A, B and C considered.

If we calculate and plot the risk and return for various combinations of three assets we would get a diagram resembling Figure 14.2.

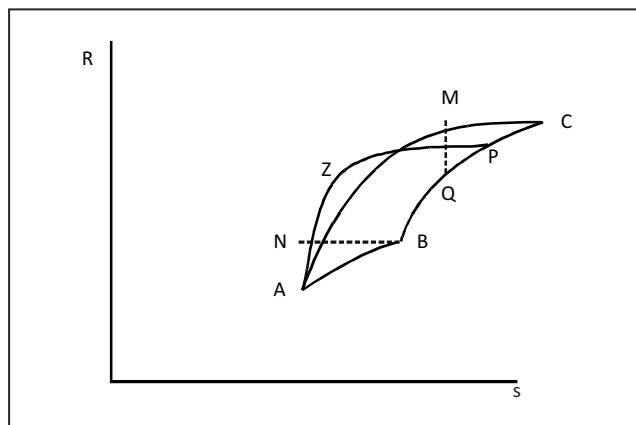


Figure 14.2: Portfolios with three Assets

The curves show the various portfolios that can be made with combinations of asset A and B, B and C, and A and C and the curve AZP shows one set of combinations of A, B and C. All portfolios that can be created from the available assets are referred to as *feasible* portfolios. In choosing between two different possible investment positions, we assume that an investor will prefer the one, which gives the largest expected return if the risks involved are the same. In Figure 14.2, portfolio M is vertically above point Q, it offers higher return for the same level of risk., therefore M is *efficient* and Q is inefficient. The portfolio that has the highest return for a given level of risk is the most efficient. If expected returns are

the same, we assume investors will choose the portfolio with the lower risk as measured by the standard deviation of returns on the total holdings. These are referred to as efficient portfolios. In Figure 14.2, N is horizontally to the left of B, it offers the same return with less risk, so N is efficient as compared to B. Portfolio Z not only offers higher return but also lower risk as compared to B; it is clearly more efficient than B. However, we cannot comment on the efficiency of M versus C, as C has higher risk and return; C may be preferred by investors willing to take more risk for higher return, while M may be preferred by investors who prefer lower return with lower risk.

Since all rational investors prefer efficient portfolios, we would like to calculate only the efficient combinations. Calculating all possible combinations is very tedious; Markowitz used quadratic programming to determine the least risk portfolio for every level of return, known as the efficient frontier³. The efficient frontier shown in Figure 14.3 is a concave function, all points on and below it are feasible while those above it are infeasible. It has the maximum return portfolio, which consists of a single asset with the highest return at the extreme right and the minimum variance portfolio on the extreme left. The area under the efficient set represents feasible but inefficient combinations of assets. Since, there are two criteria – expected return and risk – investors can select a point on the set of optimal portfolios depending on their risk and return preferences.

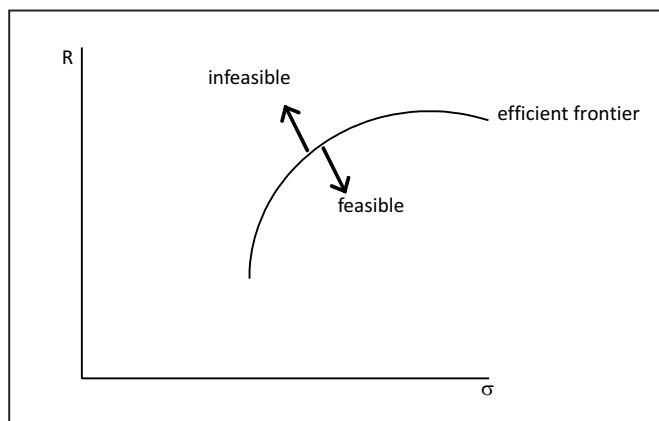


Figure 14.3: The Efficient Frontier

The efficient frontier can be drawn using any number and combination of assets. We can construct an efficient frontier of stocks, of bonds, of stocks and bonds, stocks, bonds and gold etc. What do you think can happen to the efficient frontier if a new asset is added? There is a possibility that it remains the same or may move upwards if the asset provides an opportunity for more efficient diversification⁴.

The Markowitz model, however, is very demanding in its data needs and computational requirements as expected returns and standard deviations are required for each security

³ (Markowitz 1991)

⁴ Those who have studied linear programming would recall that additional variables may help improve the solution, but can never make it worse. An additional constraint can, however, worsen the solution.

along with covariances for each pair of assets. Sharpe⁵ developed a simple index model for portfolio optimisation, which assumes that all stocks are related to each other via the market.

■ THE MARKET MODEL

Factor models or index models assume that the return on a security is sensitive to movements of various factors or indices. As a return generating process, a factor model attempts to capture the major economic forces that systematically move prices of all assets. Single index models relate the return on assets to a single index; the market model, for example, assumes that it is the return on the market index.

The market model is also known as the one-factor model, the single index market model, the linear characteristic line, and the diagonal model. It assumes that investors are single period, risk-averse, wealth maximisers who select assets based on the mean-variance criteria. The model also assumes that the rates of return for any security are linearly generated by one stochastic factor, the market activity. The market model in its ex-ante form can be expressed as:

$$\bar{R}_i = \alpha_i + \beta_i \bar{R}_m \quad (4)$$

Where R_i is the expected return on security i . The testable ex-post form may be written as:

$$R_i = \alpha_i + \beta_i R_m + \varepsilon_i \quad (5)$$

Where R_i is the return on the security, β_i is the slope or beta coefficient, R_m is the return on the market index and ε_i is the random error term with a mean of zero and constant standard deviation.

The variance of returns is

$$\sigma_i^2 = \underbrace{\beta_i^2 \sigma_m^2}_{\text{Systematic risk}} + \underbrace{\sigma_{\varepsilon_i}^2}_{\text{Unsystematic/unique residual risk}} \quad (6)$$

$\beta_i^2 \sigma_m^2$ is the measure of systematic risk and $\sigma_{\varepsilon_i}^2$ is the measure of unsystematic risk.

Portfolio return is calculated as

$$R_p = \sum \{X_i(\alpha_i + \beta_i R_m)\} \text{ for } i = 1 \text{ to } n$$

And portfolio variance is calculated as

$$\begin{aligned} \sigma_p^2 &= \underbrace{\left[(\sum X_i \beta_i)^2 \sigma_m^2 \right]}_{\text{Market risk}} + \underbrace{\sum X_i^2 \sigma^2 \varepsilon_i}_{\text{Unique risk}} \quad \text{for } i = 1 \text{ to } n \\ &= \beta_p^2 \sigma_m^2 + \sigma^2 \varepsilon_p \end{aligned} \quad (7)$$

Portfolio beta is the weighted average of the betas = $\beta_p = \sum X_i \beta_i$

Stocks are subject to systematic risks, which are common to all, and unsystematic risks which are industry or firm specific. Systematic risk includes economic and political conditions,

⁵ Sharpe (1963)

which are expected to affect all stocks in a similar fashion, though the extent may differ. These include factors such as inflation rate, interest rates, effect of the monsoon on agricultural production, change of elected government and government policies regarding taxation, dividends etc. Diversification cannot eliminate all the risks of holding common stocks, which exist due to the swings in economic activity or the stock market.

Unsystematic risk includes factors such as government policies regarding a particular industry, labour availability, the financial structure of a firm, managerial competence and consumer preferences. Unsystematic risk is considered as diversifiable through creation of portfolios as the security specific risks cancel each other partially. The best possible diversification merely minimizes the risks due to this residual uncertainty for any given level of return.

Equation (7) can be used to partition risk into systematic and unsystematic risk where $\beta^2_i \sigma_m^2$ is the measure of systematic risk and ε^2 is the measure of unsystematic risk. Strictly speaking, beta is not a measure of systematic risk; rather it is a measure of the relative sensitivity of an asset's rate of return to the market. However, for practical purposes since σ_m^2 remains the same irrespective of the portfolio, any decision made on the basis of beta will be the same as if made on the basis of $\beta^2_i \sigma_m^2$ as long as beta is positive. Therefore, beta is called a measure of systematic risk. The unsystematic or residual risk falls rapidly as the size of portfolio increases and for a well-diversified portfolio we can assume that it approaches zero. The Market Model has been suggested as a means of low cost, practical portfolio selection. In addition, it has been used to show the relationship between risk (beta) and return in the capital asset pricing model⁶. When diversifiable risk is eliminated, beta can be used as the measure of a security's risk.

The Markowitz model demonstrates the benefits of efficient diversification. Even if we make portfolios with stocks selected at random, the average portfolio risk reduces as the number of stocks in the portfolio is increased, leaving only the market risk or systematic risk. This is illustrated in Figure 14.4.

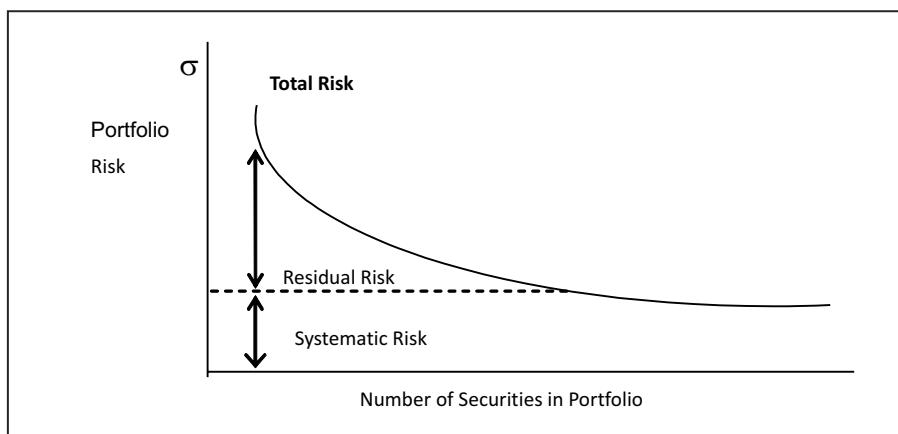


Figure 14.4: Diversification of Risk

⁶ For a review of the market model see Pactwa et al (1995)

Even if the unsystematic risk (variance) is same for all securities, say = 4

Combining 10 such securities with weightage of 10 % each will result in unsystematic risk of the portfolio = $\Sigma(0.12*4=10*(.01*4)) = 0.4$ which is one tenth the unsystematic risk of each individual security, assuming the residuals are not related.

Indian studies have shown that majority of the unsystematic risk (87%-90%) can be reduced with just 10-11 assets⁷.

In the chapter on risk and return, we derived alpha and beta through regression of stock returns and return on the stock index. The difference between the actual return on the stock and the return as calculated by the regression equation is the error term. The sum of the error terms is zero and the variance of the error terms is the unsystematic risk of the security. We can take a small numerical example to illustrate the use of the market model for calculation of portfolio return and risk.

Stock	X	Y	Z
Proportion of funds	50%	25%	25%
Alpha	-2%	8%	0
Beta	1.50	-0.20	0.80
Unsystematic risk(variance)	4%	0%	15%
Market return	10%		
Market standard deviation	5%		

We will first calculate expected return and then risk

Return= $\alpha + \beta(R_m)$	13%	6%	8%
-------------------------------	-----	----	----

$$\text{Portfolio beta} = 0.5*1.5 - 0.25*0.2 + 0.25*0.8 = 0.9$$

$$\text{Portfolio Variance} = 0.9*0.9*0.05*0.05 + (0.5*0.5*0.04 + 0 + 0.25*0.25*0.15) = 0.0214$$

Markowitz Model vs. the Single Index Model

The Markowitz model has an advantage over the market model. It can be used for all types of assets, provided we can calculate the correlation or covariance between each pair. The single index model can only be used for stocks as it uses the stock index as the common influencing factor.

The Markowitz model, however, requires more data than the single index model. For N assets, the data requirements are N returns, N standard deviations, and $(N^2 - N)/2$ covariances or correlations i.e., for 5 assets there are $5 + 5 + (25 - 5)/2 = 20$ bits of information are required. For 100 assets $200 + (10000 - 100)/2 = 5150$ bits of information are required. On the other hand, for the single index model, for N assets we require N alphas, N betas, N estimates of unsystematic risk, market return and standard deviation, i.e., for 5 assets we need $3 \times 5 + 2 = 17$ bits of information and for 100 assets we need $3 \times 100 + 2 = 302$ bits of information.

⁷ Sanyal and Sen (1998) and Singh (2007)

■ SUMMARY

Portfolio return is the weighted average return of the constituent assets, while portfolio risk depends on the proportion of assets, their variance and covariance between assets. Markowitz showed that it is possible to reduce risk through efficient diversification, i.e., by combining securities that are negatively or weakly correlated. It is possible to construct an efficient set of portfolios that have the least risk for a given return or highest return for a given level of risk; investors can choose a point on this frontier depending on their risk return preferences. An alternative method for calculating risk for portfolios of stocks is the market model; the risk is broken into systematic and unsystematic risk and interaction between stocks is accounted for via their relationship with the stock index.

■ SOLVED EXAMPLES

1. An investor is considering the following portfolio to hold:

Stock	X	Y	Z
Proportion of funds	30%	45%	25%
Alpha	2%	1%	-2%
Beta	1.3	0.8	1.1
Unsystematic risk(variance)	16%	4%	6.25%

Assume that the return on market index is expected to be 10% and its standard deviation is 7%. Calculate portfolio β , portfolio return and portfolio risk using an appropriate model.

$$\text{Ans: Portfolio return} = 30\%*(2\%+1.3*10\%)+45\%*(1\%+0.8*10\%)+25\%*(-2\%+1.1*10\%) \\ = 10.8\%$$

$$\text{Portfolio beta} = 30\%*1.3+45\%*0.8+25\%*1.1= 1.025$$

$$\text{Portfolio variance} = 1.025^2 * 1.025 * 7\% * 7\% + 30\% * 30\% * 16\% + 45\% * 45\% * 4\% + 25\% * 25\% * 6.25\% =$$

$$0.0355 \text{ and standard deviation} = \sqrt{0.0355} = 0.1776 = 17.76\%$$

2. Two stocks A and B, with the following expected returns and standard deviations:

Stocks	$E(R_i)$	Standard Deviation
A	12%	20%
B	14%	30%

The coefficient of correlation between returns of A and B is 0.4.

- (a) What is the covariance of their returns?
- (b) A portfolio P has 30% invested in A and 70% in B. What is the expected return and standard deviation of portfolio P?
- (c) If $r_{AB} = -1$, how much should be invested in A and B to get a zero variance portfolio?

Ans:

- (a) Correlation = covariance/(standard deviation A*standard deviation B)
 Covariance = correlation/(standard deviation A*standard deviation B) = $0.4/(.2*.3)$
 $= 6.66$
- (b) Return = $0.3*12+0.7*14=$ Standard deviation = $(0.3*0.3*20*20 + 0.7*0.7*30*30 + 2*0.3*0.7*30*20*0.4)^{0.5}=24.037$

3. An investor is considering the following portfolio to hold:

Stock	X	Y
Proportion of funds	30%	70%
Alpha	3%	2%
Beta	1.3	0.8
Unsystematic risk(variance)	16%	4%

Assume that the return on market index is expected to be 12% and its variance is 8%. Calculate portfolio beta, portfolio return and portfolio risk.

Ans:

Return= $\alpha+\beta(R_m)$	19%	12%
-----------------------------	-----	-----

$$\text{Beta} = 0.3*1.3+0.7*0.8=0.95$$

$$\text{Portfolio risk} = \text{variance} = 0.95*0.95*0.08*0.08+0.3*0.3*.16+0.7*0.7*.04=0.0398$$

$$\text{Portfolio standard deviation} = 0.0398^{0.5}=0.1994=19.94\%$$

4. A risky portfolio is made up of two stocks as follows:

Stock	Weightage	Expected Return %	Standard Deviation %
X	40%	15	10
Y	60%	10	9

Correlation between X and Y = 0.5

What is the return and risk of this portfolio?

Ans:

$$\text{Return} = 0.4*15+0.8*10=$$

$$\text{Standard deviation} = (0.4*0.4*0.1*0.1+0.6*0.6*0.09*0.09+2*0.4*0.6*0.1*0.09*0.5)^{0.5}= 58.17\%$$

5. Calculate expected return and standard deviation for XYZ and the market.

Probability	Return on market	Return on XYZ
0.1	10	8
0.4	9	10
0.4	15	19
0.1	20	25

Ans:

Probability	Return on mkt	R-Exp R	Prob*(R-exp R)^2
0.1	10	-2.6	0.676
0.4	9	-3.6	5.184
0.4	15	2.4	2.304
0.1	20	7.4	5.476
Exp return	12.6	Variance	13.64
		Stdev	3.69

Probability	Retn on XYZ	R-Exp R	Prob*(R-exp R)^2
0.1	8	-6.9	4.761
0.4	10	-4.9	9.604
0.4	19	4.1	6.724
0.1	25	10.1	10.201
Exp return	14.9	Variance	31.29
		Stdev	5.59

6. In question 5 above calculate covariance, correlation and beta.

Ans:

Probability	Return on mkt	Retn on XYZ	Mkt ExpR-R	XYZ ExpR-R-	Prob*Dev mkt*Dev XYZ
0.1	10	8	2.6	6.9	1.794
0.4	9	10	3.6	4.9	7.056
0.4	15	19	-2.4	-4.1	3.936
0.1	20	25	-7.4	-10.1	7.474
expected return	12.6	14.9		Covariance	20.26

$$\text{Correlation} = \text{covariance}/(\text{stddev mkt} * \text{stddev XYZ}) = 20.26/(3.69 * 5.59) = 0.98$$

$$\text{Beta} = \text{cov} / \text{stddev market}^2 = 20.26 / (3.69^2) = 1.49$$

7. Calculate the minimum variance portfolio from the following

Stock	Expected return %	Standard deviation
A	10	6
B	14	8
Correlation between A and B	0.2	

Ans:

$$\text{Proportion in A} = W_A = \sigma_B (\sigma_B - \rho_{AB} \sigma_A) / (\sigma_A^2 + \sigma_B^2 - 2\rho_{AB} \sigma_A \sigma_B) =$$

$$8 * (8 - 0.2 * 6) / (8 * 8 + 6 * 6 - 2 * 0.2 * 6 * 8) = 0.673$$

$$\text{Portfolio standard deviation} =$$

$$(0.673 * 0.673 * 6 * 6 + 0.327 * 0.327 * 8 * 8 + 2 * 0.673 * 0.327 * 0.2 * 6 * 8)^{0.5} = 5.232$$

■ MULTIPLE CHOICE QUESTIONS

1. Stock A and B are perfectly negatively correlated and have standard deviations of 20 and 30 respectively. The minimum variance portfolio should contain
 - (a) 50 % each of A and B
 - (b) 40 % A and 60 % B
 - (c) 60 % A and 40 % B
 - (d) 100% A
2. The number of correlations required for portfolio optimisation using modern portfolio theory for 50 assets is close to
 - (a) 50
 - (b) 100
 - (c) 500
 - (d) 1000
3. The systematic risk of a portfolio is equal to
 - (a) b_p
 - (b) b_p^2
 - (c) $b_p^2 s_m^2$
 - (d) $b_p^2 s_m^2 + s_e^2$
4. The coefficient of determination is
 - (a) The highest value of correlation determined through regression
 - (b) The square of the correlation
 - (c) The covariance between two assets
 - (d) The optimum combination determined
5. Which of the following portfolios cannot lie on the efficient frontier
 - (a) Portfolio A , standard deviation 10 and return 15
 - (b) Portfolio B , standard deviation 9 and return 13
 - (c) Portfolio C , standard deviation 12 and return 14
 - (d) Portfolio D, standard deviation 13 and return 19
6. Are the following statements true or false
 - (a) If the correlation between two assets reduces, the portfolio risk of all possible combinations of the assets will also reduce.
 - (b) The efficient frontier is the locus of all possible combinations of asset portfolios.

■ QUESTIONS

1. Distinguish between feasible and efficient portfolios.
2. List the type and number of inputs required to calculate return and risk for 50 securities using the Markowitz technique and the Sharpe index model.
3. What is the relationship between the correlation and covariance?
4. What do covariance and coefficient of determination tell us about the relationship between two variables?
5. If we want to create an efficient portfolio of stocks, bonds and gold would you recommend the Sharpe model or the Markowitz model? Why?

■ PROBLEMS

1. The following data are given. Calculate the proportion of variance of stock ABC that is not explained by the index

Year	Return on ABC	Return on Index
1	.31	.24
2	.10	.11
3	-.07	.03

Stock	Expected Return%	Standard Deviation
A	15	20
B	10	12

Correlation between returns of A & B is 0.30.

- (a) What is the covariance of their returns?
- (b) What is the mean and standard deviation of a portfolio with 75% of A and 25% of B
3. A risk-averse person is holding stock A. He is considering to add X and/or Y to increase return, but he is worried that risk will also increase. What do you advise?

Stock	Expected Return%	Standard Deviation	Correlation with A
A	10	5	1.0
X	14	8	0.8
Y	14	10	0.4

4. Beta of a portfolio is 1.2, standard deviation of return on the market index is 20% and unsystematic variance of the portfolio is 2%. What is the standard deviation of the portfolio?

5. X has expected return of 12% and standard deviation of 20%. Y has expected return of 15% and standard deviation of 27%. What is their covariance if correlation is 0.5?
6. The market index is currently 4000 & is expected to go up to 4400 next month. What is the expected return on stock XYZ which has an alpha of 4.5% and beta of 1.3?
7. Given the following:
 Std. Deviation stock A = 0.45
 Standard Deviation stock B = 0.32
 If stock A and B have perfect negative correlation, which portfolio combination represents minimum variance portfolio?
8. Which of the following portfolios cannot be on the efficient frontier?

Portfolio	Expected Return	Standard deviation
W	9%	21%
X	5%	7%
Y	15%	27%
Z	12%	31%

9. Following data are given:

Stock	Expected return	Standard deviation
XYZ	.17	.30
ABC	.12	.20

Coefficient of correlation + 1

Is there any benefit to the investor from holding some of XYZ and some of ABC?

10. Two stocks, A and B, with the following expected returns and standard deviations.

	Expected Return	Standard Deviation
A	12%	20%
B	14%	30%

The correlation coefficient between the returns of A and B is 0.4.

- (a) A portfolio P has 30% invested in A and 70% in B. What is the expected return and standard deviation?
- (b) Plot A, B and P in expected return-standard deviation space and draw (approximately) the feasible set for P. On this diagram, mark the minimum-variance portfolio and the efficient set.
- (c) If the correlation coefficient between A and B is -1, how much should be invested in A and B to get a zero-variance portfolio? Mark this new feasible set on the diagram in part (ii) with a dotted line.

11. An investor is considering the following portfolio to hold:

Stock	X	Y	Z
Proportion of funds	30%	30%	40%
Alpha	3%	2%	-2%
Beta	1.3	0.8	1.1
Unsystematic risk(variance)	16%	4%	9%

Assume that the return on market index is expected to be 12% and its variance is 8%. Calculate portfolio beta, portfolio return and portfolio risk using the market model.

■ PRACTICAL EXERCISES

- Download the daily, weekly or monthly prices for all the shares in the sensex or Nifty. Calculate return and standard deviation for each. Construct equally weighted random or alphabetical portfolios of two shares and calculate standard deviation of each portfolio and the average standard deviation. Repeat the process for portfolios of five shares and ten shares. What do you observe?
- Take ten companies (for a class term paper this may be done in alphabetical order group wise from the BSE 100) from the prowess data base and download the adjusted monthly stock price for each of them over the last five years.
 - For each stock, calculate the monthly return.
 - Calculate the average monthly return and the standard deviation of the monthly return for each stock.
 - Compute the correlation matrix of the 10 stocks.
 - Compute the variance-covariance matrix of the 10 stocks.
 - Draw a graph showing all combinations of risk and return for three different portfolios containing two of the stocks in your sample: (i) One portfolio containing the two stocks with the highest positive correlation, (ii) one portfolio containing two stocks with a correlation close to zero and (iii) one portfolio containing two stocks with negative correlation (if any). Explain what you observe on this graph.
 - Take five of the stocks in your sample and draw a graph showing the efficient frontier derived using these five stocks only (combine stocks to give a certain return (say 10%), and choose the combination with lowest standard deviation; repeat for other returns say, 12%, 14% etc).
 - Take all the stocks in your sample and draw a graph showing the portfolio frontier derived using your entire sample. How does this frontier compare with the one you computed with five stocks? Explain carefully.
- Take five companies (for a class term paper this may be done in alphabetical order group wise from the BSE 100) from the prowess data base and download the adjusted monthly stock price for each of them over the last five years. For the same period, collect similar data for a broad market index like the Nifty or Sensex.

- (a) For each stock and market index, calculate the monthly return.
- (b) Take the returns on the index as the independent variable and regress returns on each stock to get the alpha, beta and unsystematic risk.
- (c) Use the single index model to construct the efficient frontier.

APPENDIX 1

Statistical Concepts used in this chapter

The extent to which two random variables vary together can be measured by their **covariance**. For two variables x and y , covariance is calculated as:

$$\text{Cov}(x, y) = \sigma_{xy} = \frac{1}{n} \sum_i (x_i - \bar{x})(y_i - \bar{y})$$

For each pair of x and y occurring at the same time, the difference from their means is multiplied. If the product is positive it means they varied in the same direction from their means (negative or positive). If the product is negative, they varied in opposite directions. If there is zero covariance the variables are either independent, or may have a relationship that is not linear.

Limitations

The magnitude of covariance depends on the size of the variables. Because of this, it is not possible to compare covariance across data sets. Covariance can be normalised as follows to get the *coefficient of correlation*:

$$\text{Correl}(x, y) = \rho_{xy} = \frac{\text{Cov}(x, y)}{\sigma_x \sigma_y} = \frac{\sigma_{xy}}{\sigma_x \sigma_y}$$

The coefficient of correlation ranges between +1 and -1. The coefficient of determination, the square of the coefficient of correlation expresses the extent to which one variable can explain the other. It ranges between 0 and 1; if the coefficient of determination is 0.65, it means that 65% of the variation can be explained.

The coefficient of correlation can also be calculated directly as follows:

$$\text{Correl}(x, y) = r_{xy} = \frac{\sum xy - (\sum x)(\sum y)/N}{\sqrt{\sum x^2 - (\sum x)^2/N} \cdot \sqrt{\sum y^2 - (\sum y)^2/N}}$$

Or

$$\text{Correl}(x, y) = r_{xy} = \frac{\sum xy - (\sum x)(\sum y)/N}{\sqrt{(\sum x^2 - (\sum x)^2/N)(\sum y^2 - (\sum y)^2/N)}}$$

Scatter plots show the relationship between two variables by displaying the data points on a graph. The independent variable is plotted on the x axis, and the dependent variable on the y axis. They can be used to understand the relationship between two variables. The type of relationship – linear curved etc, the direction – positive or negative, the strength of the relationship – are the points close to each other or far away. We can use regression to have a line of best fit – a straight line, a quadratic equation or a polynomial with the minimum sum of the squared errors. This can be used to forecast the dependent variable given a value of the independent variable.

