Investment Analysis and Portfolio Management

This book is a part of the course by **Jaipur National University**, Jaipur.
This book contains the course content for Investment Analysis and Portfolio Management.

JNU, Jaipur
First Edition 2014

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Abbreviations

ABS	-	Asset-Backed Securities
AM	-	Arithmetic Mean
APT	-	Arbitrage Price Theory
ATS	-	Alternative Trading System
CAPM	-	Capital Asset Pricing Model
CML	-	Capital Market Line
DGM	-	Dividend Growth Model
EIC	-	Economy–Industry–Company
ERP	-	Equity Risk Premium
GDP	-	Gross Domestic Product
GM	-	Geometric Mean
GNP	-	Gross National Product
HPR	-	Holding Period Return
HPY	-	Holding Period Yield
ICD	-	Inter Corporate Deposit
IPO	-	Initial Public Offering
LCE	-	London Commodity Exchange
LIBOR	-	London Inter Bank Offered Rate
LIFFE	-	London International Financial Futures Exchange
LTOM	-	London Traded Options Market
NAV	-	Net Assets Value
NNP	-	Net National Product
NSCCL	-	National Securities Clearing Corporation
NSE	-	National Stock Exchange
OTC	-	Over-the-Counter
PTC	-	Pass through Certificates
SEBI	-	Securities and Exchange Board of India
SFR	-	Swap Fixed Rate
SPV	-	Special Purpose Vehicle
UTI	-	Union Trust of India
WACC	-	Weighted Average Cost of Capital

Chapter I

Introduction to Investment Analysis

Aim

The aim of this chapter is to:

- introduce investment analysis
- explain the characteristics of investment
- explicate the need and importance of investments

Objectives

The objectives of this chapter are to:

- enlist the classification of investment on the basis of physical investments
- elucidate saving and investment
- explain investment activity

Learning outcome

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

- identify the direct and indirect investments
- understand the measures of return and risk
- recognise the determinants of required rate of return

1.1 Introduction

The term 'investing' could be associated with different activities, but the common target in these activities is to 'employ' the money (funds) during the time period seeking to enhance the investor's wealth. Funds to be invested come from assets already owned, borrowed money and savings. By foregoing consumption today and investing their savings, investors expect to enhance their future consumption possibilities by increasing their wealth. However, it is always useful to make a distinction between real and financial investments. Real investments usually involve some kind of tangible assets, such as land, machinery, factories, etc. Financial investments involve contracts in paper or electronic form, such as stocks, bonds, etc.

1.1.1 Definition of Investment

"Investment analysis is the study of financial securities for the purpose of successful investing." This definition contains the following important points:

- There are institutional facts about the financial securities, how to trade and what assets are to be traded.
- There are analytical issues involved in studying these securities, the calculation of risks and returns, and the relationship between the two.
- There is the question of what success means for an investor, and the investment strategies that ensure that the choices made are successful.
- There are financial theories that are necessary to try to understand how the markets work and how the prices of assets are determined.

It is clear that the more an investor understands, the less likely they are to make an expensive mistake. Note carefully that this is not saying that the more you know, the more you will earn. An explanation for this observation will be found in some of the theories that follow. These comments partly address the question "Can you beat the market?" Whether you can, depends on the view you may hold about the functioning of financial markets. One of the interpretations of investment analysis is that this is just not possible on a repeated basis. An alternative interpretation is that knowing the theory reveals where we should look for ways of beating the market.

1.2 Characteristics of Investment

Investment refers to investing money in financial physical assets and marketing assets. Major investment features are risk, return, safety, liquidity, marketability, concealability, capital growth, purchasing power, stability and the benefits.

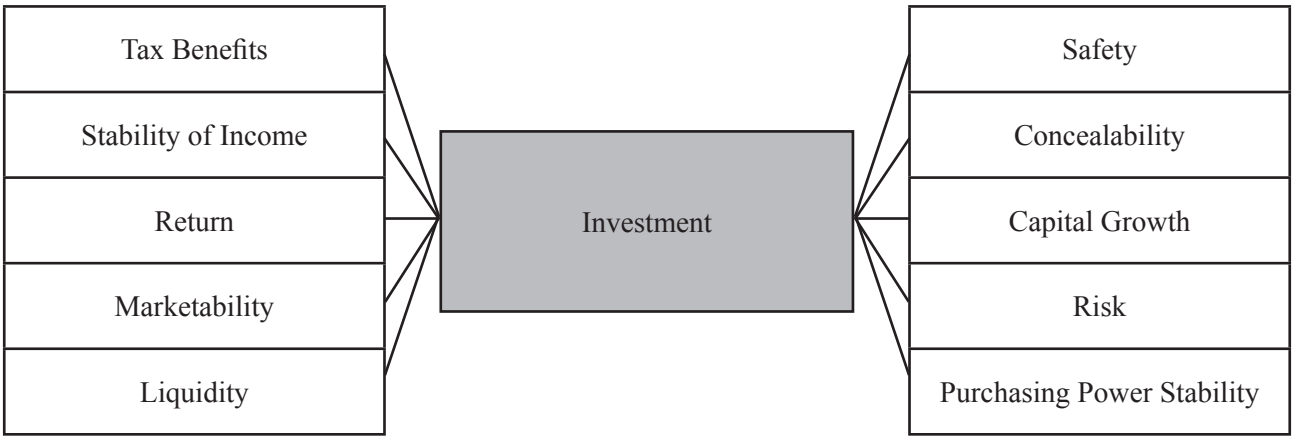

Fig. 1.1 Characteristics of investment
(Source: Investment_Management_Chapter_1_Investment.pdf)

Risk

Risk refers to the loss of principal amount of an investment. It is one of the major characteristics of an investment. The risk depends on the following factors:

- When investment maturity period is longer; investor will take larger risks.
- Government or Semi-Government bodies issue securities, which have lesser risks.
- In the case of the debt instrument or fixed deposit, the risk of above investment is less due to their secured and fixed interest payable. For instance, debentures.
- In the case of ownership instrument like equity or preference shares, the risk is more due to their unsecured nature and variability of their return and ownership character.
- The risk of degree of variability of returns is more in the case of ownership capital as compared to debt capital. The tax provisions would influence the return of risk.

Return

Return refers to expected rate of return from an investment. Return is an important characteristic of investment. Return is the major factor which influences the pattern of investment that is made by the investor. Investor always prefers high rate of return for his investment.

Safety

Safety refers to the protection of investor principal amount and expected rate of return. Safety is also one of the essential and crucial elements of investment. Investor prefers his capital's safety. Capital is the certainty of return without loss of money or it will take time to retain it. If investor prefers less-risk securities, he chooses Government bonds. In cases, where investor prefers high rate of returns, investor will choose private securities, whose safety is low.

Liquidity

Liquidity refers to investments ready to be converted into cash. In other words, it is available immediately in the cash form. Liquidity means that investment is easily realisable, saleable or marketable. When the liquidity is high, then the return may be low. For example, UTI units. An investor generally prefers liquidity for his investments and safety of funds through a minimum-risk and maximum-return investment.

Marketability

Marketability refers to buying and selling of securities in market. Marketability means transferability or saleability of an asset. Securities listed in a stock market are more easily marketable than which are not listed. Public Limited Companies' shares are more easily transferable than those of private limited companies.

Concealability

Concealability is another essential characteristic of the investment. Concealability means investment to be safe from social disorders, government confiscations or unacceptable levels of taxation. Property must be concealable and should leave no record of income received from its use or sale. Gold and precious stones have long been esteemed for these purposes, because they combine high-value with small bulk and are readily transferable.

Capital growth

Capital growth refers to appreciation of investment. Capital growth has today become an important character of investment. Capital appreciation, also known as capital growth, refers to the increase in the value of an investment over time. It tells you how much profit you would pay taxes on, if you sold the investment that day. Investors and their advisers are constantly seeking 'growth stock' in the right industry; bought at the right time.

Purchasing power stability

It refers to the buying capacity of investment in market. Purchasing power stability has become one of the import traits of investment. Investment always involves the commitment of current funds with the objective of receiving greater amounts of future funds.

Stability of income

It refers to constant return from an investment. Another major characteristic feature of the investment is the stability of income. Stability of income must look for different paths just as the security of the principal. Every investor must always consider stability of monetary income and stability of the purchasing power of income.

Tax benefits

Tax benefit is the last characteristic feature of the investment. Planning an investment programme without considering the tax burden may be costly to the investor. There are actually two problems:

- One concerned with the amount of income paid by the investment.
- Another is the burden of income tax upon that income.

1.3 Need and Importance of Investments

An investment is an important and useful factor in the context of present day conditions. Some factors are very important, while considering these investments. They are outlined below:

- Longer life expectancy or planning for retirement
- Increasing rates of taxation
- High interest rates
- High rates of inflation
- Larger incomes
- Availability of a complex number of investment outlets

Longer life expectancy

Investment decisions have become more significant as most people in India retire between the ages of 56 to 60. Investment decisions have to be planned to make wise saving decisions. Saving on their own does not increase wealth; the saving must be invested in such a way that the principal and income will be adequate for a greater number of retirement years. Longer life expectancy is one reason for effective savings and further investment activities that help the investment decisions.

Increasing rates of taxation

When tax rate is increased, it will focus on generating savings by the tax payer. When the tax payer invests their income in provident fund, pension fund, Unit Trust of India, Life Insurance, Unit Linked Insurance Plan, National Saving Certificates, Development Bonds, Post Office Cumulative Deposit Schemes, etc., it affects their taxable income.

Interest rates

Interest rate is one of the most important aspects of a sound investment plan. The interest rate differs from one investment to another. There may be changes between degree of risk and safe investments. They may also differ due to different benefit schemes offered by the institutions. A high rate of interest may not be the only factor favouring the outlet for investment. Stability of interest is an important aspect of receiving a high rate of interest.

Inflation

Inflation has become a continuous problem. It affects in terms of rising prices. Several problems are associated and coupled with falling standards of living. Therefore, investor's careful scrutiny of the inflation will make further investment process delayed. Investor ensures to check the safety of the principal amount and security of the investment. Both are crucial from the point of view of the interest gained from the investments.

Income

Income is another important element of the investment. When government provides jobs to the unemployed persons in the country, the ultimate result is ensuring income than saving the extra income. More incomes and more avenues of investment have led to the ability and willingness of working people to save and invest their funds.

Investment channels

The growth and development of the country leading to greater economic prosperity has led to the introduction of a vast area of investment outlets. Investment channels mean an investor is willing to invest in several instruments like corporate stock, provident fund, and life insurance, fixed deposits in the corporate sector and unit trust schemes.

1.4 Classification of Investment

The classification of investments into various groups is explained in the paragraphs given below:

On the basis of physical investments

Physical investments are as follows:

- House
- Land
- Building
- Gold and silver
- Precious stones

On the basis of financial investment

Financial investments are further classified on the basis of:

- Marketable and transferable investments
- Non-marketable investments

Marketable investments are as follows:

- Shares
- Debentures of Public Limited Companies, particularly the listed company in Stock Exchange
- Bonds of Public Sector Units
- Government Securities, etc.

Non-marketable investments are as follows:

- Bank deposits
- Provident and pension funds
- Insurance certificates
- Post office deposits
- National saving certificates
- Company deposits
- Private company shares, etc.

1.5 Saving and Investment

Investors are savers, but all savers cannot be good investors, as investment is a science and an art. Savings are sometimes autonomous and sometimes induced by the incentives like fiscal concessions or income or capital appreciation. The number of investors was estimated at about 50 million out of population of more than one billion in India. In the nineties, savers came from all classes except in the case of the population, who were below the poverty line. The growth of urbanisation and literacy has activated the cult of investment. More recently, since the nineties, the investment activity has become more popular with the change in the Government policies towards liberalisation and financial deregulation. The process of liberalisation and privatisation was accelerated by the Government policy changes towards a market-oriented economy, through economic and financial reforms started in July 1991.

1.6 Investment Activity

Investment activity includes buying and selling of the financial assets, physical assets and marketable assets in primary and secondary markets. Investment activity involves the use of funds or saving for further creation of assets or acquisition of existing assets.

Accordingly, investment activity refers to acquisition of assets like:

- Financial assets
- Physical assets
- Marketable assets from the primary and secondary market

Financial assets are as follows:

- Cash
- Bank deposits
- P.F.
- LIC schemes
- Pension scheme
- Post office certificates and deposits

Physical assets are as follows:

- House, land, building and flats
- Gold, silver and other metals
- Consumer durables

Marketable assets are as follows:

- Shares
- Bonds
- Government securities
- M.F schemes
- UTI units, etc.

Investment activity involves the use of funds or saving for further creation of assets or acquisition of existing assets.

1.7 Measures of Return and Risk

These chapters will enable you to choose among alternative investment assets. This selection process requires that you estimate and evaluate the expected risk return trade-offs for the alternative investments available. Therefore, you must understand how to measure the rate of return and the risk involved in an investment accurately. To meet this need, the ways to quantify return and risk are examined. The presentation will consider how to measure both historical and expected rates of return and risk. The historical measures of return and risk are considered with numerous examples of historical average rates of return and risk measures for various assets. Understanding these presentations is very important. In addition, these historical results are often used by investors, when attempting to estimate the expected rates of return and risk for an asset class.

The first measure is the historical rate of return on an individual investment over the time period the investment is held (that is, its holding period). Next, how to measure the average historical rate of return for an individual investment over a number of time periods is considered. The average rate of return for a portfolio of investments is also dealt with. Given the measures of historical rates of return, the traditional measures of risk for a historical time series of returns (that is, the variance and standard deviation) are presented. By following the presentation of measures of historical rates of return and risk, the expected rate of return for an investment is estimated.

1.7.1 Measures of Historical Rates of Return

When you are evaluating alternative investments for inclusion in your portfolio, you will often be comparing investments with widely different prices or lives. As an example, you might want to compare a $10 stock that pays no dividends to a stock selling for $150 that pays dividends of $5 a year. To properly evaluate these two investments, you must accurately compare their historical rates of returns.

When we invest, we defer current consumption in order to add to our wealth, so that we can consume more in the future. Therefore, when we talk about a return on an investment, we are concerned with the change in wealth resulting from this investment. This change in wealth can be either due to cash inflows, such as interest or dividends, or caused by a change in the price of the asset (positive or negative).

If you commit $200 to an investment at the beginning of the year and you get back $220 at the end of the year, what is your return for the period? The period during which you own an investment is called its holding period, and the return for that period is the Holding Period Return (HPR). In this example, the HPR is 1.10, calculated as follows:

$$HPR = \frac{Ending\ Value\ of\ Investment}{Beginning\ Value\ of\ Investment}$$

$$= \frac{\$220}{\$200} = 1.10$$

This HPR value will always be zero or greater, that is, it can never be a negative value. A value greater than 1.0 reflects an increase in your wealth, which means that you received a positive rate of return during the period. A value, less than 1.0 means that you suffered a decline in wealth. This indicates that you had a negative return during the period. An HPR of zero indicates that you lost all your money (wealth) invested in this asset.

Although HPR helps us express the change in value of an investment, investors generally evaluate returns in percentage terms on an annual basis. This conversion to annual percentage rates makes it easier to directly compare alternative investments that have markedly different characteristics. The first step in converting an HPR to an annual percentage rate is to derive a percentage return, referred to as the Holding Period Yield (HPY). The HPY is equal to the HPR minus 1.

$$HPY=HPY-1$$

For example:

$$HPY=1.10-1=0.10$$
$$=10\%$$

To derive an annual HPY, you compute an annual HPR and subtract 1.
Annual HPR is found by:

$$Annual\ HPR = HPR^{1/n}$$

Where:

n=number of years the investment is held

1.7.2 Computing Mean Historical Returns

Now that we have calculated the HPY for a single investment for a single year, we want to consider mean rates of return for a single investment and for a portfolio of investments. Over a number of years, a single investment will likely give high rates of return during some years and low rates of return, or possibly negative rates of return, during others. Your analysis should consider each of these returns, but you also want a summary figure that indicates this investment's typical experience, or the rate of return you might expect to receive, if you owned this investment over an extended period of time. You can derive such a summary figure by computing the mean annual rate of return (it's HPY) for this investment over some period of time.

Alternatively, you might want to evaluate a portfolio of investments that might include similar investments (for example, all stocks or all bonds) or a combination of investments (for example, stocks, bonds and real estate). In this instance, you would calculate the mean rate of return for this portfolio of investments for an individual year or for a number of years. Given a set of annual rates of return (HPYs) for an individual investment, there are two summary measures of return performance. The first is the arithmetic mean return; the second is the geometric mean return. To find the arithmetic mean (AM), the sum (Σ) of annual HPYs is divided by the number of years (n) as follows:

$$AM = \sum HPY/n$$

Where:

$$\sum HPY = the\ sum\ of\ annual\ holding\ period\ yields$$

An alternative computation, the Geometric Mean (GM), is the nth root of the product of the HPRs for n years minus one.

$$GM = [\pi HPR]^{1/n} - 1$$

Where:

π=the product of the annual holding period returns as follows:

$$(HPR_1) \text{ x } (HPR_2) \ldots (HPR_n)$$

When rates of return are the same for all years, the GM will be equal to the AM. If the rates of return vary over the years, the GM will always be lower than the AM. The difference between the two mean values will depend on the year-to-year changes in the rates of return. Larger annual changes in the rates of return, that is, more volatility will result in a greater difference between the alternative mean values.

An awareness of both methods of computing mean rates of return is important, because most published accounts of long-run investment performance or descriptions of financial research will use both the AM and the GM as measures of average historical returns. Both will be used throughout this book with the understanding that the AM is best used as an expected value for an individual year, while the GM is the best measure of long-term performance, since it measures the compound annual rate of return for the asset being measured.

A portfolio of investments

The mean historical rate of return (HPY) for a portfolio of investments is measured as the weighted average of the HPYs for the individual investments in the portfolio, or the overall percent change in value of the original portfolio. The weights used in computing the averages are the relative beginning market values for each investment; this is referred to as dollar-weighted or value-weighted mean rate of return. As shown, the HPY is the same whether you compute the weighted average return using the beginning market value weights or if you compute the overall percent change in the total value of the portfolio.

Although the analysis of historical performance is useful, selecting investments for your portfolio requires you to predict the rates of return you expect to prevail. We shall discuss how one measures this uncertainty, which is referred to as the risk of an investment.

Calculating expected rates of return

Risk is the uncertainty that an investment will earn its expected rate of return. An investor who is evaluating a future investment alternative expects or anticipates a certain rate of return. The investor might say that he or she expects the investment to provide a rate of return of 10 percent, but this is actually the investor's most likely estimate, also referred to as a point estimate.

Pressed further, the investor would probably acknowledge the uncertainty of this point estimate return and admit the possibility that, under certain conditions, the annual rate of return on this investment might go as low as 10 percent or as high as 25 percent. The point is the specification of a larger range of possible returns from an investment reflects the investor's uncertainty regarding what the actual return will be. Therefore, a larger range of possible returns implies that the investment is riskier.

An investor determines how certain the expected rate of return on an investment is by analysing estimates of possible returns. To do this, the investor assigns probability values to all possible returns. These probability values range from zero, which means no chance of the return, to one, which indicates complete certainty that the investment will provide the specified rate of return. These probabilities are typically subjective estimates based on the historical performance of the investment or similar investments modified by the investor's expectations for the future.

As an example, an investor may know that about 30 percent of the time the rate of return on this particular investment was 10 percent. Using this information along with future expectations regarding the economy, one can derive an estimate of what might happen in the future. The expected return from an investment is defined as:

$$Expected\ Return = \sum_{i=1}^{n} (Probability\ of\ Return)\ x\ (Possible\ Return)$$

$$E(R_i) = [(P_1)(R_1) + (P_2)(R_2) + (P_3)(R_3) + \cdots + (P_n)(R_n)]$$

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

1.7.3 Measuring the Risk of Expected Rates of Return

We have shown that we can calculate the expected rate of return and evaluate the uncertainty, or risk, of an investment by identifying the range of possible returns from that investment and assigning each possible return a weight based on the probability that it will occur. Although the graphs help us visualise the dispersion of possible returns, most investors want to quantify this dispersion using statistical techniques. These statistical measures allow you to compare the return and risk measures for alternative investments directly. Two possible measures of risk (uncertainty) have received support in theoretical work on portfolio theory, the variance and the standard deviation of the estimated distribution of expected returns. We shall demonstrate how variance and standard deviation measure the dispersion of possible rates of return around the expected rate of return. We will work with the examples discussed earlier. The formula for variance is as follows:

$$Variance(\sigma^2) = \sum_{i=1}^{n} (Probability)\ x\ (Possible\ Return - Expected\ Return)^2$$

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

Risk measures for historical returns

To measure the risk for a series of historical rates of returns, we use the same measures as for expected returns (variance and standard deviation), except that we consider the historical Holding Period Yields (HPYs) as follows:

$$\sigma^2 = \left[\sum_{i=1}^{n} [HPY_i - E(HPY)]^2\right] / n$$

Where:

$$\sigma^2 = the\ variance\ of\ the\ series\sigma^2 = the\ variance\ of\ the\ series$$

$$HPY_i = the\ holding\ period\ yield\ during\ period\ i$$

$$HPY_i = the\ holding\ period\ yield\ during\ period\ i$$

$$E(HPY) = the\ expected\ value\ of\ the\ holding\ period\ yield\ that\ is\ equal\ to\ the\ arithmetic\ mean\ (AM) of\ the\ series$$

N=the number of observations

The standard deviation is the square root of the variance. Both measures indicate how much the individual HPYs over time deviated from the expected value of the series.

1.8 Determinants of Required Rate of Return

In this section, we continue our discussion of factors that must be considered when selecting securities for an investment portfolio. This selection process involves finding securities that provide a rate of return that compensates you for:

- The time value of money during the period of investment.
- The expected rate of inflation during the period.
- The risk involved.

The summation of these three components is called the required rate of return. This is the minimum rate of return that you should accept from an investment to compensate you for deferring consumption. Due to the importance of the required rate of return to the total investment selection process, this section contains a discussion of the three components and what influences each of them.

The analysis and estimation of the required rate of return are complicated by the behaviour of market rates over time.

- First, a wide range of rates is available for alternative investments at any time.
- Second, the rates of return on specific assets change dramatically over time.
- Third, the difference between the rates available (that is, the spread) on different assets changes over time.

1.9 Investing Versus Financing

The term 'investing' could be associated with the different activities, but the common target in these activities is to 'employ' the money (funds) during the time period seeking to enhance the investor's wealth. Funds to be invested come from assets already owned, borrowed money and savings. By foregoing consumption today and investing their savings, investors expect to enhance their future consumption possibilities by increasing their wealth.

However, it is useful to make a distinction between real and financial investments. Real investments generally involve some kind of tangible asset, such as land, machinery, factories, etc. Financial investments involve contracts in paper or electronic form, such as stocks, bonds, etc. Corporate finance typically covers such issues as capital structure, short-term and long-term financing, project analysis and current asset management. Capital structure addresses the question of what type of long-term financing is the best for the company under current and forecasted market conditions; project analysis is concerned with the determining whether a project should be undertaken. Current assets and current liabilities management address how to manage the day-by-day cash flows of the firm. Corporate finance is also concerned with how to allocate the profit of the firm among shareholders (through the dividend payments), the government (through tax payments) and the firm itself (through retained earnings). However, one of the most important questions for the company is financing. Modern firms raise money by issuing stocks and bonds. These securities are traded in the financial markets and the investors have possibility to buy or to sell securities issued by the companies. Thus, the investors and companies, searching for financing, realise their interest in the same place in financial markets.

Corporate finance area of studies and practice involves the interaction between firms and financial markets and investments area of studies and practice involves the interaction between investors and financial markets. Investments field also differs from the corporate finance in using the relevant methods for research and decision-making. Investment problems in many cases allow for a quantitative analysis and modelling approach and the qualitative methods together with quantitative methods are more often used analysing corporate finance problems. The other very important difference is, that investment analysis for decision-making can be based on the large data sets available from the financial markets, such as stock returns, thus, the mathematical statistics methods can be used.

However, at the same time both corporate finance and investments are built upon a common set of financial principles, such as the present value, the future value, the cost of capital. Very often, investment and financing analysis for decision-making use the same tools, but the interpretation of the results from this analysis for the investor and for the financier would be different. For example, when issuing the securities and selling them in the market the company perform valuation looking for the higher price and for the lower cost of capital, but the investor using valuation search for attractive securities with the lower price and the higher possible required rate of return on his/her investments.

Together with the investment, the term speculation is frequently used. Speculation can be described as investment too, but it is related with the short-term investment horizons and usually involves purchasing the saleable securities with the hope that its price will increase rapidly, providing a quick profit. Speculators try to buy low and to sell high, their primary concern is with anticipating and profiting from market fluctuations. However, as the fluctuations in the financial markets are and become more and more unpredictable, speculations are treated as the investments of highest risk. In contrast, an investment is based upon the analysis and its main goal is to promise safety of principle sum invested and to earn the satisfactory risk.

There are two types of investors:

- Individual investors
- Institutional investors

Individual investors are individuals who are investing on their own. Sometimes, individual investors are called retail investors. Institutional investors are entities, such as investment companies, commercial banks, insurance companies, pension funds and other financial institutions. In recent years, the process of institutionalisation of investors can be observed. As the main reasons for this can be mentioned, the fact, that institutional investors can achieve economies of scale, demographic pressure on social security and the changing role of banks. One of important preconditions for successful investing both for individual and institutional investors is the favourable investment environment. The basic principles of investment management are applicable, both for individual and institutional investors.

1.10 Direct Versus Indirect Investment

Investors can use direct or indirect type of investing. Direct investing is realised using financial markets and indirect investing involves financial intermediaries. The primary difference between these two types of investing is that applying direct investing, investors buy and sell financial assets and manage individual investment portfolio themselves. Consequently, investing directly through financial markets, investors take all the risks and their successful investing depends on their understanding of financial markets, its fluctuations and on their abilities to analyse and to evaluate the investments and to manage their investment portfolio.

Contrarily, using indirect type of investing, investors are buying or selling financial instruments of financial intermediaries (financial institutions) which invest large pools of funds in the financial markets and hold portfolios. Indirect investing relieves investors from making decisions about their portfolio. As shareholders with the ownership interest in the portfolios managed by financial institutions (investment companies, pension funds, insurance companies, commercial banks, etc.), the investors are entitled to their share of dividends, interest and capital gains generated and pay their share of the institution's expenses and portfolio management fee. The risk for investor using indirect investing is related more with the credibility of chosen institution and the professionalism of portfolio managers. In general, indirect investing is more related with the financial institutions which are primarily in the business of

investing in and managing a portfolio of securities (various types of investment funds or investment companies, private pension funds). By pooling the funds of thousands of investors, those companies can offer them a variety of services, in addition to diversification, including professional management of their financial assets and liquidity.

Investors can 'employ' their funds by performing direct transactions, bypassing both financial institutions and financial markets (for example, direct lending). However, such transactions are very risky, if a large amount of money is transferred only to one's hands, following the well known American proverb "don't put all your eggs in one basket." That turns to the necessity to diversify your investments. From the other side, direct transactions in the businesses are strictly limited by laws avoiding possibility of money laundering. All types of investing discussed above and their relationship with the alternatives of financing are presented in Table 1.1

Types of Investing in the Economy	Alternatives for Financing in the Economy
• Direct Investing (through financial markets) • Indirect Investing (through financial institutions) • Direct transactions	• Raising equity capital or borrowing in financial markets • Borrowing from financial institutions • Borrowing partnership contracts

Table 1.1 Types of investing and alternatives for financing

Companies can obtain necessary funds directly from the general public (those who have excess money to invest) by the use of the financial market issuing and selling their securities. Alternatively, they can obtain funds indirectly from the general public by using financial intermediaries. The intermediaries acquire funds by allowing the general public to maintain such investments as savings accounts, certificates of deposit accounts and other similar vehicles.

1.11 Investment Environment

Investment environment can be defined as the existing investment vehicles in the market available for investor and the places for transactions with these investment vehicles. Thus, the main types of investment vehicles and the types of financial markets will be presented and described.

1.11.1 Investment Vehicles

Investment in financial assets differs from investment in physical assets in those important aspects:

- Financial assets are divisible, whereas most physical assets are not. An asset is divisible, if investor can buy or sell small portion of it. In case of financial assets, it means that, investor, for example, can buy or sell a small fraction of the whole company as investment object buying or selling a number of common stocks.
- Marketability (or Liquidity) is a characteristic of financial assets that is not shared by physical assets, which usually have low liquidity. Marketability (or liquidity) reflects the feasibility of converting of the asset into cash quickly and without affecting its price significantly. Most of financial assets are easy to buy or to sell in the financial markets.
- The planned holding period of financial assets can be much shorter than the holding period of most physical assets. The holding period for investments is defined as the time between signing a purchasing order for asset and selling the asset. Investors acquiring physical asset usually plan to hold it for a long period, but investing in financial assets, such as securities, even for some months or a year can be reasonable. Holding period for investing in financial assets varies in very wide intervals and depends on the investor's goals and investment strategy.
- Information about financial assets is often more abundant and less costly to obtain, than information about physical assets. Information availability shows the real possibility of the investors to receive the necessary information, which could influence their investment decisions and investment results. As a big portion of information important for investors in such financial assets as stocks, bonds is publicly available, the impact of many disclosed factors having influence on value of these securities can be included in the analysis and the decisions made by investors.

Even if we analyse only financial investment, there is a variety of financial investment vehicles. The ongoing processes of globalisation and integration open wider possibilities for the investors to invest into new investment vehicles which were unavailable for them some time ago, because of the weak domestic financial systems and limited technologies for investment in global investment environment.

Financial innovations suggest for the investors the new choices of investment, but at the same time make the investment process and investment decisions more complicated, because even if the investors have a wide range of alternatives to invest, they can't forget the key rule in investments, invest only in what you really understand. Thus, the investor must understand how investment vehicles differ from each other and only then to pick those which best match his/her expectations.

The most important characteristic of investment vehicles on the basis of which, the overall variety of investment vehicles can be assorted are the return on investment and the risk which is defined as the uncertainty about the actual return that will be earned on an investment. Each type of investment vehicles could be characterised by certain level of profitability and risk, because of the specifics of these financial instruments. Though all different types of investment vehicles can be compared using characteristics of risk and return and the most risky as well as less risky investment vehicles can be defined. However, the risk and return on investment are closely related and only using both important characteristics, we can really understand the differences in investment vehicles.

The main types of financial investment vehicles are:

- Short-term investment vehicles
- Fixed-income securities and common stock
- Speculative investment vehicles
- Other investment tools

Short-term investment vehicles

Short-term investment vehicles are all those which have a maturity of one year or less. Short-term investment vehicles often are defined as money-market instruments, because they are traded in the money market which presents the financial market for short-term (up to one year of maturity) marketable financial assets. The risk as well as the return on investments of short-term investment vehicles usually is lower than for other types of investments.

The main short-term investment vehicles are as follows:

- Certificates of deposit
- Treasury bills
- Commercial paper
- Bankers' acceptances
- Repurchase agreements

Certificate of deposit

Certificate of deposit is a debt instrument issued by the bank that indicates a specified sum of money has been deposited at the issuing depository institution. Certificate of deposit bears a maturity date and specified interest rate and can be issued in any denomination. Most certificates of deposit cannot be traded and they incur penalties for early withdrawal. For large money-market investors, financial institutions allow their large-denomination certificates of deposits to be traded as negotiable certificates of deposits.

Treasury bills

Treasury bills (also called T-bills) are securities representing financial obligations of the government. Treasury bills have maturities of less than one year. They have the unique feature of being issued at a discount from their nominal value and the difference between nominal value and discount price is the only sum which is paid at the maturity for these short-term securities, because the interest is not paid in cash, only accrued. The other important feature of T-bills is that they are treated as risk-free securities ignoring inflation and default of a government, which was rare in

developed countries, the T-bill will pay the fixed stated yield with certainty. However of course, the yield on T-bills changes over time influenced by changes in overall macro-economic situation. T-bills are issued on an auction basis. The issuer accepts competitive bids and allocates bills to those offering the highest prices. Non-competitive bid is an offer to purchase the bills at a price that equals the average of the competitive bids. Bills can be traded before the maturity, while their market price is subject to change with changes in the rate of interest. However, because of the early maturity dates of T-bills, large interest changes are needed to move T-bills prices very far. Bills are thus regarded as high liquid assets.

Commercial paper

Commercial paper is a name for short-term unsecured promissory notes issued by corporation. Commercial paper is a means of short-term borrowing by large corporations. Large, well-established corporations have found that borrowing directly from investors through commercial paper is cheaper than relying solely on bank loans. Commercial paper is issued either directly from the firm to the investor or through an intermediary. Commercial paper, like T-bills is issued at a discount. The most common maturity range of commercial paper is 30 to 60 days or less. Commercial paper is riskier than T-bills, because there is a larger risk that a corporation will default. Also, commercial paper is not easily bought and sold after it is issued, because the issues are relatively small compared with T-bills and hence their market is not liquid.

Bankers' acceptances

Bankers' acceptances are the vehicles created to facilitate commercial trade transactions. These vehicles are called bankers acceptances, because a bank accepts the responsibility to repay a loan to the holder of the vehicle in case the debtor fails to perform. Bankers' acceptances are short-term fixed-income securities that are created by non-financial firm whose payment is guaranteed by a bank. This short-term loan contract typically has a higher interest rate than similar short-term securities to compensate for the default risk. As bankers' acceptances are not standardised, there is no active trading of these securities.

Repurchase agreement

Repurchase agreement (often referred to as a repo) is the sale of security with a commitment by the seller to buy the security back from the purchaser at a specified price at a designated future date. Basically, a repo is a collectivised short-term loan, where collateral is a security. The collateral in a repo may be a Treasury security, other money-market security. The difference between the purchase price and the sale price is the interest cost of the loan, from which repo rate can be calculated. Due to the concern about default risk, the length of maturity of repo is usually very short. If the agreement is for a loan of funds for one day, it is called overnight repo; if the term of the agreement is for more than one day, it is called a term repo. A reverse repo is the opposite of a repo. In this transaction, a corporation buys the securities with an agreement to sell them at a specified price and time. Using repos helps to increase the liquidity in the money market.

Our focus in this course further will be not investment in short-term vehicles, but it is useful for investor to know that short-term investment vehicles provide the possibility for temporary investing of money/funds and investors use these instruments managing their investment portfolio.

Fixed-income securities

Fixed-income securities are those which return is fixed, up to some redemption date or indefinitely. The fixed amounts may be stated in money terms or indexed to some measure of the price level. This type of financial investments is presented by two different groups of securities:

- Long-term debt securities
- Preferred stocks

Long-term debt securities

It can be described as long-term debt instruments representing the issuer's contractual obligation. Long-term securities have maturity longer than 1 year. The buyer (investor) of these securities is landing money to the issuer, who undertake obligation periodically to pay interest on this loan and repay the principal at a stated maturity date. Long-term debt securities are traded in the capital markets. From the investor's point of view these securities can

be treated as a 'safe' asset. However, in reality the safety of investment in fixed-income securities is strongly related with the default risk of an issuer. The major representatives of long-term debt securities are bonds, but today there are a big variety of different kinds of bonds, which differ not only by the different issuers (governments, municipals, companies, agencies, etc.), but by different schemes of interest payments, which is a result of bringing financial innovations to the long-term debt securities market. As demand for borrowing the funds from the capital markets is growing, the long-term debt securities today are prevailing in the global markets. It is a challenge for the investor to pick long-term debt securities relevant to his/her investment expectations, including the safety of investment.

Preferred stocks

Preferred stocks are equity security, which has infinitive life and pay dividends. However, preferred stock is attributed to the type of fixed-income securities, because the dividend for preferred stock is fixed in amount and known in advance. Though, this security provides for the investor the flow of income very similar to that of the bond. The main difference between preferred stocks and bonds is that for preferred stock the flows are forever, if the stock is not callable. The preferred stockholders are paid after the debt securities holders, but before the common stock holders in terms of priorities in payments of income and in case of liquidation of the company. If the issuer fails to pay the dividend in any year, the unpaid dividends will have to be paid, if the issue is cumulative.

If preferred stock is issued as noncumulative, dividends for the years with losses do not have to be paid. Usually, same rights to vote in general meetings for preferred stockholders are suspended. As the features are attributed for equity and fixed-income securities, preferred stocks is known as hybrid security. A most preferred stock is issued as noncumulative and callable. In recent years, the preferred stocks with option of convertibility to common stock are proliferating.

The common stock is the other type of investment vehicles, which is one of most popular among investors with long-term horizon of their investments. Common stock represents the ownership interest of corporations or the equity of the stock holders. Holders of common stock are entitled to attend and vote at a general meeting of shareholders, to receive declared dividends and to receive their share of the residual assets, if any, if the corporation is bankrupt. The issuers of the common stock are the companies which seek to receive funds in the market, though 'going public'. Issuing common stocks and selling them in the market enables the company to raise additional equity capital more easily, when using other alternative sources. Thus many companies are issuing their common stocks, which are traded in financial markets and investors have wide possibilities for choosing this type of securities for the investment.

Speculative investment vehicles

Speculative investment vehicles following the term 'speculation' could be defined as investments with a high-risk and high-investment return. Using these investment vehicles, speculators try to buy low and to sell high, their primary concern is with anticipating and profiting from the expected market-fluctuations. The only gain from such investments is the positive difference between selling and purchasing prices. Of course, using short-term investment strategies, investors can use for speculations other investment vehicles, such as common stock, but here we try to accentuate the specific types of investments, which are riskier than other investment vehicles, because of their nature related with more uncertainty about the changes influencing the their price in the future.

Speculative investment vehicles could be presented the following different vehicles:

- Options
- Futures
- Commodities traded on the exchange (coffee, grain metals and other commodities)

Options

Options are the derivative financial instruments. An options contract gives the owner of the contract the right, but not the obligation, to buy or sell a financial asset at a specified price from or to another party. The buyer of the contract must pay a fee (option price) for the seller. There is a big uncertainty, if the buyer of the option will take the advantage of it and what option price would be relevant, as it depends not only on demand and supply in the options market, but on the changes in the other market, where the financial asset included in the option contract are traded. Though, option is a risky, investors use it for speculations instead of hedging.

Futures

They are other types of derivatives. A future contract is an agreement between two parties, when they agree to transact with respect to some financial asset at a predetermined price at a specified future date. One party agrees to buy the financial asset; the other agrees to sell the financial asset. It is very important that in futures contract case, both parties are obligated to perform and neither party charges the fee.

There are two types of people who deal with options (and futures) contracts:

- Speculators
- Hedgers

Speculators buy and sell futures for the sole purpose of making a profit by closing out their positions at a price that is better than the initial price. Such people neither produce nor use the asset in the ordinary course of business. In contrary, hedgers buy and sell futures to offset an otherwise risky position in the market. Transactions using derivatives instruments are not limited to financial assets. There are derivatives, involving different commodities (coffee, grain, precious metals, and other commodities). However, in this course, the target is on derivatives, where underlying asset is a financial asset.

Other investment tools

Other investment tools are as follows:

- Various types of investment funds
- Investment life insurance
- Pension funds
- Hedge funds

Investment companies/investment funds

They receive money from investors with the common objective of pooling the funds and then investing them in securities according to a stated set of investment objectives. Two types of funds are as follows:

- Open-end funds (mutual funds)
- Closed-end funds (trusts)

Open-end funds have no pre-determined amount of stocks outstanding and they can buy back or issue new shares at any point. Price of the share is not determined by demand, but by an estimate of the current market value of the fund's net assets per share (NAV) and a commission. Closed-end funds are publicly traded investment companies that have issued a specified number of shares and can only issue additional shares through a new public issue. Pricing of closed-end funds is different from the pricing of open-end funds; the market price can differ from the NAV.

Insurance companies

Insurance companies are in the business of assuming the risks of adverse events (such as, fires, accidents, etc.) in exchange for a flow of insurance premiums. Insurance companies are investing the accumulated funds in securities (treasury bonds, corporate stocks and bonds) and real estate. Three types of Insurance Companies are life insurance, non-life insurance (also known as property-casualty insurance) and reinsurance.

During recent years, investment life insurance became very popular investment alternative for individual investors, because this hybrid investment product allows to buy the life insurance policy together with possibility to invest accumulated life insurance payments or lump sum for a long time selecting investment programme relevant to investor's future expectations.

Pension funds

Pension funds are asset pools that accumulate over an employee's working years and pays retirement benefits during the employee's nonworking years. Pension funds are investing the funds according to a stated set of investment objectives in securities (treasury bonds, corporate stocks and bonds) and real estate.

Hedge funds

Hedge funds are unregulated private investment partnerships, limited to institutions and high-net-worth individuals, which seek to exploit various market opportunities and thereby to earn larger returns than are ordinarily available. They require a substantial initial investment from investors and usually have some restrictions on how quickly investor can withdraw their funds. Hedge funds take concentrated speculative positions and can be very risky. It could be noted that originally, the term 'hedge' made some sense, when applied to these funds. They would by combining different types of investments, including derivatives, try to hedge risk while seeking higher returns. However today, the word 'hedge' is misapplied to these funds, because they generally take aggressive strategies investing in stocks, bonds and other financial markets around the world, and their level of risk is high.

1.11.2 Financial Markets

Financial markets form the other important component of investment environment. Financial markets are designed to allow corporations and governments to raise new funds and to allow investors to execute their buying and selling orders. In financial markets, funds are channelled from those with the surplus, who buy securities, to those, with shortage, who issue new securities or sell existing securities. A financial market can be seen as a set of arrangements that allows trading among its participants.

Financial market provides the following three important economic functions (Frank J. Fabozzi, 1999):

- Financial market determines the prices of assets traded through the interactions between buyers and sellers.
- Financial market provides a liquidity of the financial assets.
- Financial market reduces the cost of transactions by reducing explicit costs, such as money spent to advertise the desire to buy or to sell a financial asset.

Financial markets could be classified on the basis of the following characteristics:

- Sequence of transactions for selling and buying securities.
- Term of circulation of financial assets traded in the market.
- Economic nature of securities traded in the market.

By sequence of transactions for selling and buying securities

By sequence of transactions for selling and buying securities, the markets are classified as:

- Primary market
- Secondary market

All securities are first traded in the primary market, and the secondary market provides liquidity for these securities. Primary market is where corporate and government entities can raise capital and where the first transactions with the new issued securities are performed. If a company's share is traded in the primary market for the first time, this is referred to as an Initial Public Offering (IPO).

Investment banks play an important role in the primary market:

- Usually handle issues in the primary market.
- Among other things, act as underwriter of a new issue, guaranteeing the proceeds to the issuer.

Secondary market is where previously issued securities are traded among investors. Generally, individual investors do not have access to secondary markets. They use security brokers to act as intermediaries for them. The broker delivers orders received from investors in securities to a market place, where these orders are executed. Finally, clearing and settlement processes ensure that both sides to these transactions honour their commitment.

Types of brokers

The types of brokers are as follows:

- Discount broker who executes only trades in the secondary market.
- Full service broker, who provides a wide range of additional services to clients (e.g., advice to buy or sell).
- Online broker is a brokerage firm that allows investors to execute trades electronically using internet.

Types of secondary market places are as follows:

- Organised security exchanges.
- Over-the-counter markets.
- Alternative trading system.

An organised security exchange provides the facility for the members to trade securities, and only exchange members may trade there. The members include brokerage firms, which offer their services to individual investors, charging commissions for executing trades on their behalf. Other exchange members buy or sell for their own account, functioning as dealers or market makers who set prices at which they are willing to buy and sell for their own account.

Exchanges play very important role in the modern economies by performing the following tasks:

- Supervision of trading to ensure fairness and efficiency.
- The authorisation and regulation of market participants, such as brokers and market makers.
- Creation of an environment in which securities' prices are formed efficiently and without distortion. This requires not only regulation of orders and transaction costs, but also a liquid market in which there are many buyers and sellers, allowing investors to buy or to sell their securities quickly;
- Organisation of the clearing and settlement of transactions.
- The regulation of the admission of companies to be listed on the exchange and the regulation of companies who are listed on the exchange.
- The dissemination of information (trading data, prices and announcements of companies listed on the exchange). Investors are more willing to trade, if prompt and complete information about trades and prices in the market is available.

The Over-The-Counter (OTC) market is not a formal exchange. It is organised network of brokers and dealers who negotiate sales of securities. There are no membership requirements and many brokers register as dealers on the OTC. At the same time, there are no listing requirements and thousands of securities are traded in the OTC market. OTC stocks are usually considered as very risky, because they are the stocks that are not considered large or stable enough to trade on the major exchange. An Alternative Trading System (ATS) is an electronic trading mechanism developed independently from the established market places, security exchanges and designed to match buyers and sellers of securities on an agency basis.

The brokers who use ATS are acting on behalf of their clients and do not trade on their own account. The distinct advantages of ATS in comparison with traditional markets are cost savings of transactions, the short time of execution of transactions for liquid securities, extended hours for trading and anonymity, often important for investors, trading large amounts.

By term of circulation of financial assets traded in the market

By the term of circulation of financial assets traded in the market, the markets are classified as:

- Money market, in which only short-term financial instruments are traded.
- Capital market, in which only long-term financial instruments are traded.

The capital markets allow firms, governments to finance spending in excess of their current incomes.

Features	Money Market	Capital Market
Term of circulation of securities traded	Short-term less than 1 year	Long-term, more than 1 year
Level of risk	Low, because of trading short-term securities which have lower level of risk and high liquidity	Long-term securities, traded in this market, is more risky
Fund suppliers	Commercial banks, non-financial business institutions with the excess funds	Banks, insurance companies, pension funds, lending the large amounts of funds for a long-term period; investment funds with big pools of funds for investing
Financial instruments	Certificates of deposit Treasury bills Commercial paper Bankers' acceptance Repurchase agreement, other short-term investment vehicles	Common stocks Preferred stocks Treasury stocks Municipal bonds Corporate bonds Other long-term investment vehicles
Aims for raising money	For financing of working capital and current needs	For financing of further business development and investment projects

Table 1.2 Money market and capital market

By economic nature of securities traded in the market

By economic nature of securities, traded in the market, the markets are classified as:

- Equity market or stock market
- Common stock market
- Fixed-income market
- Debt market
- Derivatives market

From the perspective of a given country, financial markets are as follows:

- Internal or national market
- External or international market

The internal market can be split into two fractions, domestic market and foreign market. Domestic market is where the securities issued by domestic issuers (companies and government) are traded. A country's foreign market is where the securities issued by foreign entities are traded.

The external market, also called the international market includes the securities which are issued at the same time to the investors in several countries and they are issued outside the jurisdiction of any single country (for example, offshore market). Globalisation and integration processes include the integration of financial markets into an international financial market. Due to the globalisation of financial markets, potential issuers and investors in any country become not limited to their domestic financial market.

1.12 Investment Management Process

Investment management process is the process of managing money or funds. The investment management process describes how an investor should go about making decisions. Investment management process can be disclosed by the five-step procedure, which includes following stages:

- Setting of investment policy
- Analysis and evaluation of investment vehicles
- Formation of diversified investment portfolio
- Portfolio revision
- Measurement and evaluation of portfolio performance

1.12.1 Setting of Investment Policy

Setting of investment policy is the first and very important step in investment management process. Investment policy includes setting of investment objectives. The investment policy should have the specific objectives regarding the investment return requirement and risk tolerance of the investor. For example, the investment policy may define that the target of the investment average return should be 15% and should avoid more than 10% losses. Identifying investor's tolerance for risk is the most important objective, because it is obvious that every investor would like to earn the highest return possible. However, because there is a positive relationship between risk and return, it is not appropriate for an investor to set his/her investment objectives as just 'to make a lot of money'. Investment objectives should be stated in terms of both risk and return.

The investment policy should also state other important constrains which could influence the investment management. Constrains can include any liquidity needs for the investor, projected investment horizon, as well as other unique needs and preferences of investor. The investment horizon is the period of time for investments. Projected time horizon may be short, long or even indefinite.

Setting of investment objectives for individual investors is based on the assessment of their current and future financial objectives. The required rate of return for investment depends on what sum today can be invested and how much investor needs to have at the end of the investment horizon. Wishing to earn higher income on his/her investments investor must assess the level of risk he/she should take and to decide if it is relevant for him or not. The investment policy can include the tax status of the investor. This stage of investment management concludes with the identification of the potential categories of financial assets for inclusion in the investment portfolio. The identification of the potential categories is based on the investment objectives, amount of investable funds, and investment horizon and tax status of the investor. Various financial assets by nature may be more or less risky and in general their ability to earn returns differs from one type to the other. As an example, for the investor with low tolerance of risk, common stock will not be the appropriate type of investment.