APPENDIX 2

Proof of minimum variance formula

$$\begin{aligned}\sigma_p^2 &= W_A^2 * \sigma_A^2 + (1-W_A)^2 * \sigma_B^2 + 2 W_A * (1-W_A) * \rho_{AB} * \sigma_A * \sigma_B \\ &= W_A \sigma_A^2 + (W_A \sigma_B^2 - 2W_A \sigma_B^2 + \sigma_B^2) + 2W_A \rho_{AB} \sigma_A \sigma_B - 2W_A^2 \rho_{AB} \sigma_A \sigma_B\end{aligned}$$

For this to be a minima differentiate with respect to W_A and set =0

$$\begin{aligned}d \sigma_p^2 / dW_A &= 2W_A \sigma_A^2 + (2W_A \sigma_B^2 - 2\sigma_B^2 + 0) + 2\rho_{AB} \sigma_A \sigma_B - 4W_A \rho_{AB} \sigma_A \sigma_B \\ &= 2W_A (\sigma_A^2 + \sigma_B^2 - 2\rho_{AB} \sigma_A \sigma_B) - 2\sigma_B^2 + 2\rho_{AB} \sigma_A \sigma_B = 0 \\ W_A &= \sigma_B (\sigma_B - \rho_{AB} \sigma_A) / (\sigma_A^2 + \sigma_B^2 - 2\rho_{AB} \sigma_A \sigma_B)\end{aligned}$$

CHAPTER - 15

Portfolio Planning and Management

LEARNING OBJECTIVES

- Understand the theoretical basis for portfolio planning
- Select an optimum portfolio of stocks
- Discuss the various objectives and constraints of portfolio planning
- Appreciate the need for planning portfolios to suit individual needs
- Apply the various techniques available for planning and allocation.

This chapter deals with portfolio selection, how an investor should select a mix of assets to fulfil current and future needs. We first look at the risk return preferences of investors in the context of the efficient frontier, then study a simple ranking technique for selecting an efficient portfolio of stocks, and finally study how investment advisors can help investors choose portfolios that suit their individual needs.

■ INVESTOR'S RISK AND RETURN PREFERENCES

In the chapter on portfolio analysis we learnt about the efficient frontier, or the set of portfolios that gives highest return for each level of risk. An investor has to choose a specific portfolio or a particular point on the efficient frontier. One way of doing this is to look at an investor's risk return preferences with the help of indifference curves in the indifference map given in Figure 15.1. Risk is represented by standard deviation of returns on the X axis and return is shown on the Y axis. The indifference curves are upward sloping since we assume all rational investors are risk averse and require higher return for higher risk. Each indifference curve represents combinations of risk and return at which the investor is indifferent i.e., which gives the investor a certain level of satisfaction or utility. The investor is indifferent between points A, B, and C on indifference curve I_1 . However, he would prefer X, Y and Z to A, B and C as they are vertically above these points and represent higher return for the same risk. In fact, since higher indifference curves represent higher levels of utility, all points on I_5 are preferable to all points on I_1 . The shape of the indifference curves depends on the risk return trade off of the investor. An investor with higher risk aversion will have steeper indifference curves see Figure 15.2 because more return will be demanded for every unit increase in risk as compared to an investor who is less risk-averse.

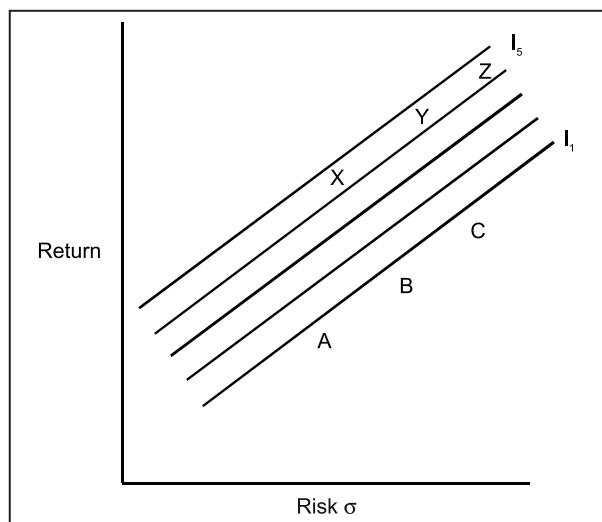


Figure 15.1: Indifference Curves

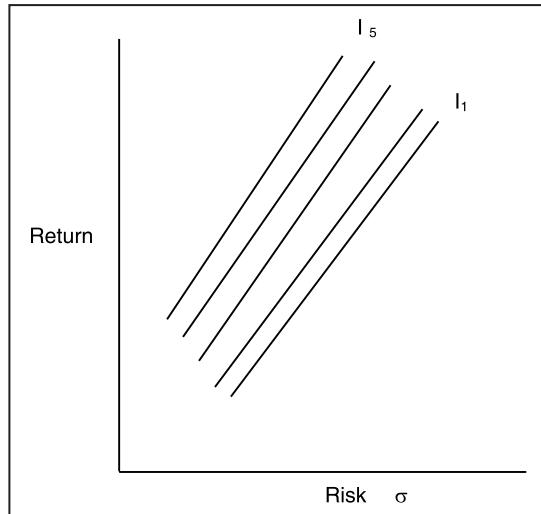


Figure 15.2: Steeper Indifference Curves-More Risk Averse

An indifference map with straight lines represents an investor whose risk return trade off is constant irrespective of the absolute amount of risk involved. If the investor demands more compensation as total risk increases, we will see upward sloping curves as represented in Figure 15.3. Again, a more risk averse investor will have steeper curves and the higher slope can be measured by tangents to the curve at each point. We have depicted a limited set of indifference and leave the rest as an exercise for the reader. By the same logic, we can theoretically project a risk lover as having downward sloping indifference curves.

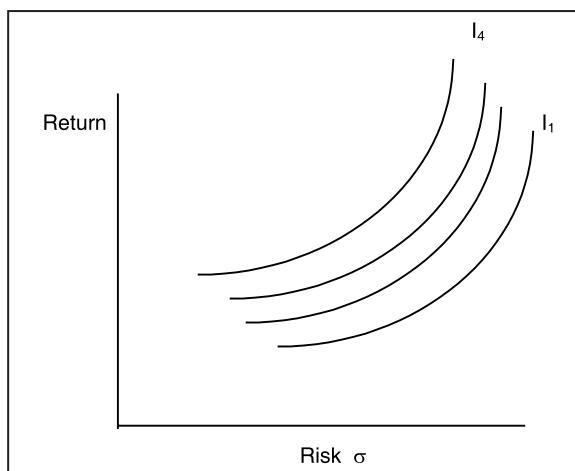


Figure 15.3: Curved Indifference Curves

The aim is to find a point on the efficient frontier which puts the investor on the highest possible indifference curve. This is shown in Figure 15.4 the highest utility is achieved at point Q, the point of tangency of I_4 with the efficient frontier. At the Q the indifference curve and efficient frontier have the same slope. All other points on the efficient frontier

such as P and R are inferior because they lie on lower indifference curves representing lower utility.

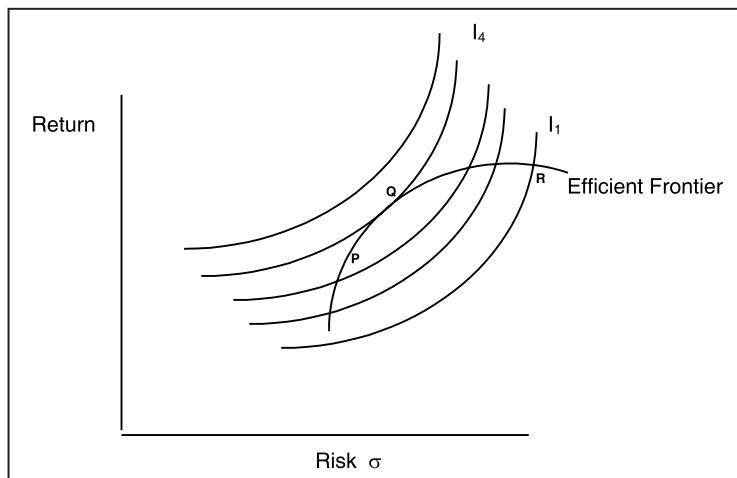


Figure 15.4: Indifference Curves and the Efficient Frontier

Psychology of Loss Aversion

Various studies have shown that people have a bias towards aversion of loss when faced with risk¹. For example, if given a choice between getting Rs 9000 with 100% probability or Rs 10,000 with 90% probability what would you choose? On the other hand, if you had a choice between losing Rs. 9000 with 100% probability or losing Rs. 10,000 with 90% probability which would you prefer? More people prefer to get Rs. 9000 with certainty in the first case and but prefer to lose Rs. 10000 with 90% probability in the second case. According to decision theory, they should be indifferent between the choices because they have the same expected monetary value (EMV = amount \times probability). Another example to illustrate this, is the choice between getting Rs. 1000 with certainty versus a 10% chance of getting Rs. 10000, more people would prefer Rs. 1000 in hand.

When we buy an insurance policy, we are willing to incur a cost (loss with 100% probability) of Rs 100 in order to prevent a loss of Rs. 100,000 with 0.1% probability (ignoring the commissions and profits of the insurance company), although the EMV is the same.

This lower tolerance for risk can lead to inefficient behaviour in the stock market. There will be less demand for risky stocks and more demand for stocks that have given good returns in the past. This results in overpricing of stocks with good past performance.

■ SIMPLE RANKING DEVICE FOR PORTFOLIO SELECTION

Elton Gruber and Padberg² devised a simple ranking device for portfolio optimisation, based on the Sharpe single index model, which yields exactly the same portfolio that would be

¹ Demonstrated by Amos Tversky and Daniel Kahneman (1979)

² Elton, Edwin J., Gruber Martin J., & Padberg Manfred W., Optimal portfolios from simple ranking devices, The Journal of Portfolio Management, Spring 1978.

produced by using quadratic programming. The desirability of any stock is measured by its excess return to beta ratio, where excess return is the return over and above the risk free return³. Stocks offering higher additional return per unit of non-diversifiable risk are preferable to those offering a lower return per unit of risk. The procedure for calculating the optimal portfolio is best demonstrated with the help of a numerical example given in Table 15.1.

Table 15.1: Data for Ranking of Stocks $R_f = 5.00$

Stock	R_i	β_i	σ_{ei}^2	$(R_i - R_f)/\beta_i$
A	15	1.3	30	7.69
B	14	1.5	20	6.00
C	13	1.8	40	4.44
D	12	0.8	10	8.75
E	11	1	20	6.00
F	10	1.2	10	4.17
$R_f =$	5			

To start with, $(R_i - R_f)/\beta_i$ is calculated for all stocks and they are to be ranked in descending order on this basis. The next step involves determination of a cut off point up to which stocks are to be included and others below the cut off are to be excluded. To do this, we first calculate C_i as given below.

$$C_i = \frac{\sigma_m^2 \sum_{i=1}^i \frac{(R_i - R_f)\beta_i}{\sigma_{ei}^2}}{1 + \sigma_m^2 \sum_{i=1}^i \frac{\beta_i^2}{\sigma_{ei}^2}} \quad (1)$$

Where σ_{ei}^2 is the non-systematic risk of the stock and σ_m^2 is the variance in return for the market index.

The steps required for computation are given below and also explained in Table 15.2.

1. Rank stocks in descending order according to excess return to beta $(R_i - R_f)/\beta_i$
2. Calculate C_i as given in Equation (1)
3. Add stocks to the portfolio as long as excess return to beta is greater than C_i
4. The C_i corresponding to the last stock to be added to the portfolio is the cut off rate C^*
5. Note that all stocks below C^* have excess return to beta smaller than C_i
6. The percentage X_i to be invested in each security is calculated as follows

$$X_i = Z_i / \sum Z_i \quad (2)$$

$$Z_i = \frac{\beta_i}{\sigma_{ei}^2} \left(\frac{R_i - R_f}{\beta_i} - C^* \right) \quad (3)$$

³ In India, the treasury bill rate or savings bank rate have been used in research to represent risk free rate.

Table 15.2: Calculations for Determination of Optimum Portfolio

												$\sigma^2_m = 10.00$	$R_f = 5.00$		
1	2	3	4	5	6	7	8	9	10	11	12	13	14		
Stock	R_i	β_i	σ_{ei}^2	$(R_i - R_f) / B_i$	$(R_i - R_f) / \beta_i / \sigma_{ei}^2$	B_i^2 / σ_{ei}^2			C_i	$(R_i - R_f) / B_i$ vs C_i	C^*	Z_i	X_i %		
									Cu col 6	Cu col 7	$\sigma^2_m * col$ $8/(1 + \sigma^2_m)$ $* Cl 9)$	$Cl 5$ vs $Cl 10$		$Z_i = (B_i / \sigma_{ei}^2) * Cl 5 - C^*$	$X_i = (Cl 13 / \Sigma Z_i)$
D	12.00	0.80	10.00	8.75	0.56	0.06	0.56	0.06	3.41	greater		0.29	56.99		
A	15.00	1.30	30.00	7.69	0.43	0.06	0.99	0.12	4.51	greater		0.11	21.82		
B	14.00	1.50	20.00	6.00	0.68	0.11	1.67	0.23	5.01	greater		0.06	12.71		
E	11.00	1.00	20.00	6.00	0.30	0.05	1.97	0.28	5.14	greater	5.14	0.04	8.47		
C	13.00	1.80	40.00	4.44	0.36	0.08	2.33	0.36	5.02	smaller					
F	10.00	1.20	10.00	4.17	0.60	0.14	2.93	0.51	4.82	smaller					
											Total	0.51	100.00		

As can be seen from the table, all securities with excess return to beta ratio greater than the cut off rate C^* have been included in the portfolio. This concept makes portfolio revision very simple. A new stock will be added to the portfolio only if excess return to beta ratio is greater than the cut off rate.

Portfolio Beta

Beta plays a central role in the selection of stocks using the Sharpe index model and the ranking technique described in the previous section. The portfolio beta is the weighted average of individual stock betas. The beta of a stock or portfolio describes its co-movement with the market index. Return on a portfolio with beta equal to 1 implies that return on the stock would be the same as the market plus alpha, the return that is independent of the market. If beta is equal to 2 and if the market return is 5%, the stock will give twice the market return i.e., 10% plus alpha. On the other hand, if the market goes down by 5% expected return will be minus 10% plus alpha. This suggests a portfolio with high beta is desirable when the market is rising. If the market is expected to decline, it is desirable to hold stocks with negative beta. However, since negative betas are not seen in practice, it may be better to sell stocks when a market decline is expected.

Such portfolio planning requires accurate forecasts of the market movement and stationarity of beta⁴. For example, if portfolio beta is raised in anticipation of a rise in the market, and the market actually falls, the fall in the return of the portfolio will be magnified due to higher beta. Similarly, if historical betas are not stationary over the forecast period, the anticipated gains may not be realised. Historically, portfolio betas have been more

⁴ We use the terminology of Gooding and O'Malley (1977), stationarity refers to the absence of period to period fluctuation in beta while stability is concerned with fluctuations in beta caused by varying the differencing intervals (weeks, months) in calculating returns.

stationary than individual security betas. A study of beta in India⁵ found that beta varies considerably with method of computation. Beta is not stable when the interval period is changed (daily, weekly, monthly). The variability of betas is higher with longer interval periods. The stationarity of beta increases with the length of the period and with increase in portfolio size. Since all these variables depend on the convenience of the analyst, the conclusions and decisions based on them may be different.

It has also been recommended⁶ that historical betas should be adjusted to incorporate changes in the fundamentals of the firm, macroeconomic and industry effects, and should also be adjusted as there is a tendency of betas to revert to the industry norm. We should also keep in mind that betas are higher in rapidly growing companies, manufacturers of capital goods, those with high fixed cost and highly levered companies⁷. Residual risk tends to be higher where technological change in products or processes is taking place very rapidly. It was also found to be high in single product and single executive dependant companies and was amplified due to high fixed cost and leverage.

■ TRADITIONAL PORTFOLIO MANAGEMENT FOR INDIVIDUALS

The Sharpe portfolio optimisation technique can only be used for identifying an optimum combination of stocks, whereas individuals hold a variety of assets including real estate, stocks, bonds, precious metals etc. It is also not possible to apply indifference curves to identify optimal portfolios in practice because of the problem in quantifying the risk-return requirement of individuals. There is also a problem in constructing an efficient portfolio of all possible assets as the data on risk and return is not available. In practice therefore, a combination of traditional and modern portfolio management techniques have to be used.

The process of portfolio management has four stages. To start with, we need to know the objective of the investor, the time horizon, the expected future sources of income, the tax status, the requirement of funds at various points of time, the existing net worth and plan for contingencies. Every individual has a unique set of needs and circumstances, which change over time. The next step is the assessment of the risk taking ability of the individual, as different people are comfortable at various levels of risk. This is followed by asset allocation, the process of deciding how to distribute available resources among asset classes such as real estate, stocks and bonds, and further among various sectors and industries, and whether to diversify internationally. Thereafter the suitability of the portfolio has to be reviewed over time to keep track of revision of objectives and constraints based on changing financial needs, changes in the investment environment and the performance of the portfolio till date.

The process of portfolio planning involves a number of issues, which are general to some extent and some which are very specific for each investor. The aim is to first provide enough income to take care of daily and emergency needs including health and life insurance. The next step would be building up security for the future, which in traditional portfolio

⁵ Singh Rohini (2008c)

⁶ Rosenberg and Guy (1976)

⁷ Treynor, Priest, Fisher & Higgins (1968), Santhanum (1998) on betas and debt financing in India.

planning may include investment in one residential property and then look for avenues to invest the surplus.

■ OBJECTIVES AND CONSTRAINTS

Objectives and constraints are derived from an understanding of the financial requirements and resources available to an individual or family. In a practical setting, the objectives and risk-taking ability of an investor are assessed by an investment advisor through a series of questions. These include an assessment of the requirements of the client and the ability to take risk by taking into account the age and health of the investor and dependants, the current and future earning capability and existing net worth. They may ask direct questions regarding risk taking ability/desirability, whether they consider the possible gains/losses when making an investment. Indirect questions could include preference for a secure government job versus quicker career progression, a fixed salary to one based on commissions, the individual's past choices for investment and whether they have changed over time. They may check the investors knowledge about investment alternatives, advantages and disadvantages of investing in various assets, the possible returns/losses, extent of percentage of decline in the value of investment that will create discomfort and whether they understand the need for inflation protection⁸.

The *investment objectives* are normally variations of current income versus future income and growth in capital within acceptable risk levels. Some investors would prefer higher current income with low risk others may prefer to have lower current income but maintain purchasing power in the future and may be willing to accept moderate levels of risk. So we can look at objectives such as current income, capital appreciation, preservation of capital, minimizing possibility of loss etc. As it is not possible to achieve all the goals at the same time, some trade-off is necessary. The objectives have to be realistic within the *constraints* which include time horizon, liquidity and tax considerations.

The mix of assets that can be considered depends on the *time horizon* of the investor. One way of analyzing the time horizon is to look at the life cycle approach which is discussed in the next section. The longer the time horizon the more the possibility of including some risky assets like stocks as intermediate ups and downs will get absorbed in the long run. More time also allows for funding of long-term assets like property. For shorter time horizons, an investor would look for more certainty and less volatility. For example, if college education is planned in the next one or two years, it would be wiser to have the money in fixed deposit or medium term debt securities where the capital amount is not likely to fluctuate.

Current wealth determines the risk taking ability of an investor. An individual who has a cushion to fall back on can afford to take higher risk than one who is dependant on his investments for survival. This determines the amount of money that can be put in risky investments and the degree of risk that can be taken.

⁸ Examples of risk assessment may be viewed on the internet at many sites including <http://www.investstone.com.au/pdf/Questionnaire.pdf> and <http://www.riskprofiling.com/>

Liquidity needs are dependant on the expected requirements of each investor and adequate provision needs to be made for the same. For short-term liquidity, the choices include savings bank accounts, short-term deposits in banks, money market instruments and money market mutual funds. For probable intermediate term requirements, stocks, bonds and mutual funds are suitable as the required amount can be liquidated easily. Property on the other hand takes longer to liquidate and cannot be sold in small parts.

Tax considerations also determine they type of investment that would be suitable for an investor. While detailed tax planning is beyond the scope of this book we will just touch upon a few aspects. The aim of the investor is to maximize after tax return, which will depend on the marginal tax bracket of the investor. For a tax payer in the 30% tax bracket a 6% tax free bond is equivalent to having an 8.57% taxable bond ($6/0.7 = 8.57$). Tax-free bonds available in India include RBI bonds, capital gain⁹ bonds and municipal bonds as outlined in the 2007-08 budget. There are also tax saving investments such as Public Provident Fund (PPF) and National Savings Certificates (NSC), infrastructure bonds, deposit linked life insurance, and insurance linked mutual fund schemes, where the amount invested up to Rupees one lakh is deducted from taxable income. Tax payers should look at net return after tax on other alternatives and compare with return through tax saving schemes. The other aspect to be considered is that tax has to be paid every year on current income, but can be deferred till the asset is sold in the case of capital growth. Capital gain is applicable after a holding period of one year for listed and government and securities and mutual fund units and three years for all assets. The maximum tax rate on capital gain is lower than maximum marginal tax rate on income and also has the benefit of indexation. There is no capital gains tax on securities sold through recognized stock exchanges and payment of securities transaction tax. However, when an investor wants to sell an asset that has appreciated over time he will again have to consider the implications of the capital gains tax. If the aim is to shift funds to an alternative investment, he must keep in mind that the capital for reinvestment reduces due to capital gains tax. The new investment must provide much higher return to compensate for the reduced capital. If it does not, the investor may decide to continue with the old investment, known as the lock in effect. Similarly, if the investor is holding some securities that have made a capital gain, and others that have incurred a capital loss, it may be wise to time the sales in order to offset the gains and losses.

Anticipated future inflation must be kept in mind while assessing the required future needs. The all-India consumer price index (CPI) stood at 528 on March 2008; it increased more than five times over a period of 23 years as compared to the base year of 1984-85. Even if we assume a very modest rate of inflation of 5% per annum, the inflation adjusted income requirement after 20 years would be 2.5 times (1.05^{20}) and after 30 years would be more than four times the current income ($1.05^{30}=4.30$). The longer the planning horizon, the more the inflation protection to be built in.

⁹ Under section 54 EC

■ ASSET ALLOCATION

Asset allocation is a major factor that determines the risk and return of a portfolio. An investor has to decide which asset classes should be considered for investment, how much of the total portfolio should be invested to each asset class and the specific assets or securities that should be purchased. This also includes choosing the country and sectors to invest in. This can be shown in the form of an asset allocation pyramid (Figure 15.5) which investors can use to plan their portfolios. The pyramid has three parts:

The base of the pyramid is the largest portion, which consists of low risk investments with predictable returns. The middle is made up of medium risk investments, which are expected to offer stable returns with some capital appreciation. The top of the pyramid has high risk investments. High risk investments should be made only if the investor has surplus funds that can be risked without serious consequences. Investors customise the size of these three parts of the pyramid to suit their needs.

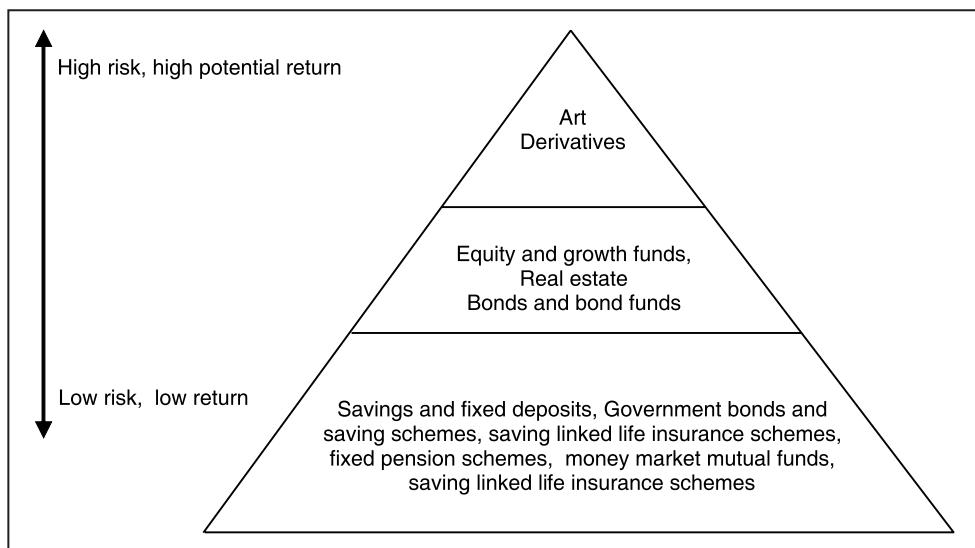


Figure 15.5: Asset Allocation Pyramid

Since higher returns normally involve higher risks, asset allocation involves management of risk. At one extreme, the strategy for risk management could be total risk avoidance. This will obviously lead to lower returns as well. Risk-free assets could be included as part of the portfolio to reduce risk. Diversification within an asset class can also be used to diversify risk. The investor may anticipate possible risks and keep part of the portfolio in cash equivalents and take appropriate insurance where available. The downside to investment in the stock market can be protected using put options.

As was seen in the chapter on risk and return, the history of returns on various asset classes shows that over a long time horizon the stock index out performs safer investments such as government bonds and fixed deposits. However, the risk is also higher. Asset allocation is also influenced by social, political and tax considerations. For example, in India, as was

seen in the chapter on debt, the household savings pattern shows risk aversion and only 1% was invested in marketable securities in 2003-2004.

It is also necessary to plan the investment strategy and allocation of funds in the context of current financial conditions and expected future trends. This will need to be monitored and revised as financial conditions change. For example, the yield on government securities in India reduced drastically from 2002-2004 (see Table 15.3). To get the same current income more than double the investment would have been required in 2004 as compared to 1997.

Table 15.3: Yield of Government of India Securities

	1 year	5 year	10 year	15 year	20 year	25 year	30 year
Mar-97	10.60	12.96	13.43				
Mar-98	10.49	11.48	12.12				
Mar-99	10.65	11.48	12.12				
Mar-00	10.39	10.45	10.86	11.02			
Mar-01	9.14	9.61	10.27	10.88			
Mar-02	5.76	6.62	7.34	7.66	7.88	7.97	
Mar-03	5.62	5.91	6.20	6.60	6.78	6.78	6.85
Mar-04	4.45	4.89	5.15	5.60	5.89	5.97	
Mar-05	5.52	6.37	6.69	7.07	7.14	7.16	7.18
Mar-06	6.42	7.24	7.53	7.67	7.72	7.77	7.82
Mar-07	7.89	7.97	7.94	8.13	8.20	8.27	8.34

Based on SGL transactions

Source: RBI

Similarly, investment in stocks comprising the BSE Sensex would have given positive returns and negative returns depending on the time of entry and exit as can be seen in Table 15.4.

Table 15.4: Returns on the Sensex

Year	Annual Return %
1990	18.58
1991	68.84
1992	36.28
1993	36.95
1994	13.40
1995	-23.15
1996	-1.04
1997	20.05
1998	-18.08
1999	67.42
2000	-14.65

Contd...

2001	-16.18
2002	3.25
2003	71.90
2004	10.68
2005	36.34
2006	39.83
2007	14.18

Investor Life Cycle Approach

The financial responsibilities and resources available for investment can be classified according to the stage in an investor's life. The ability to take risk is dependant on the ability to earn in the future, the accumulated savings and the investment horizon.

Early career/accumulation phase: At this stage, there is a need to satisfy current aspirations such as a first vehicle and reasonable standard of living along with long term goals which may include a life insurance policy and residential property. The individual has the potential for growth in career and income. However, savings are limited and debt may be greater than net worth. Since the individual has a long-term perspective surplus funds, if any, can be invested in moderate to high risk investments with higher than average expected returns.

Mid career/consolidation phase: At this stage, the investor has satisfied majority of the current aspirations and would have paid off part of the loans taken for purchase of a vehicle or residential property. There is still potential for further growth in income and the individual still has a fairly long-term perspective and can invest surplus funds in moderately risky investments.

Retirement phase: At this stage, the individual has probably paid off all debts, should have a high net worth, and may be receiving a pension, but there is no scope for increase in income from this source. There is need to preserve capital and plan for increased income to take care of future needs including medical expenses and the effect of inflation.

■ PORTFOLIO MANAGEMENT STRATEGIES

Passive Equity Portfolio Management

Passive strategies include long-term buy and hold strategies, tracking the index and systematic investment plans. A long-term buy and hold strategy may be used for any diversified portfolio which includes tracking an index over time. Assuming the efficient market hypothesis holds it makes sense to track the market. The individual or fund manager holds securities in the same proportion as the index. If funds are invested through an index fund, performance is judged with respect to the index. The fund may under perform as compared to the index due to slight differences in the proportions invested, especially since dividends are to be reinvested (tracking error). Returns are also slightly lower due to management fees and commissions. The portfolio will also need to be revised when the index constituents change.

Systematic Investment Plans (SIP) involve investment of a fixed rupee amount in the same security or fund every period over a fairly long time. This ensures that more number of shares are purchased at lower prices and fewer shares are purchased at higher prices. This only ensures a lower average cost per shares than if a fixed number of shares was bought in each period. The assumption behind such plans is that the investor gradually wants to accumulate a substantial number of shares of the same security over time. The SIP must cover a long enough period to ensure that the average includes price increases and declines.

Active Equity Portfolio Management

Active strategies attempt to outperform a benchmark portfolio on a risk adjusted basis after accounting for transaction costs. There active equity portfolio management strategies include market timing, and style investing.

For *market timing*, the portfolio manager has to assess the future direction of the market and take appropriate action. It could involve shifting funds between stocks and bonds and risk-free instruments like T-bills (asset class rotation) depending on future market forecasts; shifting funds invested in equity and/or debt in different countries, between sectors or industries (sector rotation); shifting funds in debt instruments into longer/shorter maturities; or in individual securities by attempting to buy low and sell high. For example, if the stock market is expected to decline, the manager would move investments out of stocks into cash or bonds. On the other hand, if the market is expected to boom, high beta stocks would be acquired. If interest rates are expected to decline, funds could be moved into long maturity bonds to take advantage of expected increase in bond prices. The manager may be able to identify countries with undervalued markets or better prospects based on global economic trends. Sector rotation would be based on industry analysis and within the industry, the individual stock to invest in would be based on company analysis.

Style Investing depends on the portfolio manager's strategy for picking stocks that he feels are undervalued at present or that are expected to produce over average returns in future. A few such styles are described below.

Value stocks are those that appear to be underpriced according measures such as low price to earnings (P/E) ratios and high book to market (B/M) ratios. This could be because a particular industry is temporarily out of favour in the market¹⁰ or maybe due to fundamental factors. A temporary unpopular phase may be the right time to buy cheap stocks.

On the other hand, a high P/E ratio could be an indicator for a possible momentum strategy, where stocks that have done well in the recent past are expected to continue to do well.

Growth stocks, which have higher than average growth in earnings per share are often chosen by portfolio managers as they feel the growth is likely to continue.

Stocks with low market capitalization (size), have been found to give higher than average returns in the developed markets as well as in India. However, investors need to be cautious as small size may proxy for higher risk, which may be the reason for higher returns.

¹⁰ For some years following the IT industry boom in India, some of the so called "old economy" stocks were relatively out of favour.

■ SUMMARY

We can theoretically choose an optimum portfolio based on the tangency between the efficient frontier and the indifference curves of each investor. For a portfolio of stocks, we can also use a simple ranking device to get an optimum mix of stocks that maximizes the return risk trade-off. In practice, the portfolio process involves a detailed study of the objectives and constraints of the investor, the time horizon, current wealth, tax status etc. Asset allocation is a major factor that determines the risk and return of a portfolio. The selection and rebalancing of a portfolio depend on the changing investment environment and needs of the individual.

■ MULTIPLE CHOICE QUESTIONS

1. If the indifference curves of two individuals A being more risk averse than B, are superimposed on the efficient frontier
 - (a) They will be tangent at the same point on the efficient frontier
 - (b) A will be tangent to the right of B
 - (c) A will be tangent to the left of B
 - (d) It is not possible to identify their points of tangency
2. Indifference curves that represent a rational investor with a constant risk return trade off will be
 - (a) upward sloping straight lines
 - (b) upward sloping curves
 - (c) downward sloping straight lines
 - (d) downward sloping curves
3. An investor who expects the stock market will decline should
 - (a) Buy low beta stocks
 - (b) Sell low beta stocks
 - (c) Buy high beta stocks
 - (d) none of the above
4. Which of the following is not an investment objective
 - (a) time horizon
 - (b) minimise possibility of loss
 - (c) current income
 - (d) capital growth

5. Which of the following is not applicable to Systematic investment plans (SIP)
 - (a) SIPs ensure that more shares are purchased when prices are lower as compared to when prices are higher
 - (b) assume that an investor wants to accumulate a substantial number of shares of the same security over time
 - (c) SIP must cover a long enough period to cover booms and slumps
 - (d) none of the above

■ QUESTIONS

1. Describe the stages in the portfolio planning process.
2. How and why do investment goals change over an individual's lifetime?
3. Discuss how investment goals may change with a person's circumstances.
4. Do you expect to have the same asset allocation strategies in India and the US?
5. Explain systematic investment plan.
6. Would the tangency point of indifference curves and the efficient portfolio for a person with higher risk tolerance be to the right or left of the tangency point for a person with less risk tolerance? Why?
7. If the market is expected to go up by 10% in the next two months, what kind of stocks would you advise investors to buy?
8. How would you explain the logic behind C* to a person who does not know finance?
9. What are the limitations of C* in portfolio construction?
10. What investment advice would you give to a young MBA on his first job and a person who has just retired and got a lump sum as gratuity?

■ PROBLEMS

1. Construct an optimum portfolio with the following stocks. Expected return on variance of the market is 12% and risk-free rate is 6%.

Security	Expected Return	Beta	σ^2_{ei}
P	15.00	1.00	30.00
Q	13.00	1.20	20.00
R	10.00	2.00	40.00
S	9.00	0.80	10.00
T	11.00	1.00	20.00
U	16.00	1.50	10.00

■ PRACTICAL EXERCISES

1. Prepare a questionnaire to assess investment objectives and constraints of individuals. Compare the response across age groups, existing wealth, persons with/without dependants etc. For this you may refer to investment websites such as <http://www.investstone.com.au/pdf/Questionnaire.pdf> and <http://www.riskprofiling.com/> to get an idea of the type of questions that can be asked.
2. Prepare a questionnaire to assess the asset allocation pattern of individuals. Compare the response across age groups, existing wealth, persons with/without dependants etc.
3. Take five companies (for a class term paper, this may be done in alphabetical order groupwise, from the BSE 100) from the prowess data base and download the adjusted monthly stock price for each of them over the last five years.
 - (a) For each stock, calculate the monthly return.
 - (b) Calculate the average monthly return and the standard deviation of the monthly return for each stock.
 - (c) Compute the correlation matrix of the five stocks.
 - (d) Compute the variance-covariance matrix of the five stocks.
 - (e) Draw a graph showing the efficient frontier derived using these five stocks only. (combine stocks to give a certain return (say, 10%) and choose the combination with lowest standard deviation, repeat for other returns say 12% 14% etc)
 - (f) Take the average monthly return on the five-year government bond and use it as the risk-free rate. What is the optimal combination of the stocks in your sample if you can borrow and lend at the risk-free rate?

CASE STUDY

In December 2008, officials from Canara Bank made a presentation on investment and retirement planning at a client's office. They first covered planning in general and then presented details of an equity linked saving scheme offered by them.

The points highlighted by them included the following:

1. The need to plan for enough income to fulfil intermediate needs such as children's education, marriage and enjoy a comfortable lifestyle after retirement.
2. Increased life expectancy and increase in medical expenses makes retirement planning even more important.
3. Inflation will reduce the purchasing power of money in the future.
4. Pension from employers may not be sufficient to meet future needs.
5. In the long run equity offers inflation protection and gives higher return than fixed income securities.

Their recommendations included:

1. Start early to take advantage of compounding of returns.
2. Plan your income, expenses and save regularly.
3. An equity linked tax saving plan should form a part of the portfolio, depending upon the objectives and financial position of each individual.

After the presentation, some of the members of the audience questioned the safety of unit linked schemes as they had personally experienced erosion of capital invested in such schemes in the last three years. They requested Parul, a young executive, to study the subject and the Canara Bank related tax saving scheme.

Parul searched the internet and collected the following information:

Exhibit I

Year	Year end WPI	Average Gold price	Year End Sensex	SBI 3-5 year deposit rates
2007-2008	215.7	9996	9647	7.5-9
2006-2007	206.2	9240	20287	7.5-9
2005-2006	195.6	6900	13787	6.25-7
2004-2005	187.3	6145	9398	5.75-6.25
2003-2004	175.9	5718	6603	5.25-5.5
2002-2003	166.8	5332	5839	5.5-6.25
2001-2002	161.3	4579	3377	8-8.5
2000-2001	155.7	4474	3262	9.5-10
1999-2000	145.3	4393	3972	10-10.5
1998-1999	140.7	4268	5006	10.5-11.5
1997-1998	132.8	4347	3055	11.5-12
1996-1997	127.2	5070	3659	12.5-13
1995-1996	121.6	4958	3085	13
1994-1995	112.6	4667	3110	11
1993-1994	100	4532	3927	10

Canara Robeco Equity Tax Saver

Minimum investment: Rs.500/- each at NAV related Sale price. Minimum investment in equity and equity related instruments 80% NAV as on 31 December 2008 Rs 11.51, sale price Rs. 11.77 (entry load 2.25%).

Exhibit 2: Canara Robeco Equity Tax Saver

Date	Dividend (Rs.)	NAV (Rs.)
01.06.1994	1.5	17.98
31.03.1995	1.25	14.22

Contd...

31.03.1996	1.4	11.54
22.06.1999	1.25	16.28
21.12.1999	1.25	24.44
13.03.2000	1.5	31.6
19.01.2001	2	19.65
26.07.2003	0.75	11.35
06.10.2003	0.75	13.22
14.03.2004	1.5	14.09
01.03.2005	2.5	16.84
20.02.2006	4	22.25
09.03.2007	6	20.52
28.03.2008	3	19.22

The questions she is seeking answers to are as under:

1. If a person requires Rs 20,000 per month at present, what will be required for the same standard of living after 10, 20, 30 years assuming past inflation rates continue in future?
2. If a person is expected to retire at the age of 60 and starts saving Rs 10,000 per annum what is the lump sum available at retirement with compound interest at 8% if he starts at the age of 30, 40, 50 years?
3. What is the lump sum required for an annuity of Rs. 10,000 per annum for 30 years, assuming a return of 8%?
4. From the information collected, what seem to be the advantages/risks associated with investing in an equity linked saving scheme?
5. What other information would you like to have in this connection?

CHAPTER - 16

Asset Pricing Models: Required Return Analysis

LEARNING OBJECTIVES

- Learn some of the models that explain return on investments
- Understand the concept of efficient portfolios when risky and risk-free assets are combined
- Use the Capital Asset Pricing Model (CAPM) to find out the required return on a security using beta
- Discuss the Arbitrage Pricing Theory and the various factors that may contribute to it.

Modern financial theory assumes that markets are competitive and efficient and that these markets are dominated by rational, risk-averse investors, who seek to maximize satisfaction from returns on their investments. In order to maximise returns for a given level of risk we need to be able to forecast risk and return. Historical returns vary between asset classes, between individual assets in the same class and for all assets over time. One of the fundamental issues in finance therefore is to identify the factors that drive returns, the sensitivity of returns to these factors, and the reward for bearing this sensitivity.

Return generating models have been developed to determine the relationship between returns and factors that are common to securities. *Single index models* relate returns to one factor or index, which could be the Gross Domestic Product (GDP), the production index, interest rates, exchange rates, inflation etc. The *market model* assumes that the common movements or systematic risk of stocks can be explained by the stock market index and that the remainder unexplained movements are specific to individual securities i.e., unsystematic risk. *Multiple index models* attribute returns to more than one factor, which could be statistically derived factors, or a combination of macroeconomic, industry and company related factors. These models are time series models that normally use regression to estimate the relationship between the factors and returns on a particular asset over the time period studied.

General equilibrium models make assumptions about the behaviour of investors and draw conclusions about risk and return of across assets in the market. The two major asset pricing models are the Capital Asset Pricing Model (CAPM) and the Arbitrage Pricing Theory (APT). The CAPM explains equilibrium with respect to a single factor, the market portfolio and the APT assumes that security returns are generated by a multiple factor model but does not specify the factors. Asset pricing models can be used to estimate the covariance between securities, select securities according to their exposure to the risk factors, calculate expected return and evaluate portfolio performance.

■ COMBINING RISK-FREE ASSETS AND RISKY ASSETS

In the portfolio analysis chapter, we had derived the risk and return for combinations of risky assets. We now introduce a risk-free asset¹ with the assumption that it is possible to invest i.e., lend at the risk-free rate and to borrow at the risk-free rate for investment in risky assets. The formulae for calculation of risk and return are the same as the previous chapters.

$$\text{Portfolio Return} = R_p = \sum W_i R_i \text{ for } i = 1 \text{ to } N$$

Where W_i is the fraction of the portfolio held in each asset and R_i are the returns.

$$\text{Portfolio Variance} = \sigma_p^2 = (\sum \sum W_i W_j \rho_{ij} \sigma_i \sigma_j) \text{ and}$$

$$\text{Portfolio Standard Deviation} = \sigma_p = \sqrt{\sum \sum W_i W_j \rho_{ij} \sigma_i \sigma_j}$$

for $i = 1 \text{ to } N$ and $j = 1 \text{ to } N$

¹ Risk-free assets have zero standard deviation and zero correlation with other assets.

where σ_i and σ_j are the standard deviations of each pair of assets and ρ_{ij} is the correlation between them.

For combinations of a risk-free asset RF and risky asset A, the return and risk will be

$$\text{Portfolio Return} = R_p = W_A R_A + (1 - W_A) R_{RF}$$

$$\text{Portfolio Standard Deviation } \sigma_p = \sqrt{(W_A^2 \sigma_A^2 + W_{RF}^2 \sigma_{RF}^2 + 2W_{RF} W_A \rho_{RF} \sigma_{RF} \sigma_A)}$$

Since the variance of a risk-free asset is equal to zero, and the covariance between the risk-free asset and any risky asset is zero, the portfolio standard deviation reduces to $(W_A^2 \sigma_A^2)^{0.5} = W_A \sigma_A$ i.e., the proportion of investment in the risky asset multiplied by standard deviation of the risky asset.

If the risk-free rate R_f is 6% and return and standard deviation for a risky asset R_A are 20% and 12% respectively, then return and risk on a portfolio of 50% of each would be as follows:

$$\text{Return} = 0.5 \times 6 + 0.5 \times 20 = 13\%$$

$$\text{Standard Deviation} = 0.5 \times 12 = 6\%$$

The standard deviation and return for various proportions of risky and risk-free asset are shown in Table 16.1 and plotted in Figure 16.1. As can be seen the various combinations lie on a straight line.

Table 16.1: Risk and Return for various Combinations of Risky and Risk-free Asset

Return on A 20%, Return on RF 6%, Standard Deviation of A 12%			
Proportion of A	Proportion of RF	Portfolio Standard Deviation (%)	Portfolio Return (%)
0	1	0	6
0.1	0.9	1.2	7.4
0.2	0.8	2.4	8.8
0.3	0.7	3.6	10.2
0.4	0.6	4.8	11.6
0.5	0.5	6	13
0.6	0.4	7.2	14.4
0.7	0.3	8.4	15.8
0.8	0.2	9.6	17.2
0.9	0.1	10.8	18.6
1	0	12	20

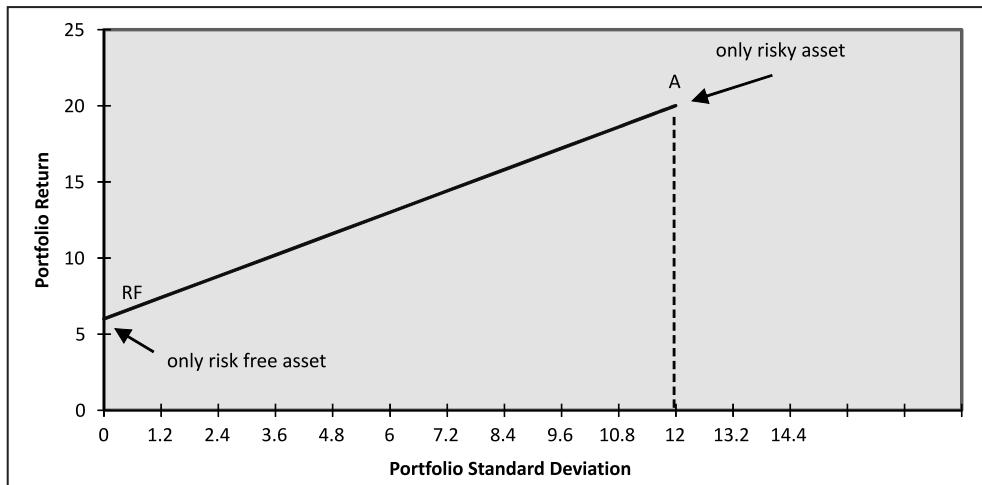


Figure 16.1: Combination of a Risky and Risk-free Asset

An investor can also borrow at the risk-free rate and invest in the risky asset, which offers higher returns i.e., make use of financial leverage. If proportion of own funds is 1.0 and proportion of borrowed funds is 0.5 and the entire sum (1.5) is invested in the risky asset A, portfolio return and risk will be

$$\text{Portfolio Return} = W_A R_A + (1 - W_A)R_{RF} = 1.5 \times 20 + (1 - 1.5) \times 6 = 27\%$$

$$\text{Portfolio Risk} = 1.5 \times 12 = 18\%$$

The risk and return for various combinations of risky and risk-free asset including lending and borrowing are shown in Table 16.2 and plotted in Figure 16.2. As can be seen from the table, financial leverage leads to higher return but also increases the risk. The various combinations still plot on a straight line. Points to the left of A are combinations where part of the money is invested in risk-free and part in risky assets. Points to the right side of A show risk and return for portfolios where additional money is borrowed at the risk-free rate to invest in the risky security A.

Table 16.2: Risk and Return for Risky Asset with Borrowing and Lending at the Risk-free Rate

Return on A 20%, Return on RF 6%, Standard Deviation of A 12%			
Proportion of A	Proportion of RF	Portfolio Standard Deviation	Portfolio Return
0	1	0	6
0.2	0.8	2.4	8.8
0.4	0.6	4.8 ¹	11.6
0.6	0.4	7.2	14.4
0.8	0.2	9.6	17.2
1.0	0	12	20
1.2	-0.2	14.4	22.8
1.4	-0.4	16.8	25.6
1.6	-0.6	19.2	28.4
1.8	-0.8	21.6	31.2

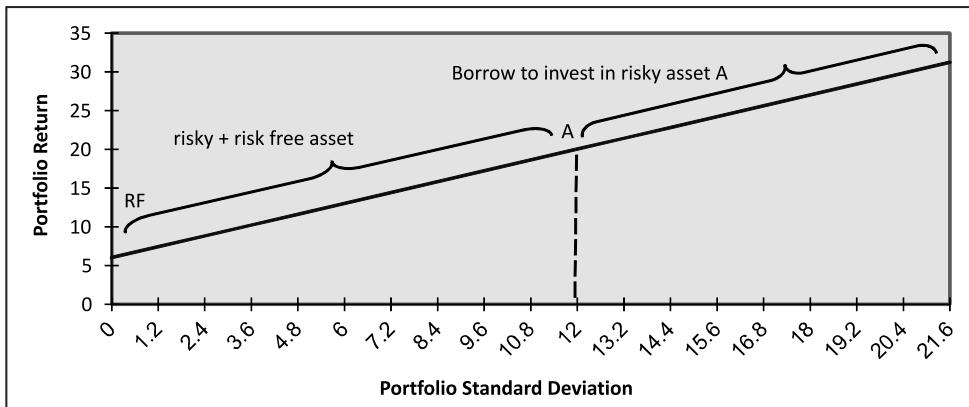


Figure 16.2: Risky Asset with Borrowing and Lending at Risk-free Rate

■ CAPITAL MARKET THEORY—THE CAPITAL ASSET PRICING MODEL

The simplest form of an equilibrium model is the standard CAPM or the one-factor CAPM. The credit for the CAPM goes to Sharpe (1964), Lintner (1965) and Mossin (1966) who developed the model almost simultaneously². Their main contribution was the derivation of equilibrium prices for individual securities as a function of potentially measurable market parameters after eliminating individual utility information³.

The original CAPM makes many simplifying assumptions. The market is perfect; no investor can influence the market price. All relevant information is freely available to all investors. There are no transaction costs or taxes. All securities are infinitely divisible. All investors can borrow or lend any amount at the risk-free rate. All investors have the same single period investment horizon. Investors are rational and risk-averse and take decisions using the mean-variance rule. Unlimited short sales are allowed. All assets including human capital are marketable. In spite of all these unrealistic assumptions, the model is a good description of the process. Some of these assumptions and their implications are discussed in more detail later.

The CAPM can be derived using a simple intuitive approach⁴. If risk-less borrowing and lending are introduced along with the efficient frontier, all combinations of risk-free asset with risky portfolios would form straight lines originating at the risk-free rate on the vertical axis. (see Figure 16.3). The line that is tangent to the efficient frontier of risky assets would form the new set of efficient portfolios. It gives highest feasible return for each level of risk and lies above the efficient set of risky assets.

² Fama (1968) showed that the Sharpe and Lintner models lead to the same measure of risk and the same relationship between risk and return. See Litzenberger (1969) for a brief comparison of the three approaches.

³ Jensen (1972)

⁴ Those interested in a more rigorous mathematical approach for CAPM and APT may refer to Elton & Gruber (1996)

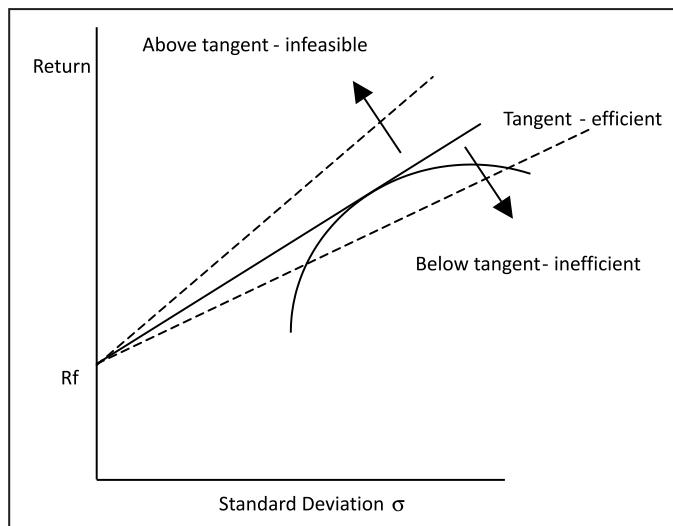


Figure 16.3: Combinations of Risk-free Asset and Risky Portfolios

If all investors have homogeneous expectations they will all hold the same identical risky portfolio, which in equilibrium is the market portfolio (Figure 16.4). Each investor will hold a combination of the risk-free asset (either borrow or lend) and the market portfolio depending on their risk preferences. Risk-averse investors will invest either at R_f with risk zero risk or at points to the left of M, where a part of the portfolio is invested in risk-free assets and part in the market portfolio. More aggressive investors will invest to the right of M and borrow at risk-free rate to invest in the market portfolio; their return and risk would be magnified due to leverage. This combination of market portfolio and risk-free asset is also known as the *two fund separation theorem*; the investor does not have to think about asset allocation in the risky portfolio as these two assets are sufficient to satisfy the risk and return requirements of all investors. This straight line is called the *capital market line* (CML) and all *efficient portfolios* lie on this. Those above it are not feasible and those below it are inefficient. The equation describing the capital market line is

$$\bar{R}_e = R_f + \frac{(\bar{R}_m - R_f)\sigma_e}{\sigma_m}$$

where the subscript e defines an efficient portfolio. The return is a function of the risk-free rate plus the extra return per unit of risk $(\bar{R}_m - R_f)/\sigma_m$ multiplied by the risk of the portfolio. Individual assets are inefficient portfolios, they will always plot below the CML. It is also useful to view this equation as reward for time and reward for risk⁵.

$$\begin{array}{rcl} \bar{R}_e & = & R_f + \frac{(\bar{R}_m - R_f)}{\sigma_m} \sigma_e \\ \text{Expected / required return} & \uparrow & \text{Reward for waiting/} \\ & & \text{Price of time} \\ & & \text{(intercept of CML)} \\ & & \uparrow \\ & & \text{Reward per unit of risk} \\ & & \text{(slope of CML)} \end{array}$$

⁵ The reward to risk ratio, called the Sharpe ratio is also used for portfolio performance evaluation in the chapter on mutual funds.