1.12.2 Analysis and Evaluation of Investment Vehicles

When the investment policy is set up, investor's objectives defined and the potential categories of financial assets for inclusion in the investment portfolio identified, the available investment types can be analysed. This step involves examining several relevant types of investment vehicles and the individual vehicles inside these groups. For example, if the common stock was identified as investment vehicle relevant for investor, the analysis will be concentrated to the common stock as an investment. The one purpose of such analysis and evaluation is to identify those investment vehicles that currently appear to be mispriced. There are many different approaches how to make such analysis. Most frequently, two forms of analyses are used, technical analysis and fundamental analysis.

Technical analysis involves the analysis of market prices in an attempt to predict future price movements for the particular financial asset traded on the market. This analysis examines the trends of historical prices and is based on the assumption that these trends or patterns repeat themselves in the future. Fundamental analysis in its simplest form is focused on the evaluation of intrinsic value of the financial asset. This valuation is based on the assumption that intrinsic value is the present value of future flows from particular investment. By comparison of the intrinsic value and market value of the financial assets, those which are under-priced or overpriced can be identified. This step involves identifying those specific financial assets in which to invest and determining the proportions of these financial assets in the investment portfolio.

1.12.3 Formation of Diversified Investment Portfolio

Formation of diversified investment portfolio is the next step in investment management process. Investment portfolio is the set of investment vehicles, formed by the investor seeking to realise its' defined investment objectives. In the stage of portfolio formation, the issues of selectivity, timing and diversification need to be addressed by the investor. Selectivity refers to micro-forecasting and focuses on forecasting price movements of individual assets. Timing involves macro-forecasting of price movements of particular type of financial asset relative to fixed-income securities in general.

Diversification involves forming the investor's portfolio for decreasing or limiting risk of investment. Two techniques of diversification are as follows:

- Random diversification, when several available financial assets are put to the portfolio at random.
- Objective diversification when financial assets are selected to the portfolio following investment objectives and using appropriate techniques for analysis and evaluation of each financial asset.

Investment management theory is focused on issues of objective portfolio diversification. Professional investors follow settled investment objectives constructing and managing their portfolios.

1.12.4 Portfolio Revision

This step of the investment management process concerns the periodic revision of the three previous stages. This is necessary, because over time investor with long-term investment horizon may change his/her investment objectives and this, in turn means that currently held investor's portfolio may no longer be optimal and even contradict with the new settled investment objectives. Investor should form the new portfolio by selling some assets in his portfolio and buying the others that are not currently held. It could be the other reasons for revising a given portfolio: over time the prices of the assets change, meaning that some assets that were attractive at one time may no longer be so.

Thus, investor should sell one asset and buy the other more attractive in this time according to his/her evaluation. The decisions to perform changes in revising portfolio depend, upon other things, in the transaction costs incurred in making these changes. For institutional investors, portfolio revision is the continuing and very important part of their activity. However, individual investor managing portfolio must perform portfolio revision periodically as well. Periodic re-evaluation of the investment objectives and portfolios based on them is necessary, because financial markets change, tax laws and security regulations change, and other events alter the stated investment goals.

1.12.5 Measurement and Evaluation of Portfolio Performance

This, the last step in investment management process involves determining periodically how the portfolio performed, in terms of not only the return earned, but also the risk of the portfolio. For evaluation of portfolio performance, appropriate measures of return and risk and benchmarks are needed. A benchmark is the performance of predetermined set of assets, obtained for comparison purposes. The benchmark may be a popular index of appropriate assets, stock index and bond index. The benchmarks are widely used by institutional investors evaluating the performance of their portfolios. It is important to point out that investment management process is a continuing process influenced by changes in investment environment and changes in investor's attitudes as well. Market globalisation offers investors new possibilities, but at the same time investment management becomes more and more complicated with growing uncertainty.

Summary

- The term 'investing' could be associated with the different activities, but the common target in these activities is to 'employ' the money (funds) during the time period seeking to enhance the investor's wealth.
- Real investments usually involve some kind of tangible asset, such as land, machinery, factories, etc.
- Investment analysis is the study of financial securities for the purpose of successful investing.
- Investment refers to invest money in financial physical assets and marketing assets.
- Risk refers to the loss of principal amount of an investment.
- Interest rate is one of the most important aspects of a sound investment plan.
- Investors are savers, but all savers cannot be good investors, as investment is a science and an art.
- Investment activity includes buying and selling of the financial assets, physical assets and marketable assets in primary and secondary markets.
- Investors can use direct or indirect type of investing.
- Investment environment can be defined as the existing investment vehicles in the market available for investor and the places for transactions with these investment vehicles.
- Commercial paper is a name for short-term unsecured promissory notes issued by corporation.
- Bankers' acceptances are the vehicles created to facilitate commercial trade transactions.
- Preferred stocks are equity security, which has infinitive life and pay dividends.
- Financial markets are the other important component of investment environment.
- The Over-The-Counter (OTC) market is not a formal exchange.
- Investment management process is the process of managing money or funds.
- Setting of investment policy is the first and very important step in investment management process.
- Formation of diversified investment portfolio is the next step in investment management process.

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Self Assessment

1. _____ investments usually involve some kind of tangible assets, such as land, machinery, factories, etc.
   a. Major
   b. Real
   c. Minor
   d. Valid

2. What is the study of financial securities for the purpose of successful investing?
   a. Investment analysis
   b. Capital market
   c. Real insurance
   d. Liquidity

3. Match the following

1. Risk	A. It refers to the protection of investor principal amount and expected rate of return.
2. Return	B. It refers to the loss of principal amount of an investment.
3. Safety	C. It refers to an investment ready to convert into cash position.
4. Liquidity	D. It refers to expected rate of return from an investment.

   a. 1-B, 2-D, 3-A, 4-C
   b. 1-D, 2-B, 3-C, 4-A
   c. 1-A, 2-C, 3-B, 4-D
   d. 1-C, 2-A, 3-D, 4-B

4. Which of the following refers to buying and selling of securities in market?
   a. Liquidity
   b. Safety
   c. Risk
   d. Marketability

5. Investment _____ can be defined as the existing investment vehicles in the market available for investor and the places for transactions with these investment vehicles.
   a. banking
   b. market
   c. environment
   d. analysis

6. Which of the following statement is true?
   a. Marketability means transferability or saleability of an asset.
   b. Concealability means transferability or saleability of an asset.
   c. Capital Growth means transferability or saleability of an asset.
   d. Safety means transferability or saleability of an asset.

7. Which of the following is the debt instrument issued by the bank that indicates that a specified sum of money has been deposited at the issuing depository institution?
   a. Treasury bills
   b. Commercial paper
   c. Bankers' acceptances
   d. Certificate of deposit

8. Commercial paper is a means of short-term borrowing by _____ corporations.
   a. small
   b. large
   c. medium
   d. average

9. Which of the following statement is false?
   a. Concealability is another essential characteristic of the investment.
   b. Capital Growth refers to appreciation of investment.
   c. Purchasing power stability refers to the buying capacity of investment in market.
   d. Marketability of income refers to constant return from an investment.

10. Which of the following are equity security, which has infinitive life and pay dividends?
   a. Long-term debt security
   b. Preferred stock
   c. Speculative investment
   d. Open-end fund

Chapter II

Risk and Return in Investment Analysis

Aim

The aim of this chapter is to:

- introduce the concept of risk
- explain the elements of risk
- explicate the sources of risk

Objectives

The objectives of this chapter are to:

- explain return on investment and expected rate of return
- elucidate risk and return
- explicate covariance

Learning outcome

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

- identify correlation and coefficient of determination
- understand the returns
- recognise the effect of diversification

2.1 Introduction

The dictionary meaning of risk is the possibility of loss or injury; risk is the possibility of not getting the expected return. The difference between expected return and actual return is called the risk in investment. Investment situation may be high-risk, medium and low-risk investment.

2.1.1 Elements of Risk

The components of risk are broadly two groups:

- Systematic risks
- Unsystematic risks

Systematic risks

The systematic risks is caused by factors external to the particular company and uncontrollable by the company. The systematic risk affects the market as a whole. It refers to that portion of the total variability of the return caused by common factors affecting the prices of all securities alike through economic, political and social factors.

Unsystematic risks

In case of unsystematic risks, the factors are specific, unique and related to the particular industry or company. It refers to that portion of the total variability of the return caused due to unique factors, relating to that firm or industry, through such factors as management failure, labour strikes, raw material scarcity, etc.

2.1.2 Sources of Risk

Sources of risk are discussed in the paragraphs given below:

Interest rate risk

Interest rate risk is the variation in the single period rates of return caused by the fluctuations in the market interest rate. Most commonly, the interest rate risk affects the debt securities like bonds and debentures.

Market risk

Jack Clark Francis has defined market risk as that portion of total variability of return caused by the alternating forces of bull and bear market. This is a type of systematic risk that affects share market price. Shares move up and down consistently for some period of time.

Purchasing power risk

Another type of systematic risk is the purchasing power risk. It refers to the variation in investor return caused by inflation.

Business risk

Every company operates within a particular operating environment; operating environment comprises both internal environment within the firm and external environment outside the firm. Business risk is thus a function of the operating conditions faced by a company and is the variability in operating income caused by the operating conditions of the company.

Financial risk

It refers to the variability of the income to the equity capital due to the debt capital. Financial risk in a company is associated with the capital structure of the company. The debt in the capital structure creates fixed payments in the form of interest. This creates more variability in the earning per share available to equity share holders. This variability of return is called financial risk and it is a type of unsystematic risk.

Liquidity risk

While there is almost always a ready market for government bonds, corporate bonds are sometimes entirely different animals. There is a risk that an investor might not be able to sell his or her corporate bonds quickly due to a thin market with few buyers and sellers for the bond. Low interest in a particular bond issue can lead to substantial price volatility and possibly have an adverse impact on a bondholder's total return (upon sale). Much like stocks that trade in a thin market, you may be forced to take a much lower price than expected to sell your position in the bond.

Exchange rate risk

It is the uncertainty of returns to an investor who acquires securities denominated in a currency different from his or her own. The likelihood of incurring this risk is becoming greater as investors buy and sell assets around the world, as opposed to only assets within their own countries. A U.S. investor who buys Japanese stock denominated in yen must consider not only the uncertainty of the return in yen, but also any change in the exchange value of the yen relative to the U.S. dollar. That is, in addition to the foreign firm's business and financial risk and the security's liquidity risk, the investor must consider the additional uncertainty of the return on this Japanese stock, when it is converted from yen to U.S. dollars.

Country risk

It is also called political risk. It is the uncertainty of returns caused by the possibility of a major change in the political or economic environment of a country. The United States is acknowledged to have the smallest country risk in the world, because its political and economic systems are the most stable. During the spring of 2011, prevailing examples include the deadly rebellion in Libya against Muammar Gadhafi; a major uprising in Syria against President Bashar al-Assad; and significant protests in Yemen against President Ali Abdullah Saleh. In addition, there has been a recent deadly earthquake and tsunami in Japan that is disturbing numerous global corporations and the currency markets. Individuals who invest in countries that have unstable political or economic systems must add a country risk premium when determining their required rates of return.

2.1.3 Investment Income and Risk

A return is the ultimate objective for any investor. However, a relationship between return and risk is a key concept in finance. As finance and investments areas are built upon a common set of financial principles, the main characteristics of any investment are investment return and risk. However, to compare various alternatives of investments, the precise quantitative measures for both these characteristics are needed.

2.1.4 Return on Investment and Expected Rate of Return

General definition of return is the benefit associated with an investment. In most cases, the investor can estimate his/her historical return precisely. Many investments have two components of their measurable return:

- A capital gain or loss
- Some form of income

The rate of return is the percentage increase in returns associated with the holding period:

Rate of return = Income + Capital gains/Purchase price (%) (2.1)

For example, rate of return of the share (r) will be estimated:

$$R = \frac{D+(P_{ms} - P_{mb})}{P_{mb}} (\%) \quad (2.2)$$

The rate of return, calculated in formulae 2.2 and 2.3 is called holding period return, because its calculation is independent of the passage of the time. All that the investor knows is that, there is a beginning of the investment period and an end. The percent calculated using this formula might have been earned over one month or year. Investor must be very careful with the interpretation of holding period returns in investment analysis. Investor can't compare the alternative investments using holding period returns, if their holding periods (investment periods) are different. Statistical data which can be used for the investment analysis and portfolio formation deals with a series of holding period returns. For example, investor knows monthly returns for a year of two stocks. How he/she can compare these series of returns? In these cases, arithmetic average return or sample mean of the returns (ř) can be used:

$$\check{r} = \frac{\sum_{i=1}^{n} r_i}{n} \quad (2.3)$$

However, both holding period returns and sample mean of returns are calculated using historical data. However, what happened in the past for the investor is not as important as what happens in the future, because all the investors' decisions are focused to the future, or to expected results from the investments. Of course, no one investor knows the future, but he/she can use past information and the historical data as well as use his knowledge and practical experience to make some estimates about it. Analysing each particular investment vehicle possibilities to earn income in the future investor must think about several 'scenarios' of probable changes in macro economy, industry and company which could influence asset prices ant rate of return.

Theoretically, it could be a series of discrete possible rates of return in the future for the same asset with the different probabilities of earning the particular rate of return. However, for the same asset the sum of all probabilities of these rates of returns must be equal to 1 or 100 %. In mathematical statistics, it is called simple probability distribution. The expected rate of return E(r) of investment is the statistical measure of return, which is the sum of all possible rates of returns for the same investment weighted by probabilities:

$$E(r) = \sum_{i=1}^{n} h_i \, x \, r_i$$

Here, $h_i = probability\ of\ rate\ of\ return$
$r_i = rate\ of\ return$ (2.4)

In all cases, when investor has enough information for modelling future scenarios of changes in rate of return for investment, the decisions should be based on estimated expected rate of return. However, sometimes sample mean of return (arithmetic average return) is a useful proxy for the concept of expected rate of return. Sample mean can give an unbiased estimate of the expected value, but obviously it's not perfectly accurate, because based on the assumption that the returns in the future will be the same as in the past. However, this is the only one scenario in estimating the expected rate of return. It could be expected, that the accuracy of sample mean will increase, as the size of the sample becomes longer (if n will be increased). However, the assumption, that the underlying probability distribution does not change its shape for the longer period becomes more and more unrealistic. In general, the sample mean of returns should be taken for as long time, as investor is confident there has not been significant change in the shape of historical rate of return probability distribution.

2.1.5 Variance and Co-variance

The essential feature of investing is that the returns on the vast majority of financial assets are not guaranteed. The price of stocks can fall just as easily as they can rise, so a positive return in one holding period may become a negative in the next. For example, an investment in the shares of Yahoo! Inc. would have earned a return of 137% between October 2002 and September 2003. Three years later, the return from October 2005 through to September 2006 was 31%. The following year, the stock had a return of 2%. Changes of this magnitude in the returns in different holding periods are not exceptional.

It has already been stressed that as well as caring about the return on an asset or a portfolio, investor has to be equally concerned with the risk. What risk means in this context is the variability of the return across different holding periods. Two portfolios may have an identical mean return, but can have very different amounts of risk. There are few (if any) investors who would knowingly choose to hold the riskier of the two portfolios.

A measure of risk must capture the variability. The standard measure of risk used in investment analysis is the variance of return (or, equivalently, its square root which is called the standard deviation). An asset with a return that never changes has no risk. For this asset, the variance of return is 0. Any asset with a return that does vary will have a variance of return that is positive. More risk is on an asset with larger variance of return.

When constructing a portfolio it is not just the risk on individual assets that matters, but also the way in which this risk combines across assets to determine the portfolio variance. Two assets may be individually risky, but if these risks cancel when the assets are combined then a portfolio composed of the two assets may have very little risk. The risks on the two assets will cancel, if a higher than average return on one of the assets always accompanies a lower than average return on the other. The measure of the way returns are related across assets is called the covariance of return. The covariance will be seen to be central to the understanding portfolio construction. The portfolio variance and covariance are now developed by first introducing the variance of return as a measure of the risk and then developing the concept of covariance between assets.

2.2 Risk and Return

The expected rate of return and the variance or standard deviation provide investor with information about the nature of the probability distribution associated with a single asset. However, all these numbers are only the characteristics of return and risk of the particular asset. However, how does one asset having some specific trade-off between return and risk influence the other one with the different characteristics of return and risk in the same portfolio? What could be the influence of this relationship on the investor's portfolio? The answers to these questions are of great importance for the investor when forming his/her diversified portfolio. The statistics that can provide the investor with the information to answer these questions are covariance and correlation coefficient. Covariance and correlation are related and they generally measure the same phenomenon, the relationship between two variables. Both concepts are best understood by looking at the math behind them.

2.2.1 Covariance

The following two methods of covariance estimation can be used:

- Sample covariance
- Population covariance

The sample covariance

The sample covariance is estimated, when the investor hasn't enough information about the underlying probability distributions for the returns of two assets and then the sample of historical returns is used.

Sample covariance between two assets, A and B is defined in the next formula:

$$Cov_{(\acute{r}_A \acute{r}_B)} = \frac{\sum_{t=1}[(r_{A,t} - \acute{r}_A)x\ (r_{B,t} - \acute{r}_B)]}{n-1}$$

Here, $r_{A,t}, r_{B,t}$ $-$ $consequently, rate\ of\ return\ for\ assets\ A\ and\ B\ in\ the\ time\ period\ t,$

When t varies from 1 to n;

$\acute{r}_A, \acute{r}_B$ $-$ $Sample\ mean\ of\ rate\ of\ returns\ for\ assets\ A\ and\ B\ consequently.$

(2.5)

$\acute{r}_A, \acute{r}_B$ - sample mean of rate of returns for assets A and B consequently

As can be understood from the formula, a number of sample covariance can range from "–" to "+" infinity. Though, the covariance number doesn't tell the investor much about the relationship between the returns on the two assets, if only this pair of assets in the portfolio is analysed. It is difficult to conclude, if the relationship between returns of two assets (A and B) is strong or weak, taking into account the absolute number of the sample variance. However, what is very important using the covariance for measuring relationship between two assets is the identification of the direction of this relationship. Positive number of covariance shows that rates of return of two assets are moving to the same direction. When return on asset A is above its mean of return (positive), the other asset B tends to be the same (positive) and vice versa. When the rate of return of asset A is negative or below its mean of return, the returns of other asset tend to be negative too. Negative number of covariance shows that rates of return of two assets are moving in the contrariwise directions. When return on asset A is above its mean of return (positive), the returns of the other asset B tends to be negative and vice versa.

Though, in analysing relationship between the assets in the same portfolio using covariance for portfolio formation, it is important to identify which of the three possible outcomes exists:

- Positive covariance (+)
- Negative covariance (-)
- Zero covariance (0)

If the positive covariance between two assets is identified, the common recommendation for the investor would be not to put both of these assets to the same portfolio, because their returns move in the same direction and the risk in portfolio will be not diversified. If the negative covariance between the pair of assets is identified, the common recommendation for the investor would be to include both of these assets to the portfolio, because their returns move in the contrariwise directions and the risk in portfolio could be diversified or decreased.

If the zero covariance between two assets is identified, it means that there is no relationship between the rates of return of two assets. The assets could be included in the same portfolio, but it is rare case in practice and usually covariance tends to be positive or negative. For investors who use sample covariance as one of the initial steps in analysing the potential assets to put in the portfolio, the graphical method instead of analytical one using formula 2.5 could be a good alternative.

In figures 2.1, 2.2 and 2.3 the identification of positive, negative and zero covariance is demonstrated in graphical way. In all these figures, the horizontal axis shows the rates of return on asset A and vertical axis shows the rates of return on asset B. When the sample mean of return for both assets is calculated from historical data given, then all area of possible historical rates of return can be divided into four sections (I, II, III and IV) on the basis of the mean returns of two assets, (ŕA, ŕB consequently).

In section I, both asset A and asset B have the positive rates of returns above their means of return; in section II, the results are negative for asset A and positive for asset B; in section III, the results of both assets are negative below their means of return and in section IV, the results are positive for asset A and negative for asset B. When the historical rates of return of two assets known for the investor are marked in the area formed by axes ŕA, ŕB, it is very easy to identify what kind of relationship between two assets exists simply by calculating the number of observations in each:

- If the number of observations in sections I and III prevails over the number of observations in sections II and IV, the covariance between two assets is positive (+).
- If the number of observations in sections II and IV prevails over the number of observations in sections I and III, the covariance between two assets is negative (-).
- If the number of observations in sections I and III equals the number of observations in sections II and IV, there is the zero covariance between two assets (0).

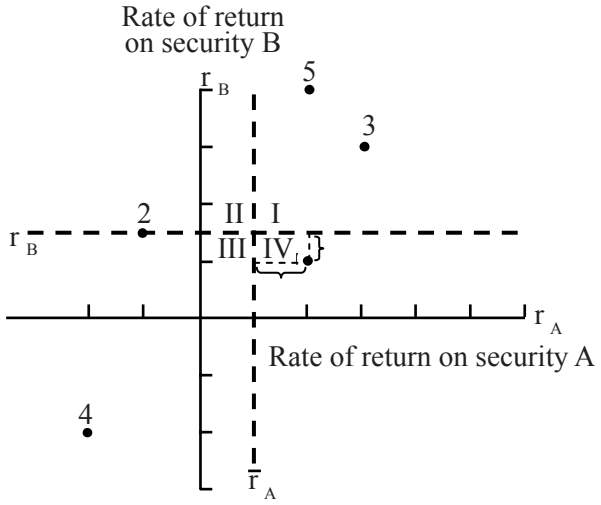

Fig. 2.1 Relationship between two assets: positive covariance
(Source: http://www.bcci.bg/projects/latvia/pdf/8_IAPM_final.pdf)

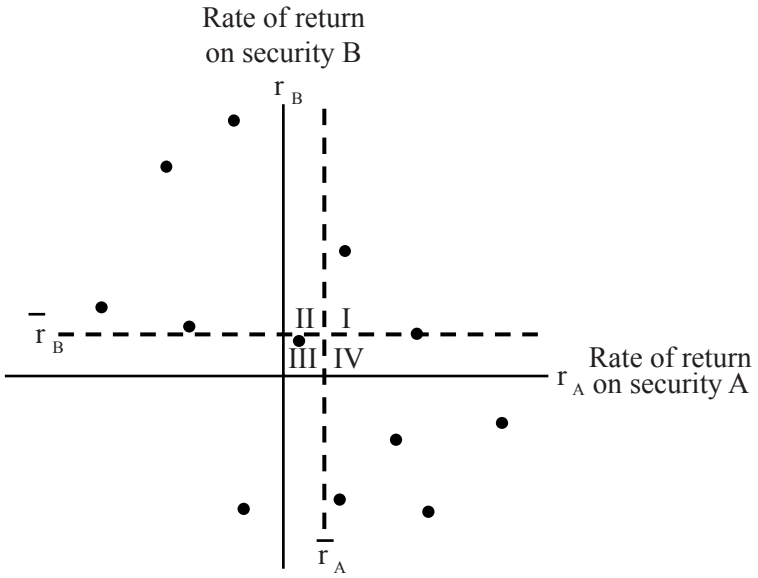

Fig. 2.2 Relationship between two assets: negative covariance
(Source: http://www.bcci.bg/projects/latvia/pdf/8_IAPM_final.pdf)

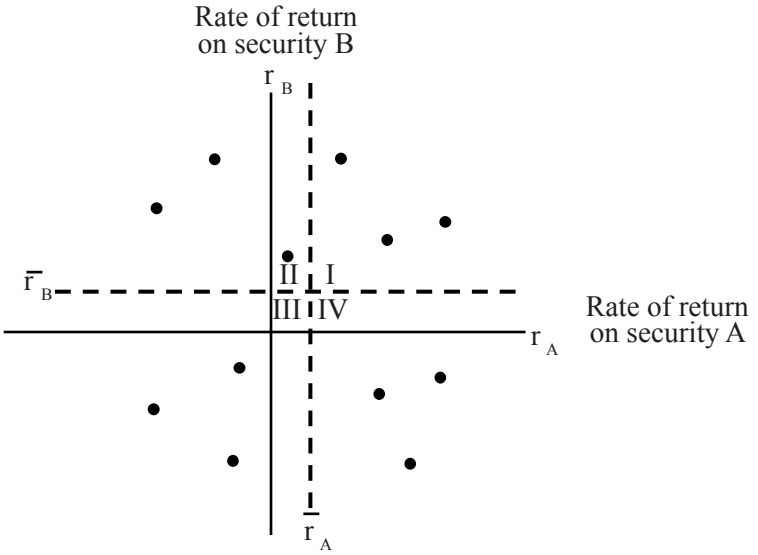

Fig. 2.3 Relationship between two assets: zero covariance
(Source: http://www.bcci.bg/projects/latvia/pdf/8_IAPM_final.pdf)

The population covariance is estimated when the investor has enough information about the underlying probability distributions for the returns of two assets and can identify the actual probabilities of various pairs of the returns for two assets at the same time. The population covariance between stocks A and B is as follows:

$$Cov(r_A, r_B) = \sum_{i=1}^{m} h_i x \left[r_{A,i} - E(r_A)\right] x \left[r_{B,i} - E(r_B)\right]$$

Similar to using the sample covariance, in the population covariance case, the graphical method can be used for the identification of the direction of the relationship between two assets. However, the graphical presentation of data in this case is more complicated because three dimensions must be used (including the probability). Despite this, if investor observes that more pairs of returns are in the sections I and III than in II and IV, the population covariance will be positive. If the pairs of return in II and IV prevail over I and III, the population covariance is negative.