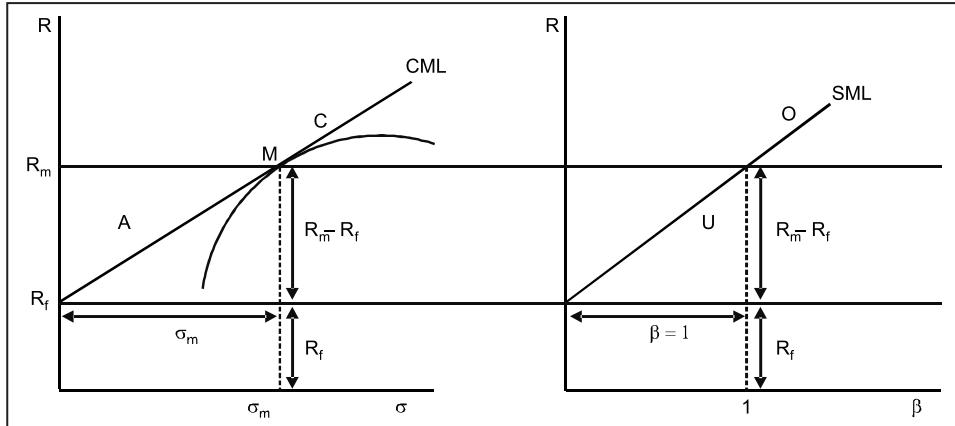


Figure 16.4: The Capital Market Line and the Security Market Line

Every investor is holding the market portfolio, which is very well diversified. As the unsystematic risk for the market portfolio is diversified away it approaches zero, and the only relevant risk that remains is beta⁶. All securities and portfolios will lie on a straight line in the return-beta space known as the *security market line* (SML) shown in Figure 16.4. The SML has an intercept equal to the risk-free rate on the vertical axis and return equal to market return when beta is equal to one. Any security or portfolio that lies above the line will be giving higher return per unit of risk than securities/portfolios vertically below it on the SML, as a result of which risk less arbitrage opportunities will result in increased demand and push prices up till expected returns become equal for equal risk. Similarly, for securities/portfolios below the line prices will fall till expected returns converge on the SML. Since unsystematic risk can be diversified, the investor is rewarded only for systematic risk. It is very important to note here that the SML is an *ex-ante* or forward looking model. It tells us what the relationship between return and risk are expected to be or should be in equilibrium.

The SML which is the equation representing the CAPM is expressed as

$$\text{ER}_i = R_f + (\text{ER}_m - R_f) \beta_i$$

↑ ↑ ↑ ↑
 Expected/required return Reward for waiting/
 Price of time
 (intercept of CML) Reward per unit of risk
 (slope of CML) Expected risk
 (systematic)

Beta is first derived for each security from historical (ex-post) data using a time series regression. The calculation of the characteristic line has been done in the chapter on risk and return and then for an empirical test of CAPM, the betas of various securities and their respective returns are used in a cross-sectional regression to get the security market line.

⁶ Strictly speaking, beta is not a measure of systematic risk; rather it is a measure of the relative sensitivity of an asset's rate of return to the market while $\beta_i^2 \sigma_m^2$ is the measure of systematic risk. However, since σ_m^2 remains the same irrespective of the portfolio, any decision made on the basis of beta will be the same as if made on the basis of $\beta_i^2 \sigma_m^2$ as long as beta is positive, therefore beta is called a measure of systematic risk. A completely diversified portfolio would have a correlation with the market portfolio of +1.00. All portfolios on the CML are perfectly positively correlated with each other and with the completely diversified market Portfolio M.

However, CAPM is a forward-looking model. It explains the relationship that *should be* there between beta and return for all the assets. $E(R_i)$ is the expected return on asset i , R_f is the risk-free rate, $E(R_m)$ is the expected return on the market portfolio and β_i is the systematic risk of security i . Beta can also be expressed in terms of covariance σ_{im} or correlation ρ_{im} between the market and the security as follows:

$$\beta_i = \frac{\sigma_{im}}{\sigma_m^2} = \frac{\rho_{im}\sigma_i}{\sigma_m}$$

CAPM is, therefore, an equilibrium model that relates the required rate of return for a security or portfolio with the risk for that security as measured by beta. Every investment carries two distinct risks, the risk of being in the market, which is called systematic risk or beta, and the other the unsystematic risk which is company specific and can be diversified through creation of portfolios. Investors hold portfolios comprising of the market portfolio and lend or borrow at the risk-free rate depending on individual risk preferences. Securities or portfolios with high betas tend to do better in good times and worse in bad times than those with low betas. Although the CAPM is derived using the CML which uses total risk (standard deviation), it does not say anything about the relationship between expected return and total risk.

According to CAPM, if assets offer a higher or lower expected return as compared to the SML, asset prices will adjust until equilibrium occurs, and every security and portfolio lies on the SML. When the expected return from a security is lower than that required by the CAPM (point U in Figure 16.4), then the security is said to be *overvalued* or overpriced. In such cases, investors will not want to hold a security with lower expected returns and will try to sell the security. This will drive down the price and the expected return will rise. Similarly, when the expected return from a security is higher than the required by CAPM, the security is said to be *undervalued*, or underpriced. Investors will want to buy this security, as it offers higher than required return. This increase in demand will push up the price and the expected return will decrease.

The difference between a security's expected return and required equilibrium return or *mispicing* is also known as *alpha*. This should not be confused with alpha the intercept of the characteristic line. In the context of the CAPM, alpha is defined as:

$$\alpha_i = E(R_i) - [R_f + \{E(R_m) - R_f\} \beta_i]$$

The alpha of a security is equal to the vertical distance by which it lies above or below the SML. If $\alpha_i = 0$ then it is correctly priced and expected return lies on the SML, $\alpha > 0$ it plots above the SML and the security is underpriced, and if $\alpha_i < 0$ it lies below the SML and the security is overpriced. This concept is also used in performance measurement in the mutual fund chapter.

The security market line represents the required rate of return on a security or portfolio. Since the required rates of return change over time, it is interesting to study these changes with respect to the SML. If the beta of a security changes, this would be a movement along the SML. If there is a change in the required premium on the market (expected

market return minus the risk-free rate) there would be a change in the slope of the SML. Changes in market environment such as an expected economic slow down could change the expected return on the market. A change in the risk-free rate of return would lead to an upward or downward parallel shift in the SML. Inflation rates would lead to a change in the risk-free rate of return. Similarly, a change in the risk-free rate of return would shift the CML and a change in the risk premium of the market portfolio would change the slope of the CML.

Most of the assumptions underlying the CAPM violate the conditions in the real world. While some of the differences from reality may not materially affect the explanatory power of the model, incorporation of realistic assumptions allows their impact to be investigated. The prediction (and assumption) of the CAPM is that all investors are holding efficient portfolios in the return-standard deviation space. However, investors may hold portfolios inside the minimum variance set due to a variety of reasons. Unlimited short selling may not be possible, returns may not be normally distributed, each investor may face a different efficient set after transaction costs and taxes, some capital assets are indivisible, some assets are not marketable, all investors do not have access to the same information etc. As a result, we cannot expect a security market line but a “security market cloud”⁷. Over the years, more complex models, generally relaxing some of the original assumptions have been proposed. A few of the well known extended CAPM models are discussed below.

CAPM with no Risk-free Asset – the Zero Beta Model

The CAPM with no risk-free asset is widely used. In this case, the lowest risk portfolio (also known as the minimum variance zero beta portfolio) has zero correlation with the market. The return on this portfolio is uncertain and expected return on this portfolio is lower than the expected return on the market portfolio. The zero beta portfolio is not an efficient portfolio. All other assumptions of the standard model remain the same. This is known as the zero beta version or two factor CAPM as investors hold a combination of these two mutual funds. The SML in this case has a y intercept equal to the zero beta portfolio (Figure 16.5).

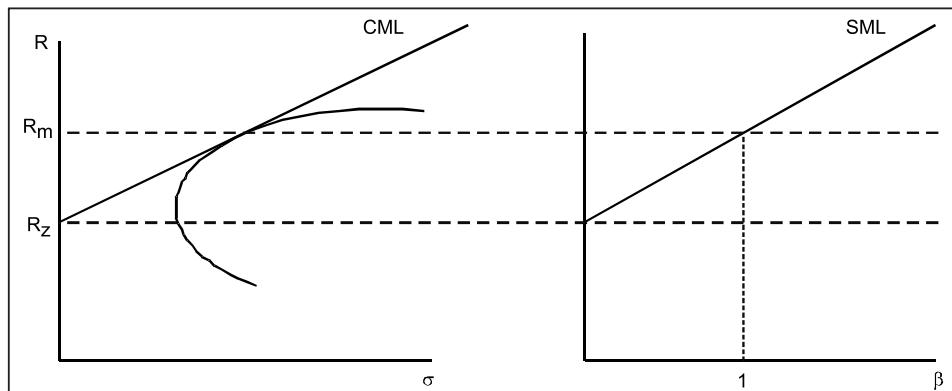


Figure 16.5: The Zero Beta Model

⁷ Haugen (1997, pg 219)

Borrowing and Lending at Different Rates

While it is unrealistic to assume that investors can borrow at risk-free rate, it is quite realistic to assume lending at the risk-free rate. In this case, all investors can be satisfied by holding some combination of the market portfolio, borrowing at a higher rate and lending at the lower risk-free rate⁸. The efficient opportunity set is $R_f A B C D$ (Figure 16.6).

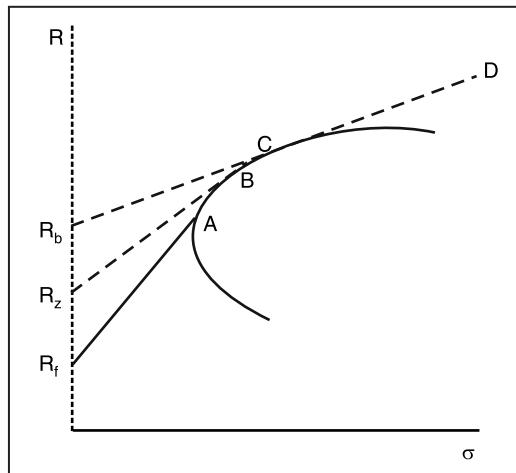


Figure 16.6: Borrowing and Lending at Different Rates

Investors with risk-free lending would hold an efficient portfolio of risky securities at the tangency point A and those with borrowing at point C. For portfolios consisting of only risky securities, the SML would be the same as the zero beta model. Investors who prefer to have part investment in the risk-free investments have lower expected return than investors investing partly in the zero beta portfolio. This is due to the fact that the return on the risk less asset is certain, but return on the zero beta portfolio is not.

Does the CAPM Actually Work?

CAPM has been tested extensively, for over three decades, in various forms primarily in developed capital markets and to some extent in developing markets. If the CAPM holds, we should expect the following:

- 1 Higher beta should be associated with higher return, i.e., the relationship between risk and return should be positive and statistically significant.
- 2 The intercept of the SML should correspond to the risk-free return or zero beta return and slope should be $(R_m - R_f)$ or $(R_m - R_z)$.
- 3 The relationship between risk and return should be linear.
- 4 As beta is the relevant measure of risk, the residual risk should be insignificant.

⁸ Black, Jensen and Scholes (1972), Fama and McBeth (1973) and Blume and Friend (1973)

Early work in this area in the US supported the CAPM⁹ though the intercept was generally found to be higher, which was interpreted as support for the zero beta model. However, it was not found to be applicable in later periods. Early studies in India reported mixed results while recent work shows that it does not describe the Indian stock market¹⁰. Some further studies have highlighted the danger of focusing exclusively on mean-beta space as they found that the return generation process also depends on other variables like size, book to market ratio and earnings price ratio¹¹.

There are also many problems in testing CAPM, which can lead to misleading results. CAPM is an ex-ante (forward looking) model and we need to estimate future beta using the world market portfolio. Since there are no figures for future returns, we use ex-post (historical) data¹². Beta varies considerably with method of computation and the major reason for variation seems to be the interval between data points¹³. Historical betas for individual stocks have not been found to be stationary over time and should not be used for future projection. Since portfolio betas are comparatively more stationary than individual stocks, most studies use portfolios. In the absence of a market portfolio most empirical studies also use the stock market index as a proxy for the market portfolio. According to Roll (1977 and 1979), portfolio grouping procedures can support a theory even when it is false because individual asset deviations from linearity can cancel out in portfolios and even more important, the CAPM can never be tested in the absence of the market portfolio.

■ THE ARBITRAGE PRICING THEORY

Factor models help determine factors that securities respond to and the sensitivity of their returns to movements in these factors. Single index models such as the market model, explain returns using the stock market index while the CAPM is a single factor equilibrium model based on the market index. Multi-index models assume a return generating process that is a linear function of many factors, where each factor is a source of systematic risk. Multi-index models attempt to capture the market and non-market influences that cause securities to move together. The standard form of the multi-index model is as follows:

$$R_i = a_i + b_{i1} I_1 + b_{i2} I_2 + b_{i3} I_3 + b_{i4} I_4 \dots + b_{ij} I_j + e_i$$

This is a time series regression where R_i is expected return on asset i , a_i is return on stock i if all indices have a value of zero, b_{ij} is the reaction coefficient describing the change in asset i 's return for a unit change in factor j , I_j is the value of the j th index and e_i is the random error term. This can be considered as equivalent to the characteristic line, which is used to derive beta for the CAPM.

⁹ Obaidullah and Mohanty (1994) and Dhankar (1996), Sehgal (1997), Vipul (1998) and Dhankar & Singh (2005).

¹⁰ Banz(1981), Reinganum (1981), Gibbons(1982), Shanken (1985) and Fama and French (1992).

¹¹ Regression of return on the stock with return on the market index yields the characteristic line with intercept alpha and slope beta. The betas are calculated for all the stocks/portfolios being studied, then their returns are regressed with the betas to find the slope and intercept of the security market line.

¹² Singh (2008c).

¹³ In reality also, there will be more securities than factors.

APT developed by Ross (1976) assumes that security returns are generated by a factor model, but does not identify the factors. The major assumptions of the model are that markets are perfectly competitive and that investors always prefer more wealth to less wealth with certainty. It assumes that there are an infinitely large number of assets, and that investors have homogeneous expectations. It is assumed that the unique effects of individual assets are independent and will be diversified away in large portfolios. Since systematic risk cannot be diversified, investors should be compensated according to the sensitivity of the security to each factor. It also states that the factor sensitivities are linearly related to expected returns.

It implies that securities or portfolios with equal factor sensitivities should offer the same expected returns. If not, investors will take advantage of arbitrage opportunities, causing their elimination. The equilibrium expected return on a security is a linear function of its sensitivities to the factors. APT can be described by the following equation:

$$ER_i = R_f + \lambda_1 b_{i1} + \lambda_2 b_{i2} + \lambda_3 b_{i3} + \dots + \lambda_j b_{ij}$$

This is a cross-sectional regression where ER_i is expected return on asset i , R_f is return on a risk-free asset because all its b_{ij} 's are zero, b_{ij} is the reaction coefficient describing the change in asset i 's return for a unit change in factor j , and $\lambda_j = (R_j - R_f)$ is the premium for risk associated with factor j . If there are portfolios with identical risk but different returns, investors will push up the prices of undervalued portfolios and vice-versa for overvalued portfolios, till risk and return are equated. Arbitrage is the earning of risk-less profit by taking advantage of different prices for the same asset. In this case, we are using "almost arbitrage" by taking advantage of opportunities offered by similar portfolios. Also, arbitrage in this case is arbitrage in expected returns, as there is no guarantee that the expected returns will materialise.

This concept of arbitrage can be explained with simple numerical examples. We start with a portfolio containing three stocks and sensitivity to just one factor as follows:

Example 16.1A

Stock i	Return R_i	Sensitivity b_{i1}	Investment Rs lakh	Proportion Invested	Exposure to Factor 1	Return
					Proportion* b_{i1}	Proportion* R_i
1	10	0.5	2	0.33	0.17	3.33
2	18	1.1	2	0.33	0.37	6
3	15	0.7	2	0.33	0.23	5
Total			6	1	0.77	14.33

If it is possible to increase return without increasing the risk i.e., exposure to the factor, while keeping total investment the same, there is an opportunity for arbitrage. One such possibility is shown below:

Example 16.1B

Stock i	Return R_i	Sensitivity b_{i1}	Investment Rs lakh	Proportion invested	Exposure to factor 1	Return
					Proportion* b_{i1}	Proportion* R_i
1	10	0.5	1.9	0.32	0.16	3.17
2	18	1.1	1.95	0.33	0.36	5.85
3	15	0.7	2.15	0.36	0.25	5.37
Total			6	1	0.77	14.39

The exposure of the portfolio remains at 0.77 and the return is 0.09% higher. If we examine the change in proportions, investment in the third security has gone up while investment in the other two has gone down. Increased demand for the third security will push up its prices and sales pressure on the other two will result in a decline in their prices. This will continue till equilibrium is reached. This concept is the same as in CAPM and can be represented on a graph (see Figure 16.7) like the security market line (SML) when there is just one factor. When there are two factors, there will be a two dimensional plane and in case there are more than two factors, it cannot be represented on a diagram.

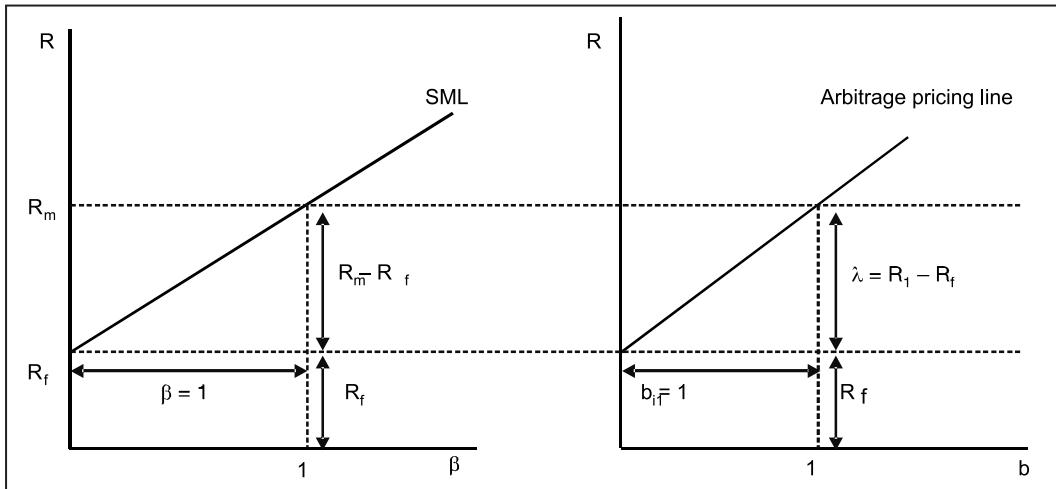


Figure 16.7: The Security Market Line (CAPM) & The Arbitrage Pricing Line (APT)

Since APT is a multifactor model, an example of arbitrage with two factors is also given in Example 16.2A and B.

Example 16.2A

Stock i	Return R _i	Sensitivity b _{i1}	Sensitivity b _{i2}	Proportion Invested	Exposure to Factor 1	Exposure to Factor 2	Return
					Proportion* b _{i1}	Proportion* b _{i1}	Proportion* R _i
1	20	1	2	0.25	0.25	0.5	5
2	10	2	3	0.25	0.50	0.75	2.5
3	18	3	4	0.25	0.75	1	4.5
4	15	1	1	0.25	0.25	0.25	3.75
Total				1.00	1.75	2.50	15.75

If we take x₁, x₂, x₃, and x₄, to represent the proportions in each security, for arbitrage the following conditions must be satisfied:

1. Total investment must remain the same: x₁ + x₂ + x₃ + x₄ = 1
2. Sensitivity to factor 1 must be same: 1x₁ + 2x₂ + 3x₃ + 1x₄ = 1.75
3. Sensitivity to factor 2 must be same: 2x₁ + 3x₂ + 4x₃ + 1x₄ = 2.50

Since there are four unknowns and only three equations there are infinite possibilities¹⁴, we, therefore, arbitrarily fix one of the unknowns and solve for the remaining three. We can set x₁ = 0.30 and check if arbitrage is possible. In this case, we need to solve the following equations:

1. 0.3 + x₂ + x₃ + x₄ = 1
2. 1 × 0.3 + 2x₂ + 3x₃ + 1x₄ = 1.75
3. 2 × 0.3 + 3x₂ + 4x₃ + 1x₄ = 2.50

The following solution is obtained:

$$x_1 = 0.3, x_2 = 0.15, x_3 = 0.30, \text{ and } x_4 = 0.25$$

We need to check if this new portfolio gives higher return or not. As can be seen in Example 16.2B, the total sensitivity of the portfolio to each of the factors remains unchanged yet return has increased i.e., arbitrage is possible with this new portfolio¹⁵.

Example 16.2B

Stock i	Return R _i	Sensitivity b _{i1}	Sensitivity b _{i2}	Proportion invested	Exposure to factor 1	Exposure to factor 2	Return
					Proportion* b _{i1}	Proportion* b _{i1}	Proportion* R _i
1	20	1	2	0.30	0.30	0.6	6
2	10	2	3	0.15	0.30	0.45	1.5
3	18	3	4	0.30	0.90	1.2	5.4
4	15	1	1	0.25	0.25	0.25	3.75
Total				1	1.75	2.50	16.65

¹⁴ In reality also, there will be more securities than factors.

¹⁵ This is a process of trial and error, arbitrage is possible only when return increases.

Does the APT Actually Work?

A great deal of research work on APT has been undertaken in developed markets, particularly in the U.S. market, using two approaches. In the first approach factor analysis is used to extract the significant factors. The analysis showed that APT could explain variation in returns, however number of significant factors varied with the length of period studied and the number of stocks included in the study¹⁶. A study of the Indian stock market also showed that APT with statistically extracted factors provides better estimates of required return than CAPM¹⁷. The drawback of this approach is that it is difficult to interpret the factors in economic terms¹⁸.

In the second approach, factors are specified in advance. These could be macroeconomic factors, market factors, industry factors or fundamental factors that are derived from the balance sheet and income statements of companies¹⁹. Macroeconomic factors identified by various researchers include growth rate in industrial production, rate of inflation, spread between long-term and short-term interest rates, spread between low grade and high grade bonds, growth rate in aggregate sales, rate of return on S&P 500, growth rate in GNP, rate of interest, rate of change in oil prices and rate of change in defence spending. The risks and returns associated with various factors and sensitivities of securities to factors have also been reported to change over time²⁰. In India, the National Index, WPI and exchange rates were found significant in the first stage, but none were significant in the second stage²¹.

Studies that document the relationship between stock returns and company attributes are voluminous. The most prominent are the earnings yield and the size²²; other factors include leverage, dividend yield, book to market ratio, sales per share and cash flow. The Barra multi-index model, which uses a combination of macroeconomic, industry and company specific variables has been found to be superior to statistically derived factors and macroeconomic indicators²³. In India, size has been found to be most prominent²⁴.

¹⁶ Factor analysis, was used by Roll and Ross (1980), Chen (1983) and Dhrymes, Friend and Gultekin (1984).

¹⁷ Dhankar and Singh (2005).

¹⁸ As observed by Dybvig (1983).

¹⁹ Fama & French (1992) used portfolios based on fundamental factors.

²⁰ Chen, Roll and Ross (1986) found yield differential between long and short-term treasury bonds, inflation rate, yield differential between BB rated corporate and treasury bonds, and growth rate in industrial production were significant. Burmiester and McElroy (1988) concluded that CAPM can be rejected in favour of their APT model which included factors like default premium and time premium.

²¹ Vipul and Gianchandani (1997).

²² Earnings yield, Basu (1977 and 1983) and size effect, Banz (1981).

²³ Conner (1995) found the fundamental BARRA model outperforms the statistically determined factor model, which in turn is superior to the macroeconomic model. Moreover, he found the macroeconomic model does not add to the explanatory power of the fundamental model, which may indicate that the fundamental factors in some way capture the risk characteristics of macroeconomic variables.

²⁴ Mohanty (2002) found size, market leverage, E/P ratio and price to BV ratio were related to returns and the size effect was most prominent. Connor & Sehgal (2001) found that proxies for market, size and value factors could explain the cross-sectional dispersion of their mean returns. Singh (2008a and b) found size to be a dominant factor in explaining security returns.

■ CAPM VS. APT

The CAPM is based on portfolio theory while the APT is based on a return generating process. As a result, the APT has fewer assumptions regarding investor behaviour than the CAPM. Unlike the CAPM, APT does not require a market portfolio or unlimited lending and borrowing at the risk-free rate. It does not require all investors to behave in an identical manner and hold a combination of the market portfolio and risk-free asset. However, both models do have a number of things in common:

- 1 Investors make decisions to maximise their expected utility.
- 2 Investors have homogeneous expectations.
- 3 Markets are perfectly competitive.
- 4 The unique effects of each security are independent and will be diversified away in large portfolios.
- 5 Every asset must be compensated only according to its systematic risk.
- 6 In both models the factor sensitivities are linearly related to expected returns.

One of the major differences is that, in the CAPM, the systematic risk is defined to be the co-variability of the asset with the market portfolio, whereas, in the APT it is the co-variability with possibly a number of factors. It is sometimes misleadingly suggested that the CAPM is a single factor model while APT is a multifactor model as many authors have developed multi beta interpretations of the CAPM²⁵. Even if there is more than one priced factor, it is not sufficient proof to reject the CAPM.

Early empirical studies supported the CAPM, but subsequent studies showed that risk was not solely explained by beta and anomalies such as size, P/E ratio, B/M ratio could explain returns, that beta could not. Other anomalies include calendar effects, momentum and over and under reaction which are discussed in greater detail in the chapter on the efficient market hypothesis. Various explanations have been offered for these anomalies. Ball's (1978) explanation was that earnings variables proxy for omitted variables or other mis-specification effects. *Fama and French (1988)* feel that yield surrogates like dividend and earnings yield are correlated with returns because they proxy for underlying risks not accounted for by beta. In 1977, Roll stated that CAPM can never be tested as the true market portfolio should contain every asset in the international economy. On the other hand, tests of APT are not easy to formulate because the model does not specify the factors.

Following the criticism by Roll (1977), some researchers continued to test the CAPM while others tested the alternative model the APT.

²⁵ Roll and Ross (1980 page 1080) stated "We think that in many discussions of the CAPM, scholars were actually thinking of the APT and of process (1) [the factor model] with just one factor". On the other hand, according to Shanken (1985 pg 1189) "in many discussions of the APT, scholars may have actually been thinking of a multi-beta interpretation of the CAPM".

■ SUMMARY

Asset pricing models attempt to identify the factors that drive the returns on investments. The CAPM states that beta or co-movement with the market is the relevant factor as the unsystematic risk can be diversified away in portfolios. All assets should be priced according to the risk-free rate plus a premium for the systematic risk. The arbitrage pricing theory states that there are many relevant factors, but does not name them. Empirical studies have identified various factors at the macroeconomic and company level. The supremacy of either of the models is yet to be established.

■ SOLVED EXAMPLES

- The market return is 15% and risk free rate 5%. Which of the following securities is over/under priced according to CAPM?

Security	Beta	Expected return
A	1.2	20
B	0.8	15
C	1.5	18

Ans: Required return according to CAPM = $R_f + (R_m - R_f)Beta$

Required return	Expected return	
$A \ 5 + 1.2*(15 - 5) = 17$	20	Under priced
$B \ 5 + 0.8*10 = 13$	15	Under priced
$C \ 5 + 1.5*10 = 20$	18	Over priced

- The market return is 15%, standard deviation is 20% and risk free rate 5%. Which of the following securities is efficient/inefficient according to CML?

Security	Standard deviation	Expected return	
A	15	13	
B	18	12	
C	20	17	

Ans: Required return according to CML= $R_f + (R_m - R_f) * \text{stdev asset} / \text{stdev market}$

Required return	Required return	Expected return	
$A \ 5 + (15-5)*15/20$	12.5	13	Efficient
$B \ 5 + 10*18/20$	14	12	Inefficient
$C \ 5 + 10*20/20$	15	17	Inefficient

- An investor looking for a return of 14 % by investing in the market index and government bonds. The estimated return on the market is 21 % with standard deviation of 24% and return on the bonds is 7%. Recommend the proportion to be invested in each and also the risk of this portfolio.

Ans: Let x be the proportion in the index and remainder (1-x) in bonds

$$21x + (1 - x)7 = 14$$

$$21x - 7x = 14 - 7 = 7$$

$$14x = 7 \text{ therefore } x = 0.5 \text{ i.e. } 50\% \text{ in each.}$$

$$(\text{cross check } 0.5*21 + 0.5*7 = 10.5 + 3.5 = 14 \text{ the desired return})$$

Since risk (standard deviation) of government bonds=0

Risk of this portfolio according to the Markowitz portfolio risk = $0.5*24 = 12\%$

4.

Risk free rate	5.00%
Return on market	12.00%
Standard deviation of market	6.00%
Correlation of XYZ with market	0.75
Standard deviation of XYZ	5.00%

What is the required return on the stock XYZ according to CAPM ?

Ans: First calculate beta for XYZ

$$\text{Beta of XYZ} = \text{correlation with market} * \text{stdev of XYZ} / \text{stdev of market} = 0.75 * 5 / 6 = 0.625$$

$$\text{Required return according to CAPM} = R_f + (R_m - R_f)\text{Beta} = 5 + 0.625(12 - 5) = 9.375\%$$

5.

Beta of ABC	1.5
Expected return on ABC	19.00%
Risk free rate (R _f)	5.00%
Return on the market (R _m)	15.00%

If the investor is a believer of CAPM should he buy shares of XYZ?

$$\text{Ans: Required return according to CAPM} = R_f + (R_m - R_f)\text{Beta} = 5 + 1.5(15 - 5) = 20$$

Since expected return is lower do not buy.

6. In question 2 above, the company is planning to reduce its debt and its beta is expected to be 1.2, all other things remaining the same. What is your recommendation to the investor?

$$\text{Ans: Required return according to CAPM} = R_f + (R_m - R_f)\text{Beta} = 5 + 1.2(15 - 5) = 17$$

Since expected return is higher, yes he should buy.

7. ABC Ltd has beta of 1.5 and standard deviation of 50%. The standard deviation of the market portfolio is 25%. What is the correlation between them? What is the systematic risk and unsystematic risk of ABC?

$$\text{Ans: Correlation} = \text{beta} * \text{stdev of market} / \text{stdev of ABC} = 1.5 * 25 / 50 = 0.75$$

$$\text{Total risk} = \text{variance} = 50 * 50 = 2500$$

Systematic risk = beta square*market variance = $0.75^2 \times 25 = 1406.25$

Unsystematic risk = variance of ABC - systematic risk = $2500 - 1406.25 = 1093.75$

Can crosscheck calculations

Correlation = (systematic risk/variance of ABC) $^{0.5} = (1406.25/2500)^{0.5} = 0.75$

8. The return and beta of two stocks that lie on the security market line are as follows. ABC has return of 17% and beta 1.2 and XYZ has return 19 and beta 1.4. What is the required return on PQR with beta of 0.8?

Ans: The stocks that lie on the SML satisfy the equation $\text{Return} = R_f + (R_m - R_f)\Beta$

For ABC $17 = R_f + (R_m - R_f) \times 1.2$ and for XYZ $19 = R_f + (R_m - R_f) \times 1.4$

Solve simultaneous equations as there are two unknown and two equations.

$$19 - 17 = (1.4 - 1.2)(R_m - R_f)$$

$$(1.4 - 1.2)(R_m - R_f) = 2$$

$R_m - R_f = 10$ Put this in the equation for ABC

$$17 = R_f + 10 \times 1.2 \text{ therefore } R_f = 5\%$$

Crosscheck with the equation for XYZ also $19 = 5 + 10 \times 1.4$

Required return for PQR is $5 + 0.8 \times 10 = 13$

■ MULTIPLE CHOICE QUESTIONS

1. Which of the following is not an assumption of CAPM
 - (a) Unlimited borrowing and lending at risk free rate
 - (b) Infinite number of assets
 - (c) Unsystematic risk is diversified away
 - (d) All of the above
2. Which of the following is not an assumption of APT
 - (a) Unlimited borrowing and lending at risk free rate
 - (b) Infinite number of assets
 - (c) Unsystematic risk is diversified away
 - (d) All of the above
3. A stock has alpha 4, beta 1.2, standard deviation of returns 10. What is required return according to CAPM if return on the market and treasury bills is 10 and 5 respectively, and standard deviation of market returns is 8.

<input type="radio"/> 11	<input type="radio"/> 13.6
<input type="radio"/> 16	<input type="radio"/> 17

4. What is the standard deviation of a portfolio with 40 % in treasury bills with 5% return and 60% in a mutual fund with return and standard deviation of 15% and 20% respectively.
 - (a) 7%
 - (b) 10%
 - (c) 12%
 - (d) 14%
5. According to the CAPM all investors choose a combination of risky and risk free assets
 - (a) In the return and standard deviation space
 - (b) In the return and beta space
 - (c) On the characteristic line
 - (d) None of the above
6. An investor borrows Rs one lakh from the bank at 10% interest and invests Rs two lakhs in a mutual fund giving return of 25% and standard deviation of returns of 30%. The risk and return of the portfolio is
 - (a) Return 17.5%, risk 15%
 - (b) Return 17.5%, risk 30%
 - (c) Return 25%, risk 30%
 - (d) Return 40%, risk 60%

■ QUESTIONS

1. List the assumptions of the capital asset pricing model.
2. What is the shape of the efficient frontier when a risk-free asset is combined with the Markowitz efficient frontier?
3. What are the assets that make up the market portfolio?
4. What is a risk-free asset and what are its risk-return characteristics?
5. Distinguish between systematic and unsystematic risk.
6. What do we mean by complete diversification?
7. How do we measure diversification for an individual portfolio?
8. What is the difference between the capital market line, and security market line?
9. Sketch and label the capital market line, characteristic line and security market line and write their respective equations.
10. What is the characteristic line for a stock? How is its equation derived?
11. What are the slopes of the capital market line and security market line?
12. Where in the capital market line graph would a very risk averse investor's portfolio plot?
13. What is the correlation between the risk-free asset and a portfolio of risky assets?

14. What is the beta of the market portfolio and of the risk-free asset?
 15. Do securities with low beta also have low volatility?
 16. Compare the assumptions of the APT and CAPM.
 17. Name some of the factors considered in the empirical studies of the APT.
 18. What are the conditions that an arbitrage portfolio must satisfy?
 19. Which of the following stocks lies on the CML? Give reasons.
 - (a) Infosys
 - (b) HLL
 - (c) IDBI Bank
 20. Given the following equation for the security market line (SML)
- $r_i - r_f = \alpha + b\beta_i + c\sigma_{ei}^2$
- if CAPM is valid what should the value of a,b, and c be equal to.

■ PROBLEMS

1. XYZ Ltd. has a beta of 1.2 and standard deviation of 50%. The standard deviation in the market portfolio is 30%. What is the correlation between XYZ and the market? What is the systematic risk and unsystematic risk of XYZ?
2. Mr X has all his savings of Rs 5 lakhs invested in a mutual fund with an expected return of 20% per annum and a standard deviation of 40%. He is advised to shift Rs 1 lakh to government securities giving a return of 8% per annum. What is the expected risk and return of his portfolio?
3. According to the CML every investor should hold a combination of the market portfolio and a risk-free asset. The expected return on the market is 20% and standard deviation is 30% and return on the risk-free asset is 5%. Design portfolios with:
 - (a) no standard deviation
 - (b) standard deviation of 15%
 - (c) standard deviation of 30%
 - (d) standard deviation of 45%
4. Stock A has an expected return of 7.8% and a beta of 0.7. Stock B has an expected return of 10.2% and a beta of 1.3. The risk-free rate is 5%.
 - (a) Plot the Security Market Line.
 - (b) What is the expected return on the market?
 - (c) Stock C has a beta of 1.1 What is its expected return according to the CAPM?
 - (d) If Stock C has an expected return of 9.75% plot it on the diagram in part (i). Is it overvalued or undervalued?

5. The risk-free rate is 5% and there are two risky assets A and B. A has mean 15% and standard deviation 15% while B has mean 20% and standard deviation 30%. If you had to choose between A or B to combine with the risk-free asset, which would you prefer?
 - (a) Solve graphically
 - (b) Solve with calculations
6. The risk-free rate is 6% and expected return on the market is 15%. What is the expected equilibrium return on the following:
 - (a) ABC Ltd, beta = 1.5
 - (b) PQR Ltd., beta = 0.8
 - (c) XYZ Ltd, beta = 1.0
 - (d) What is the expected return and beta for a portfolio with 10% of ABC, 50% of PQR and 40% of XYZ?
7. A risky portfolio is made up of two stocks as follows:

	Weightage	Expected Return	Variance
X	60%	0.15	0.01
Y	40%	0.10	0.0081

Correlation between X and Y = 1

Risk-free rate of return = 0.05

Mr Patel wants a portfolio with 11% return. How much should he invest in the risk-free asset and the risky portfolio. What is the risk of this new portfolio?

8. Following data are available:

Security	Expected Return	Beta	Standard Deviation
A	0.20	1.1	0.50
B	0.30	1.4	0.35
Stock Index	0.25	1	
Treasury Bills	0.06	0	

In terms of SML, which securities are undervalued or overvalued?

9. Mr X has invested in the following portfolio. Do you have any suggestions for improvement?

Stock	Return	Factor Sensitivity	Investment (Rs lakh)
1	16	0.9	1
2	12	1.2	1
3	10	0.8	1

10. Stock A has beta of 1.2 and return of 11%, stock B has beta of 0.8 and return is 9%. If the returns are according to the CAPM what is the equation of the security market line.

■ PRACTICAL EXERCISES

1. Take the daily, weekly and monthly adjusted prices of any stock of your choice. Calculate the characteristic line using daily returns, weekly returns and monthly returns. What is the impact on the characteristic line when we use different return intervals.
2. Calculate the characteristic line for any stock using different proxies for the market portfolio (for example, sensex, nifty, BSE 200 etc.). What is the impact on the characteristic line when we use different market proxies?
3. Calculate the return and beta for various industry or sector indices using a broad market index as the independent variable. What do you observe?
4. Calculate the return and beta for various industry or sector indices using a broad market index as the independent variable. What do you observe?

CHAPTER - 17

Mutual Funds and Performance Analysis

LEARNING OBJECTIVES

- Understand the types of collective investment mechanisms available
- Describe the various types of mutual fund schemes available
- Discuss the advantages and disadvantages of investing in mutual funds
- Calculate the returns from mutual fund investments
- Evaluate and compare the performance of mutual funds.

Mutual funds have become a very popular form of investment all over the world. At the end of 2006, the worldwide investment in mutual funds was US \$ 21,764,912 million¹. The first modern mutual fund was probably launched in Belgium in 1774. The concept spread to Europe and the US and experienced tremendous growth in the 1980s and 1990s. In India, the first mutual fund was the Unit Trust of India, which was established by an act of parliament in 1963; public sector banks and institutions were permitted in 1987, while private players were allowed only in 1993. At the end of September 2007, there were 37 mutual funds with over 3,200 schemes and Rs. 477 thousand crores of assets under management.

A ***mutual fund*** is a collective investment mechanism where investors pool their resources and share the income and capital gain or losses in proportion to their investments. Funds are invested in securities and other assets in accordance with objectives disclosed in the offer document and investors are issued shares or units for the money invested by them. They offer investors an opportunity to invest in diversified, professionally managed portfolios at a relatively low cost due to economies of scale. A mutual fund is set up in the form of a trust, which has a sponsor, trustees, an Asset Management Company (AMC) and a custodian. The trust is established by one or more sponsors; trustees hold the assets for the benefit of the unit holders and supervise the AMC; the AMC manages the funds by making investments in various types of assets and the custodian has possession of physical securities owned by the fund. All mutual funds are governed and regulated by SEBI to protect the interest of investors and have to register with SEBI² before they launch any scheme. SEBI regulations permit mutual funds to invest in transferable securities in the capital and money market and privately placed debt securities and participate futures and options subject to prudential limits³. They are not allowed short sales or carry forward transactions.

¹ Investment Company hand book 2007.

² Registration under SEBI (Mutual Funds) Regulations, 1996, conditions include being in the financial services business and possessing positive net worth for the last five years, having net profit in three out of the last five years and general reputation of fairness and integrity in all business transactions. Formalities include setting up a trustee company/board of trustees comprising two thirds independent trustees, incorporating the asset management company (AMC) with minimum net worth of Rs. 10 crore, sponsors contribute at least 40% of the net worth of the AMC and appointment of a custodian.

³ Restrictions on investment maximum 15% (20% with approval of Board of Trustees and the Board of AMC) of NAV in debt of single issuer, maximum 10% of NAV in unrated debt instruments of single issuer and total such investments up to 25% of the NAV. No investment in unlisted or private placements in associate or group companies of the sponsor and not more than 30% of assets in group companies. Not more than 10% (5% for open ended schemes) of NAV in equity or equity related instruments of a single company (more allowed for index/sector/industry funds).

Maximum 80% exposure in the futures and options segment backed by liquid securities or cash. Position limits for index derivatives higher of Rs 250 crore or 15 percent of the total open interest of the market. For stock derivatives 20% of market wide position when market limit is up to Rs 250 crore, and Rs 50 crore when market wide position limit is greater than Rs 250 crore. Short positions in index derivatives (short futures, short calls and long puts) allowed within the limit of stock holdings.

Collective Investment Schemes (CIS) are schemes that enable investors to participate and to receive profits or income or produce or property arising from the management of any property such as plantations, agricultural schemes, real estate etc. These schemes consist of a trust and a Collective Investment Management Company (CIMC) and require registration with SEBI⁴. Such schemes have to be compulsorily credit rated as well as appraised by an appraising agency and assets of the scheme have to be insured. The schemes have to have a minimum duration of three years and units issued under CIS are to be listed on a recognised stock exchange.

Hedge funds are private, professionally managed collective investment mechanisms. They can be thought of as mutual funds for very high net worth individuals, but differ from mutual funds in many ways. The minimum investment is very high and membership is not open to the public for subscription. They are registered but not regulated with respect to their investment strategies, fees and reporting requirements. As a result, there is a lack of comprehensive information regarding their policies, investments, returns etc. Historically, hedge funds tried to hedge against the downside risk of bear markets through short selling. Modern-day hedge fund managers do not just hedge risks, but make speculative investments to maximise profits⁵, and can have very high risk; some hedge funds have provided spectacular returns to investors, while others have eroded the entire investment. There are no hedge funds registered in India, though overseas hedge funds are allowed to invest in India.

Portfolio management services are offered by banks, asset management companies, brokerage firms etc. for professional management of portfolios belonging to individuals, companies, societies, etc. Investments are planned according to the specified requirements of each investor. Discretionary portfolio managers manage the funds for each client independently, while non-discretionary portfolio managers manage the funds in accordance with the directions of the client. The minimum investment requirement stipulated by SEBI is Rs 5 lacs, but varies from scheme to scheme⁶.

■ HISTORY OF MUTUAL FUNDS IN INDIA

The first mutual fund to be set up in India was the Unit Trust of India in 1964. It had a virtual monopoly till 1987, when public sector banks were permitted. Private players were

⁴ Under the SEBI (Collective Investment Schemes) Regulations, 1999, the company should have a minimum net worth of Rs. 5 crore.

⁵ Investment could be in stocks, futures, options, bonds, commodities and currencies. They may look for special opportunities in mergers, acquisitions, takeovers, bankruptcies or political changes. They may fund research or invest in upcoming areas like biotech, alternative fuels etc. They may indulge in large scale short selling, or betting on futures.

⁶ For example, Angel Broking and Benchmark Rs 5 lacs, India Infoline Rs 10 Lacs and Rs 50 Lacs, Franklyn Templeton Rs 50 lakhs, HDFC Rs 1 crore.

allowed to enter the market only in 1993. As can be seen from Table 17.1, there has been a phenomenal growth in the funds mobilised by mutual funds, especially in the private sector.

Table 17.1: Net Mobilisation of Funds by Mutual Funds

Year	UTI	Bank-sponsored	FI-sponsored	Private sector	Total
1976-77	0.35	-	-	-	0.35
1980-81	0.52	-	-	-	0.52
1986-87	12.61	-	-	-	12.61
1989-90	55.84	8.89	3.15	-	67.88
1992-93	110.57	12.04	7.60	-	130.21
1993-94	92.97	1.48	2.38	15.60	112.43
2003-04	10.50	45.26	7.87	415.10	478.73
2004-05	-24.67	7.06	-33.84	79.33	27.88
2005-06	34.24	53.65	21.12	415.81	524.82
2006-07	73.26	30.33	42.26	794.77	940.62
2007-08	106.78	75.97	21.78	1382.24	1586.77
2008-09	-41.12	44.89	59.54	-305.38	-242.08
2009-10	156.53	98.55	48.71	479.68	783.47
2010-11	-166.36	13.04	-169.88	-162.81	-486.00
2011-12	-31.79	3.89	-30.98	-395.25	-454.13
2012-13	46.29	67.08	22.41	652.84	788.62
2013-14	4.01	48.45	25.72	467.61	545.79
2014-15	-12.78	-11.48	-9.94	1063.00	1028.80
2015-16	154.16	274.21	13.88	875.33	1317.58

Source: RBI database

The composition of assets under management of mutual funds can be seen in Table 17.2. As can be seen, 79% majority of investments are in open ended schemes and investors have divided their funds mainly in income, equity money market funds. The advantages and disadvantages of the various options are discussed in the next section.

Table 17.2: Assets under Management as on 31st March 2016

	Open Ended	Close Ended	Interval	Total	(Rs'000 Crore) %of Total
Income	408	149	8	565	45.9
Infrastructure Debt Fund		2		2	0.2
Equity	327	18		345	28.0
Balanced	39			39	3.2
Liquid/Money Market	199			199	16.2

Contd...

Gilt	16			16	1.3
ELSS-Equity	39	3		42	3.4
Gold ETF	6			6	0.5
Other ETFs	16			16	1.3
Fundof Funds	2			2	0.2
TOTAL	1052	172	8	1232	100

Source: AMFI

■ TYPES OF MUTUAL FUND SCHEMES BY STRUCTURE

A mutual fund scheme can be classified as close-ended or open-ended depending on its maturity period. As the name suggests, a **close-ended** fund has a fixed maturity period. The fund is open for subscription for a specified period when it is launched, and a fixed number of shares/units are issued. Thereafter, units are bought and sold on stock exchanges where they are listed. Some close-ended funds also give investors an option of selling back the units to the mutual fund through periodic repurchase at NAV-related prices. SEBI regulations stipulate that at least one of the two exit routes is provided to the investor i.e., either repurchase facility or through listing on stock exchanges. These mutual funds schemes generally disclose NAV on a weekly basis. The value of the shares/units depends on the NAV of the fund, as well as supply and demand. In case of close-ended schemes, the investors would get either a demat account statement or unit certificates as these are traded in the stock exchanges.

An **open-ended** fund is one that is available for subscription and repurchase on a continuous basis. There is no fixed maturity period. Investors can buy and sell units at Net Asset Value (NAV) related prices, which are declared on a daily basis. As a result, the number of shares changes as investors buy and sell shares. In case of open-ended schemes, a statement of account is issued to investors.

Interval funds can be repurchased and sold at NAV related prices at predetermined intervals (yearly, monthly etc.)⁷. They are a combination of open and close ended funds. This allows more flexibility than close ended funds as it offers investors an exit route without the risk of realising a value much lower than NAV.

Mutual funds that charge a percentage of their net asset value (NAV) for entry or exit are known as **load funds**. The **entry load** (front end load) is added to the NAV and **exit load** (back end load) is subtracted from NAV. For example, on NAV of Rs.10, if entry and exit load is 1%, buyers will pay Rs.10.10 and sellers will get only Rs.9.90 per unit from the mutual fund. Entry and exit loads are specified in the offer document and subsequent changes are only applicable to new investors. MFs generally utilise the entry load to meet

⁷ Interval funds have been launched by Birla Sun Life Mutual Fund, Prudential ICICI Mutual Fund and ABN-AMRO Mutual Fund.

the commission of agents or distributors⁸. *No load funds* distribute these costs of distribution and marketing among all unit holders.

■ MUTUAL FUND CATEGORIES BY OBJECTIVE

Open and close ended funds can further be classified into broad categories according to their investment objectives:

Growth/Equity Oriented Funds aim to provide capital appreciation over the medium to long-term. A major part of their corpus is invested in equities as a result of which such funds have comparatively higher risks.

Income/Debt Oriented Funds aim to provide regular and steady income to investors. They generally invest in fixed income securities such corporate debentures, government securities and money market instruments. Though they are less risky compared to equity schemes, the opportunities of capital appreciation are also limited. The NAVs of such funds are subject to interest rate risk as prices of fixed income securities fall when there is an increase in interest rates in the economy. This is not a problem for long-term investors.

Balanced Funds aim to provide both growth and regular income and invest in equities and fixed income securities in the proportion indicated in their offer documents. These are appropriate for investors looking for moderate risk and growth.

Money Market Mutual Funds income funds that aim to provide easy liquidity, with preservation of capital and moderate income. They invest in short-term money market instruments such as treasury bills, certificates of deposit, commercial paper, government securities, etc. Returns and NAV of these schemes fluctuate much less than other funds. Investors can park surplus money for short periods in such funds. These funds have a lock in period of 15 days and can offer cheque writing facilities. Money market mutual funds (MMMFs) are regulated by the RBI and SEBI⁹.

Floating Rate Funds are debt funds that mainly invest in floating rate debt instruments along with some fixed rate bonds. Floating rate bonds are almost immune to price risk; when market rates increase, the coupon also increases and price remains almost constant. Fixed coupon instruments on the other hand not only give a lower coupon, but also experience a decline in price. These funds protect investors from the effect of volatility in interest rates, especially when interest rates are expected to rise. However, when rates go down, income reduces but NAV remains constant.

Gilt Funds invest exclusively in government securities. Government securities have no default risk, but NAV fluctuates due to change in interest rates, like other debt instruments.

Index Funds aim to replicate (or track) the portfolio of a particular index such as the BSE Sensitive index, S&P NSE 50 index (Nifty), etc. and their NAVs almost mirror the index.

⁸ Funds are not permitted to charge an entry load for close ended funds and direct subscriptions.

⁹ MMMFs can be launched by banks, public financial institutions with RBI approval while private sector MFs need additional approval from SEBI. They can invest in all money market instruments and GOI securities and rated corporate debt securities with remaining maturity of up to one year. Investment in bonds, debentures and commercial paper in a single company cannot exceed 3% and to all CPs 15.

However, it is not always possible to hold stocks in exactly the same proportion as the index which results in differences in returns known as the tracking error.

Real Estate Mutual Funds (REMFs) aim to invest directly or indirectly in real estate. Other investments could include mortgage backed securities, securities of companies that deal in properties and property development and other securities. SEBI requires a custodian to hold the titles to the properties and that these closed ended funds be listed on stock exchanges. It also requires the REMF to invest at least 35 per cent of its corpus in completed real estate and at least 75 per cent of the corpus should be invested in real estate or related securities.

Real Estate Investment Trusts (RIETs) own or finance income generating real estate assets on behalf of investors. This allows investors to diversify their investments in real estate with easy entry and exit without the need for huge investment. The job of managing and maintaining the properties will also be handled by professionals. Among other regulations, SEBI requires that at least 90% of the value of the assets be invested in completed and rented properties. Infrastructure Investment Trusts (InvITs), require at least 80% of the value of assets be invested in completed and revenue generating infrastructure projects

Sector-specific Funds invest in the securities of sectors or industries as specified in the offer documents e.g., pharmaceuticals, software, fast moving consumer goods (FMCG), petroleum stocks, etc. These funds may give higher returns if the sector is outperforming others, but are also more risky than diversified funds.

Exchange Traded Funds (ETFs) are open ended funds that are traded on stock exchanges. **Exchange traded index funds** are based on an underlying index, which could be a market index, sector specific index¹⁰. **Gold ETFs** track domestic prices of gold through investments in physical gold. Liquid BeES is the first **Liquid ETF** in the world based on basket of call money, short-term government securities and money market instruments of short maturities. ETFs are no load funds that can be traded instantaneously through a broker all day long. Traditional open ended funds are bought from and sold back to the fund at prices based on NAV calculated at the close of the market. Liquidity on the stock exchange is provided by authorised participants i.e., large institutions/arbitrageurs/market makers/brokers who hold large quantities of the underlying stocks and exchange them for ETF units directly with the fund. The fund may also provide for direct subscription/redemption of units¹¹. Prices of the ETF are not identical to the underlying assets, investors can make use of arbitrage opportunities provided between the spot, future and the ETF prices¹².

Tax Saving Schemes offer tax rebates to the investors under specific provisions of the Income Tax Act, e.g., **Equity Linked Savings Schemes (ELSS)**¹³ which requires a three year lock

¹⁰ ETFs based on the broad market indices-Nifty BeES, UTI Sunder(Nifty) and Sensex ICICI Prudential ETF, sector specific-Bank BeES and Kotak PSU Bank ETF.

¹¹ Sensex ICICI Prudential ETF-In case, there are no quotes on the BSE for five trading days consecutively, an investor can sell directly to the fund with an exit load of 2.5 per cent of applicable NAV.

¹² Trading of ICICIs Sensex based ETF SPICE was suspend from May 06-May 07 because prices were much higher than the NAV.

¹³ Under section 80C, up to Rs 1 lakh invested is deductible from gross income. There were 70 ELSS schemes in Sept. 2007.

in period. **Unit Linked Insurance Plans**¹⁴ offer life cover and accident insurance cover and have a tax benefit. **Retirement Funds**¹⁵ offer a retirement focus and a tax benefit wherein an investor can choose between lifelong pension or lump sum payment. Returns are higher than an ordinary fund because of the tax saved, but there are conditions regarding the redemption period.

Assured Return Schemes¹⁶ assure a specific return to the unit holders irrespective of performance of the scheme. Such returns have to be guaranteed by the sponsor or AMC and this has to be disclosed in the offer document. Sometimes, return is assured only for a certain period, or for one year at a time.

Fund of Funds (FoF) Schemes invest primarily in other mutual fund schemes. This allows investors greater diversification through investment in a single scheme.

Global Funds offer the advantage of investing offshore if higher returns are available. However, of late as India has been the destination for huge inflows from FIIs, there may be no advantage for Indians to invest in global funds. Exchange rates also affect the returns from global investments. When the rupee rises, investors in India get lower returns on global investments.