2.2.2 Correlation and Coefficient of Determination

Correlation is the degree of relationship between two variables. The correlation coefficient between two assets is closely related to their covariance. The correlation coefficient between two assets A and B ($k_{A,B}$) can be calculated using the next formula:

$$k_{A,B} = \frac{Cov(r_A, r_B)}{\delta(r_A)x\ \delta(r_B)}$$

Here, $\delta\ (r_A)$ and $\delta\ (r_B)$ are standard deviation for asset A and B consequently.

Instead of covariance, when the calculated number is unbounded, the correlation coefficient can range only from -1, 0 to +1, 0. The more close the absolute meaning of the correlation coefficient to 1, 0, the stronger the relationship between the returns of two assets. Two variables are perfectly positively correlated, if correlation coefficient is +1,0, that means that the returns of two assets have a perfect positive linear relationship to each other (see Fig. 2.4), and perfectly negatively correlated, if correlation coefficient is-1,0, that means the asset returns have a perfect inverse linear relationship to each other (see Fig. 2.5). However, most often correlation between asset returns is imperfect (see Fig. 2.6). When correlation coefficient equals 0, there is no linear relationship between the returns on the two assets (see Fig. 2.7). Combining two assets with zero correlation with each other reduces the risk of the portfolio. While a zero correlation between two assets returns is better than positive correlation, it does not provide the risk reduction results of a negative correlation coefficient.

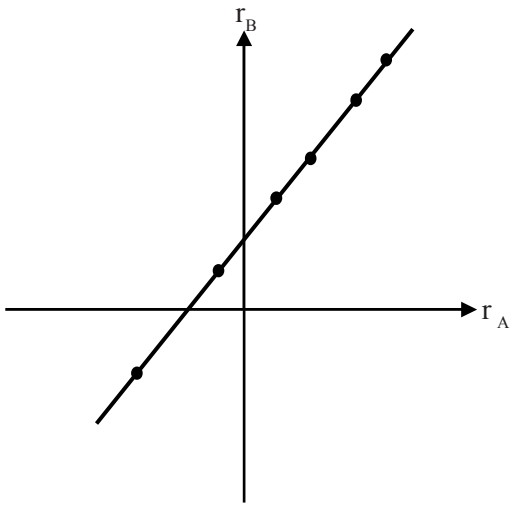

Fig. 2.4 Perfect positive correlation between returns of two assets
(Source: http://www.bcci.bg/projects/latvia/pdf/8_IAPM_final.pdf)

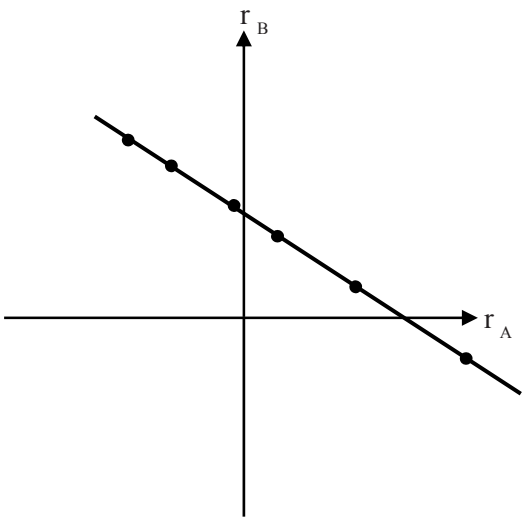

Fig. 2.5 Perfect negative correlation between returns of two assets
(Source: http://www.bcci.bg/projects/latvia/pdf/8_IAPM_final.pdf)

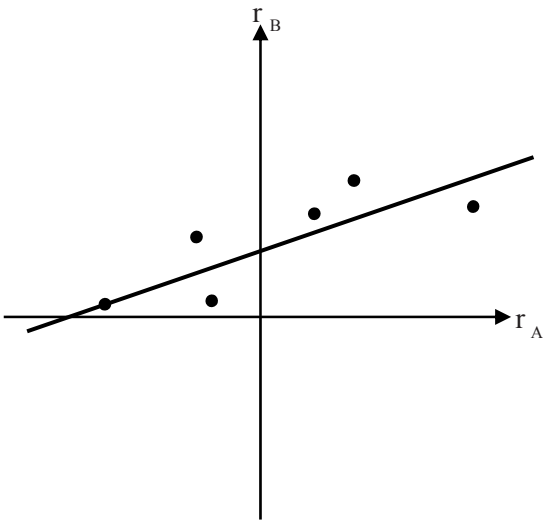

Fig. 2.6 Imperfect positive correlation between returns on two assets
(Source: http://www.bcci.bg/projects/latvia/pdf/8_IAPM_final.pdf)

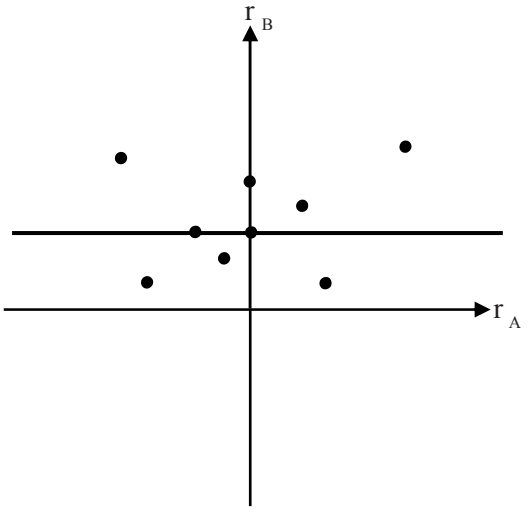

Fig. 2.7 Zero correlation between returns on two assets
(Source: http://www.bcci.bg/projects/latvia/pdf/8_IAPM_final.pdf)

It is useful to note, that when investor knows correlation coefficient, the covariance between stocks A and B can be estimated, because standard deviations of the assets' rates of return will already are available:

$$Cov(r_A, r_B) = k_{A,B}\ x\ \delta(r_A) x\ \delta(r_B)$$

Therefore, as it was pointed out earlier, the covariance primarily provides information to the investor about whether the relationship between asset returns is positive, negative or zero, because simply observing the number itself without any context with which to compare the number, is not very useful. When the covariance is positive, the correlation coefficient will be also positive, when the covariance is negative, the correlation coefficient will be also negative. However, using correlation coefficients instead of covariance investor can immediately assess the degree of relationship between asset returns.

The coefficient of determination ($\mathrm{Det}_{A,B}$) is calculated as the square of correlation coefficient:

$$Det_{A,B} = k^2_{A,B}$$

The coefficient of determination shows how much variability in the returns of one asset can be associated with variability in the returns of the other. For example, if correlation coefficient between returns of two assets is estimated + 0, 80, the coefficient of determination will be 0, 64. The interpretation of this number for the investor is that approximately 64 percent of the variability in the returns of one asset can be explained by the returns of the other asset. If the returns on two assets are perfectly correlated, the coefficient of determination will be equal to 100 %, and this means that in such a case, if investor knows what will be the changes in returns of one asset, he/she could predict exactly the return of the other asset.

2.2.3 Effect of Diversification

As an application of the formula for the variance of the return of a portfolio, this section considers the effect of diversification. Diversification means purchasing a larger number of different assets. It is natural to view diversification as a means of reducing risks because in a large portfolio the random fluctuations of individual assets will have a tendency to cancel out. To formalise the effect of diversification, consider holding N assets in equal proportions. This implies that the portfolio proportions satisfy $X_i = \frac{1}{N}$ for all assets i = 1, ..., N. From the variance of this portfolio is:

$$\sigma_p^2 = \sum_{i=1}^{N} [\left[\frac{1}{N}\right]^2] \sigma_i^2 + \sum_{k=1,k\neq i}^{N} \left[\frac{1}{N}\right]^2 \sigma_{ik}$$

Observe that there are N terms in the first summation and N [N − 1] in the second. This suggests extracting a term from each summation to write the variance as:

$$\sigma_p^2 = \left[\frac{1}{N}\right] \sum_{i=1}^{N} [\frac{1}{N}] \sigma_i^2 + \left[\frac{N-1}{N}\right] \sum_{i=1}^{N} \sum_{k=1,k\neq i}^{N} \left[\frac{1}{[N-1]N}\right] \sigma_{ik}$$

Now, define the mean of the variances of the N assets in the portfolio by:

$$\bar{\sigma}_a^2 = \sum_{i=1}^{N} \left[\frac{1}{N}\right] \sigma_i^2$$

And the mean covariance between all pairs of assets in the portfolio by:

$$\bar{\sigma}_{ab} = \sum_{i=1}^{N} \sum_{k=1,k\neq i}^{N} \left[\frac{1}{[N-1]N}\right] \sigma_{ik}$$

Using these definitions, the variance of the return on the portfolio becomes:

$$\sigma_p^2 = \left[\frac{1}{N}\right] \bar{\sigma}_a^2 + \left[\frac{N-1}{N}\right] \bar{\sigma}_{ab}$$

This formula applies whatever the number of assets (but the mean variance and mean covariance change in value as N changes). Diversification means purchasing a broader range of assets which in the present context is reflected in an increase in N. The extreme of diversification occurs as the number of assets in the portfolio is increased without limit. Formally, this can be modelled by letting $N \rightarrow \propto$ and determining the effect on the variance of the return on the portfolio. It can be seen from the equation above that as $N \rightarrow \propto$ the first term will converge to zero (we are dividing the mean value by an ever increasing value of N) and the second term will converge to $\bar{\sigma}_{ab}$ (because as N increases $\frac{N-1}{N}$ tends to 1).

Therefore, at the limit of diversification:

$$\sigma_P^2 \rightarrow \bar{\sigma}_{ab}$$

This result shows that in a well-diversified portfolio, only the covariance between assets counts for portfolio variance. In other words, the variance of the individual assets can be eliminated by diversification, which confirms the initial perspective on the consequence of diversification.

2.2.4 Two Assets

Consider a portfolio composed of two assets, A and B, in proportions XA and XB. Using the definition of the population variance, the variance of the return on the portfolio is given by the expected value of the deviation of the return from the mean return squared. The analysis of portfolio return has shown that $r_p = X_A r_A + X_B r_B$ and $\bar{r}_P = X_A \bar{r}_A + X_B \bar{r}_B$. These expressions can be substituted into the definition of the variance of the return on the portfolio to write:

$$\sigma_P^2 = \mathrm{E}[([\mathrm{X_A r_A} + \mathrm{X_B r_B}] - [\mathrm{X_A \bar{r}_A} + \mathrm{X_B \bar{r}_B}]^2)]$$

Collecting together the terms relating to asset A and the terms relating to asset B gives:

$$\sigma_P^2 = E[(X_A[r_A - \bar{r}_A] + X_B[r_B - \bar{r}_B])^2]$$

Squaring the term inside the expectation:

$$\sigma_P^2 = E\left[X_A^2\,[r_A - \bar{r}_A]^2 + X_B^2[r_B - \bar{r}_B]^2 + 2X_A X_B[r_A - \bar{r}_A][r_B - \bar{r}_B]\right]$$

The expectation of a sum of terms is equal to the sum of the expectations of the individual terms. This allows that variance to be broken down into separate expectations

$$\sigma_P^2 = E\left[X_A^2\,[r_A - \bar{r}_A]^2\right] + E[X_B^2[r_B - \bar{r}_B]^2] + E[2X_A X_B[r_A - \bar{r}_A][r_B - \bar{r}_B]]$$

The portfolio proportions can then be extracted from the expectations because they are constants. This gives:

$$\sigma_P^2 = X_A^2 E[[r_A - \bar{r}_A]^2] + X_B^2 E[r_B - \bar{r}_B]^2 + 2X_A X_B E\left[[r_A - \bar{r}_A][r_B - \bar{r}_B]\right]$$

The first expectation in this expression is the variance of return on asset A, the second expectation is the variance of return on asset B, and the third expectation is the covariance of the returns of A and B. Employing these observations allows the variance of the return on a portfolio of two assets, A and B, to be written succinctly as:

$$\sigma_P^2 = X_A^2 \sigma_A^2 + X_B^2 \sigma_B^2 + 2X_A X_B \sigma_{AB}$$

The expression can be used to calculate the variance of the return on the portfolio given the shares of the two assets in the portfolio, the variance of returns of the two assets, and the covariance. The result has been derived for the population variance (so the values entering would be population values), but can be used equally well to calculate the sample variance of the return on the portfolio using sample variances and sample covariance.

2.3 Return

Various types of returns are explained in the paragraphs given below.

2.3.1 Stock Returns

The process for the calculation of a return can also be applied to stocks. When doing this, it is necessary to take care of the payment of dividends, since these must be included as part of the return. We first show how to calculate the return for a stock that does not pay a dividend and then extend the calculation to include dividends. Consider a stock that pays no dividends for the holding period over which the return is to be calculated. Assume that this period is one year. In the formula for the return, we take the initial value, V0, to be the purchase price of the stock and the final value, V1, to be its trading price one year later. If the initial price of the stock is p (0) and the final price p (1), then the return on the stock is:

$$r = \frac{p(1) - p(0)}{p(0)}$$

Example

The price of Lastminute.com stock trading in London on May 29 2002 was £0.77. The price at close of trading on May 28 2003 was £1.39. No dividends were paid. The return for the year of this stock is given by:

$$r = \frac{1.39 - 0.77}{0.77} = 0.805 \ (80.5\%)$$

The method for calculating the return can now be extended to include the payment of dividends. To understand the calculation, it needs to be recalled that the return is capturing the rate of increase of an investor's wealth. As dividend payments are an addition to wealth, they need to be included in the calculation of the return. In fact, the total increase in wealth from holding the stock is the sum of its price increase plus the dividend received. So, in the formula for the return, the dividend is added to the final stock price. Letting 'd' denote the dividend paid by a stock over the holding period, this gives the formula for the return:

$$r = \frac{p(1) + d - p(0)}{p(0)}$$

Stocks in the US pay dividends four times per year and stocks in the UK pay dividends twice per year. When there are multiple dividend payments during the holding period, the value is the sum of these dividend payments.

2.3.2 Characteristic Line and Beta Factor

Before examining the relationship between a specific asset and the market portfolio, the concept of 'market portfolio' needs to be defined. Theoretical interpretation of the market portfolio is that it involves every single risky asset in the global economic system, and contains each asset in proportion to the total market value of that asset relative to the total value of all other assets (value weighted portfolio). Going from conceptual to practical approach, market index can be used while measuring the return of the market portfolio in such a broad understanding. The investors can think of the market portfolio as the ultimate market index. If the investor following his/her investment policy makes the decision to invest, for example, only in stocks, the market portfolio practically can be presented by one of the available representative indexes in particular stock exchange. Most often, the relationship between the asset return and market portfolio return is demonstrated and examined using the common stocks as assets, but the same concept can be used analysing bonds, or any other assets. With the given historical data about the returns on the particular common stock (r_j) and market index return (r_M) in the same periods of time investor can draw the stock's characteristic line (see Fig. 2.8).

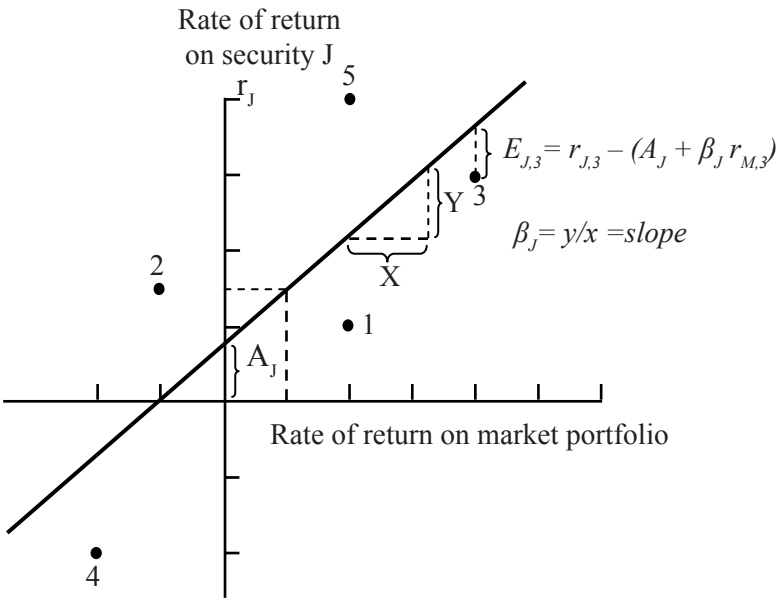

Fig. 2.8 Stock's J characteristic line
(Source: http://www.bcci.bg/projects/latvia/pdf/8_IAPM_final.pdf)

Stock's characteristic line:

- Describes the relationship between the stock and the market.
- Shows the return investor expects the stock to produce, given that a particular rate of return appears for the market.
- Helps to assess the risk characteristics of one stock relative to the market.

Stock's characteristic line as a straight line can be described by its slope and by point in which it crosses the vertical axis-intercept (point A in Fig. 2.8). The slope of the characteristic line is called the Beta factor. Beta factor for the stock J and can be calculated using the following formula:

$$\beta_J = \frac{Cov(rJ,rM)}{\delta^2(rM)}$$

Here: $\mathrm{Cov(rJ,rM)}$ – covariance between returns of stock J and the market portfolio

$\delta^2(\mathrm{rM})$ – variance of returns on market portfolio

The Beta factor of the stock is an indicator of the degree to which the stock reacts to the changes in the returns of the market portfolio. The Beta gives the answer to the investor how much the stock return will change, when the market return will change by 1 percent. Intercept AJ (the point where characteristic line passes through the vertical axis) can be calculated using following formula:

$$A_J = rJ - \beta J \; x \; rM$$

Here: rJ – rate of of stock J

$\beta J - Beta\ factor\ for\ the\ stock\ J$

rm – rate of return of the market

The intercept technically is a convenient point for drawing a characteristic line. The interpretation of the intercept from the investor's point of view is that it shows what would be the rate of return of the stock, if the rate of return in the market is zero.

2.3.3 Residual Variance

The characteristic line is a line-of-best-fit through some data points. A characteristic line is what in statistics is called as time-series regression line. However, in reality the stock produce returns deviates from the characteristic line (see Fig. 2.8). In statistics, this propensity is called the residual variance. Residual variance is the variance in the stock's residuals and for the stock J can be calculated using formula:

$$\delta^2_{\varepsilon,t} = \frac{\sum_{t=1}^{n} \varepsilon^2_{J,t}}{n-2}$$

Here $\varepsilon_{J,t} - residual\ of\ the\ stock\ J\ in\ period\ t$

n– – number of periods observed

To calculate residual variance, the residual in every period of observations must be identified. Residual is the vertical distance between the point which reflect the pair of returns (stock J and market) and the characteristic line of stock J. The residual of the stock J can be calculated:

$$\varepsilon_{J,t} = r_{J,t} - (A_J + B_J \times r_{M,t})$$

It is useful for the interpretation of residual to investor to accentuate two components in formula of residual.

- $r_{J,t}$ reflects the return actually generated by the stock J during period t.
- $A_J + B_J\ x\ r_{M,t}$ represents investor's expectations for the stock's return, given its characteristic line and market's returns.

2.3.4 Portfolio Return

It was noted in the introduction that the definition of a return could be applied to any form of investment. So far, it has only been applied to individual assets. We now show how the method of calculation can be applied to portfolios of assets. The purchase of a portfolio is an example of an investment and consequently a return can be calculated. The calculation of the return on a portfolio can be accomplished in two ways. Firstly, the initial and final values of the portfolio can be determined, dividends added to the final value and the return computed. Alternatively, the prices and payments of the individual assets, and the holding of those assets can be used directly. Focusing first on the total value of the portfolio, if the initial value is V0, the final value is V1 and dividends received are d, then the return is given by:

$$r = \frac{V1 + d - V0}{V0}$$

2.3.5 Mean Return

The examples have illustrated that over time the return on a stock or a portfolio may vary. The prices of the individual stocks will rise and fall and this will cause the value of the portfolio to fluctuate. Once the return has been observed for a number of periods, it becomes possible to determine the average, or mean, return. For the moment, the mean return is taken just as an average of past returns. If a return, on an asset or portfolio, is observed in periods 1, 2, 3, ... T, the mean return is defined as $\hat{r}$.

Summary

- The dictionary meaning of risk is the possibility of loss or injury; risk the possibility of not getting the expected return.
- The systematic risk is caused by factors external to the particular company and uncontrollable by the company.
- Interest rate risk is the variation in the single period rates of return caused by the fluctuations in the market interest rate.
- Jack Clark Francis has defined market risk as that portion of total variability of return caused by the alternating forces of bull and bear market.
- The essential feature of investing is that the returns on the vast majority of financial assets are not guaranteed.
- The expected rate of return and the variance or standard deviation provide investor with information about the nature of the probability distribution associated with a single asset.
- Correlation is the degree of relationship between two variables.
- Diversification means purchasing a larger number of different assets.
- The process for the calculation of a return can also be applied to stocks.
- The characteristic line is a line-of-best-fit through some data points.
- The calculation of the return on a portfolio can be accomplished in two ways.
- The prices of the individual stocks will rise and fall and this will cause the value of the portfolio to fluctuate.

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Self Assessment

1. The dictionary meaning of risk is the possibility of loss or injury; risk the possibility of not getting the expected_____.
   a. return
   b. sale
   c. investment
   d. components

2. What is caused by factors external to the particular company and uncontrollable by the company?
   a. The unsystematic risk
   b. The systematic risk
   c. Interest rate risk
   d. Business risk

3. Match the following

1. Interest rate risk	A. It is that portion of total variability of return caused by the alternating forces of bull and bear market.
2. Market risk	B. It refers to the variation in investor return caused by inflation.
3. Purchasing power risk	C. It refers to the variability of the income to the equity capital due to the debt capital.
4. Financial risk	D. Most commonly, it affects the debt securities like bond, debentures.

   a. 1-C, 2-B, 3-A, 4-D
   b. 1-D, 2-A, 3-B, 4-C
   c. 1-A, 2-C, 3-D, 4-B
   d. 1-B, 2-D, 3-C, 4-A

4. Which of the following is the uncertainty of returns to an investor who acquires securities denominated in a currency different from his or her own?
   a. Country risk
   b. Liquidity risk
   c. Financial risk
   d. Exchange rate risk

5. What is also called political risk?
   a. Country risk
   b. Liquidity risk
   c. Financial risk
   d. Exchange rate risk

6. A _____ is the ultimate objective for any investor.
   a. risk
   b. investment
   c. return
   d. purchase

7. Which of the following statement is true?
   a. Correlation is the degree of relationship between three variables.
   b. Correlation is the degree of relationship between six variables.
   c. Correlation is the degree of relationship between four variables.
   d. Correlation is the degree of relationship between two variables.

8. _____ risk in a company is associated with the capital structure of the company.
   a. Country
   b. Liquidity
   c. Financial
   d. Exchange

9. Which of the following statement is false?
   a. Diversification means purchasing a larger number of different assets.
   b. A characteristic line is what in statistics is called as time-series regression line.
   c. Investment situation may be high risk, medium and low risk investment.
   d. The unsystematic risk affects the market as a whole.

10. Which of the following is the variation in the single period rates of return caused by the fluctuations in the market interest rate?
   a. Market risk
   b. Interest rate risk
   c. Purchasing power risk
   d. Business risk

Chapter III

Fundamental and Technical Analysis for Investing in Stock

Aim

The aim of this chapter is to:

- introduce fundamental analysis
- explain economical analysis
- explicate industry analysis

Objectives

The objectives of this chapter are to:

- enlist the influence of the economy on companies
- elucidate company analysis
- explain technical analysis

Learning outcome

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

- identify the tools of technical analysis
- understand industry life cycle
- recognise the characteristics of industry analysis

3.1 Introduction

Fundamental analysis is really a logical and systematic approach to estimating the future dividends and share price. It is based on the basic premise that share price is determined by a number of fundamental factors relating to the economy, industry and company. In other words, fundamental analysis means a detailed analysis of the fundamental factors affecting the performance of companies.