Socially responsible investing (SRI) Funds favour companies that follow ethical parameters, and are classified according to ESG standards based environmental, social factors and governance. In India, a list of 50 Indian companies that meet certain ESG criteria and have been drawn from the Crisil 500¹⁷.

Further Options Available in Mutual Fund Schemes

Mutual funds also offer options like dividend option, capital appreciation etc. Investors choose one of these options at the time of purchase and may be allowed to switch over at a later date. Under the **growth option**, dividend is not paid out under and the investor only gets capital appreciation on the investment represented by an increase in NAV. Dividends are paid to investors under a **Dividend Payout Option**. However, the NAV of the mutual fund scheme falls to that extent. Mutual funds may also offer investors an option of re-investing dividends to purchase additional units in the same fund i.e., a **Dividend Re-investment Plan**.

Systematic Investment Plans (SIP) give the investor the option of investing a fixed amount every period through postdated cheques or bank transfers. **Systematic Encashment Plans (SEP)** are just the opposite; they allow the investor periodic withdrawal of a predetermined amount/number of units from the fund at predetermined intervals.

¹⁴ Two mutual fund insurance schemes, offer tax benefits under Section 80C. UTI offers Unit Linked Insurance Plan (ULIP), LIC Mutual Fund offers LIC Dhanraksha 89 scheme.

¹⁵ Two mutual funds have a retirement plan with tax benefit under section 80C-UTI's Retirement Benefit Plan (RBP) and Franklin Templeton's Pension Plan (FTPP).

¹⁶ There were no assured return schemes in India in October 2007.

¹⁷ ESG defined by Standard & Poor's, Crisil, and KLD Research & Analytics. Example of an SRI fund in India-Amro Sustainable Development Fund.

Advantages and Disadvantages

There are several advantages of investing through mutual funds.

1. Professional research and management—to select quality securities and time purchases and sales to maximise gains.
2. Diversification—spreading risk over a larger variety of investments with limited resources which is not possible at an individual level. However, if a single mutual fund is selected, it should not be sector – or industry – specific.
3. Divisibility and liquidity—the ability to add to the investment in small quantities as in a systematic investment plan and the ability to liquidate part of the investment when needed.
4. Economies of scale—fund managers buy securities in large quantities and can negotiate lower brokerage.
5. Delegation of administration and paperwork—that would otherwise be required for such diversified investments.
6. Tax benefits—dividends on debt schemes are tax free in the hands of the recipient

However, there are also some disadvantages:

1. The ability and integrity of the fund manager will determine the performance of the fund.
2. There may be restrictions on method or timing of exit.
3. Unreasonably high loads and management fees and too many transactions in the fund might result in higher cost to the investor.
4. Over diversification¹⁸ can add to cost without proportional reduction in systematic risk.
5. Unlike bank deposits, money market mutual funds are not guaranteed in case of dissolution¹⁹.

It is important to remember that mutual funds are also subject to market fluctuations like any other investment. Historically, the mutual fund industry has grown in boom periods, and has suffered in bear markets²⁰. Investors should assess the risks and returns before investing in them.

■ INVESTING IN MUTUAL FUNDS

Mutual funds are sold through agents and distributors including post offices and banks. It is also possible to buy units of mutual funds over the internet²¹. Like any other investment,

¹⁸ See Singh (2007), 10-11 securities are sufficient to diversify approximately 90% of unsystematic risk.

¹⁹ Bank deposits are covered by the Insurance upto Rs. One lakh per account.

²⁰ Post liberalisation, most public sector mutual funds, e.g. Canstar had to be bailed out by their parent institutions, while UTI was bailed out with tax payers money (Rs 4800 crore) in 1999. In 1999-2000 many sector specific funds managed by private players also reported losses.

²¹ For example, IDBIPaisaBuilder, ICICIDIRECT, etc.

an investor should take into account his risk taking capacity, age factor, financial position, etc. and decide whether to invest in mutual funds and in which type of fund. The next step would be to study the offer document of a particular fund, its past performance and future prospects and decide whether to invest in it.

The offer document contains the main features of the scheme, risk factors, initial issue expenses and recurring expenses to be charged to the scheme, entry or exit loads, sponsor's track record, educational qualification and work experience of key personnel including fund managers, performance of other schemes launched by the mutual fund in the past, pending litigations and penalties imposed, etc. The procedure of repurchase is also mentioned in the offer document. In case, there is a change in the fundamental attributes of the scheme e.g., structure, investment pattern, etc. A written communication is sent to each unit holder and also advertised in a national and local newspaper and unit holders are given the option to exit the scheme at the prevailing NAV without any exit load.

■ EVALUATION OF RETURN ON MUTUAL FUND INVESTMENTS

Returns on mutual funds consist of periodic disbursements in the form of dividends and capital gain or loss. The capital gain is realised at the time of sale and accrued gains are measured through the net asset value.

Net Asset Value (NAV) is used to evaluate investments in mutual funds. It is the market value of the assets of the scheme (the current market values of all securities held by the fund, cash and accrued income) minus its liabilities. The NAV per unit is obtained by dividing NAV by the number of units outstanding on the date of valuation. Since the market value of securities change every day, the NAV of a scheme also varies on day-to-day basis. Assets are valued as per SEBI guidelines and NAV per unit is disclosed daily for open ended schemes and at least weekly for close ended schemes. It is also published in newspapers and is available on the web-site of the Association of Mutual Funds in India (AMFI). Mutual funds are also required to disclose full portfolios of all of their schemes on a quarterly basis²².

Accrued return on investment in mutual funds is calculated as

$$[(\text{NAV}_t + \text{Dividend})/\text{NAV}_{t-1}] - 1$$

where NAV is the net asset value per unit and dividends are disbursements received from the fund during the period under consideration.

When units are bought/sold the actual price is used in place of NAV; the exit load and commissions if any have to be deducted from current NAV and entry load will be added to the purchase related NAV²³. The calculation is as follows

At time of purchase, Price = NAV * (1 + entry load in decimals)

²² Many funds including Franklin Templeton India, Kotak Mahindra Mutual Fund, HDFC Mutual Fund, UTI Mutual Fund, Sundaram Newton and PruICICI Mutual Fund, provide monthly updates.

²³ The maximum difference allowed between NAV and sale/repurchase in the case of open ended funds is 7% and close ended funds for repurchase is 5%.

At time of sale, Repurchase Price = NAV * (1 – exit load in decimals)

In the case of a closed ended fund if units are sold over the stock exchange, the realised prices may be different from NAV.

Mutual funds have two types of costs, *direct costs* payable by the unit holder, in the form of entry and exit fee, and annual operating fees charged as a percentage of assets which is an *indirect cost*. The annual fee is charged for payment of salaries, administrative expenses, marketing, custodial services, taxes, legal expenses, accounting and audit fees, etc. Only direct costs are to be taken into account when calculating return as indirect costs are already reflected in NAV.

Taxation of Mutual Fund Returns²⁴

Investors need to look at the after tax returns from mutual funds. The tax rate applicable depends on the nature of the scheme and its holding period and is also dependant on whether the investor is a resident individual, a corporate investor etc. The latest rates of tax for income, short term capital gains and long term capital gains need to be checked and investments and withdrawals made accordingly.

■ EVALUATION OF PERFORMANCE OF MUTUAL FUNDS

Investors can compare the performance of mutual fund schemes with those of other mutual funds under the same category. They can also compare the performance of equity oriented schemes and sector specific schemes with comparable *benchmark* indices. Equity-oriented funds can be compared with indices provided by the BSE and NSE²⁵; funds with investments in large companies can use the Nifty, a fund specialising in smaller stocks can use the junior Nifty, and industry-specific funds can use corresponding indices where available. Various benchmark indices have also been provided by CRISIL²⁶ for balanced funds and debt oriented schemes. Though past performance cannot indicate the future, it is the only quantitative way to judge how good a fund is at present.

A portfolio that delivers a higher return is not necessarily superior, as return has to be seen along with the risk of the portfolio. In the portfolio analysis chapter, we learnt that risk or fluctuations in portfolios can be divided into systematic risk (market risk) and unsystematic risk (security specific risk). Total risk is measured by the standard deviation of returns and beta is a measure of unsystematic risk. One measure of comparative performance is to rank portfolios by return per unit of risk (return/standard deviation or beta); the higher the better. However, since it is possible to get a risk-free return on government securities and treasury bills it is better to compare additional return (over and above the risk free rate) with risk. Three measures of portfolio performance that use risk adjusted returns are Sharpe's investment performance index, Treynor's portfolio performance index, and Jenson's alpha.

²⁴ All figures are applicable for AY 2007-2008.

²⁵ See chapter on stock market for the list of indices.

²⁶ Examples of Crisil benchmark indices include: Composite Bond Fund Index, Short-term Bond Fund Index, MIP Blended Index, Balanced Fund index.

Sharpe's Ratio

This Ratio compares the average excess return (return–risk free rate) to the portfolio's total risk measured by the standard deviation of returns over the measurement period. Since standard deviation is a measure of variability of returns, it is also known as the reward-to-variability ratio. It is calculated as

$$S_p = \frac{R_p - R_f}{\sigma_p}$$

For example, if average return over a year was 25%, return on treasury bills was 5% and standard deviation of returns was 10%. The Sharpe Ratio would be $(25 - 5)/10 = 2$. A high and positive Sharpe Ratio shows a superior risk-adjusted performance of a fund, while a low or negative Sharpe Ratio is an indication of unfavourable performance.

However, this figure does not tell us how good or bad the performance was and cannot be used in isolation. It can only be used for ranking and for comparison with other portfolios and indices. We can calculate the Sharpe Ratio for the market index in the same way to see if various portfolios outperformed the market or not.

$$S_m = \frac{R_m - R_f}{\sigma_m}$$

In terms of the capital market theory, the Sharpe Ratio compares portfolios with the Capital Market Line (CML). In Figure 17.1, a portfolio with higher Sharpe Ratio than the market portfolio would lie above the CML (point C) and indicate superior risk adjusted performance whereas a lower ratio (point A) would be inferior.

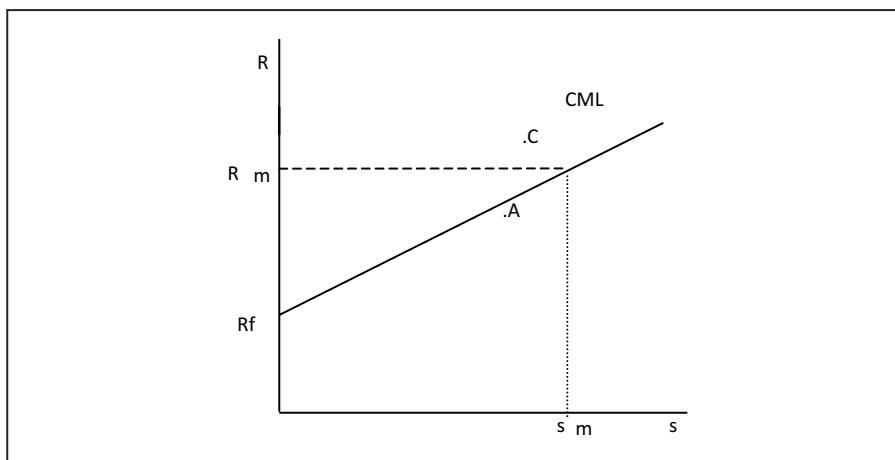


Figure 17.1: Sharpe Ratio and the Capital Market Line

Treynor's Ratio

Treynor's Ratio measures the excess returns earned per unit of market risk. It is the ratio of a fund's average excess return to the fund's beta. The calculation of this ratio is similar to the Sharpe Ratio except it uses unsystematic risk represented by beta instead of total risk

represented by the standard deviation. It assumes that unsystematic risk has been diversified away and is also known as the reward-to-volatility ratio. A larger value indicates better performance.

$$T_p = \frac{R_p - R_f}{\beta_p}$$

For example, if average return of a portfolio over a year was 25%, return on treasury bills was 5% and beta was 1.5, Treynor's Ratio for the portfolio would be $(25 - 5)/1.5 = 13.33$

Just as Sharpe's Ratio cannot be used in isolation, Jensen's Ratio can also be used only for ranking and comparison with other portfolios and indices. Treynor's Ratio can also be calculated for the market index to see if other portfolios outperformed the market or not. Treynor's Ratio for the market portfolio is calculated as

$$T_m = \frac{R_m - R_f}{\beta_m} = \frac{R_m - R_f}{1} = R_m - R_f$$

In terms of the CAPM, this measure uses the systematic risk to compare portfolios with the Security Market Line (SML). In Figure 17.2, a portfolio with higher Treynor's Ratio than the market portfolio would lie above the CML (point Q) and indicate superior risk adjusted performance, whereas a lower ratio (point R) would be inferior.

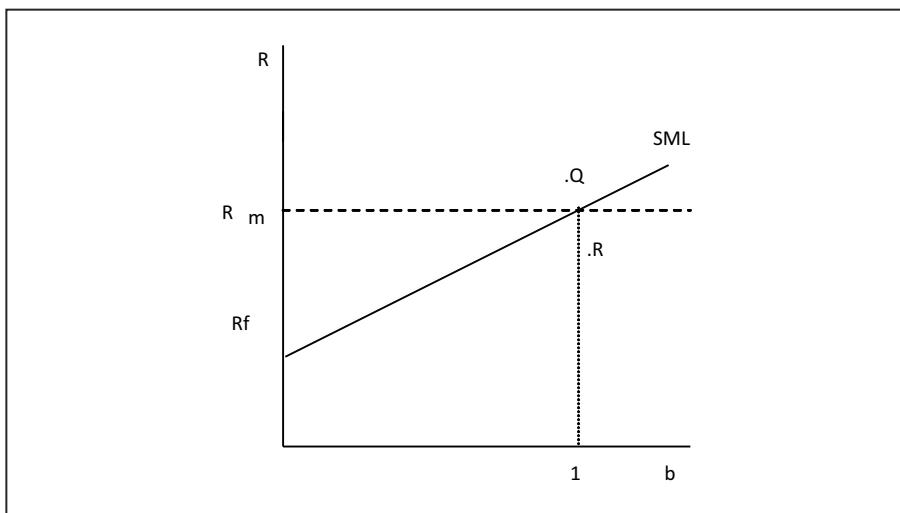


Figure 17.2: Treynor Ratio and the Security Market Line

Jensen's Alpha

Jensen's measure is derived through regression of the mutual fund's returns with the return on the market index. The regression equation is:

$$R_p - R_f = \alpha_p + \beta_p(R_m - R_f) + e_p$$

This equation is similar to the CAPM, except that an intercept term alpha and an error term have been added. The intercept alpha measures the performance of the fund with

respect to the required return according to the CAPM, while the error term shows the goodness of fit. This is also known as the differential return method. A negative value of alpha indicates a performance below that required, while a positive value indicates better performance than the benchmark i.e., the market portfolio. It measures the ability of the portfolio manager to earn returns above the returns required for bearing market risk. Unlike the Sharpe's and Treynor's Ratios, it is an absolute measure compared to the market return. From the regression, it is also possible to check if alpha is statistically significant or not.

Comparison of Sharpe's and Treynor's and Jensen's Measures

Sharpe's portfolio performance measure uses the standard deviation of returns as the measure of risk whereas, Treynor's ratio uses beta coefficient in the denominator. Sharp's measure ranks the portfolios in the context of the capital market line (CML), while Treynor's measure ranks them according to the security market line (SML). Rankings based on total risk (Sharpe) and systematic risk (Treynor) should be identical for a well-diversified portfolio, as the unsystematic risk is diversified and only the systematic risk is left. It is also possible that Sharpe and Treynor Ratios give different ranks. Since standard deviation consists of both systematic and unsystematic risk, a security with more unsystematic risk may get a lower rank with the Sharpe Ratio. In such situations, the choice of a performance measure will depend on the investor's portfolio. If the investor has many other diversified assets, we can assume that unsystematic risk will be diversified and Treynor's Ratio may be used; otherwise the Sharpe index would be more appropriate. Similarly, since Jensen's measure uses only systematic risk, it should be used only for well diversified portfolios. For practical purposes, we can generalise that the Sharpe index may be more appropriate for a small investor while Treynor's Ratio would be suitable for institutional investors who have sufficient funds to be diversified. Treynor's and Jensen's method will give the same assessment when used to measure performance relative to the market index, but ranking may differ.²⁷ These concepts are best understood with the help of a numerical example. (Example 17.1).

Example 17.1: Mutual Fund Evaluation

Portfolio	Return	Std. Dev.	Correlation with Mkt. **	Beta	Sharpe's Ratio	Treynor's Ratio	Jensen's Alpha	Rank Sharpe	Rank Treynor	Rank Jensen
A	15	27	0.8	1.80	0.333	5.000	-3.600	5	5	5
B	23	19	0.5	0.79	0.895	21.474	11.458	1	1	1
C	16	22	0.3	0.55	0.455	18.182	6.150	4	2	4
D	20	20	0.6	1.00	0.700	14.000	7.000	3	4	3
E	22	18	0.7	1.05	0.889	15.238	8.650	2	3	2
Market	13	12	1.0	1.00	0.583	7.000				
T-Bills	6.0									

In Example 17.1, portfolios have been ranked according to the Sharpe, Treynor and Jensen performance measures. As can be seen, the ranks are not the same for the Sharpe and

²⁷ For details see: *A Jigsaw Puzzle of Basic Risk-adjusted Performance Measures* by Hendrick Scholz, Marco Wilkens.

Treynor measures. This is because of high unsystematic risk in portfolio C which ranks it lower with the Sharpe Ratio. All portfolios other than portfolio A have a higher value of the Sharpe Ratio than calculated for the market, this means they have outperformed the market portfolio in terms of excess return to total risk. Similarly, all portfolios other than portfolio A also have higher Treynor's Ratios than the market, indicating that they have outperformed the market with respect to systematic risk as well. It is worth noting here that Jensen's alpha is also positive for all portfolios, except portfolio A. Portfolio A has a return of 15%, which is higher than the return on the market portfolio of 12%, but since its risk measured in terms of standard deviation and beta is higher than the market, it is ranked lower in all the three performance measures. Ranks based Treynor's measure and Jensen's alpha are not the same for portfolio C, D and E.

** In case beta is not given, it can be derived using standard deviation and correlation with the market as follows:

$$\text{Systematic Risk of the portfolio} = \beta^2_p \sigma_m^2$$

The coefficient of determination between the portfolio and the market ρ_{pm}^2 is the proportion of movement explained by the market so $\rho_{pm}^2 \sigma_p^2 = \text{systematic risk of the portfolio}$

$$\text{Therefore, } \rho_{pm}^2 \sigma_p^2 = \beta^2_p \sigma_m^2$$

$$\text{And, } \beta^2 = \frac{r^2 \sigma_p^2}{\sigma_m^2} \text{ and } \beta = \frac{r \sigma_p}{\sigma_m}$$

Mutual Fund Performance

Studies in the US²⁸ have shown that mutual funds on an average have underperformed the market after expenses. They also found that while some funds are able to beat the market over short horizons, they do not sustain this over longer periods. Other studies that related costs to returns found that the performance of load funds was no better than load funds. In India, no conclusive evidence was found regarding the superior ability of mutual funds.²⁹

In such a scenario, how should investors choose a fund to invest in? Past performance of funds over a period of time could be one of the indicators of the competence of the asset management company. If portfolio managers are not able to beat the market, investors can invest in the market through a low cost index fund.

■ SUMMARY

Mutual funds offer investors a low cost, convenient method of diversifying their investments. There are various types of funds available; investors can invest in funds that satisfy their liquidity requirements, sector preferences and tax status etc. The performance of funds can be judged by comparing returns in excess of the risk free rate with the risk of the portfolio, or with some benchmark. For small investors, with less diversified portfolios, the relevant measure of risk is the standard deviation, and for large investors with diversified portfolios

²⁸ Jensen, 1968; Grinblatt and Titman 1989; Elton, Gruber, Das and Hlavka 1993.

²⁹ Amitabh Gupta 2002.

we can use beta. We can also compare the returns and risk with the market portfolio, wherein the investor need not pay a specialist to manage the funds. Since studies show that mutual fund managers have not been able to outperform the market, investors can consider investing in index funds.

■ SOLVED EXAMPLES

- Rank the portfolios on the basis of Sharpe and Treynor's ratios.

<i>Portfolio</i>	<i>Return</i>	<i>Standard Deviation</i>	<i>Beta</i>
X	20	15	0.9
Y	36	18	1.2
Z	40	20	1.3
Market Index	25	15	1
Risk free rate	6		

Ans: Sharpe ratio = $(R_p - R_f) / \text{stddev of portfolio}$

Treynor Ratio = $(R_p - R_f) / \text{beta of portfolio}$

<i>Portfolio</i>	<i>Return</i>	<i>Standard Deviation</i>	<i>Beta</i>	<i>Sharpe</i>	<i>Treynor</i>	<i>Rank Sharpe/Treynor</i>
X	20	15	0.9	0.93	15.56	4 4
Y	36	18	1.2	1.67	25.00	2 2
Z	40	20	1.3	1.70	26.15	1 1
Market Index	25	15	1	1.27	19.00	3 3
Risk free rate	6					

- Rank the portfolios on the basis of Sharpe and Treynor's ratios. Did the portfolios outperform the market?

<i>Portfolio</i>	<i>Return</i>	<i>Standard Deviation</i>	<i>Correlation with Market</i>
X	25	16	0.64
Y	30	18	0.72
Z	35	19	0.85
Market Index	27	15	
Risk free rate	9		

Ans: Beta = correlation * std dev portfolio / std dev market

Sharpe ratio = $(R_p - R_f) / \text{stddev of portfolio}$

Treynor Ratio = $(R_p - R_f) / \text{beta of portfolio}$

<i>Portfolio</i>	<i>Return</i>	<i>Standard Deviation</i>	<i>Correlation with Market</i>	<i>Beta</i>	<i>Sharpe</i>	<i>Treynor</i>	<i>Rank Sharpe/Treynor</i>
X	25	16	0.64	0.68	1.00	23.44	4 3

Contd...

Y	30	18	0.72	0.86	1.17	24.31	3 1
Z	35	19	0.85	1.08	1.37	24.15	1 2
Market Index	27	15		1	1.20	18.00	2 4
Risk free rate	9						

All portfolios out-performed the market according to Treynor , but only Z out-performed the market according to the Sharpe measure.

This happens when there is higher unsystematic risk resulting in higher total risk as compared to beta which brought down the ranks of X and Y

3. Rank the portfolios on the basis of Sharpe and Treynor's ratios.

Portfolio	Return	Standard Deviation	Correlation with Market
X	20	15	0.6
Y	35	18	0.75
Z	40	22	0.85
Market Index	25	15	
Risk free rate	8		

Ans: Beta = correlation*stdev portfolio/stdev market

Sharpe ratio = $(R_p - R_f) / \text{stdev of portfolio}$

Treynor Ratio= $(R_p - R_f) / \text{beta of portfolio}$

Portfolio	Return	Standard Deviation	Correlation with Market	Beta	Sharpe	Treynor	Rank Sharpe/Treynor
X	20	15	0.6	0.60	0.80	20.00	4 3
Y	35	18	0.75	0.90	1.50	30.00	1 1
Z	40	22	0.85	1.25	1.45	25.67	2 2
Market Index	25	15		1	1.13	17.00	3 4
Risk free rate	8						

■ MULTIPLE CHOICE QUESTIONS

- Which measure will you use to rank Mutual funds for a small investor?
 - Sharpe
 - Treynor
 - Jensen
 - Any of the above

2. Given Return on portfolio and market are 18% and 25% respectively, Risk free rate 5%, Beta of portfolio 0.7, Standard deviation of portfolio and market 15 % and 20% respectively. Sharpe's measure is closest to
 - (a) 1.00
 - (b) 0.87
 - (c) 21.42
 - (d) 28.57
3. Using the data in question 2 above which of the following is true
 - (a) Portfolio out performed market according to Sharpe ratio
 - (b) Market outperformed portfolio according to Treynor ratio
4. The best bench mark for judging the performance of mutual funds in India is
 - (a) BSE Sensex
 - (b) Nifty
 - (c) BSE 200
 - (d) None of the above
5. A close ended funded fund is one that
 - (a) Has been closed for auditing of accounts
 - (b) Does not allow periodical withdrawals
 - (c) Cannot be traded for a given period
 - (d) Has a fixed number of units
6. Which of the following statements is true
 - (a) Fund A with return of 20% is better than B with 15% return
 - (b) Since mutual funds invest in many securities only systematic risk is relevant
 - (c) If two funds have same return the one with lower standard deviation may be preferred

■ QUESTIONS

1. What is a mutual fund?
2. What is the difference between portfolio management services (PMS) and mutual funds?
3. If mutual fund provides its investors with annual return of 25%, is the performance good or bad?
4. Explain how a systematic investment plan works.
5. What is a benchmark portfolio?
6. What are the expenses and other charge claimed by mutual funds?
7. Are hedge fund managers are more competent because they give higher returns to investors?

8. Compare the Sharpe and Treynor portfolio performance measures.
9. Why does the ranking with Sharpe and Treynor's measure sometimes differ?
10. What are the advantages and disadvantages of investing through mutual funds?
11. What are the advantages/disadvantages of an exchange traded fund as compared to an open ended mutual fund?

■ PROBLEMS

1. A mutual fund has assets of Rs. 279,00,000 and liabilities of Rs. 43,00,000. If the number of shares is 56,01,709 what is the NAV?

2.

	Portfolio X	Market Index
Return	0.12	0.14
Standard deviation	0.18	0.20
Covariance with market	0.0288	
Correlation with market	0.80	
Risk free rate of return is 0.05		
(a) Calculate Sharpe and Treynor ratios.		
(b) Did portfolio X outperform the market?		
3. The table compares the performance of mutual fund XYZ, with the performance of the market index over the previous two years.

	<i>Annual average returns</i>	<i>Standard deviation of returns</i>	<i>Beta</i>
XYZ	11%	6%	0.3
Index	20%	15%	1
Risk-free rate	6%		

- (a) Calculate the Treynor, Sharpe, and Jensen performance measures.
- (b) Comment on the performance of XYZ compared to the index, using all three measures and suggest possible reasons for conflicting results if any.

Which performance measure is generally preferable?

- 4.

<i>Portfolios</i>	<i>Annual Return %</i>	<i>Std. Deviation</i>	<i>Correlation with market</i>
A	15.6	27	0.81
B	11.8	18	0.55
C	8.3	15.2	0.38
D	19	21.2	0.75
Market	13	12	
Treasury Bills	6		

- (a) Rank these portfolios using Sharpe's method and Treynor's method.
- (b) Compare the rankings in (a) and explain the reasons behind the differences noted if any.