Each share is assumed to have an economic worth based on its present and future earning capacity. This is called its intrinsic value or fundamental value. The purpose of fundamental analysis is to evaluate the present and future earning capacity of a share based on the economy, industry and company fundamentals and thereby assess the intrinsic value of the share. The investor can compare the intrinsic value of the share with the prevailing market price to arrive at an investment decision. If the market price of the share is lower than its intrinsic value, the investor would decide to buy the share as it is underpriced. The price of such share is expected to move up in the future to match with its intrinsic value.

On the contrary, when the market price of a share is higher than its intrinsic value, it is perceived to be overpriced. The market price of such a share is expected to come down in future and hence, the investor should decide to sell such a share. Fundamental analysis thus provides an analytical framework for rational investment decision-making. This analytical framework is known as EIC framework, or economy-industry-company analysis.

3.1.1 Influence of the Economy

Companies are a part of the industrial and business sector, which in turn is a part of the overall economy. Thus, the performance of a company depends on the performance of the economy in the first place. If the economy is in recession or stagnation, ceteris paribus, the performance of companies will be bad in general, with some exceptions, however. On the other hand, if the economy is booming, incomes are rising and the demand is good, then the industries and the companies in general may be prosperous, with some exceptions however. The following are some effects of the influence of economy on companies:

- In the Indian economy, the matters to be considered in the first place are the behaviour of the monsoon and the performance of agriculture. As agriculture is the mainstay of about 60% of the population and contributes nearly 25% of the output of the economy, it is important for the assessment and forecast of industrial performance. If the monsoon is good and agricultural incomes rise, the demand for industrial products and services will be good and industry prospers.
- India has a mixed economy, where the public sector plays a vital role. The Government being the biggest investor and spender, the trends in public investment and expenditure would indicate the likely performance of the Indian economy. Concomitant with this, the government budget policy, tax levies and government borrowing programme along with the extent of deficit financing will have a major influence on the performance of the Indian economy, as these influence the demand and incomes of the people. The changes in excise and customs duties, corporate taxes, etc., are all relevant to assess the trends in the economy as they have an impact on the industry and the companies.
- The monetary policy and trends in money supply which mainly depend on the government's budget policy, its borrowing from the public and credit from the banks and the RBI, have a major impact on the industrial growth through the cost and availability of credit, the profit margins of the companies, etc. The monetary situation along with the budgetary policy influences the movement in price level (inflation) and interest rates. The tight money position, increasing budget deficits and RBI-creation of currency lead to an inflationary spiral. Although the interest rates in the organised financial system are controlled, this is being changed to a free market economy and the bazaar rates in the unorganised market do reflect the availability of funds in the free markets. So, interest rates in the free markets and the degree of inflation do have a major influence on the economy and the performance of the industries. Although a mild inflation is good for business psychology, higher degrees of inflation, particularly in two digits, will defeat all business planning, lead to cost escalations and squeeze on profit margins. These will adversely affect the performance of industry and companies.
- The general business conditions in the form of business cycles or the level of business activities do influence the demand for industrial products and the performance of the industry. In India, there are no business cycles, but outputs do fluctuate depending upon the state of the economy, performance of agriculture, availability of

power and other infrastructural outputs, imported inputs and a host of other factors. These factors do influence the costs and profit margins of companies from both demand and supply sides. The business earnings and profits are affected by such changes in business conditions.

- The economic and political stability in the form of stable and long-term economic policies and a stable political system with no uncertainty would also be necessary for a good performance of the economy in general and of companies in particular. The Government regulations being all pervasive in India, the government policy has to be known in advance in all its aspects and there should be no uncertainty about the political system as economic and political factors are interlinked. Political uncertainties and adverse changes in government policy do adversely affect industrial growth. Government policy relating to projects, clearance for foreign collaboration and foreign investment price and distribution controls, and listing requirements on stock exchanges and a host of other matters like import restrictions do affect the performance of companies. The foreign exchange position and the balance of payments situation at any time would also indicate the rigours of government policy with regard to imports, exports, foreign investment and related matters.

All the above factors of the economy influence the corporate performance and the industry in general. In any investment analysis, a broad picture of these factors and a forecast of the growth of the economy and of industry would be necessary to decide, when to invest and what to invest in.

Fundamental analysis thus involves three steps:

- Economic analysis
- Industry analysis
- Company analysis

3.2 Economic Analysis

The performance of a company depends on the performance of the economy. Let us look at some of the key economic variables that an investor must monitor as part of his fundamental analysis.

Growth rate of national income

The rate of growth of the national economy is an important variable to be considered by an investor. GNP (Gross National Product), NNP (Net National Product) and GDP (Gross Domestic Product) are the different measures of the total income or total economic output as a whole. The estimated growth rate of the economy would be a pointer towards the prosperity of the economy. An economy typically passes through different stages of prosperity known as economic or business cycle.

The four stages of an economic cycle are as follows:

- Depression: This isthe worst of the four stages. During a depression, demand is low and declining. Inflation is often high and so are interest rates.
- Recovery stage: The economy begins to receive after a depression. Demand picks up leading to more investments in the economy. Production, employment and profits are on the increase.
- Boom: The phase of the economic cycle is characterised by high demand. Investments and production are maintained at a high-level to satisfy the high demand. Companies generally post higher profits.
- Recession: The boom phase gradually slows down. The economy slowly begins to experience a downturn in demand, production employment, etc.; the profits of companies also start to decline. This is the recession stage of the economy.

Inflation

Inflation leads to erosion of purchasing power in the hands of consumers, this will result in lower the demand of products. Inflation prevailing in the economy has considerable impact on the performance of companies. Higher rate of inflation upsets business plans.

Interest rates

Interest rates determine the cost and availability of credit for companies operating in an economy. A low interest rate stimulates investment by making credit available easily and cheaply. On the contrary, higher interest rates result in higher cost of production which may lead to lower profitability and lower demand.

Government revenue, expenditure and deficits

Government is the largest investor and spender of money, the trend in government revenue and expenditure and deficit have a significant impact on the performance of industries and companies' expenditure by the government stimulates the economy by creating jobs and generating demand. The nature of government spending is of greater importance in determining the fortunes of many companies.

Exchange rates

The performance and profitability of industries and companies that are major importers or exporters are considerably affected by the exchange rates of the rupee against major currencies of the world. A depreciation of the rupee improves the competitive position of Indian products in the foreign markets, thereby stimulating exports. However, it would also make import more expensive. A company depending more on imports may find that devaluation of the rupee affects its profitability adversely.

Infrastructure

The development of an economy depends very much on the infrastructure available. The availability of infrastructure facilities, such as power, transportation, and communication systems affects the performance of companies bad infrastructure lead to inefficiencies, lower productivity, wastage and delays.

Monsoon

The Indian economy is essentially an agrarian economy and agriculture forms a very important sector of the Indian economy. The performance of agriculture to a very extent depends on the monsoon; the adequacy of the monsoon determines the success or failure of the agricultural activities in India.

Economic and political stability

A stable political environment is necessary for steady and balanced growth. Stable long-term economic policies are what are needed for industrial growth. Such stable policies emanate only from stable political systems as economic and political factors are interlinked.

3.3 Industry Analysis

An industry ultimately invests money in the securities of one or more specific companies, each company can be characterised as belonging to an industry. The performance of companies would therefore, be influenced by the fortunes of the industry to which it belongs. an industry "as a group of firms producing reasonably similar products which serve the same needs of common set of buyers."

3.3.1 Industry Life Cycle

The industry life cycle theory is generally attributed to Julius Grodinsky. According to the industry life cycle theory, the life of an industry can be segregated into to the pioneering stage the expansion stage, the stagnation stage, and the decay stage. This kind of segregation is extremely useful to an investor, because the profitability of an industry depends upon its stage of growth.

Pioneering stage

This is the first stage in the industrial life cycle of a new industry, where the technology as well as the products are relatively new and have not reached a state of perfection. Pioneering stage is characterised by rapid growth in demand for the output of industry. As a result, there is a greater opportunity for profit. Many firms compete with each other vigorously. Weak firms are eliminated and a lesser number of firms survive the pioneering stage. Example: Leasing industry.

Expansion stage

Once an industry has established itself, it enters the second stage of expansion or growth. These companies continue to become stronger. Each company finds a market for itself and develops its own strategies to sell and maintain its position in the market. The competition among the surviving companies brings about improved products at lower prices. Companies in the expansion stage of an industry are quite attractive for investment purposes.

Stagnation stage

In this stage, the growth of the industry stabilises. The ability of the industry to grow appears to have been lost. Sales may be increasing, but at a slower rate than that experienced by competitive industries or by the overall economy. The transition of an industry from the expansion stages to stagnation stages is very slow. Important reason for this transition is change in social habits and development of improved technology. Example: The black and white television industry in India provides s a good example of an industry which passed from the expansion stages to stagnation stage.

Decay stage

Decay stage occurs when the products of the industry are no longer in demand. New products and new technologies have come to the market. Customers have changed their habits, style and liking. As a result, the industry become obsolete and gradually ceases to decay of an industry

3.3.2 Industry Characteristics

In an industry analysis, there are a number of key characteristics that should be considered by the analyst.

Demand supply gap

The demand for the product usually tends to change at a steady rate, where as the capacity to produce the product tends to change at irregular intervals, depending upon the installation of additional production capacity. As a result, an industry is likely to experience under-supply and over-supply of capacity at different times. Excess supply reduces the profitability of the industry through a decline in the unit price realisation. On the contrary, insufficient supply tends to improve the profitability through higher unit price realisation.

Competitive conditions in the industry

The level of competition among various companies in an industry is determined by certain competitive forces. These competitive forces are:

- Barriers to entry
- The threat of substitution
- Bargaining power of the suppliers
- The rivalry among competitors

Permanence

Permanence is the phenomenon related to the products and the technology used by the industry. If an analyst feels that the need for a particular industry will vanish in a short period, or that the rapid technological changes would render the products obsolete within short period of time, it would be foolish to invest in such industry.

Labour conditions

In our country, the labour unions are very powerful. If the labour in a particular industry is rebellious and is inclined to resort to strikes frequently, the prospects of that industry cannot become bright.

Attitude of government

The government may encourage certain industries and can assist such industries through favourable legislation. On the contrary, the government may look with disfavour on certain other industries. In India this has been the experience of alcoholic drinks and cigarette industries. A prospective investor should consider the role that the government is likely to play in the industry.

Supply of raw materials

This is also one of the important factors that determines the profitability of an industry. Some industry may have no difficulty in obtaining the major raw materials as they may be indigenously available in plenty. Other industries may have to depend on a few manufactures within the country or on imports from outside the country for their raw material supply.

Cost structure

The cost structure, that is the fixed and variable cost, affect the cost of production and profitability of the firm. The higher the fixed cost component, higher is the sales volume necessary to achieve breakeven point. Conversely, the lower the proportion of fixed cost relative to variable cost, lower would be the breakeven point. It provides higher margin of safety. So, an analyst would consider favourably an industry that has a lower breakeven point.

3.4 Company Analysis

Company analysis is the final stage of fundamental analysis. The economy analysis provides the investor a broad outline of the prospects of growth in the economy, the industry analysis helps the investor to select the industry in which investment would be rewarding. Now, he has to decide the company in which he should invest his money. Company analysis provides answer to this question. In company analysis, the analyst tries to forecast the future earnings of the company, because there is a strong evidence that the earnings have a direct and powerful effect upon share prices. The level, trend and stability of earnings of a company, however depend upon a number of factors concerning the operations of the company.

Financial statements

The financial statements of a company help to assess the profitability and financial health of the company. The two basic financial statements provided by a company are the balance sheet and the profit and loss account. The balance sheet indicates the financial position of the company on a particular date, namely the last day of the accounting year. The profit and loss account, also called income statement, reveals the revenue earned, the cost incurred and the resulting profit and loss of the company for one accounting year.

Analysis of financial statements

Financial ratios are most extensively used to evaluate the financial performance of the company, it also help to assess the whether the financial performance and financial strengths are improving or deteriorating, ratios can be used for comparative analysis either with other firms in the industry through a cross sectional analysis or a time series analysis.

3.5 Technical Analysis

Technical analysis is explained in the paragraphs given below.

Importance of timing in investment

While fundamental analysis and security evaluation explain why share prices fluctuate, how they are determined and what to buy or sell, the technical analysis will help the decision, when to buy and traditional theory of capital market efficiency postulates, that entry into the market at any time leads to the same average return as that of the market. However, in the real world of imperfections, are investors who have burnt their fingers by entering the market at the wrong time. Investment timing is, therefore, crucial as the market is continuously jolted by waves of buying and selling and prices are moving in trends and cycles and are never stable. The stock market is different from other markets, as there is a continuous buying and selling and bid and offer rates as under a system of auctions. The resultant prices, led by the sheer force of the market, may fluctuate either way and may exhibit waves or trends. Entry and exit in the market will, therefore, make all the difference to the spread between buying and selling prices and the profits or losses. Timing of investment is, therefore, of vital importance for trading in the stock market.

Basic tenets of technical analysis

Technical analysis of the market is based on some basic tenets, namely, that all fundamental factors are discounted by the market and are reflected in prices. Secondly, these prices move in trends or waves which can be both, upward or downward depending on the sentiment, psychology and emotions of operators or traders. Thirdly, the present

trends are influenced by the past trends, and the projection of future trends is possible by an analysis of past price trends. Analysis of historical trends confirmed the above principles and the Random Walk Theory explaining the randomness of price changes have been found to be not applicable by the technical analysts in practice.

3.5.1 Basics of Technical Analysis

A technical analysis believes that the share price is determined by the demand and supply forces operating in the market. A technical analysis concentrates on the movement of share prices. By examining past share price movements, future share price can be accurately predicted. The basic premise of technical analysis is that prices move in trends or waves which may be upward or downward. A rational behind the technical analysis is that share price behaviour repeats itself over time and analysts attempt to drive methods to predict this repetition.

3.5.2 Basic Principles of Technical Analysis

The market value of a security is related to the demand and supply factors operating in the market. There are both rational and irrational factors which surround the supply and demand factors of a security. Security prices behave in a manner that their movement is continuous in a particular direction for some length of time. Trends in stock prices have been seen to change, when there is a shift in the demand and supply factors. The shift in demand and supply can be detected through charts prepared specially to show the market action. Patterns which are projected by charts record price movements and these recorded patterns are used price movements and these recorded patterns are used by analysts to make forecasts about the movement of prices in future.

3.6 Tools of Technical Analysis

Tools of technical analysis are discussed in the paragraphs given below.

3.6.1 Dow Theory

This theory is formulated by Charles H. Dow. Dow who is the editor of the Wall Street Journal in the U.S.A formulated a hypothesis that the stock market does not move on random basis, but is influenced by three distinct cyclical trends that guide its direction. According to Dow Theory, the market has three movements and these movements are simultaneous in nature. These movements are the primary movements, secondary reactions and minor movements.

The primary movement is the long-range cycle that carries the entire market up or down. This is the long-term trend in the market. The secondary reactions act as a restraining force on the primary movement. These are in the opposite direction to the primary movement and last only for a short while and are known as corrections. These are secondary reactions. The third movement in the market is the minor movements which are the day-to-day fluctuations in the market. The minor movements are not significant and have no analytical value as they are of very short duration. The three movements of the market have been compared to the tides, the waves and the ripples in the ocean.

3.6.2 Bullish Trend

During the bull market (upward moving market), in the first phase, the price would advance with the revival of confidence in the future of business. During the second phase, price would advance due to improvements in corporate earnings, in the third phase, prices advance due to inflation and speculation. According to Dow Theory, the formulation of higher bottoms and higher tops indicates a bullish trend.

3.6.3 Bearish Trend

The bear market is also characterised by three phases, in the first phase, price begin to fall due to abandonment of hopes. In the second phase, companies start to reporting lower profits and lower dividends, in the final phase, price falls still further due to distress selling. A bearish market would be indicated by the formulation of lower tops and lower bottoms. The theory also makes certain assumptions, which have been referred to as the hypothesis of the theory.

- The first hypothesis states that the primary trend cannot be manipulated. It means that no single individual or institution or group of individuals and institutions or group of individuals and institutions can exert influence on the major trends of the market.

- The second hypothesis states that the averages discount everything. Which means is that the daily prices reflect the aggregate judgement and emotions of all stock market participants. In arriving at the price of a stock, the market discounts everything known and predictable about the stock that is likely to affect the demand and supply position of the stock.
- The third hypothesis states that the theory is not infallible. The theory is concerned with the trend of the market and has no forecasting value as regards the duration.

3.6.4 Chartist Method

As referred to earlier, technical analysis is a study of the market data in terms of factors affecting supply and demand schedules, namely, prices, volume of trading, etc. A study of the historical trends of market behaviour shows the cycles and trends in prices, which may repeat as the present is a reflection of the past and the future of the present. This is the basis for forecasting the future trends, which are used for deciding on the basis of the buy or sell signals. For forecasting, analysts use charts and diagrams to depict the past trends and project the future. However, these methods are rough and ready methods and there are no foolproof methods of forecasting the stock prices. The technical analysis only helps to improve the knowledge of the probabilities of price behaviour (upswing or downswing) and help the investment process.

The technical analysis does not claim 100% chance of success in predictions that are made for investment. In view of the limitations inherent in the technical analysis, this analysis is generally juxtaposed with fundamental analysis of the market and the scripts. It was the past experience that the receipt of information and the actual price absorption of the information would not coincide and there is a time lag between them. As a result, the current price changes would give a clue to the subsequent price changes, if properly analysed and interpreted. In the market analysis, the variables to be taken into account are the breadth of the market, volume of trading, etc. Market breadth is the dispersion of the general price rise or decline, which means daily cumulation of a net number of advancing or declining issues. Breadth analysis focuses on change, rather than level in prices. Breadth of price changes in terms of the number of gainers or losers among the scripts is analysed to know the width of rise or fall in prices.

3.6.5 Charts and Trade Lines

The technical analysis uses charts for analysis of prices. Fitting a trend line for price changes on a daily-basis is the first step in the analysis of charts. These changes may be pointing upwards or downwards or stable over a horizontal one. The movements are such that there are both peaks and troughs in these price changes, peaks showing an upward trend troughs or reactions to the uptrend, viz., line joining the lowest points or troughs pointing up. If this line is pointing downwards, then it is a bearish phase. If the movements are downwards generally, then there will be rallies moving up the prices. These upper peaks, if they are joined, give the trend line as much as the lowest troughs.

The bull phase depicts the rising peaks successively, while the bear phase shows the falling peaks successively. When the share prices are rising or falling, there will be a resistance level above which the prices may not pierce in the upward direction or a support level, below which the price may not fall. These support lines and resistance lines are clearly noticed, when the prices are moving in a narrow band for some time. When the price pierces the resistance line, this is the first indication of the reversal of the trend in the upward direction. So, also in a bull phase when the price line falls below the support line, a reversal of the trend is indicated. Various configurations of price movements like stable pattern, M and W patterns, head and shoulders, etc., are formed. It is possible that various triangles, flags, pendants, etc., can be described by the price trends. The basic analysis involves the deciphering of the trend, identifying the reversal and fixing up of buy and sell signals in these price movements. The stable price pattern is ideal for genuine investors to enter the market.

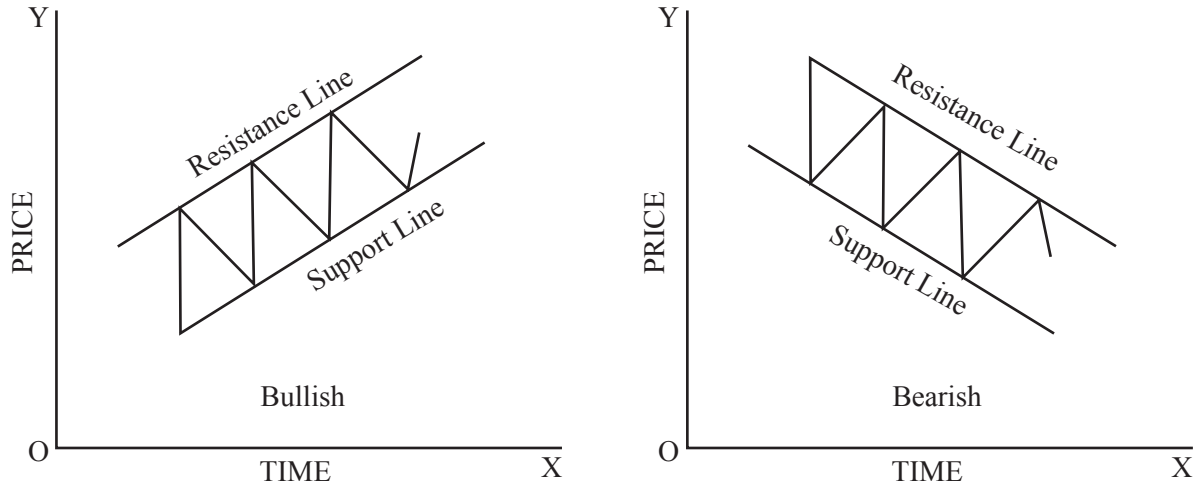

Fig. 3.1 Trade lines

(Source: http://site.ebrary.com/lib/utspune/docDetail.action?docID=10415576&p00=Security+analysis+%26+portfolio+management)

3.6.6 Criticism of Dow

The Dow Theory is subject to various limitations in actual practice. Dow has developed this theory to depict the general trend of the market, but not with the intention of projecting the future trends or to diagnose the buy and sell signals in the market. These applications of the Dow Theory have come in the light of analytical studies of financial analysts. This theory is criticised on the ground that it is too subjective and based on historical interpretation; it is not infallible as it depends on the interpretative ability of the analyst. The results of this theory do not also give meaningful and conclusive evidence of any action to be taken in terms of buy and sell operations.

Summary

- Fundamental analysis is really a logical and systematic approach to estimating the future dividends and share price. It is based on the basic premise that share price is determined by a number of fundamental factors relating to the economy, industry and company.
- The investor can compare the intrinsic value of the share with the prevailing market price to arrive at an investment decision.
- If the economy is in recession or stagnation, ceteris paribus, the performance of companies will be bad in general, with some exceptions however.
- The monetary situation along with the budgetary policy influences the movement in price level (inflation) and interest rates.
- The performance of a company depends on the performance of the economy.
- The rate of growth of the national economy is an important variable to be considered by an investor.
- The estimated growth rate of the economy would be a pointer towards the prosperity of the economy.
- Inflation leads to erosion of purchasing power in the hands of consumers, this will result in lower the demand of products.
- The development of an economy depends very much on the infrastructure available.
- The industry life cycle theory is generally attributed to Julius Grodinsky.
- The cost-structure that is the fixed and variable cost, affect the cost of production and profitability of the firm.
- Company analysis is the final stage of fundamental analysis.
- A technical analysis believes that the share price is determined by the demand and supply forces operating in the market.

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Self Assessment

1. Fundamental analysis is really a logical and _____ approach to estimating the future dividends and share price, it is based on the basic premise that share price is determined by a number of fundamental factors relating to the economy, industry and company.
   a. practical
   b. realistic
   c. systematic
   d. rational

2. When each share is assumed to have an economic worth based on its present and future earning capacity, what is it called?
   a. Intrinsic value or fundamental value
   b. Fundamental analysis
   c. Economic analysis
   d. Industry analysis

3. Match the following

1. Depression	A. Investments and production are maintained at a high level to satisfy the high demand.
2. Recovery stage	B. During this stage, demand is low and declining.
3. Boom	C. In this stage the economy slowly begin to experience a downturn in demand, production employment etc. the profits of companies are also start to decline.
4. Recession	D. Demand picks up leading to more investments in the economy.

   a. 1-B, 2-D, 3-A, 4-C
   b. 1-D, 2-C, 3-B, 4-A
   c. 1-A, 2-B, 3-C, 4-D
   d. 1-C, 2-A, 3-D, 4-B

4. What leads to erosion of purchasing power in the hands of consumers, this will result in lower the demand of products?
   a. Interest rate
   b. Boom
   c. Recession
   d. Inflation

5. Which of the following statement is true?
   a. The development of an economy does not depend on the infrastructure available.
   b. The development of an economy depends very much on the infrastructure available.
   c. The process of an economy depends on the infrastructure available.
   d. The development of exchange rate depends very much on the infrastructure available.