■ PRACTICAL EXERCISES

1. Visit the AMFI site and collect historical information on fund NAVs. Compare funds using the performance measures given. See if rankings are consistent over time.
2. Survey investors in your area to find out the following:
 - (a) Age and income profile of investors.
 - (b) How many have defined investment objectives?
 - (c) Percentage of investments in various asset classes
 - (d) Source of information/advice on investing – Fund company/Friends, family, etc/ Mutual fund prospectuses/Print or television media/Mutual fund shareholder reports/Fund company sales literature/Mutual fund rating services.
 - (e) Percentage that use the services of an agent or deal directly with the fund.
 - (f) Percentage that consider the fund's fees and expenses.
 - (g) Percentage that studied the past performance of the fund.
 - (h) Did they study the risks and returns?
 - (i) Are they aware of the securities that the fund has invested in?
 - (j) Did they compare the performance of the fund with other funds or the index?
 - (k) The tax consequences of investing in the fund – do they use tax advisors?
 - (l) The asset management company managing the fund and the portfolio manager.
 - (m) Percentage of investors that use the Internet for financial purposes—bank accounts, bill payment, financial information, investment advice, purchase anything online, purchase or sell shares and mutual funds.
 - (n) How many review their portfolios regularly and at what intervals?

APPENDIX

Performance Evaluation of Fund Managers

Investors and academicians are interested in evaluating the performance of fund managers. Two simple models are discussed here.

The Fama Model – Components of Investment Performance

#All assets should provide returns commensurate with the risk free rate and the risk. So far we studied ranking of mutual funds with respect to total risk (Sharpe) and systematic risk (Treynor) and performance compared to required return using CAPM (Jensen). The analysis by Fama provides a detailed breakup of returns into risk free return, reward for systematic risk, reward for unsystematic risk as compared to the market and remainder due to net stock selectivity. The return due to stock selectivity, positive or negative, can be used to judge the performance of the fund manager in terms of return for bearing the risk for diversification which was different from the market portfolio. If positive investors have benefited from the stocks selected by the fund manager.

$$R_p = R_f + R_{sys} + R_{unsys} + R_{sel}$$

$$R_{sys} = \text{reward for systematic risk} = \beta_p (R_m - R_f)$$

$$R_{unsys} = \text{reward for unsystematic risk} = [(\sigma_p / \sigma_m) - \beta_p] * (R_m - R_f)$$

$$R_{sel} = \text{reward from selectivity} = R_p - (R_f + R_{sys} + R_{unsys})$$

$$= (R_p - R_f) - \beta_p (R_m - R_f) - [(\sigma_p / \sigma_m) - \beta_p] * (R_m - R_f) = (R_p - R_f) - [(\sigma_p / \sigma_m) * (R_m - R_f)]$$

It may help to view these rewards in terms of what has been discussed earlier – (1) reward for total risk as in the capital market line used to derive CAPM; (2) reward for systematic risk as in the security market line in CAPM; and reward for unsystematic risk = reward for total risk-reward for systematic risk i.e. (1)-(2). Also just as we had Jensen's alpha which helped us identify whether the portfolio had done better or worse than required by the CAPM, we have Fama's reward from selectivity which measures whether the return is more or less as required by the capital market line.

We take the same data as example 17.1 on page 330 to illustrate this concept

<i>Fama's Performance Measure</i>						
				Reward for systematic risk	Reward for unsystematic risk	Reward from selectivity
Portfolio	Return	Std. Dev	Beta	$\beta_p(R_m - R_f)$	$(\sigma_p / \sigma_m) * (R_m - R_f)$	$R_p - R_f - (\sigma_p / \sigma_m) * (R_m - R_f)$
A	15	27	1.80	12.6	3.15	-6.75
B	23	19	0.79	5.53	5.55	5.92
C	16	22	0.55	3.85	8.98	-2.83
D	20	20	1.00	7.00	4.67	2.33

Contd...

E	22	18	1.05	7.35	3.15	5.50
Market	13	12				
T-Bills	6					

Portfolios B, D and E have positive rewards from selectivity; the managers selected stocks that gave higher return than the required return for systematic and unsystematic risk. On the other hand portfolios A and C had negative rewards from selectivity.

PART VII

Research

Chapter 18

Writing a Project Report or Journal Paper

CHAPTER - 18

Eighteen

LEARNING OBJECTIVES

At the end of this chapter, you will be able to:

- Appreciate the diversity of research
- Identify a topic for research
- Understand the process of data collection and analysis
- Describe the requirements of a project report or journal article
- Apply the learning to do research and write a paper.

Writing a term paper or project paper has become an essential part of most business courses. Research provides a valuable learning experience in diverse skills such as data gathering, hypothesis generation and testing, and interpretation. A paper that is well-researched and written can also be presented at a seminar or published as a journal article. There is immense satisfaction and a feeling of pride when the work is seen in print.

To start with, the objective of the research should be very clear. The focus of a short-term paper that is to be completed in ten days will be very different from a project report or journal article that is to be completed over a few months.

Research is vast and varied; this chapter aims to provide simple guidelines that should be useful for writing a finance related project paper or journal article¹. We need to choose a topic and define the scope of work to be done and methodology to be adopted. This is followed by data collection and analysis. Finally we state the summary and conclusion.

■ TYPES OF RESEARCH

Research is the systematic study of materials and sources in order to establish facts and reach new conclusions². *Basic research* aims to develop theories such as the CAPM and APT etc., whereas in *applied research*, we apply the theory to see if it can explain reality. Basic research normally follows an inductive approach, where the researcher collects data, observes certain patterns and tries to generalise them to form an opinion, hypothesis or theory. In applied research, the deductive approach is followed, where we start with a theory or a generalisation, form a testable hypothesis, collect appropriate data, analyse the data and conclude whether it supports the hypothesis or not.

Research may be quantitative or qualitative or a mix of both. In *quantitative research*, we collect and analyse data that can be expressed in a numerical form and is analysed statistically. The quantitative approach can further be sub-divided into descriptive, correlational, causal and experimental research.

In *descriptive research*, a hypothesis or research question is tested by collecting data through direct observation, interview or with a questionnaire. Business confidence surveys, consumer confidence surveys, and surveys of investors investment preferences are examples of descriptive research. The researcher collects data on variables of interest and reports the numerical results for them.

Correlational research, as the name suggests is an attempt to find out if two or more variables are related and the degree and significance of the same. If the value of one variable is known, this can be used to forecast the value of the other. Correlation has been used to measure the relationship between share prices and economic variables such as inflation, oil prices, index of industrial production etc.

Causal research goes a step further, and attempts to identify if there is a significant cause-effect relationship. We study the effect of an independent variable or a number of

¹ This chapter is intended to provide a general guideline for students at the undergraduate and graduate level. There are detailed books available for advanced research.

² Oxford Dictionary.

independent variables on a dependant variable. Tests of the CAPM and APT are examples of causal research.

In *Experimental* research, the researcher creates groups with conditions that he wants to test as the independent variable and then measures the effect which is the dependant variable. Experimental studies have been used to determine if people have a bias towards aversion of loss when faced with risk³.

In *Qualitative* research we collect, classify and analyse narrative data. Qualitative research attempts to understand the processes which lie behind the observed patterns. There are many types of qualitative research processes such as a single case study, or a comparison of similar cases (like the effect of mergers) or we may study a group of companies over a period of time, to see the effect of changes in key personnel etc.

In some cases, when a research problem is not clearly defined, *exploratory research* helps to determine how the research should be conducted. This could be through literature and data reviews, interviews, case studies, pilot studies etc. *Pilot studies* are done prior to the main research (like testing with a smaller sample) to find out if the research design works.

■ SELECTING A RESEARCH TOPIC

Once we are clear about the objective of our research and have some idea about the type of research that is to be considered, the next step is to select a research topic. Ideally, the work to be done should be original and have some theoretical or practical significance. It should also be of interest to the researcher. There are many ways to find a research topic including the following:

1. A question that had come to your mind during coursework or discussions can be reshaped in terms of a researchable topic.
2. You can read the broad topics in a text or reference book and go into more detail on a topic that interests you.
3. Read a financial newspaper and see if it raises some questions that need an answer, observations that can be generalised or general statements that need validation. Check if there has been any formal research on that topic.
4. An Internet search can also help identify a topic of interest.
5. Consult a person who is knowledgeable in the area of your interest. An academician or practitioner will have lots of unanswered questions that would have practical value if researched.
6. Look at journal articles and identify aspects that merit further research. You can easily extend or modify existing articles; you can test the same theory or replicate the same idea in a different context. For example, you can study the same aspects in a different country, time period or sample. The same sample can be studied with a different set of assumptions or methodology, for example you can use daily vs. weekly vs. monthly

³ Demonstrated by Amos Tversky and Daniel Kahneman (1979)

returns. You can also test two competing theories using the same sample data. Basically, find a gap in the existing literature and fill it with something original. Do give credit to the paper that inspired the research and highlight the differences in the aim of the research.

7. Approach a company/institution for sponsored research.
8. Your guide may have specified a topic; the exact focus and scope of work can be designed to suit your interests.

When deciding on a topic, it is also a good idea to check out how practical the research is:

1. What methodology do you plan to follow?
2. What data is required?
3. Is the data available?
4. Do you have access to that data?
5. How much time and effort is required to collect it?
6. What are the computational requirements?
7. Do you have the software for computation?
8. Will you be able to interpret the results?

It is also useful to make a short list of keywords that can describe your topic as they will help in searching for further information and articles for the literature review. It is also possible that you may decide to redefine your topic during this process.

■ PARTS OF A RESEARCH PAPER

It is useful to plan and conduct the research keeping the end product in mind. This will ensure that the work is done in a systematic manner. A project paper or journal article has the following main parts:

1. Title
2. Abstract
3. Introduction
4. Review of Literature
5. Scope and Methodology
6. Results
7. Discussion
8. Conclusion
9. References

It is not necessary to write the report in this order. You may decide to write the abstract and introduction after the conclusion, because by then you know exactly what you want to convey to the reader.

Title

The title should convey the area and scope of the project. For example, “CAPM” would be too general. “An empirical study of CAPM in the Indian stock market” would be more specific.

Abstract

The abstract is a very brief summary⁴, of the article. It covers the hypothesis, the sample, the methodology used, results and implications of the study. Readers use it to decide if the article is relevant for their purpose. You can read the abstract to decide whether an article is relevant for your research, and then get the full article from the library/internet etc.

While writing an abstract, do state how your work is relevant and would be useful to practitioners, researchers and policy-makers.

Introduction

As the name suggests, this part of the paper introduces the reader to the problem or issue that is being studied, and what is to be expected in the paper. It gives the background in terms of a brief idea of existing knowledge in the area, the purpose of your research and the type of research done and how it will be useful. In the case of an empirical study, the theoretical background is also discussed here and the hypothesis to be tested is given in detail.

Literature Review

This section provides justification for the selection of the topic and work done. It contains a brief summary of published articles that are related to the current research. It also helps identify the gaps in the existing literature that are being addressed by the researcher.

The list of articles in the literature review and references of one or two of the latest published papers in the area provide a very good starting point for this section. This can be followed by a library or Internet search for articles using the keywords in your proposed research. If there are many related works, and it is not practical to include all of them, only the pioneering work and latest literature may be reviewed. The pioneering work and some references can also be found in books. I have found *Modern Portfolio Theory and Investment Analysis* by Elton and Gruber very useful in this respect.

Take care that the sources you use are authentic. The authenticity can be judged by the reputation of the authors and the publication or website on which it was found. Make a short summary of what you read, and if possible, enter it right away in the computer. Summarising the article will help you understand the article and will also serve as ready material for the literature review in future. Putting in the reference as soon as it is available will also keep your references section ready with practically no effort at the time of writing the report.

⁴ Approximately 100-200 words.

The sequence of articles reviewed should logically lead to and justify the need for the current study.

Scope and Methodology

In this section, the author gives details of how the study was conducted. It enables the reader to gauge the reliability of the study, whether it can be used to make generalisations, and to replicate the research if desired. It gives details of the exact source and size of sample and the criteria for inclusion/exclusion. It also gives details of the method of data collection and proportion of usable data. It specifies the statistical/analytical procedures used and the tests of significance conducted. It also states how the tests will be interpreted.

In case, a questionnaire is to be used, some of the important points to be kept in mind⁵ are the sample, the questions to be asked and mode of administering the questionnaire. In the sample, we need to have a representative sample, the number of respondents and method of selecting them. Are the questionnaires going to be filled in by the interviewer or person being interviewed? Is it over the Net, telephone, by post or face to face? Are the questions qualitative and open ended, or can they be quantified by giving choices such as yes/no, using a numerical scale or scale with degrees⁶ etc. The entire process has to be designed to get the correct information with least inconvenience to the respondent.

Research is an ongoing process. While exploring one area, other related questions may come to your mind. However, it will be necessary to limit the scope of your work depending on the depth required and the time and resources available.

The methodology to be used in the current research may have been taken from a book or journal articles. The sources should be acknowledged to give due credit and to authenticate the methodology being used.

Results

The results of the statistical analysis are reported here, along with tables and figures. All tables and figures need to be sequentially numbered and explained in the text. In case the tables are too long, they can be summarised and presented in this section, or can be placed in the appendix. The text should also contain a reference to each appendix.

Discussion

The results are explained and interpreted in this section with respect to the hypotheses being tested. They are compared with other studies that were given in the survey of literature and the differences and similarities are highlighted. Be objective, state all assumptions clearly and be careful about making generalisations without sufficient evidence.

If your results are very different from those reported in previous research, cross check the data, methodology and calculations. Once you are satisfied that there are no errors, present your analysis and also the reason why the results may differ from earlier studies. In empirical research we work with historical samples and try to generalise the conclusions for future

⁵ These are covered in the market research paper, taught in most management schools.

⁶ Likert scale-strongly agree, agree, neither agree nor disagree, disagree, strongly disagree

applications. The sample size, time period, conditions under which samples have been drawn and difference in methodology can lead to very different results.

Do not worry if your tests do not support the hypothesis being tested. For example, even if your study rejects the hypothesis that CAPM can explain stock returns during a given period in the Indian stock market, it is a contribution to research and is worth reporting.

Summary and Conclusion

The results and major conclusions are presented here along with the implications if any for practitioners, policy-makers and researchers. Areas where further research is possible are also mentioned.

References

All the empirical studies mentioned in the paper in alphabetical order are listed here. For term papers/projects, you can follow the reference style of any reputed journal, or the style recommended by your guide. For publication of a paper, you have to follow the style prescribed by the journal.

Do not quote a paper you have not read. Keep a hard/soft copy of each reference – it may be required when you are writing the paper or references, to be shown to your project guide, or for revision of a paper to be published. You need to record the authors, title of the paper, journal or book, and date of publication. For a journal article, the volume number and issue, for a book the publisher and place of publication, for internet references the exact site reference and the date when it was accessed. For quotations, the page numbers also need to be noted. Having these details is very useful at the time of writing the report. Keeping a note of the library or source where you found the readings is also useful in case you need to refer to the article in future.

A project report will also have the following additional items:

1. *Disclaimer:* A declaration by the student that this project report is based his/her original work and has not been submitted in part or full for any other degree/diploma. The contribution of other authors/publications has been duly acknowledged at the relevant places.
2. *Acknowledgements:* For guidance, financial aid, library and computing resources and secretarial assistance etc.
3. *Table of Contents:* Chapterwise contents and list of tables, figures etc. with respective page numbers are given here.

■ GENERAL TIPS/GUIDELINES

Planning your work: Break up the work involved into smaller tasks, and plan their execution keeping in mind the deadline. Make an outline of the paper and note the major points and logic that you intend to follow. For very long projects, try to do some work every day. If nothing else, just read and correct grammatical errors. It keeps the topic fresh in your mind and you are likely to get some new ideas and complete it faster.

Sharing the work and credit: If the work is being shared, distribute tasks among group members with deadlines for each task. In case of publication, decide the order of names according to the work done.

Data collection: Ideally, the scope of the project should be clear and data requirements should be known in advance. Try to collect all required data at one time as collecting even one additional bit of data at a later stage is a waste of time and may be impossible in some cases. In a questionnaire-based survey for example, it may not be possible to contact the respondents again.

Give credit where due: Cite all the work you have read, a referee/guide always looks for citation of his/her work! Do not forget to cite your own related papers. The abstract and list of references may help the journal decide who is to be selected as a referee.

Avoid plagiarism: Plagiarism is theft of another person's writings. At the extreme, it involves submission of another person's work under your own name. Only limited portions of published material can be copied, provided due credit is given. The source of all data, tables, figures, opinions, quotations etc. should be provided. While the internet has made it easy to copy and paste material, editors and examiners also have means to identify such activities.

Writing the report: Use simple language that can be understood by the target audience. It is a good idea to read project reports and articles to get a feel of how they should be written.

Revisions: Keep enough time for revision; read your paper several times while writing and try to see if you are on track in conveying the main points as you had planned. Think about the strengths and weaknesses of the paper. If possible, ask a friend to review it and to see if it sounds logical and convincing and to check for grammatical errors. It is possible that you are so involved with your work that you may not be able to identify gaps or errors in it.

Things to check before printing/submission: Ensure the font, margins, section headings, table formats, numbering of equations etc. are uniform throughout the paper. Run the spelling and grammar check before printing the report/article. Check the order of pages before binding. These details may sound very elementary, but such mistakes are common, and if taken care of go a long way in creating a good impression.

■ PUBLISHING AN ARTICLE

Compare the standard and content of your paper with published articles and choose a journal that is likely to accept your paper. You may consult your guide or someone who has publications to help you in this regard. They can advise you on the possibility of acceptance and time taken to review papers.

Follow the instructions and style prescribed by the journal with respect to the length of the article, naming and numbering of sections, placement of tables, numbering of tables, figures, references and footnotes.

A paper submitted for publication will normally have some additional requirements:

1. Full name, affiliation of all authors

2. Postal address, e-mail address, telephone and fax numbers of the authors. (correspondence will normally be addressed to the first named author)
3. A declaration that the paper is based on his/her original work and that it has not been submitted for publication elsewhere.
4. Key words
5. JEL classification, if required⁷.

Review Process

Papers submitted for publication are normally sent to two or more persons for review. The paper may be accepted as it is, rejected, or you may be asked to revise it. Do not be disheartened if you are asked to revise your paper, it means the work is worth publishing, provided you make the necessary changes.

Suggestions to revise a paper should be incorporated point by point. Thank the referee, and explain the changes that have been made. If a particular suggestion cannot be included or requires too much effort, you may request that it be condoned. If the modification suggested requires you to redo the entire research, you may decide to send the paper to another journal with a higher acceptance rate.

If your paper has been rejected by one journal, correct any weaknesses that you can detect, and submit to another journal for consideration.

If the paper is accepted, the journal may ask you to assign the copyright to them.

Paper Presentation

If the paper is to be presented at a seminar or as part of the examination process, design the content keeping the audience in mind. If the audience is familiar with the theoretical background, briefly introduce the aim of the paper and mention the theory. Spend more time on the methodology and your contribution; what were your findings, the conclusions and applications.

■ SOURCES OF INFORMATION

This section has a list of journals and data sources that you may find useful for your work in the area of security analysis and portfolio management. The lists are not exhaustive; some of these may be easily available in libraries or available without any charges over the Internet, while others may have to be subscribed to by your university or institution.

Journal Articles

It is not possible to enumerate all the journals here. A few have been listed as a starting point for research. As you read articles of your interest, the list of references will lead you to other articles and journals that you can refer to. Most journals also have abstracts of articles available on their websites, these may be viewed before searching for the full article.

⁷ The classification and codes can be seen at http://www.aeaweb.org/journal/jel_class_system.html

International Journals

1. Financial Analysts Journal
2. Harvard Business Review
3. Journal of Business
4. Journal of Finance
5. Journal of Finance and Quantitative analysis
6. Journal of Financial Economics
7. Journal of Political Economy
8. Journal of Portfolio Management
9. Review of Financial Studies

Indian Journals

1. Asia Pacific Business Review
2. Decision
3. Economic and Political weekly
4. Finance India
5. ICFAI Journal of Applied Finance
6. ICFAI Journal of Behavioral Finance
7. ICFAI Journal of Financial Economics
8. Journal of Financial Management and Analysis
9. Pranjan
10. The Chartered Accountant
11. Vikalpa
12. Vision

Working Papers

Working papers are available at many university and institutional sites.

The SSRN website has abstracts of working papers and published articles. In many cases, the full text of papers are also available without a fee.

www.ssrn.com/

Subscription to Journal Services

Check if your institution had a subscription to journal services such as jstor, elsevier, emeraldinsight etc. The full text of articles offered by them can be accessed online by subscribers. For example, popular finance journals available on jstor include the *Journal*

of Finance, Journal of Business, Financial Analysts Journal and Journal of Financial and Quantitative Analysis.

Free Data Sources

World

The World Bank site

<http://www.worldbank.org>

The Bank of International Settlements has worldwide information on stock markets, currencies, derivates etc.

<http://www.bis.org>

The World Federation of Exchanges (WFE) site has data for worldwide securities and derivatives markets.

<http://www.world-exchanges.org>

The Econstats site gives historical data for major stock indices, interest rates, currencies, and other economic and financial statistics for many countries.

<http://www.econstats.com>

India

The Reserve Bank of India (RBI) website has information about monetary policy and operations, issues of government securities and an extensive database of economic and financial statistics for the Indian economy.

<http://www.rbi.org.in>

The Ministry of Statistics and Program Implementation, Government of India (MOSPI) website provides information and statistics related to national income accounting including historical data on the index of industrial production (IIP) and the consumer price index (CPI). The site also contains links to data bases of other countries and states of India.

<http://mospi.nic.in/>

The National Stock Exchange (NSE) has information and historical data on indices and securities listed and traded on it.

<http://www.nse-india.com>

The Bombay Stock Exchange (BSE) has information and historical data on indices and securities listed and traded on it.

<http://www.bseindia.com>

The Over the Counter Exchange of India (OTCEI)

<http://www.otcei.net>

Association of Mutual Funds in India (AMFI), has information and historical data on mutual funds operating in India

<http://www.amfiindia.com>.

Securities and Exchange Board of India (SEBI) for rules and regulations pertaining to the capital market.

<http://www.sebi.gov.in>

iCharts provides charting software and charts with adjusted price data free of cost.

Other useful sites:

http://www.khoj.com/Business_and_Economy/Stock_Markets/

<http://www.indiainfoline.com>

<http://www.finance.yahoo.com/>

Paid Data Services

Some of the advantages of subscribing to paid services are the ease of accessing data at one place and uniformity in presentation of data that simplifies aggregation and comparison. For share prices, a major advantage is the availability of adjusted prices (adjusted for capital changes) when using time series data. Stock prices need to be adjusted for bonus shares and share splits, otherwise the resulting price reductions will be interpreted as a loss to the shareholder. Examples of such services-providers are:

Fixed Income Money Market and Derivatives Association of India (FIMMDA) offers current information free of cost, and historical information to members only.

<http://www.fimmda.org>

Centre for Monitoring Indian Economy Pvt. Ltd. (CMIE) has a variety of paid services that include data on the macro economy, sectoral services, firm level data, and analysis of states.

<http://www.cmie.com/>

Capitaline offers paid services including data on industries, at the firm level, mutual funds.

www.capitaline.com/

■ STATISTICAL ANALYSIS

Some of the common and elementary statistical tools used for research in the finance area include mean, standard deviation, covariance, correlation, regression and factor analysis. Students will already have covered these in their statistics or market research courses. Some of these have also been discussed in the earlier chapters. For more advanced tools and tests of significance, it is advisable to consult a book on research or econometrics. A book that I have found very useful is *Econometric Models and Economic Forecasts*, by Pindyck and Rubinfeld.

Certain conventions may be followed that are different from what we expect. For example, in the chapter on risk and return, we calculated stock returns as dividends plus difference

in selling price and purchase price. In research, many studies ignore dividends and simply take the price change to represent returns⁸. Continuously compounded return or natural log return or logarithmic return is used in research and for valuation of options. Some studies use log returns instead of simple returns because log returns are approximately normally distributed⁹. Another advantage of continuous compounding is that returns for sub-periods can be added up and antilog taken to give holding period return.

Most students will be familiar with the use of spreadsheet software such as Excel. Spreadsheets have many built-in statistical functions such as stdev for sample standard deviation and stdevp for population standard deviation; in investment analysis we normally use stdevp. For correlation use correl; coefficient of determination i.e., correlation squared, use rsq; and for covariance, covar. For regression coefficients, use the intercept and slope functions (alpha and beta in CAPM). The advantage of spreadsheets is that they are user-friendly; event studies, volatility, simple technical analysis using moving averages etc. can be done using Excel.

Specialised statistical software may be needed for more advanced statistical applications such as multiple regression, factor analysis etc. In some cases, even though a particular function is available in a spreadsheet, it may be more efficient to use a package like SPSS. For example, regression analysis with details of the statistical significance can be done with excel for one regression at a time. Statistical packages such as SPSS offer the advantage of batch processing, which helps speed up the analysis and makes it easier to summarise the results.

■ EXAMPLES OF RESEARCH

We take some highly simplified examples to illustrate the research process¹⁰. The first is the Capital Asset Pricing Model (CAPM), where we use regression with two variables; the second is the Arbitrage Pricing Theory (APT) using principal components analysis and multiple regression, the third is the computation of beta.

Selection of a Topic

If the topic of interest is asset pricing and the tentative research question is whether the CAPM is applicable in the Indian stock market, the following discussion shows how a variety of research possibilities emerge.

The first step would be to review the published literature and see if the question has already been answered, or if some aspect remains to be explored. We find that the CAPM has been

⁸ Sharpe & Cooper (1972) have shown that omitting dividend payments in the computation of return has only a minor effect on the estimate of beta.

⁹ Many tests of significance are based on normal distributions.

¹⁰ Adapted and simplified from:

1. Dhankar and Singh (2005), Arbitrage Pricing Theory and the Capital Asset Pricing Model-Evidence from the Indian stock Market. *Journal of Financial Management and Analysis*. Vol. 18, No. 1
2. Dhankar and Singh (2005), Application of CAPM in the Indian stock market: A comprehensive reassessment. *Asia - Pacific Business Review*, Vol. No. 2.
3. Singh (2008), *Beta Estimation in the Indian Stock Market: Stability, Stationarity and Computational Considerations*. Decision, Vol. 35, No. 2.

extensively researched in the US and to some extent in India. Since our focus is on the Indian stock market, we look further at the recent work done in this area. If the search reveals that most studies have come to the same conclusion, have covered all time periods with a representative cross-section of stocks, we may decide that we can generalise whether CAPM is applicable/not applicable and there is no need to study it further.

On the other hand, if most studies conclude that CAPM is not applicable, it could be because the model being tested is not the one applicable in India. If the studies so far have used the classical CAPM model, we may decide to use the zero beta model or the model that relaxes the assumption of risk free borrowing and lending. On the other hand we may decide not to pursue the CAPM but to test the Arbitrage Pricing Theory (APT). If the studies give conflicting conclusions, and we feel this could be due to difference in the number of stocks used in different studies, or length of time periods studied, we may decide to study a longer period and sub-periods and use a greater number of stocks.

We may want to modify the methodology used for conducting the tests. For example, in the US, tests of CAPM use beta calculated over a five-year period, whereas most Indian studies calculate beta over a one or two year period. We may decide to test CAPM over a long period with five year betas.

We may want to find out what is the appropriate method for calculation of beta, and do an in depth study of beta instead of testing the CAPM.