6. A _____ of the rupee improves the competitive position of Indian products in the foreign markets, thereby stimulating exports.
   a. depreciation
   b. development
   c. productivity
   d. wastage

7. Which of the following is the first stage in the industrial life cycle of a new industry, where the technology as well as the product are relatively new and have not reached a state of perfection?
   a. Expansion stage
   b. Stagnation stage
   c. Decay stage
   d. Pioneering stage

8. Which of the following statement is false?
   a. Pioneering stage is characterised by rapid growth in demand for the output of industry.
   b. Expansion stage occurs when the products of the industry are no longer in demand.
   c. Excess supply reduces the profitability of the industry through a decline in the unit price realisation.
   d. Insufficient supply tends to improve the profitability through higher unit price realisation.

9. _____ analysis is the final stage of fundamental analysis.
   a. Economic
   b. Industry
   c. Company
   d. Future

10. Who formulated a hypothesis that the stock market does not move on random basis, but is influenced by three distinct cyclical trends that guide its direction?
   a. Charles H. Dow
   b. Julius Grodinsky
   c. Mike Tyson
   d. Charles Darwin

Chapter IV

Portfolio Management

Aim

The aim of this chapter is to:

- introduce portfolio management
- explain the portfolio meaning and definition
- explicate objectives of portfolio management

Objectives

The objectives of this chapter are to:

- explain portfolio theories
- elucidate the expected rate of return and risk of portfolio
- explicate arbitrage price theory

Learning outcome

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

- identify market efficiency theory
- understand security analysis and portfolio management
- recognise risk of the portfolio

4.1 Introduction

In India, Portfolio Management is still in its infancy. Barring a few Indian banks, foreign banks and UTI, no other agency had professional Portfolio management until 1987. After the success of Mutual Funds in Mutual Funds, since 1987, Professional Portfolio Management, backed by competent research staff became the order of the day. After the success of Mutual Funds in Portfolio Management, a number of brokers and Investment Consultants, some of whom are also professionally qualified have become Portfolio Managers. They have managed the funds of clients on both discretionary and nondiscretionary basis. It was found that many of them, including Mutual Funds have guaranteed a minimum return or capital appreciation and adopted all kinds of incentives, which are now prohibited by SEBI. They resorted to speculative over trading and insider trading, discounts, etc., to achieve their targeted returns to the clients, which are also prohibited by SEBI.

The recent CBI probe into the operations of many market dealers has revealed the unscrupulous practices by banks, dealers and brokers in their portfolio operations. The SEBI has then imposed stricter rules, which included their registration, a code of conduct and minimum infrastructure, experience and expertise, etc. It is no longer possible for any unemployed youth, or retired person or self-styled consultant to engage in Portfolio Management without the SEBI's licence. The guidelines of SEBI are in the direction of making Portfolio Management a responsible professional service to be rendered by experts in the field.

Basically portfolio management involves the following:

- A proper investment decision-making of what to buy and sell.
- Proper money management in terms of investment in a basket of assets, so as to satisfy the asset preferences of investors.
- Reduce the risk and increase returns.

4.1.1 Portfolio Meaning and Definition

"The life of every man is diary in which he means to write one story, and writes another; and his humblest hour is when he compares the volume as it is with what he vowed to make it." by, J. M. Barrie

The traditional investments' course covers two principal topics:

- Security analysis
- Portfolio management

Security analysis

Security Analysis involves estimating the merits and demerits of individual investments. Portfolio Management concerns the construction and maintenance of a collection of investments.

Portfolio management

The portfolio management primarily involves reducing risks rather than increasing return. Return is obviously important, though, and the ultimate objective of the portfolio manager is to achieve a chosen level of return by incurring the least possible risk. The aim of portfolio management is to achieve the maximum return from a portfolio, which has been delegated to be managed by an investment manager or financial institution. The manager has to balance the parameters which define a good investment, i.e., security, liquidity and return. The goal is to obtain the highest return for the client from the managed portfolio.

The purpose of the systematic development and implementation of an investment strategy is to achieve the investor's financial goals. Often, portfolio management is mistaken for the simple buying of new securities and the selling of current holdings.

The process of managing assets and investments in order to achieve desired organisational outcome consists of the following activities:

- Selection
- Management
- Evaluation

4.1.2 Objectives of Portfolio management

There are four traditional objectives. They are as outlined below:

- Stability of principal
- Income
- Growth of income
- Capital appreciation

Stability of principal

Sometimes, the beneficiary of a portfolio cannot stand any chance of loss to the original principal. This might be because of by law provisions, statute, or the client's attitude towards risk. When someone says, "I don't want any chance of losing the money I invest." The fund manager should interpret this person's objective as stability of principal. This is the most conservative portfolio, and over the long-run, it will generate the most modest return. When stability of principal is the objective, the appropriative investment vehicles include any of the money market instruments and bank certificates.

Income

The income objectives differ from stability of principal in that; there is no specific prescription against declines in principal values. For instance, a new issue of five year Treasury notes might have a coupon rate of 9 percent. If the fund manager were to buy Rs. 10,000 of these at par, they would yield Rs. 900 per year. However, these securities are marketable, and they are interest rate sensitive. If the general level of interest rates rises, the market value of these securities will fall. On paper, the foundation will show a loss on these securities relative to their purchase price. If they are held until maturity, though, they will be redeemed at the original par value, the paper loss will disappear. Had it been necessary to sell them prior to maturity, an actual realised loss certainly would have been possible.

The consequence of fluctuations in market values varies. In this instance of a fund to benefit a public non-profit organisation, an income objective is probably more reasonable than one of stability of principal, when income is the chosen objective; appropriate investments include corporate bonds, government bonds, government agency securities, preferred stock and perhaps common stock.

Growth income

The time value of money is one of the two key concepts in finance. Rupees today are worth more than an equal number at any point in the future. A growth of income objective sacrifices some current return for some purchasing power protection. This objective usually involves a reduced initial income payout, but one that grows over time and eventually overtakes the level amount from an income objective. Funds with growth of income as the primary objective often seek to have the annual income increase by at least the rate of inflation. A growth of income objective requires some investment in equity securities.

Capital appreciation

Occasionally, it is not important that a portfolio generates any income at all. A retired couple, for example, might receive pension and social security cheques that are sufficient to finance their retirement life cycle. If these people have an investment portfolio, they might be more interested in having it continue to grow in value rather than getting additional income from it. There is also an income tax consideration. Interest or dividends received are immediately taxable. Capital gains are not taxed, until they are actually realised.

4.2 Portfolio Theory

Portfolio theories are listed in the paragraphs given below.

4.2.1 Markowitz Portfolio Theory

The author of the modern portfolio theory is Harry Markowitz who introduced the analysis of the portfolios of investments in his article 'Portfolio Selection' published in the Journal of Finance in 1952. The new approach presented in this article included portfolio formation by considering the expected rate of return and risk of individual stocks and, crucially, their interrelationship as measured by correlation. Prior to this, investors would examine investments individually, build up portfolios of attractive stocks, and not consider how they are related to each other. Markowitz

showed how it might be possible to better of these simplistic portfolios by taking into account the correlation between the returns on these stocks. The diversification plays a very important role in the modern portfolio theory. Markowitz approach is viewed as a single period approach. At the beginning of the period, the investor must make a decision in what particular securities to invest and hold these securities until the end of the period. As portfolio is a collection of securities, this decision is equivalent to selecting an optimal portfolio from a set of possible portfolios. Essentiality of the Markowitz portfolio theory is the problem of optimal portfolio selection.

The method that should be used in selecting the most desirable portfolio involves the use of indifference curves. Indifference curves represent an investor's preferences for risk and return. These curves should be drawn, putting the investment return on the vertical axis and the risk on the horizontal axis. Following Markowitz approach, the measure for investment return is expected rate of return and a measure of risk is standard deviation. The exemplified map of indifference curves for the individual risk-averse investor is presented in Fig. 4.1. Each indifference curve here, (I1, I2 and I3) represents the most desirable investment or investment portfolio for an individual investor. That means, that any of investments (or portfolios) plotted on the indifference curves (A, B, C or D) are equally desirable to the investor.

Features of indifference curves:

- All portfolios that lie on a given indifference curve are equally desirable to the investor. An implication of this feature: Indifference curves cannot intersect.
- An investor has an infinitive number of indifference curves. Every investor can represent several indifference curves (for different investment tools).

Every investor has a map of the indifference curves representing his or her preferences for expected returns and risk (standard deviations) for each potential portfolio.

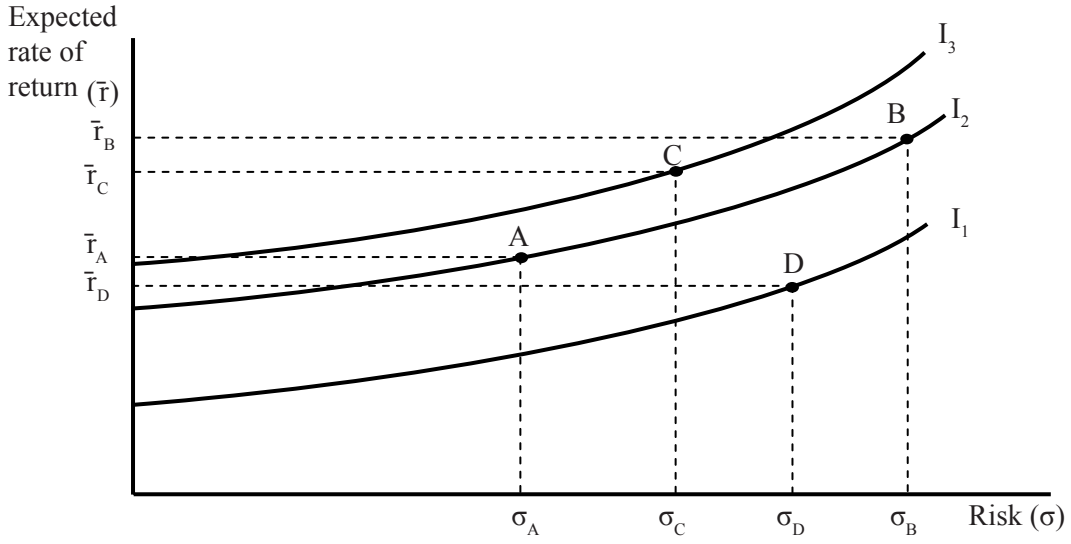

Fig. 4.1 Map of indifferent curves for a risk-averse investor
(Source: http://www.bcci.bg/projects/latvia/pdf/8_IAPM_final.pdf)

Two important fundamental assumptions while examining indifference curves and applying them to Markowitz portfolio theory are as follows:

- The investors are assumed to prefer higher levels of return to lower levels of return, because the higher levels of returns allow the investor to spend more on consumption at the end of the investment period. Thus, given two portfolios with the same standard deviation, the investor will choose the portfolio with the higher expected return. This is called an assumption of non-satiation.
- Investors are risk-averse. It means that the investor, when given the choice will choose the investment or investment portfolio with the smaller risks. This is called assumption of risk aversion.

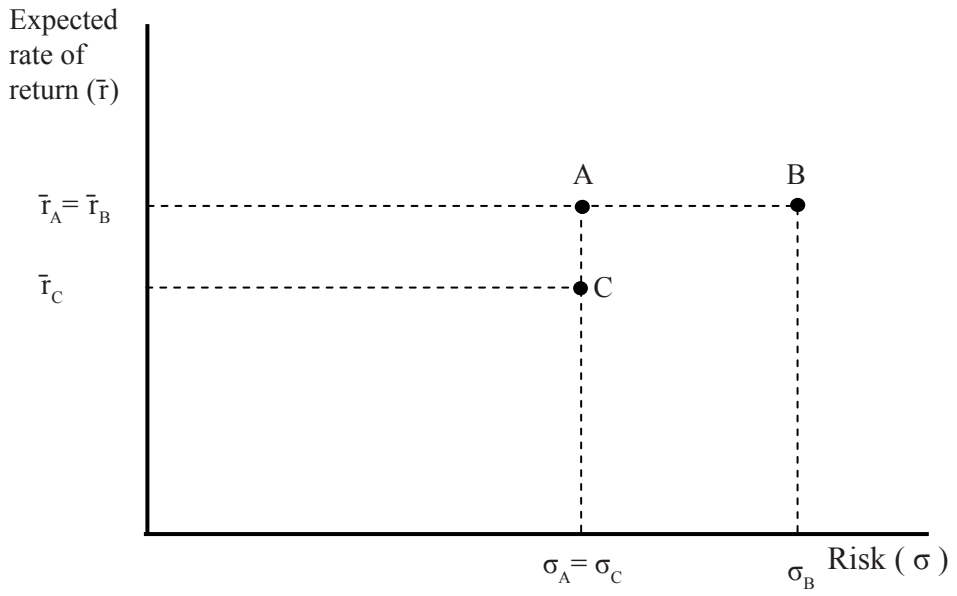

Fig. 4.2 Portfolio choice using the assumptions of non-satiation and risk aversion
(Source: http://www.bcci.bg/projects/latvia/pdf/8_IAPM_final.pdf)

Fig. 4.2 gives an example how the investor chooses between 3 investments, A, B and C. By following the assumption of non-satiation, investor will choose A or B which have the higher levels of expected return than C. By following the assumption of risk aversion, investor will choose A, despite of the same level of expected returns for investment A and B, because the risk (standard deviation) for investment A is lower than for investment B. In this choice, the investor follows so called furthest northwest 'rule'.

In reality, there are an infinitive number of portfolios available for the investment. It means that the investor needs to evaluate all these portfolios on return and risk basis. Markowitz portfolio theory answers this question using efficient set theorem. An investor will choose his/her optimal portfolio from the set of the portfolios that:

- Offer maximum expected return for varying level of risk.
- Offer minimum risk for varying levels of expected return.

Efficient set of portfolios involves the portfolios that the investor will find optimal ones. These portfolios are lying on the 'northwest boundary' of the feasible set and are called an efficient frontier. The efficient frontier can be described by the curve in the risk-return space with the highest expected rates of return for each level of risk. Feasible set is opportunity set, from which the efficient set of portfolio can be identified. The feasibility set represents all portfolios that could be formed from the number of securities and lie within the boundary of the feasible set.

In Fig. 4.3, feasible and efficient sets of portfolios are presented. Considering the assumptions of non-satiation and risk aversion discussed earlier in this section, only those portfolios lying between points A and B on the boundary of feasibility set investor will find the optimal ones. All the other portfolios in the feasible set are inefficient portfolios. Furthermore, if a risk-free investment is introduced into the universe of assets, the efficient frontier becomes the tangential line, this line is called the Capital Market Line (CML) and the portfolio at the point at which it is tangential (point M) is called the Market Portfolio.

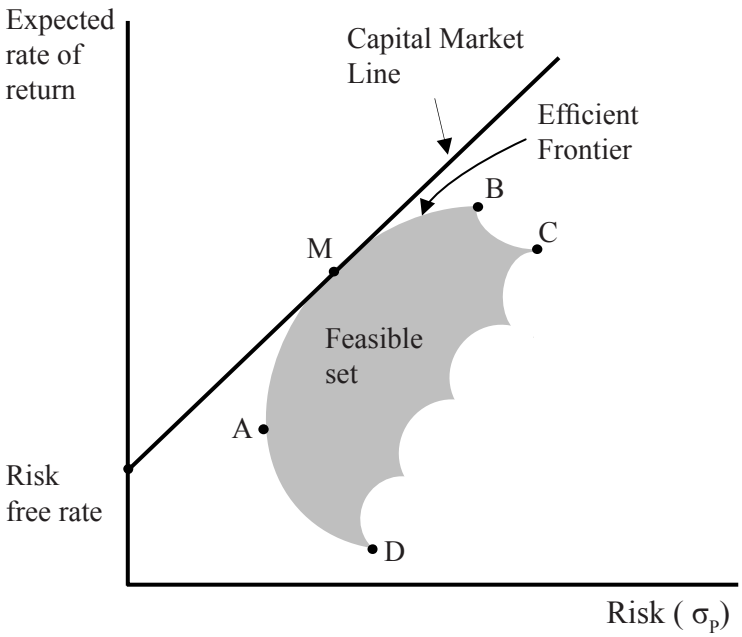

Fig. 4.3 Feasible set and efficient set of portfolios (efficient frontier)
(Source: http://www.bcci.bg/projects/latvia/pdf/8_IAPM_final.pdf)

4.2.2 The Expected Rate of Return and Risk of Portfolio

By following Markowitz efficient set portfolios approach, an investor should evaluate alternative portfolios inside feasibility set on the basis of their expected returns and standard deviations using indifference curves. Thus, the methods for calculating expected rate of return and standard deviation of the portfolio must be discussed. The expected rate of return of the portfolio can be calculated in some alternative ways. The Markowitz focus was on the end-of-period wealth (terminal value) and using these expected end-of-period values for each security in the portfolio the expected end-of-period return for the whole portfolio can be calculated. However, the portfolio really is the set of the securities. Thus, the expected rate of return of a portfolio should depend on the expected rates of return of each security included in the portfolio. This alternative method for calculating the expected rate of return on the portfolio ($E_{(r)_p}$) is the weighted average of the expected returns on its component securities:

$$E_{(r)p} = \sum_{i=1}^{n} w_i * E_{i(r)} = E_{1(r)} + w_2 * E_{2(r)} + \ldots + E_{n(r)}$$

Due to the portfolio's expected return is a weighted average of the expected returns of its securities. The contribution of each security to the portfolios' expected rate of return depends on its expected return and its proportional share from the initial portfolio's market value (weight). Nothing else is relevant. The conclusion here could be that the investor who simply wants the highest possible expected rate of return must keep only one security in his portfolio which has a highest expected rate of return. However, why the majority of investors doesn't do so and keep several different securities in their portfolios? This is as they try to diversify their portfolios aiming to reduce the investment portfolio risk.

Risk of the portfolio

The most often used measure for the risk of investment is standard deviation, which shows the volatility of the securities' actual return from their expected return. If a portfolio's expected rate of return is a weighted average of the expected rates of return of its securities, the calculation of standard deviation for the portfolio can't simply use the same approach.

The reason is that the relationship between the securities in the same portfolio must be taken into account. The relationship between the assets can be estimated using the covariance and coefficient of correlation. As covariance can range from "–" to "+" infinity, it is more useful for identification of the direction of relationship (positive or negative), coefficients of correlation always lie between -1 and +1 and is the convenient measure of intensity and direction of the relationship between the assets. Risk of the portfolio, which consists of 2 securities (A ir B):

$$\delta_p = (w_A^2 * \delta_A^2 + w_B^2 * \delta_B^2 + 2w_A * w_B * k_{AB} * \delta_A * \delta_B)^{1/2}$$

Here: w_A or w_B - the proportion of the portfolio's initial value invested in security A and B ($w_A + w_B = 1$);

δ_A or δ_B -Standard deviation of security A and B.

k_{AB} -Coefficient of correlation between the returns of security A and B.

Standard deviation of the portfolio consisting n securities:

$$\delta = (\sum_{i=1}^{n}\sum_{j=1}^{n} w_i w_j k_{ij} \delta_j)^{1/2}$$

Here: w_i ir w_j - the proportion of the portfolio's initial value invested in security i and j ($w_i + w_j = 1$);

δ_i or δ_j -Standard deviation of security i and j.

k_{ij} -Coefficient of correlation between the returns of security i and j.

4.3 Arbitrage Price Theory

APT was proposed by Stephen S. Rose and presented in his article 'The arbitrage theory of Capital Asset Pricing', published in Journal of Economic Theory in1976. Still, there is a potential for it and it may sometimes displace the CAPM. In the CAPM, returns on individual assets are related to returns on the market as a whole. The key point behind APT is the rational statement that the market return is determined by a number of different factors. These factors can be fundamental factors or statistical. If these factors are essential, there to be no arbitrage opportunities there must be restrictions on the investment process. Arbitrage is understood as the earning of riskless profit by taking advantage of differential pricing for the same assets or security. Arbitrage is a widely applied investment tactic.

APT states, that the expected rate of return of security J is the linear function from the complex economic factors common to all securities and can be estimated using formula:

$$E_{(rJ)} = E_{(\dot{r}J)} + \beta_{2J} I_{2J} + \cdots + \beta_{nJ} I_{nJ} + \varepsilon_J$$

Here: $E_{(rJ)} - expected\ return\ on\ stock\ J$

$E_{(\dot{r}J)} -$ *expected rate of return for security J, if the influence of all factors is* 0

$I_{iJ} -$ *the change in the rate of return for security J,*

if the influences by econimic factor $i\ (i = 1, \ldots., n)$

$\beta_{iJ} -$ *coefficient Beta, showing sensitivity of security´s J*

rate of return upon the factor i(this influence could be both positive or negative)

$\varepsilon_J -$ *Error of rounding for the security J(Expected value* $- 0)$

It is important to note that the arbitrage in the APT is only approximate, relating diversified portfolios, on assumption that the asset unsystematic (specific) risks are negligible compared with the factor risks. There could presumably be an infinitive number of factors, although the empirical research done by S. Ross together with R. Roll (1984) identified the following four factors, economic variables, to which assets having even the same CAPM Beta, are differently sensitive:

- Inflation
- Industrial production
- Risk premiums
- Slope of the term structure in interest rates

In practice, an investor can choose the macroeconomic factors which seem important and related with the expected returns of the particular asset. The examples of possible macroeconomic factors which could be included in using APT model:

- GDP growth
- An interest rate
- An exchange rate
- A default spread on corporate bonds, etc.

Including more factors in APT model seems logical. The institutional investors and analysts closely watch macroeconomic statistics, such as the money supply, inflation, interest rates, unemployment, changes in GDP, political events and many others. Reason for this might be their belief that new information about the changes in these macroeconomic indicators will influence future asset price movements. However, it is important to point out that not all investors or analysts are concerned with the same set of economic information and they differently assess the importance of various macroeconomic factors to the assets they have invested already or are going to invest.

At the same time, the large number of the factors in the APT model would be impractical, because the models seldom are 100 percent accurate and the asset prices are function of both macroeconomic factors and noise. The noise is coming from minor factors, with a little influence to the result, expected rate of return.

The APT does not require identification of the market portfolio, but it does require the specification of the relevant macroeconomic factors. Much of the current empirical APT research is focused on identification of these factors and the determination of the factors' Betas. This problem is still unsolved. Although more than two decades have passed, since S. Ross introduced APT model, it has yet to reach the practical application stage. The CAPM and APT are not really essentially different, because they are developed for determining an expected rate of return based on one factor (market portfolio-CAPM) or a number of macroeconomic factors (APT). However, both models predict how the return on asset will result from factor sensitivities and this is of great importance to the investor.

4.4 Market Efficiency Theory

The concept of market efficiency was proposed by Eugene Fama in 1965, when his article 'Random Walks in Stock Prices' was published in Financial Analyst Journal. Market efficiency means that the price which investor is paying for financial asset (stock, bond, other security) fully reflects fair or true information about the intrinsic value of this specific asset or fairly describes the value of the company, the issuer of this security. The key term in the concept of the market efficiency is the information available for investors trading in the market. It is stated that the market price of stock reflects:

- All known information, including:
  - Past information, e.g., last year's or last quarter's, month's earnings
  - Current information as well as events, that have been announced, but are still forthcoming, e.g., shareholders' meeting.
- Information that can reasonably be inferred, for example, if many investors believe that ECB will increase interest rate in the nearest future or the government deficit increases, prices will reflect this belief before the actual event occurs.

Capital market is efficient, if the prices of securities which are traded in the market react to the changes of situation immediately, fully and credibly reflect all the important information about the security's future income and risk-related with generating this income.

What is the important information for the investor? From economic point of view, the important information is defined as such information which has direct influence to the investor's decisions seeking for his defined financial goals. Example, the essential events in the joint stock company, published in the newspaper, etc. Market efficiency requires that the adjustment to new information occurs very quickly as the information becomes known. Internet has made the markets more efficient in the sense of how widely and quickly information is disseminated.

There are 3 forms of market efficiency under efficient market hypothesis:

- Weak form of efficiency
- Semi-strong form of efficiency
- Strong form of the efficiency

Weak form of efficiency

Under the weak form of efficiency stock prices are assumed to reflect any information that may be contained in the past history of the stock prices. So, if the market is characterised by weak form of efficiency, no one investor or any group of investors should be able to earn over the defined period of time, abnormal rates of return by using information about historical prices available for them and by using technical analysis. Prices will respond to news, but if this news is random then price changes will also be random.