As can be seen from the above discussion, the possibilities for research on any topic are endless. The researcher can choose one that seems most exciting and practical to complete in the given time frame.

■ EXAMPLE OF RESEARCH ON CAPM

Scope and Methodology

If we decide to test the CAPM using the zero beta model with betas calculated over a two year period, we first give a theory in brief (not given here) and the hypotheses to be tested by us:

1. Higher beta should be associated with higher return
2. The relationship between beta and return is linear
3. The intercept of the SML should correspond to the zero beta return and slope should be $(R_m - R_z)$.

We will need to specify the sample size, and how we chose the companies to be included. Since we plan to take data from the prowess database, the period of study will be limited to the data available there. Let us say we decide to take all companies that are part of the BSE 200, and study weekly returns for 12 years. We justify our sample because we need to have stocks that were traded regularly during the period studied. We also need to specify the market index and risk free rate to be used and justify the same.

When we actually collect the data we find that some companies got merged during the period, or some of the new companies did not exist in the first few years. We also find data missing for a few months for some companies. We have a choice — either allow companies to enter and exit midway, or exclude those where data is not available throughout. If we decide to exclude such companies, we may be left with approximately 150 companies. This entire process has to be given in the methodology. In case of a questionnaire-based survey, we would have described the entire process and reported the number of questionnaires administered and number that were actually usable after elimination.

The model used is also to be explained here:

First, estimate the systematic risk, beta, using the market model.

$$R_i = R_z + R_m B_i + e_i$$

Where R_i is the return on asset i , R_m is the return on the market portfolio, and B_i is $\text{Cov}(R_i, R_m)/\text{Var } R_m$, the systematic risk of security i and e_i is the residual risk.

Then arrange the stocks in ascending order of beta and make 15 equally weighted portfolios, and calculate return and beta of these portfolios for the second stage regressions.

For the second stage regressions, the testable ex-post version of the zero beta CAPM is used.

$$R_i = R_z + \{R_m - R_z\}B_i + e_i$$

Where R_i is the return on asset i , R_z is the risk free rate, R_m is the return on the market portfolio, B_i is $\text{Cov}(R_i, R_m)/\text{Var } R_m$, the systematic risk of security i and e_i is the residual risk.

We also state the assumptions:

The CAPM is an ex-ante model; the return on the security and the market are expected future returns and beta is the future beta of the security. Since ex-ante data is not available for analysis, ex-post data is used for empirical testing. The ex-post data can be used if we assume that the market model holds in every period, the CAPM holds in every period and beta is stable over time.

Analysis

The prowess data is extracted in an excel sheet. We name the variables in a presentable but short form that can be read by the SPSS and import the file into SPSS for further processing. The return on the stock index is the independent variable, and return on individual stocks the dependant variable. All the 150 regressions can be processed in a batch with a single output sheet. If desired, this can be exported in an excel sheet for sorting and creation of portfolios and for summarising the results.

In the analysis, we give the following:

1. Results of the first pass regressions i.e., summary for the 150 stocks in a table. We report whether the F-Statistic is significant to show whether the market model holds for the data analysed. We also report the R square (coefficient of determination) to show the degree of movement in individual securities explained by the market.

2. Report results for the 15 portfolios in the same manner.
3. The cross-sectional test results. Report the values and significance (t-test) for the intercept and the slope.

Discussion

1. Compare the F statistics and R square figures for individual stocks and portfolios. This will reveal the advantages/disadvantages of using individual stocks and portfolios.
2. Compare the values for the intercept with the risk-free rate of return. Compare the value of the slope with the return on the market minus the risk free rate. According to the CAPM, the slope should be positive and equal to excess return over the risk-free rate or zero beta return and intercept should be equal to the risk-free rate or to the zero beta portfolio return.
3. Compare your findings with other studies and try to explain differences, if any.
4. Come to a conclusion whether your hypotheses are accepted or rejected and the significance level. Suggest areas for further research-related questions/ideas that came to your mind, but have not been addressed in this paper. For example, would we get the same results over shorter sub-periods or during boom and slump periods?

■ EXAMPLE OF RESEARCH ON APT

Topic

The literature review shows a great deal of research work on APT has been undertaken in developed markets, particularly in the U.S. markets using two approaches. The first approach is factor analysis, wherein four or five statistically extracted factors were found to have significant explanatory power. In the second approach, factors are specified in advance. Company attributes such as size, dividend yield and sector membership, and macroeconomic variables have been found to have a significant explanatory influence on stock returns.

We decide to test APT using the first approach.

Methodology

The data is taken from Prowess just as was done for the CAPM and grouped into industry or sector based portfolios. Then factors for each portfolio are extracted using principal components analysis (SPSS). We find that 5 factors can explain 90% variation so we continue the analysis with 5 factors.

The sensitivity to factors (like beta in CAPM) are estimated using multiple regression for each portfolio (SPSS) as follows:

$$R_{it} = b_{io} + b_{i1}\delta_{1t} + b_{i2}\delta_{2t} + b_{i3}\delta_{3t} + \dots + b_{ij}\delta_{jt} + u_{it} \quad t = 1, \dots, 5$$

Where R_{it} is the return on asset i in period t , b_{io} is the estimated return on asset i when all δ_{jt} values are zero, δ_{jt} is the value at time t of factor j common to the returns of all

assets, b_{ij} is the estimated sensitivity of asset i to factor j , and u_{it} represents residual risk. These factor sensitivities and returns for each portfolio are used as independent variables and return as the dependant variable in the second pass regression to get the risk premiums, using the following equation (multiple regression in SPSS):

$$E(R_i) = R_o + \lambda_1 b_{i1} + \lambda_2 b_{i2} + \lambda_3 b_{i3} + \dots + \lambda_j b_{ij}$$

Where $E(R_i)$ is expected return on asset i , R_o is return on a risk free asset because all its b_{ij} s are zero, b_{ij} is the reaction coefficient describing the change in asset i 's return for a unit change in factor j , and λ_j is the premium for risk associated with factor j .

Analysis and Discussion

Just as was done in the case of CAPM, we present tables showing the following:

1. Percentage of variation explained by 1,2,3,4,5 factors and the Kaiser-Meyer Olkin measure of statistical adequacy which indicates whether factor analysis is suitable for the data or not.
2. Summary of first pass regressions for each portfolio, the value of factor sensitivities, t tests and R square.
3. Details of values and t tests for cross regression.

If time permits, and if the scope of the study can be expanded, we can do the CAPM study too, and compare the results to see which of the two theories can explain stock returns more accurately.

In the discussion we interpret the results, discuss the implications and compare with earlier studies. Finally, we suggest areas for further research such as the approach where macroeconomic and company variables have been used etc.

■ EXAMPLE OF RESEARCH ON BETA

Topic

Beta is used in the market model and the Capital Asset Pricing Model (CAPM). The survey of literature shows that the technique used for estimation of beta varies. Authors use weekly or monthly returns; they calculate beta over one to five years; portfolio sizes vary depending on the sample size etc. We decide to examine the effect of the interval between data points (daily, weekly, monthly).

Methodology

Data collection process was the same as for CAPM. Beta for the 150 stocks is calculated for each year using daily, weekly and monthly returns.

The regression equation used was

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it} \quad t = 1 \dots T$$

The correlation between betas is calculated using Pearson's correlation coefficient and Spearman's rank correlation.

Analysis

1. The results of the regressions (150 stocks \times number of years \times 3 intervals) are summarized and presented in a table. The range of betas, their average and their standard deviation are shown for each stock for daily, weekly and monthly returns.
2. The correlation between yearly betas using daily, weekly and monthly for 158 companies from 1991-2002 is summarized in a table.
3. Stocks with beta > 1 are often classified as aggressive/more risky. We see if the interval used for calculation of beta changes this classification.

Discussion

1. We compare the maximum, minimum, average and standard deviation of betas year wise for daily, weekly and monthly returns to see variation of betas calculated with different intervals. The aim is to see if beta is stable or not.
2. We discuss the correlation between betas over the years. The aim is to see if there is variation in beta over the years and whether this varies with the interval period chosen.
3. If the interval used for calculation of beta changes the classification of stocks between risky and not so risky, it has implications for portfolio managers using beta for decision-making.

We compare with other studies and recommend the interval that offers the most stationarity to be used in future studies. We also suggest further areas for study such as calculation of beta over 1-5 years and effect on beta, if we use portfolios of various sizes.

■ EXAMPLE OF RESEARCH USING EVENT STUDIES

Event studies can be used to analyse the impact of specific events on the returns of a company. These could be macro-economic events such as international and national news, natural disasters, budget announcements, government policies on corporate taxation or tax free dividends or could be corporate actions such as dividend announcements, sale of new shares, new debt issues etc.

Scope and Methodology

One such study could be to examine the semi strong form efficiency of the Indian stock market and determine whether the market reacts to information regarding bonus issues¹¹. Bonus issues are expected to send positive signals to investors and hence prices are expected to rise when an issue is announced. If there is a significant predictable increase in price

¹¹ Adapted from Sharma Jyoti & Singh Rohini, Market Reaction to Bonus Issues in the Indian Stock Market, *Asia Pacific Business Review*, Vol.V, No.3, July-Sept 2009, pp56-62.

after the bonus announcement that can be used to make abnormal profits, the market is considered to be inefficient.

For this we need to select at least 25 events , in this case, bonus issues in a defined period and calculate abnormal returns using the market model or CAPM for calculation of “normal returns”. We will need to define the event date, we can take it as the date on which information regarding the bonus issue became public. The actual date of bonus issue can also be studied separately. The daily adjusted closing prices of each security in the sample needs to be collected for an event window (could range from few days to months depend on the type of event being studied) say 40 days before & 40 days after the event date. An estimation period of six months to one year before the event date is also required to estimate “normal returns”. The return on the market portfolio is calculated by using the index as a proxy.

The null hypothesis would be there is no significant average abnormal return (AAR) around the event dates, $1/n\Sigma AR = 0$ where n is the number of sample companies. Averages are calculated to remove any stock specific bias. If the market model is employed to compute the normal returns, abnormal returns are calculated as follows:

$$R_{jt} = \alpha_j + \beta_j R_{mt} + \varepsilon_{jt}$$

Where, R_{jt} = the daily return security j at day t

R_{mt} = the daily return on Indian stock market at day t

α_j , β_j = OLS intercept and slope coefficient estimators, respectively

ε_{jt} = the error term for security j at day t

The daily return on the index used as a proxy for the market return is computed using logarithms of daily returns: $R_{mt} = \log(I_t/I_{t-1})$

The daily return for security j is:

$$R_{jt} = \log(R_t/R_{t-1})$$

α_j , β_j are derived from the market model over the estimation period prior to the event date. The expected returns for security j at day t are defined as,

$$ER_{jt} = \alpha_j + \beta_j R_{mt}$$

Where α_j , β_j are OLS estimators of (α_j, β_j) .

The daily abnormal return are calculated from the following equation:

$$AR_{jt} = R_{jt} - ER_{jt}$$

For each event date t, the cross sectional average abnormal returns for all firms are defined as:

$$AAR_t = 1/n \sum \varepsilon_{jt} \text{ for } j = 1 \text{ to } n$$

t = for the event window

n = number of bonus issues studied

Cumulative Average Abnormal Returns are calculated for 81 days (announcement date is in the center) using the following equation, in order to analyze the price effects:

$$CAAR = \Sigma AAR_t$$

Analysis and Discussion

The aim is to determine whether there are average abnormal returns on and around the event date. Details of day wise AAR and CAAR are calculated and graphs of AAR and CAAR are plotted to identify patterns if any around the event date. The percentage of the sample companies having positive mean return during the event window and negative return during the event window are recorded. Finally AAR and CAAR are checked if statistically significantly different from zero.

The results of the analysis of reaction to bonus issues is compared with existing studies , if similar the hypothesis is strengthened , if not we try to identify the reasons for difference. Further research in this area that may provide further insights could be suggested.

■ ADVANCED TIME SERIES ANALYSIS

If we want to study the causal effect of inflation or oil prices or GDP on the stock market we can run an ordinary least squares regression to find out the direction and strength of the relationship. However in time series regressions data needs to be stationary i.e. the means, variances and covariances should not depend on the time period in which they are observed For example if we are studying the GDP, it does normally increase every year so mean is not stationary. Also it is possible that the variance (fluctuations around the mean) and covariance (between GDP at various intervals of time) may have increased or decreased over time. Time series data need to be tested and made stationary before running the regression analysis, otherwise we may find spurious relationships and also we will not be able to perform tests of statistical significance .

A step by step procedure for testing causality between time series data has been discussed by Prof. David Giles . The solved example in his blog is very helpful for further clarity and he has also provided tips on what to do and what to watch out for¹².

■ SUMMARY

Writing a research paper involves deciding on a topic, the type of research to be done, and the scope and methodology to be adopted. These are based on a survey of existing literature and the time and resources available. This is followed by data collection and analysis and interpretation of the results. The work is given a final shape in the form of a project report or sent for publication. Written reports and journal articles have almost the same requirements, for which some guidelines have been provided. The research process illustrated using four published articles. Though these articles represent some of the research done in the area, the variety of research possible is endless.

¹² <http://davegiles.blogspot.in/2011/04/testing-for-granger-causality.html>

Glossary

A

Accrued interest: Interest earned but not due.

Adjusted EPS: EPS after extraordinary and non-recurring items are removed. See also diluted EPS.

Alpha: The intercept of the characteristic line. See also Jensen's measure.

American option: A call or put option that can be exercised at any time on or before the expiry date. See also European option.

Annualised returns: Absolute returns expressed as returns over a period of one year.

Asset management company (AMC): The company responsible for managing the operations of a mutual fund.

At the money option: When the price of the underlying asset equals the exercise price of the option. See also in the money and out of the money options.

B

Bad delivery: Delivery of a share certificate and transfer deed that do not meet the requirements for transfer of shares in the name of the buyer. The opposite is a good delivery.

Balanced funds: Mutual funds that invest in equity and debt instruments for a mix of income and capital appreciation.

Basis: The difference between the spot price and the futures price of the underlying asset.

Bear market: A period of declining prices. The opposite is a bull market.

Bear spread: Sell a call/put with lower exercise price and buy the one with higher strike price. See also bull spread.

Benchmark: A parameter to compare with; for example, the RBI repo rate acts as a benchmark for short-term interest rates, the Sensex acts as a benchmark for equity funds.

Beta: A measure of the co-movement of a stock or portfolio of stocks relative to the market index.

Bid: An offer to buy a security at a given price. Offer is the price at which it is offered for sale.

Bond: Normally refers to a secured debt instrument. In India, bonds are issued by the Government, financial institutions, public sector units etc. See also debentures.

Bonus shares: Additional shares allotted at no extra cost existing investors in proportion to the shares held by them, through capitalisation of accumulated reserves.

Book value per share: Share capital, reserves and surplus of a company divided by the number of equity shares outstanding.

Broker: The company or individual who executes orders for securities on behalf of clients. Brokerage/commission: the fee charged by a broker.

Bull market: A period of rising market prices. The opposite is a bear market.

Bull spread: Buy a call/put with lower exercise price and sell the one with higher strike price. See also bear spread.

C

Call option: A contract that gives the buyer the right, but not the obligation, to buy the underlying asset at a fixed price during a given period or on a specific future date. See also American and European option.

Capital market: A market for trading in financial instruments with maturities exceeding one year.

Cash orders: Orders intended for settlement by delivery, of money for purchases and shares for sales.

Cash reserve ratio (CRR): The percentage of net demand and time liabilities that has to be deposited with RBI.

Certificate of Deposit (CD): Deposit certificates issued by commercial banks and financial institutions at discount to face value, with maturity ranging from 15 days to one year. Unlike ordinary fixed deposits, they are transferable through endorsement and delivery.

Circuit breakers: A mechanism by which the stock exchanges suspend trading in a security or the entire market when prices are more volatile than justified by historical movements.

Clearing house/corporation: An agency that acts as counter party and settles trades undertaken on exchanges.

Close ended schemes: Mutual fund schemes with a fixed maturity.

Closing price: The rate at which the last transaction in a security is struck before the close of the trading hours. For derivatives, this is the average of the last half hours traded prices in the underlying.

Concurrent/coincident indicators: Indicators that move at the same time as the economy and confirm or negate the trend implied by the leading indicators. See lagging and leading indicators.

Cost of carry: In financial futures markets, it is the net difference between the returns (dividend, interest received) the interest paid for funds required to buy the security.

Coupon: The promised annual interest rate on a debt instrument.

CPI: Consumer price index is a measure of inflation based on a basket of retail goods and services consumed by a defined section of consumers.

Cum bonus: A share that entitles the current holder or purchaser to receive the declared bonus. The opposite is ex bonus i.e., after bonus has been given.

Cum rights: A share is cum rights when a purchaser is entitled to receive the announced rights.

Current yield: The ratio of the coupon to the current market price of the debt instrument.

D

Debentures: Normally refer to unsecured debt securities. In India debentures are issued by companies. See also bond

Debt funds/income funds: Funds that primarily invest in interest bearing instruments such as Government bonds, corporate debentures, T bills, certificates of deposit and commercial paper.

Delta: A measure of how much an option premium will change, in response to a unit change in the price of the underlying asset.

Dematerialisation (demat): The process by which physical share certificates are cancelled and replaced with electronic book keeping.

Derivatives: Financial instruments that derive their value from other assets known as underlying assets.

Diluted EPS: EPS calculated after taking into account all committed future stock issues. See also adjusted EPS.

Dirty price: The price payable for a bond including accrued interest.

Discount bonds: Bonds issued at price lower than the value payable at maturity. The difference is equal to interest. These can be in the form of zero coupon bonds or bonds offering lower interest than prevailing rates.

Discount rate: The required rate of return on an asset that is used to calculate the present value of cash flows.

Dividend re-investment: An option offered by mutual funds to reinvest dividends to purchase additional units in the same fund.

Dividend: Part of profits that a company or a mutual fund distributes to its shareholders or unit holders.

E

Entry load/front end load: The fee charged at the time of investment in a mutual fund.

Equity schemes: Mutual fund schemes where more than 65% of the investments are in equity.

Equity shares/stocks/scripts: Represent partial ownership in a company. Returns are earned in the form of dividends and appreciation in the value of shares. See also preference shares.

European option: A put or call option that can be exercised only on the expiration date. See also American option.

Ex bonus: When a purchaser is not entitled to receive the announced bonus, as it will be given to the seller.

Exercise price/Strike price: The price at which the underlying asset in call or put option can be purchased or sold.

Exit load/back end load: The fee charged by a mutual fund at the time of redemption. See also entry load.

F

Face value/nominal value: The original issue price of a share (without premium).

First in first out (FIFO): The accounting method under which units sold are assumed to be those in stock which were purchased first. This can be used for physical inventory or for shares for the purpose of computing capital gains.

Forward contract: A negotiated contract in which a seller agrees to deliver a specific asset at a fixed price to a buyer sometime in the future. See also futures contract.

Front end load: See entry load.

Fundamental analysis: A method of anticipating the intrinsic or fair price of shares using economy, industry and company analysis

Futures contract: A standardised forward contract traded over an exchange.

G

Gamma: A measure of rate of change of delta, given a unit change in the underlying asset.

Gilt funds: Funds that invest only in government securities.

H

Hedging: Offsetting the price risk inherent in holding a security by taking an equal but opposite position in the futures market.

I

In the money option: A call whose strike price is below the current price of the underlying asset, or a put whose strike price is above the current price of the underlying asset. See also at the money and out of the money.

Index fund: A mutual fund that invests in equity shares of various companies in the same proportion as a popular stock index.

Indexation: For calculation of capital gains with the benefit of indexation, the purchase price is multiplied by the ratio of the index of the year of sale to the index of the year of purchase.

Internal rate of return (IRR): The rate at which future cash flows must be discounted in order to equal the present value of the investment.

J

Jensen's measure: Portfolio returns are measured with respect to the required return according to the CAPM. Jensen's alpha measures the excess/shortfall. See also Treynor's and Sharpe's measure.

L

Lagging indicators: In economy analysis, indicators that follow later and help confirm the general direction of the economy. See also leading and concurrent indicators.

Leading indicators: In economy analysis, indicators that precede and help forecast the general direction of the economy. See also lagging and concurrent indicators.

Leverage: The ability to magnify profits (and losses) on investment through the use of borrowed money or derivative instruments.

Liquidity adjustment facility (LAF): LAF of RBI allows injection of liquidity through Repo auctions (lend to banks) and reduction of liquidity through reverse Repo auctions (take surplus from banks).

Liquidity: Ease of finding a trading partner. An asset is said to have liquidity if there are sufficient buyers and sellers to allow large transactions without a substantial change in price.

Listing: Registration with the stock exchanges to qualifies for trading on it.

Lock in Period: The period for which an investor cannot sell/withdraw funds from investment in securities/mutual fund units/fixed deposits etc.

Long position: Owner of shares or buyer of a futures contract.

M

Margin: Selling shares not owned is also known as short selling or selling on margin; buying shares without making full payment is known as buying on margin.

Margin: In derivatives, trading are money to be deposited with the exchange to ensure performance of the contract. Initial margin is deposited when entering into a transaction. Subsequent shortfalls in the margin account are met by depositing maintenance margins.

Mark to market: The margin account is debited/credited daily based on the closing price for the day.

Market lot: The minimum number of shares (and multiples thereof) of a particular security that must be transacted on the Exchange. For demat stocks the market lot is one share.

Market stabilisation scheme (MSS): Is used by RBI to absorb liquidity through issue of treasury bills and dated government securities.

Money market instruments: Very liquid short-term debt instruments with maturity up to one year including GOI securities with residual maturity of less than one year.

Money market mutual funds (MMMF)/liquid funds: Funds that invest in money market instruments as defined under the SEBI mutual fund regulations.

Money market: A market for trading in financial instruments having less than one year maturity.

Money supply: Narrow money or M1= currency with the public + demand deposits with the banking system + other deposits with the RBI. M2= M1 + savings deposits with post office savings banks. Broad money M3= M1+ time deposits with the banking system. M3 is the most commonly used measure of money supply.

Mutual fund: A collective investment mechanism where investors pool their resources and share the income and capital gain or losses in proportion to their investments.

N

NAV: Net asset value is the market value of the assets of the scheme minus liabilities.

Nifty: NSE 50 Index is a value weighted index which consists of fifty stocks traded on the National Stock Exchange with base year 1995 and the base value 1000.

Nominal yield/coupon: The periodic interest payment promised by the issuer and expressed as a percentage of the par value of the bond.

O

Odd lot: Trades involving less than the market lot, normally traded cheaper than market lots.

Offer: Expressed desire to sell a share or commodity at a given price. See also bid.

Open ended fund: A mutual fund that is available for subscription and repurchase on a continuous basis at Net Asset Value (NAV) related prices. There is no fixed maturity period. See also close ended fund.

Open interest: The number of futures or options contracts that are held by buyers and sellers and are yet to be exercised or closed.

Open market operations (OMO) of RBI: The RBI buys and sells Government securities from participants in the financial markets to absorb or provide liquidity in the market.

Opening Price: The price at which the first transaction takes place in a security after the opening of the market.

Option premium: The amount of money paid by the option buyer for the rights granted by the option.

Option spread: The simultaneous purchase and sale of two or more options contracts. Price/vertical spread has same expiry month, but different exercise prices. For time/horizontal/calendar spreads, the exercise price is the same but expiry months are different. See also bull and bear spreads.

Option writer: Option seller.

Option: The seller of the option grants the buyer of the option the right to buy or sell a specified asset, at a given price during a given period or on a specific future date.

Out of the money option: A call whose strike price is above the current price of the underlying asset, or a put whose strike price is below the current price of the underlying asset. See also at the money and in the money.

Over the counter: Customised trading in stocks/derivatives not conducted over an exchange.

P

Par value: The face value of a security.

Portfolio: The basket of investments held by an individual or mutual fund.

Preference shares: Represent ownership in the company like equity shares, but do not have voting rights. They have a fixed dividend payable every year before dividend can be paid on common stock.

Primary dealer: Under writers and market makers for Government securities.

Primary market: Market for new issues of securities.

Prime lending rate (PLR): The interest rates that banks charge for loans to borrowers with the highest credit rating or the lowest risk.

Put option: A contract that gives the buyer the right but not the obligation to sell the underlying asset at a given during a given period or on a specific future date. See also American and European option.

R

Re-materialisation: Re-conversion of shares held in electronic form into paper form. See also dematerialisation.

Ready forward/Repo/Repurchase agreement: A transaction in which the borrower sells securities to the lender with a mutual agreement to repurchase the same at a decided future date and a price.

Reserve requirements: The minimum amount of cash and liquid assets as a percentage of demand and time deposits that banks are required to maintain as specified by RBI. See also CRR and SLR.

S

SEBI: Securities and Exchange Board of India.

Secondary market: A market where previously issued securities are bought and sold. See also primary market.

Securities: Financial assets that are issued in fixed denominations and are fungible (each unit is indistinguishable from the other) and tradable.

Sensex: BSE Sensex comprising of 30 stocks listed on the Bombay stock exchange is a value weighted index using free float with the base year 1978-79 and base value of 100.

Sharpe ratio: Compares the average excess return (return minus risk free rate) to the portfolio's total risk (standard deviation). See also Treynor's and Jensen's measure.

Short selling: Selling an asset that is not owned at present. See also margin.

SLR: See statutory liquidity ratio.

Spot/cash price: The price to be paid for immediate delivery. This is different from the price to be paid on a forward or futures contract for delivery and payment at a later date.

Spread: The price difference or yield difference between two markets or types of securities.

Statutory liquidity ratio (SLR): The percentage of net demand and time liabilities that has to be invested in Government notified securities.

Stock index: A statistic that reflects the value of a list of stocks as compared with a standard or base value. See also Nifty and Sensex.

Stock market: A market for trading in the shares of companies. See also capital market.

Stop loss order: An order which gets activated only when the last traded price of the share is reached or crosses the trigger price.

Strike price/exercise price: The price at which the underlying asset in call/put option can be purchased/sold.

Systematic risk: Part of risk that influences all stocks or all bonds though the extent may differ for each security and is beyond the control of individual firms. See also unsystematic risk.

T

Technical analysis: The study of past price and volume data to forecast future price movements.

Treasury bills (T-bills): Short-term debt instrument issued by the government with a maturity period of one year or less.

Treynor's ratio: The ratio of a fund's average excess return (return – risk free rate) to the beta of the portfolio. See also Sharpe's and Jensen's measure.

U

Unsystematic risk/diversifiable risk/residual risk/specific risk: Part of risk that is specific to a particular industry or company. See also systematic risk.

V

Volatility: A measure of the variation in price over a given period.

W

WPI: Wholesale price index is a measure of inflation based on the price of goods at the wholesale level.

Y

Yield curve: Shows the relation between the interest rate (or returns on lending) and the time remaining to maturity for a particular issuer or debt of the same credit quality.

Yield to maturity (YTM): The rate of return on a bond held until maturity.

Yield: A measure of the periodic return on an investment. See also current yield, nominal yield, yield to maturity.

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