Semi-strong form of efficiency

Under the semi-strong form of efficiency, all publicly available information is presumed to be reflected in stocks' prices. This information includes information in the stock price series as well as information in the firm's financial reports, the reports of competing firms, announced information relating to the state of the economy and any other publicly available information, relevant to the valuation of the firm. Note that the market with a semi-strong form of efficiency encompasses the weak form of the hypothesis, because the historical market data is a part of the larger set of all publicly available information. If the market is characterised by semi-strong form of efficiency, no one investor or any group of investors should be able to earn over the defined period of time, abnormal rates of return by using information about historical prices and publicly available fundamental information (such as, financial statements) and fundamental analysis.

Strong form of the efficiency

The strong form of efficiency which asserts that stock prices fully reflect all information, including private or inside information, as well as that which is publicly available. This form takes the notion of market efficiency to the ultimate extreme. Under this form of market, efficiency securities' prices quickly adjust to reflect both the inside and public information. If the market is characterised by strong form of efficiency, no one investor or any group of investors should be able to earn over the defined period of time abnormal rates of return by using all information available for them.

The validity of the market efficiency hypothesis, whichever form is of great importance to the investors because it determines whether anyone can outperform the market, or whether the successful investing is all about luck. Efficient market hypothesis does not require behaving rationally, only that in response to information, there will be a sufficiently large random reaction that an excess profit cannot be made.

The concept of the market efficiency now is criticised by some market analysts and participants by stating that no one market can be fully efficient as some irrational behaviour of investors in the market occurs which is more based on their emotions and other psychological factors than on the information available. However, at the same time, it can be shown that the efficient market can exist, if in the real markets following events occur:

- A large number of rational, profit-maximising investors exist, who are actively and continuously analysing valuing and trading securities.
- Information is widely available to market participants at the same time and without or at very small cost.
- Information is generated in a random walk manner and can be treated as independent.
- Investors react to the new information quickly and fully, though causing market prices to adjust accordingly.

Summary

- In India, Portfolio Management is still in its infancy.
- After the success of Mutual Funds in Portfolio Management, a number of brokers and Investment Consultants some of whom are also professionally qualified have become Portfolio Managers.
- "The life of every man is diary in which he means to write one story, and writes another; and his humblest hour is when he compares the volume as it is with what he vowed to make it." This is the definition of Portfolio Management by, J. M. Barrie.
- Security Analysis involves estimating the merits and demerits of individual investments.
- The portfolio management primarily involves reducing risk rather than increasing return.
- When stability of principal is the objective, the appropriative investment vehicles include any of the money market instruments and bank certificates.
- The income objectives differ from stability of principal in that there is no specific prescription against declines in principal values.
- The time value of money is one of the two key concepts in finance.
- The author of the modern portfolio theory is Harry Markowitz who introduced the analysis of the portfolios of investments in his article 'Portfolio Selection' published in the Journal of Finance in 1952.
- The most often used measure for the risk of investment is standard deviation, which shows the volatility of the securities actual return from their expected return.
- APT was proposed by Stephen S. Rose and presented in his article 'The arbitrage theory of Capital Asset Pricing', published in Journal of Economic Theory in 1976.
- The concept of market efficiency was proposed by Eugene Fama in 1965, when his article 'Random Walks in Stock Prices' was published in Financial Analyst Journal.
- Under the weak form of efficiency, stock prices are assumed to reflect any information that may be contained in the past history of the stock prices.
- Under the semi-strong form of efficiency, all publicly available information is presumed to be reflected in stocks' prices.
- The strong form of efficiency which asserts that stock prices fully reflect all information, including private or inside information, as well as that which is publicly available.

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- *CFA Level I Portfolio Management An Overview Video Lecture by Mr. Arif Irfanullah Part 2.* [Video online] Available at: <https://www.youtube.com/watch?v=Zxvxuct4w60> [Accessed 07 July 2014].

Recommended Reading

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Self Assessment

1. The traditional investments course covers _____ principal topics.
   a. three
   b. two
   c. five
   d. six

2. Which of the following concerns the construction and maintenance of a collection of investments?
   a. Security analysis
   b. Selection management
   c. Portfolio management
   d. Stability of principal

3. Match the following

1. Security analysis	A. It primarily involves reducing risk rather than increasing return.
2. Portfolio management	B. Under this form of efficiency, all publicly available information is presumed to be reflected in stocks' prices.
3. Weak form of efficiency	C. It involves estimating the merits and demerits of individual investments.
4. Semi-strong form of efficiency	D. Under this, stock prices are assumed to reflect any information that may be contained in the past history of the stock prices.

   a. 1-D, 2-C, 3-B, 4-A
   b. 1-B, 2-D, 3-A, 4-C
   c. 1-C, 2-A, 3-D, 4-B
   d. 1-A, 2-B, 3-C, 4-D

4. The aim of portfolio management is to achieve the _____ return from a portfolio which has been delegated to be managed by an investment manager or financial institution.
   a. maximum
   b. minimum
   c. lowest
   d. only

5. What are not taxed until they are actually realised?
   a. Growth income
   b. Income
   c. Assets
   d. Capital gains

6. Which of the following statement is true?
   a. None of the portfolios that lie on a given indifference curve are equally desirable to the investor.
   b. All portfolios that lie on a given indifference curve are equally desirable to the investor.
   c. Four portfolios that lie on a given indifference curve are equally desirable to the investor.
   d. All portfolios that lie on a given indifference curve are unequally desirable to the investor.

7. _____ curves represent an investor's preferences for risk and return.
   a. Financial
   b. Indifference
   c. Market
   d. Portfolio

8. Who is the author of the modern portfolio theory?
   a. Harry Markowitz
   b. Stephen S. Rose
   c. R. Roll
   d. Eugene Fama

9. Who proposed the concept of market efficiency?
   a. Harry Markowitz
   b. Stephen S. Rose
   c. R. Roll
   d. Eugene Fama

10. Which of the following statement is false?
   a. An investor has an infinitive number of indifference curves.
   b. Investors are risk averse.
   c. There are 6 forms of market efficiency under efficient market hypothesis.
   d. Arbitrage is widely applied investment tactic.

Chapter V

Capital Asset Pricing Model

Aim

The aim of this chapter is to:

- introduce capital asset pricing model
- explain CAPM equilibrium
- explicate uses and limitations of CAPM

Objectives

The objectives of this chapter are to:

- enlist the CAPM assumptions
- elucidate capital market line
- explain security market line

Learning outcome

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

- identify pricing and discounting
- understand the CAPM and the single-index
- recognise APT and CAPM

5.1 Introduction

The analysis of equilibrium model and Capital Asset Pricing Model (CAPM) the expected returns and variances as given data and these to determine the investment policy. The intellectual step now is to consider the explanation for the observed data. Equilibrium models explain the process of investor choice and market clearing that lies behind the observed pattern of asset returns. Higher expected return means higher risk is already clear. An equilibrium model predicts exactly how much more expected return is required to compensate for additional risk.

The value of an equilibrium model and of the Capital Asset Pricing Model (CAPM) in particular, is that it allows the evaluation of portfolio performance. The model generates an equilibrium relationship between expected return and risk. If a portfolio delivers a lower level of expected return than predicted by this relationship for its degree of risk, then it is a poor portfolio. The CAPM model also carries implications in the area of corporate finance. It can be used as a tool in capital budgeting and project analysis.

The CAPM provides an explanation of the concept of financial market equilibrium. A position of equilibrium is reached, when the supply of assets is equal to the demand. This position is achieved by the adjustment of asset prices and hence the returns on assets. This adjustment occurs through trading behaviour. If the expected return on an asset is viewed as high, relative to its risk, then demand for the asset will exceed supply. The price of the asset will rise, and the expected return will fall, until equilibrium is achieved. The particular assumptions about investors' preferences and information made by a model, then determine additional features of the equilibrium.

The CAPM determines very precise equilibrium relationships between the returns on different assets. That is, they construct the efficient set and choose the portfolio that makes the value of their mean variance expected utility as high as possible. Some additional assumptions are then added and the implications are then traced. It is shown that this model leads to especially strong conclusions concerning the pricing of assets in equilibrium. If the model is correct, these can be very useful in guiding investment and evaluating investment decisions.

5.1.1 Assumptions

The set of assumptions upon which the CAPM is based upon, are now described. The interpretation of each assumption is also discussed. The first set of assumptions describes properties that all assets possess. They are as follows:

- All assets are marketable: This is the basic idea that all assets can be traded, so that all investors can buy anything that is available. For the vast majority of assets, this is an acceptable assumption. How easily an asset can be traded depends upon the extent to which an organised market exists. There are some assets that cannot be easily traded. An example is human capital. It can be rented as a labour service, but cannot be transferred from one party to another
- All assets are infinitely divisible: The consequence of this assumption is that, it is possible to hold any portfolio no matter what are the portfolio proportions.
- In practice, assets are sold in discrete units: It is possible to move close to this assumption by buying a fraction of mutual funds. For instance, treasury bills may have denominations of $100,000, but a fraction of one can be bought, if it is shared between several investors. The second set of assumptions characterises the trading environment.
- No transaction costs: Transactions costs are the costs of trading. Brokers charge commission for trade and there is a spread between the buying and selling prices. The role of the assumption is to allow portfolios to be adjusted costless to continually ensure optimality.
- Short sales are allowed: The role of short sales has already been described in the extension of the efficient frontier. They are permitted in actual financial markets. Where the CAPM diverges from practice is that, it is assumed there are no charges for short selling. In practice, margin must be deposited with the broker who is costly to the investor, since it earns less than the market return.
- No taxes: Taxes affect the returns on assets and tax rules can alter the benefit of capital gains relative to dividends and coupons. The assumption that there are no taxes removes this distortion from the system. The next pair of assumptions implies that the market is perfect.

- Lending and borrowing can be undertaken at the risk-less rate: Investors face a single rate of interest. This is the assumption of a perfect capital market. There are no asymmetries of information, that prevent lending and borrowing at a fair rate of interest.
- No individual can affect an asset price: This is idea of a competitive market where each trader is too small to affect price. It takes away any market power and rules out attempts to distort the market. The next set of assumptions describes the trading behaviour of investors.
- All investors have mean/variance preferences: This allows us to set the model in mean variance space and analyse choice through the efficient frontier.
- All investors have a one period horizon: This simplifies the investment decision. Final assumption ties together all the individual investors.
- All investors hold same expectations: This makes the investors identical in some sense. Note that the investors are not identical, because they can differ in their risk aversion. Some may be very risk-averse some may be less risk-averse.

Example

Give example of same information and different preferences. This set of assumptions combines the Markowitz model of portfolio choice with the assumption that investors have the same information and reach the same assessment of the expected return and variance of return for every asset. It is the information and assessment assumptions that permit the aggregation of individual choices into market equilibrium with specific properties.

5.1.2 CAPM Equilibrium

The general properties of equilibrium are now determined by tracing through the implications of the CAPM assumptions. All investors have the same information and expectations. They use this information to construct the portfolio frontier. Having the same expectations, it follows that the investors perform the same calculations. Hence all investors construct the same portfolio frontier for risky assets and assess there to be the same trade-off between expected return and risk. The general form of portfolio frontier for the risky assets constructed by all investors is shown in Fig. 5.1.

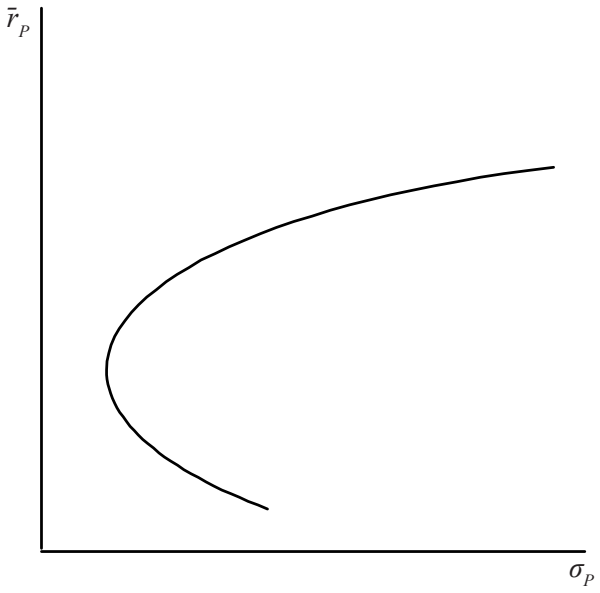

Fig. 5.1 Portfolio frontier

(Source: http://people.exeter.ac.uk/gdmyles/Teaching/IAPM/finb1.pdf)

Given this portfolio frontier, all the investors must face the same efficient frontier. The risk-free rate is the same for all and the tangency profile must be the same. Given that they face the same efficient frontier; all investors must combine the risky tangent portfolio M and the risk-free asset. However, the proportions in which they are combined will differ according to the degree of risk-aversion of each investor. Some may borrow at the risk-free rate, while

others may lend. As all consumers are purchasing portfolio M, this must be the market portfolio of risky assets. By market portfolio, it is meant a portfolio with the risky assets in the same proportions as they are found in the market as a whole. This is the separation principle that states that, an investor only needs to purchase two assets. All investors combine the risk free assets and the market portfolio.

What differs between investors is the proportion of these in the portfolio. The more risk-averse is an investor; the higher will be the proportion of the risk-free asset in the portfolio. Less risk-adverse investors will hold a larger proportion of the market portfolio. Those with a low enough level of risk aversion will go short in the risk-free asset to invest in the market portfolio. The market portfolio is assumed to be well-diversified. The consequence of this is that non-systematic risk is diversified away by all investors, since they hold the market portfolio. Finally, if all investors are purchasing the same risky portfolio, there can be no short selling in equilibrium. If any investor were short-selling a risky asset, all would be short-selling. This cannot be equilibrium, since the aggregate demand for the asset would be negative.

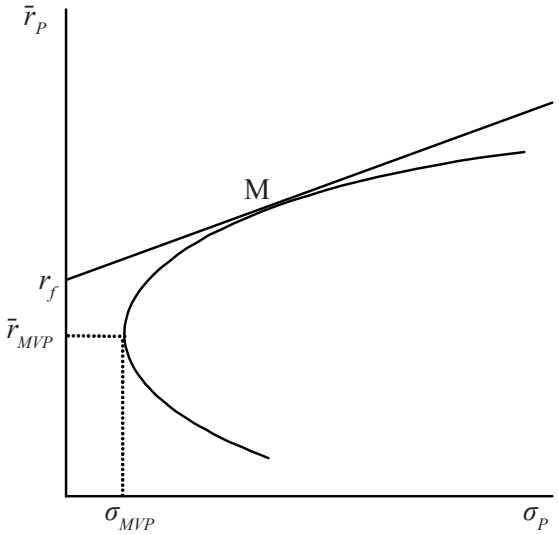

Fig. 5.2 Efficient frontier and market portfolio
(Source: http://people.exeter.ac.uk/gdmyles/Teaching/IAPM/finb1.pdf)

5.1.3 Uses and Limitations

The uses and limitations of CAPM are discussed in the paragraphs given below.

Advantages of the CAPM

The CAPM has several advantages over other methods of calculating required return, explaining why it has remained popular for more than 40 years:

- It considers only systematic risk, reflecting a reality in which most investors have diversified portfolios from which unsystematic risk has been essentially eliminated.
- It generates a theoretically-derived relationship between required return and systematic risk which has been subject to frequent empirical research and testing.
- It is generally seen as a much better method of calculating the cost of equity than the Dividend Growth Model (DGM) in that, it explicitly takes into account a company's level of systematic risk relative to the stock market as a whole.
- It is clearly superior to the WACC in providing discount rates for use in investment appraisal.

Disadvantages of the CAPM

The CAPM suffers from a number of disadvantages and limitations that should be noted in a balanced discussion of this important theoretical model. In order to use the CAPM, values need to be assigned to the risk-free rate of return, the return on the market, or the Equity Risk Premium (ERP) and the equity beta. The yield on short-term Government debt, which is used as a substitute for the risk-free rate of return, is not fixed, but changes on a daily-basis according to economic circumstances. A short-term average value can be used in order to smooth out this volatility.

Finding a value for the ERP is more difficult. The return on a stock market is the sum of the average capital gain and the average dividend yield. In the short-term, a stock market can provide a negative rather than a positive return, if the effect of falling share prices outweighs the dividend yield. It is therefore usual to use a long-term average value for the ERP, taken from empirical research, but it has been found that the ERP is not stable over time. In the UK, an ERP value of between 2% and 5% is currently seen as reasonable. However, uncertainty about the exact ERP value introduces uncertainty into the calculated value for the required return.

Beta values are now calculated and published regularly for all stock exchange-listed companies. The problem here is that uncertainty arises in the value of the expected return, because the value of beta is not constant, but changes over-time, using the CAPM in investment appraisal. Problems can arise when using the CAPM to calculate a project-specific discount rate. For example, one common difficulty is finding suitable proxy betas, since proxy companies very rarely undertake only one business activity. The proxy beta for a proposed investment project must be disentangled from the company's equity beta. One way to do this is to treat the equity beta as an average of the betas of several different areas of proxy company activity, weighted by the relative share of the proxy company market value arising from each activity. However, information about relative shares of proxy company market value may be quite difficult to obtain.

A similar difficulty is that the un-gearing of proxy company betas uses capital structure information that may not be readily available. Some companies have complex capital structures with many different sources of finance. Other companies may have debts that are not traded or use complex sources of finance, such as convertible bonds. The simplifying assumption that the beta of debt is zero will also lead to inaccuracy in the calculated value of the project-specific discount rate. One disadvantage in using the CAPM in investment appraisal is that the assumption of a single-period time horizon is at odds with the multi-period nature of investment appraisal. While CAPM variables can be assumed constant in successive future periods, experience indicates that this is not true in reality.

5.2 Capital Market Line (CML)

The capital market line is the name assigned to the efficient frontier in the CAPM. All efficient portfolios must lie on this line which implies that there is a linear relationship between risk and return for all portfolios chosen in equilibrium. Any portfolio above the line will be demanded by all investors. Its price will rise, and so return falls, until in equilibrium it lies on the line. The opposite applies to any portfolio below the line. Its price will fall and return will rise, until it lies on the line.

As the points $(0, r_f)$ and $(\sigma_M, \bar{r}_f)$ are both on the capital market line, its gradient can be calculated to be $\frac{\bar{r}_M - \bar{r}_f}{\sigma_M}$. From this, it follows that any portfolio, p, located on the Capital Market Line must satisfy the equation:

$$\bar{r}_p = r_f + [\frac{\bar{r}_M - \bar{r}_f}{\sigma_M}]\sigma_p \qquad 5.1$$

The interpretation of (5.1) is that r_f is the reward for 'time'. This is the return earned, when no risk is involved ($\sigma_p = 0$), but consumption is postponed. Holding the risk-free asset delays consumption for one period and an investor requires compensating for this. The compensation received is the risk-free rate of return. The gradient of the line $\frac{\bar{r}_M - \bar{r}_f}{\sigma_M}$ is the reward for 'risk' or the market price of risk. To hold risk, an investor requires compensation beyond that given by the risk-free rate. Each unit of standard deviation is rewarded by extra $\frac{\bar{r}_M - \bar{r}_f}{\sigma_M}$ units of return. The term $\frac{\bar{r}_M - \bar{r}_f}{\sigma_M}$ is the Sharpe ratio, which is used later in portfolio evaluation.

Example: Assume r_f , $\bar{r}_M$ and σ_M. Then construct capital market line. Then, take an asset σi and find the implied $\bar{r}$.

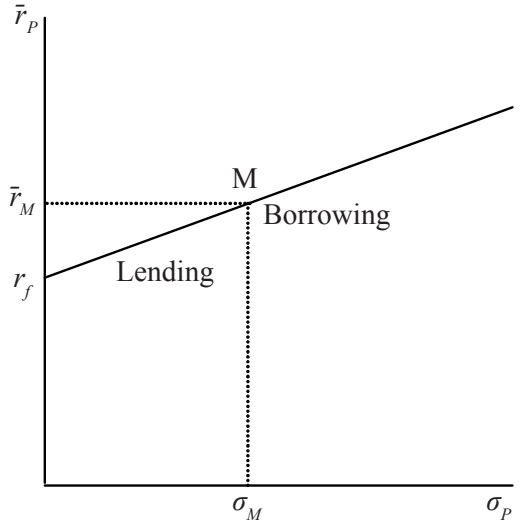

Fig. 5.3 Capital market line
(Source: http://people.exeter.ac.uk/gdmyles/Teaching/IAPM/finb1.pdf)

Before proceeding, the fact that r_p is random must be recalled. The consequence is that in any particular period the realised portfolio return may be above or below the value predicted by the capital market line. Only in expected terms are they always upon the line. This is just to stress that randomness distinguishes r_p from $\bar{r}_p$. Although non-systematic risk may be diversified away, there is still the systematic risk.

5.3 Security Market Line

The CAPM also has implications for the returns on individual assets. Consider plotting the covariance of an asset with the market against the asset's expected return. Combining M and risk-free allows movement along a line through the two points these assets determine. The covariance of the risk-free asset with the market is zero and the assets return is r_f. The covariance of the market with the market is σ_M^2. Hence the points (0,r_f) and (σ_M^2, $\bar{r}_M$.) can be linearly combined to determine the Security Market Line. In equilibrium, all assets must offer return and risk combinations that lie on this line. If there was an asset (or portfolios) located above this line, all investors would buy it. Equally, if there was an asset that lay below the line, no investor would hold it. Trading these assets must ensure that in equilibrium, they will lie on the line.

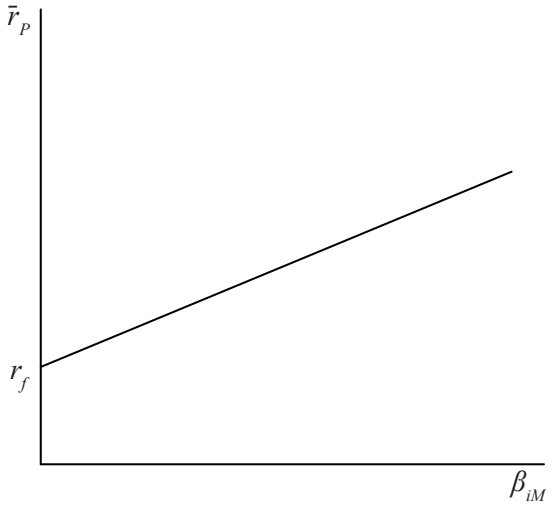

Fig. 5.4 Security market line
(Source: http://people.exeter.ac.uk/gdmyles/Teaching/IAPM/finb1.pdf)

Using the two identified points, the equation of the Security Market Line is

$$\bar{r}_i = r_f + [\frac{\bar{r}_i - r_f}{\sigma_M^2}]\sigma_{iM}, \quad (5.2)$$

or, defining, $\beta_{iM} = \frac{\sigma_{iM}}{\sigma_M^2}$

$$\bar{r}_i = r_f + [\bar{r}_i - r_f]\beta_{iM}. \quad (5.3)$$

Hence, there is a linear trade-off between risk measured by β_{iM} and return $\bar{r}_i$.

If there are any assets that lie above the line, then they are underpriced and should be purchased. Any below the line are overpriced and should be sold. In this way, the CAPM can be used to identify assets to purchase and sell.

5.4 CAPM and Single Index

The CAPM and the single-index model both generate a parameter β which determines the return on the asset. Consequently, it is important to make clear the interpretation of β_{iI} and β_{iM}.

The basic difference is that β_{iI} is derived from an assumption about the determination of returns. In particular, it is derived from a statistical model of the return process. The index on which returns are based is chosen, not specified by any underlying analysis. In contrast, β_{iM} is derived from an equilibrium theory. It emerges from the assumptions of that theory rather than being imposed upon it. The assumptions also generate a precisely defined value forβ_{iM}. Also, in the single-index model, the index 'I' is usually assumed to be the market index, but in principal could be any index. In the CAPM model, M is always the market portfolio. Finally, the CAPM provides a sufficient set off assumptions for the single index model to be the true representation of the return-generating process, rather than just an approximation. Under its assumptions, returns are generated by a linear relationship.

The two methods which are shown below will give equal results::

$$\beta_i = \frac{cov(r_i, r_m)}{var(r_m)} = \frac{cov(r_i - r_f, r_m - r_f)}{var(r_m - r_f)}$$

Example: The general relationship is used to demonstrate that $cov(r_i, r_m) = cov(r_i - r_f, r_m - r_f)$ and $var(r_m) = var(r_m - r_f)$.

5.5 Pricing and Discounting

The CAPM also has implications for asset prices. As the returns of assets are related by the Security Market Line in equilibrium, the prices must also be related. To derive the relationship for asset prices, note that the return on an asset can be written as:

$$r_i = \frac{q_i - p_i}{p_i}, \quad (5.4)$$

Where pi, is the purchase price and q_i the (random) sale price. If dividends are paid, they can be incorporated within q_i. From the security market line:

$$\bar{r}_i = r_f + \beta_{iM}[\bar{r}_M - r_f]. \quad (5.5)$$

So,

$$\frac{\bar{p}_i(1) - p_i(0)}{p_i(0)} = r_f + \beta_{i,M}[\bar{r}_M - r_f], \quad (5.6)$$

Or

$$p_i(0) = \frac{\bar{p}_i(1)}{1 + r_f + \beta_{i,M}[\bar{r}_M - r_f]}. \quad (5.7)$$

This should be the equilibrium market price of the asset.

Note: Work out expected price and dividend in period 1 and discount back to period 0. The role of $\beta_{i,M}$ is to adjust the risk-free rate of return to give the correct rate of discounting for the degree of risk of the asset. This illustrates a general principle for discounting to find the present value of a project. Note that $\bar{p}_i(1)$ can be seen as the expected value of a future random-payoff from any kind of investment project. Then $p_i(0)$, the value today, is just the discounted value of the set of payments. The discounting includes the return on risk-free to represent the time element and the beta term to reflect corrections for risk. Notice that the higher the beta, the greater is the discounting. So, more risky projects (more risky in terms of beta with market) are discounted more heavily.

To see this as a general process observe that the problem at the heart of valuation is to take a sequence of random cash flows $\{\tilde{C}_t\}$, t = 0, ..., T, and to construct a present value at time 0. If preferences are risk-neutral, the present value is found easily by discounting the expected cash flow at t and discounting at the risk-free rate. This would give:

$$PV_0 = C_0 + \frac{E\{\tilde{C}_1\}}{1+r_f} + \frac{E\{\tilde{C}_2\}}{1+r_f{}^2} + \cdots \qquad (5.8)$$

Where C_0 is taken as known at time 0. The difficulties begin, when there is risk aversion. Several methods are now considered for achieving the valuation with risk aversion. Discount is at a rate capturing the risk in the cash flow. The present value then becomes:

$$PV_0 = C_0 + \frac{E\{\tilde{C}_1\}}{1+r_c} + \frac{E\{\tilde{C}_2\}}{1+r_c{}^2} + \cdots, \qquad (5.9)$$

with $r_c = r_f + r_p$. Here, rp can be interpreted as the risk premium that the risky cash flow must pay in excess of the risk-free rate. The difficulty in using this approach is the determination of r_p. It should reflect the premium applied to other assets with similar risk. Use the certainty equivalent. For each random cash flow, there is a certainty equivalent that satisfies

$$U(C_t^e) = EU(\tilde{C}_t) \qquad (5.10)$$

So, that the utility of the certainty equivalent is equal to the expected utility of the random cash flow. The present value then becomes:

$$PV_0 = C_0 + \frac{C_1^e}{1+r_f} + \frac{C_2^e}{[1+r_f]^2} + \cdots \qquad (5.11)$$

This method is limited by the need to employ the utility function to determine the certainty equivalent. Each of these methods will work, but has its own drawbacks. A further method is now proposed and then explored in detail. Apply CAPM. The risk premium rp can be determined very easily, if the CAPM model is appropriate. If CAPM applies, then the security market line gives the relationship.

$$r_c = r_f + \beta_c[r_M - r_f]. \qquad (5.12)$$

The drawback with using CAPM is that it relies on restrictive assumptions.

5.6 Market Portfolio

The CAPM model relies on the use of a market portfolio in order to be operative. This market portfolio is meant to include the entire set of risky assets that are available. It is not clear, how this is obtained. The major difficulty is the breadth of the market portfolio. It is meant to include all risky assets not just financial securities. For example, it includes real assets, such as art and property and other assets such as human capital. This is obviously not easy to define.

There are three situations in which this problem of defining the market portfolio arises. The first is in the calculation of the beta values for assets. Recall that these are obtained by covariance of the return on an asset with the market divided by the variance of the return on the market. If the market portfolio is incorrectly defined, both of these values will also be wrong and the estimated beta will not be correct. The next problem is the construction of the capital market line and the security market line. If an incorrect market portfolio is chosen and the beta values estimated on the basis of this are wrong, then the two lines will not provide the correct predictions on returns.

The final problem is that the problem of the market portfolio makes it difficult to test whether the CAPM model is correct or not. If the prediction of the security market line is used as a test of the model, then a rejection can show that either the model does not apply or the wrong market portfolio is used.

5.7 APT and CAPM

Arbitrage Pricing Theory (APT) and the multi-factor model are not necessarily inconsistent with CAPM. In the simplest case with one factor, the two are clearly identical. With more factors, further conditions must be met. To obtain an insight into these, assume that returns are generated from two factors so:

$$r_i = a_i + b_{1i}f_1 + b_{2i}f_2 + e_i. \quad (5.13)$$

The equilibrium from the APT model is then determined by the equilibrium equation:

$$\bar{r}_i = r_f + \lambda_1 b_{1i} + \lambda_2 b_{2i}, \quad (5.14)$$

Where the condition $\lambda_0 = r_f$ has been used, the interpretation of λ_k is that this is the return above the risk-free rate earned by an asset with b_{ki} = 1 and all other values of bji = 0. From the CAPM, the value of this excess return should be:

$$\lambda_i = \beta_{\lambda_i}[\bar{r}_M - r_f]. \quad (5.15)$$

Substituting this into (5.14) gives:

$$\bar{r}_i = r_f + b_{1i}\beta_{\lambda_1}[\bar{r}_M - r_f] + b_{2i}\beta_{\lambda_2}[\bar{r}_M - r_f] \quad (5.16)$$

$$\bar{r}_i = r_f + [b_{1i}\beta_{\lambda_1} + b_{2i}\beta_{\lambda_2}][\bar{r}_M - r_f]. \quad (5.17)$$

This is exactly the CAPM model where, $\beta_i = b_{1i}\beta_{\lambda_1} + b_{2i}\beta_{\lambda_2}$. The two remains consistent provided this identity holds.

Summary

- The analysis to this point has considered the expected returns and variances as given data and used these to determine investment policy.
- The value of an equilibrium model and of the Capital Asset Pricing Model (CAPM) in particular is that it allows the evaluation of portfolio performance.
- The CAPM provides an explanation of the concept of financial market equilibrium.
- A position of equilibrium is reached, when the supply of assets is equal to the demand.
- The CAPM determines very precise equilibrium relationships between the returns on different assets.
- The set of assumptions upon which the CAPM is based upon, are now described.
- The general properties of equilibrium are now determined by tracing through the implications of the CAPM assumptions.
- The investors have the same information and expectations.
- Beta values are now calculated and published regularly for all stock exchange-listed companies.
- The proxy beta for a proposed investment project must be disentangled from the company's equity beta.
- The capital market line is the name assigned to the efficient frontier in the CAPM.
- The CAPM also has implications for the returns on individual assets.
- The covariance of the risk-free asset with the market is zero and the assets return is r_f
- The CAPM and the single-index model both generate a parameter β which determines the return on the asset.
- The CAPM also has implications for asset prices.
- The CAPM model relies on the use of a market portfolio in order to be operative.
- APT, and the multi-factor model, is not necessarily inconsistent with CAPM.

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Self Assessment

1. _____ models explain the process of investor choice and market clearing that lies behind the observed pattern of asset returns.
   a. Capital
   b. Equilibrium
   c. Demand
   d. Price

2. Which of the following provides an explanation of the concept of financial market equilibrium?
   a. The CAPM
   b. An equilibrium model
   c. Assets
   d. Portfolio market

3. The value of an equilibrium model and of the capital asset pricing model (CAPM) in particular, is that it allows the _____ of portfolio performance.
   a. evaluation
   b. revolution
   c. rise
   d. equilibrium

4. Which of the following model predicts exactly how much more expected return is required to compensate for additional risk?
   a. The CAPM
   b. Capital market
   c. Security market
   d. An equilibrium

5. Which of the following statement is true?
   a. The less risk averse is an investor; the lower will be the proportion of the risk free asset in the portfolio.
   b. The more risk averse is an investor; the lower will be the proportion of the risk free asset in the portfolio.
   c. The less risk averse is an investor, the higher will be the proportion of the risk free asset in the portfolio.
   d. The more risk averse is an investor; the higher will be the proportion of the risk free asset in the portfolio.

6. _____ risk adverse investors will hold a larger proportion of the market portfolio.
   a. More
   b. High
   c. Less
   d. Many

7. Which of the following statement is false?
   a. The market portfolio is assumed to be well-diversified.
   b. If any investor were short-selling a risky asset, none would be short-selling.
   c. In the UK, an ERP value of between 2% and 5% is currently seen as reasonable.
   d. The proxy beta for a proposed investment project must be disentangled from the company's equity beta.

8. What is the name assigned to the efficient frontier in the CAPM?
   a. The Equity Risk Premium (ERP)
   b. Dividend Growth Model (DGM)
   c. Capital Market Line
   d. WACC

9. The CAPM and the _____ model both generate a parameter β which determines the return on the asset.
   a. single-index
   b. capital market
   c. security market
   d. equilibrium

10. The CAPM also has implications for _____ prices.
   a. market
   b. high
   c. asset
   d. low

Chapter VI

Bond Market Analysis

Aim

The aim of this chapter is to:

- introduce bond market analysis
- explain bond analysis at micro-level
- explicate bonds classification by their key features

Objectives

The objectives of this chapter are to:

- enlist benefits of bonds
- elucidate debt market in India
- explain listing of debentures

Learning outcome

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

- identify public sector bonds and fixed deposit bonds
- understand bond analysis at macro-level
- recognise inflation and price risk

6.1 Introduction

Bonds are not as attractive as equity for reasons of lack of high risk, high return profile and no capital appreciation and bonus, rights and other privileges of ownership. Bonds have fixed interest returns and less variability of returns. Bonds however have their own advantages discussed below. Bond market returns are good varying between to 15% in the last decade in the developed markets of UK, USA, Germany Japan and France. The Bond Index for different varieties of bonds is published abroad. The bond description of listed and traded securities is given in terms of the name of issuer, coupon rate or interest rate and year of maturity. The Government security in India is quoted for example as 12.32% Loan, 2011.

6.2 Bond Analysis at Micro Level

Bonds are not as attractive as equity for reasons of lack of high risk-high return profile and no capital appreciation and bonus, rights and other privileges of ownership. Bonds have fixed interest returns and less variability of returns. Bonds have their own advantages too, as discussed below.

6.2.1 Identification and Classification of Bonds

Bonds are securities with the following basic characteristics:

- They are typically securities issued by a corporation or governmental body for specified term. Bonds become due for payment at maturity, when the par value/face value of bond is returned to the investors.
- Bonds usually pay fixed periodic interest instalments, called coupon payments. Some bonds pay variable income.
- When investor buys bond, he or she becomes a creditor of the issuer. Buyer does not gain any kind of ownership rights to the issuer, unlike in the case with equity securities.

The main advantages of bonds to the investor:

- They are good source of current income.
- Investment to bonds is relatively safe from large losses.
- In case of default, bondholders receive their payments before shareholders can be compensated.

A major disadvantage of bonds is that potential profit from investment in bonds is limited. Currently in the financial markets, there are a lot of various types of bonds and investor must understand their differences and features before deciding what bonds would be suitable for his/her investment portfolio.

6.2.2 Bond-classification by their Key Features

Bond-classification by their key features is discussed below.

By form of payment

Classification by form of payment is as follows:

- Non-interest bearing bonds are bonds issued at a discount. Throughout the bond's life, its interest is not earned, however, the bond is redeemed at maturity for face value.
- Regular serial bonds are bonds in which all periodic instalments of principal repayment are equal in amount.
- Deferred interest bonds are bonds paying interest at a later date.
- Income bonds are bonds on which, interest is paid when and only earned by the issuing firm.
- Indexed bonds are bonds, where the values of principal and the payout rise with inflation or the value of the underlying commodity.
- Optional payment bonds are bonds that give the holder the choice to receive payment on interest or principal or both in the currency of one or more foreign countries, as well as in domestic currency.

Coupon payment

Coupon payment is as follows:

- Coupon bonds are bonds with interest coupons attached.
- Zero-coupon bonds are bonds sold at a deep discount from its face value and redeemed at maturity for full face value. The difference between the cost of the bond and its value when redeemed is the investor's return. These securities provide no-interest payments to holders.
- Full coupon bonds are bonds with a coupon rate near or above current market interest rate.
- Floating-rate bonds are debt instruments issued by large corporations and financial organisations on which the interest rate is pegged to another rate, often the Treasury-bill rate, and adjusted periodically at a specified amount over that rate.

Collateral

Classification by collateral is as follows:

- Secured bonds: Bonds secured by the pledge of assets (plant or equipment), the title to which is transferred to bondholders in case of foreclosure.
- Unsecured bonds: Bonds backed up by the faith and credit of the issuer instead of the pledge of assets.
- Debenture bonds: Bonds for which there is no any specific security set aside or allocated for repayment of principal.
- Mortgage bonds (or mortgage-backed securities) are bonds that have as an underlying security a mortgage on all properties of the issuing corporation.
- Sinking fund bonds are bonds secured by the deposit of specified amounts. The issuing corporation makes these deposits to secure the principal of the bonds, and it is sometimes required that the funds be invested in other securities.
- Asset-Backed Securities (ABS) are similar to mortgage bonds, but they are backed by a pool of bank loans, leases and other assets. The ABS are related with the new market terminology, securitisation which understood as the process of transforming lending vehicles, such as mortgages into marketable securities. The main features of ABS for investor are relatively high yield, shorter maturities (3-5 years) and monthly, rather than semi-annual principal/ interest payments. From their introduction to the market, they were ranked as high credit quality instruments. However, the recent financial crises showed that these debt instruments could be extremely risky investments, when banks loans portfolios as a guarantee of ABS become worthless causing banks' insolvency problems.
- General obligation bonds: Bonds, secured by the pledge of the issuer's full faith and credit, usually including unlimited tax-power.
- Guaranteed bonds: Bonds which principal or income or both are guaranteed by another corporation or parent company in case of default by the issuing corporation.
- Participating bonds: Bonds which, following the receipt of a fixed rate of periodic interest, also receive some of the profit generated by issuing business.
- Revenue bonds: Bonds whose principal and interest are to be paid solely from earnings.

Type of circulation

Classification by type of circulation is as follows:

- Convertible bonds: Bonds that give to its owner the privilege of exchanging them for other securities of the issuing corporation on a preferred basis at some future date or under certain conditions;
- Interchangeable bonds: Bonds in coupon form that can be converted to the other form or its original form at the request of the holder paying the service charge for this conversion.

Type of issuers

Types of issuers are as follows:

- Treasury (government) bonds (an obligation of the government). These bonds are of the highest quality in each domestic market because of their issuer, Government. This guarantee together with their liquidity makes them popular with both individual and institutional investors. The government bonds are dominant in the fixed-income market.
- Municipal bonds: Bonds issued by political subdivisions in the country (county, city, etc.).
- Corporate bonds: A long-term obligation of the corporation.
- Industrial bonds: Bonds issued by corporations other than utilities, banks and railroads. This debt is used for expansion, working capital and retiring other debts.
- Public utility bonds: High-quality debt instruments issued by public utility firms.

Recall possibility

Classification by recall possibility is as follows:

- Callable (redeemable) bonds: Bonds issued, all or part of which may be redeemed by the issuing corporation under definite conditions, before the issue reaches maturity.
- Non-callable (irredeemable) bonds: Bonds issued which contains no provision for being 'called' or redeemed prior to maturity date.

Place of circulation

Place of circulation is as follows:

- Internal bonds: Bonds issued by a country payable in its own currency.
- External bonds: Bonds issued by government or firm for purchase outside the nation, usually denominated in the currency of the purchaser. The term Eurobond is often applied to these bonds that are offered outside the country of the borrower and outside the country in whose currency the securities are denominated. As the Eurobond market is neither regulated nor taxed, it offers substantial advantages for many issuers and investors in bonds.

Quality

Classification by quality is as follows:

- Gilt-edged bonds: High-grade bonds issued by a company that has demonstrated its ability to earn a comfortable profit over a period of years and to pay its bondholders their interest without interruption.
- Junk bonds: Bonds with low rating, also regarded as high-yield bonds.

These bonds are primarily issued by corporations and also by municipalities. They have a high risk of default, because they are issued as unsecured and have a low claim on assets.

Other types of bonds

Other types of bonds are as follows:

- Voting bonds: Unlike regular bonds, these bonds give the holder some voice in corporation management.
- Senior bonds: Bonds having prior claims to the assets of the debtor upon liquidation.
- Junior bonds: Bonds which are subordinated or secondary to senior bonds.

6.2.3 Benefits of Bonds

Advantages of bonds are given below:

- Bonds are attractive to those who are risk-averse and are happy with assured modest fixed income or interest income, and certainty of income.
- Bonds are necessary in a portfolio to diversify assets into various alternative categories, in order to reduce risk of the total portfolio.

- Bonds have only lower risk, but in combination with stocks or other assets, lower the total risk of portfolio due to low correlation or low tendency to vary in the same direction and to the same extent as the prices of other assets.
- Investors, if properly trained can learn to capitalise on the bond price movement and benefit from capital gain.

6.3 Debt Market in India

Debt Market is not developed in India for many reasons, despite the fact that debt in terms of market capitalisation is 42% of GDP, while equity market capitalisation is 56% which has gone up to more than 100% of GDP in the peak of frenzy on the stock market in February, 2000 and in July-August 2007.

- Government and semi-Government bodies being largest issuers of debt, the interest rates on debt are controlled historically by the Government For long, the interest rates on fixed Deposits of Companies and P.S.U.s were also fixed by the RBI at ceiling levels.
- These interest rates were kept low to facilitate Government funding at cheaper cost. The individual investors could not find these rates attractive to invest in.
- The requirements of law in respect of banks, insurance companies and financial institutions forced them to invest a proportion of their funds, in Government and semi-Government debt, which led to a captive market in them.

They thus used to invest accordingly in these securities and hold them, until maturity or trade in them among banks and financial institutions, only for purposes of adjustments to duration of maturity and yield. Secondary market and retail trading did emerge only after 1994-95. In the case of corporate debt also, individual investors are not attracted except through the route of fixed deposits with the companies which are not marketable. Debentures which are long-term debt, used to be sold mostly to financial institutions, insurance companies and more recently to mutual funds, UTI, etc. They also used to hold them until maturity, particularly when it is privately placed or are unsecured. The secondary market in these instruments did not develop as a result. Similar is the case with P.S.U. bonds which were allowed to be issued since 1985. Retail market and trading in these debt instruments did not develop due to these legal and structural factors. Bulk holders of the corporate debt are still the banks and financial institutions. Debt instruments used to carry lower rates than the free market rates and have no chance of capital appreciation and hence are not welcome to individual investors.

6.3.1 Public Sector Bonds and Fixed Deposit Bonds

Public sector bonds and fixed deposit bonds are discussed in the paragraphs given below:

Public sector bonds

During 1995 and 1996, the largest amount of funds was raised by the PSUs and public financial institutions, through the bond route. lDBI, IFCI, SBI, MTPL, SAIL and NTPC are a few examples, which raised large amount of debt during the last few years. The interest rates offered were in the range of 16-18%. Although the bonds are generally issued for 5 to 7 years, they are issued by public financial institutions like lDBI, ICICI and IFCI for longer periods of 20 to 30 years with the permission of the Government. At the other extreme, since companies raised debt for less than 18 months, to enjoy the benefits of debt route for equity, but yet not credit rated by any agency, as the SEBI guidelines exempt these issues of less than 18 months from this requirement of compulsory credit rating; the distinction between those with less than 18 months and more than 18 months was dropped in March 1998.

ICD and fixed deposits

Companies borrowing through the ICD (Inter Corporate Deposit route) have to pay as high a rate as 30 to 60% in times of tight liquidity. As such, they find it convenient and cheaper to raise funds from the public, individuals and institutions at 15% to 20% through short-term debt instruments of one year in the form of deposits or some form of debentures. As per the RBI rules, Company deposits carry a maximum rate of 15 to 16% and the rest of the money out of 20% is passed on to investors the form of cash incentive and to the sub-brokers and brokers, is the form of brokerage and commissions. The above ceiling on interest rates was removed in July 1996. An example of company issuing NCDs with a maturity of 18 months is SRF Ltd. and CEAT Financial Services. The funds so mobilised by them are at 18-20% and are used in ICD investments at 30-40%, a clean 20% gain in financial deal. SRF issued these debentures at 18% compounded on a quarterly basis and the yield to maturity works out to 20.61%. The CEAT Financial Services offered those NCDs at 19%, with interest payable on a quarterly basis and yield to maturity of 20.41%.

6.4 Listing of Debentures

Debentures, which are not convertible into equity or redeemable within 18 months, should be compulsorily rated by a credit rating agency for the issue to the public. Some of those issued to the public are also listed on BSE, OTCEI and NSE. However, there are some issues like those of Sundaram Finance SRF, GE Cap, Core Health, Care Dee Pharma, etc., which made private placement at coupon rates of 18-19%, yielding 21-22% to the investors. As these are not listed and traded, buying and selling will be a problem and liquidity is less. However, issues quoted on OTC and NSE are now available for regular trading in retail in marketable lots and in OTCEI the facility of market makers is also available which will ensure their tradability and a quotation.

6.4.1 OTC Debentures

Example of OTC listed debentures show that Birla Global Finance is rated A + only, but is at a premium with Rs. 100 debentures quoting at Rs. 132.50, while Raymond with AA is quoting at a discount at Rs. 83.10. The yields to maturities varied from 15.10% in the case of BGFL to 18.36% the case of Dabur India and these yields depend on a host of factors like credit rating, coupon rate, maturity period, performance of the company, etc.

6.4.2 NSE Debentures

The Triple 'A' rated Tisco Secured promissory notes were yielding 21.39% in 1996 while Torrent Gujarat was yielding 27.09% (YTM) with only a double 'A' (AA).

As a matter of thumb rule, the better the credit-rating, the better is the safety of the debenture, but liquidity is provided by availability of market maker and trading on a regular basis. The higher the rating, the lower is generally the coupon rate, as the company can issue the security with less risk, which means lower return. The higher the risk, the higher is the return. In case of Reliance and Ranbaxy with a credit rating of AA + which means high safety, the issues were made at coupon rates ranging from 12.5% to 15%, while United Phosphorus with a lesser rating of only AA (meaning adequate safety) issued debentures at 17%. Coupon rates in general varied from 12.5% to 18.5%, while the current yield, in which investors are interested varied from 15% to 20%, in 1996, and from 10 to 15% in 2006-07.

6.5 Asset Based Securities (Securitisation)

Asset based securities and bonds issued in the place of receivables held by a company, with a highly diversified portfolio. HDFC converted its Housing loans into securities and sold them. So did the Citi Bank in December 1995 through what are called 'Pass through Certificates' (PTC). Such securities are first purchased by the Special Purpose Vehicle (SPV) which is structured as a trust company for this purpose. SPV is ready to buy before maturity, offering liquidity to these instruments. Investors get 17-18% interest. Sometimes, the paper is sold as zero coupon bonds at an initial discount and they are redeemable at the end of 5 to 7 years at par. The Citi Bank was the first to get their PTC rated by a credit Agency (AAA) and have them listed on the NSE. In the case of Citi Bank securities, the SPV has a right to receive interest at 17.36% and the tenor of the security is 30 months, for these zero coupon bonds. The market maker is the Hoare Govett (India) on the NSE and the PTCs are traded on the NSE open to both, residents and NREs, OCBS or Fils. The issue, price and other details of PTCs listed on NSE are seen in the chart below. HDFC, S R FF, Ashok Leyland, etc., have also used the PTC, but they are not listed on any of the Stock Exchanges. In fact, only the NSE, BSE and DSE provide the facilities for trading in bonds or debentures. Of these, the bulk of trading is on NSE, which is expected to develop the debt market in India.

6.6 Inflation and Price Risk

Inflation and price risk are discussed in the paragraphs below.

6.6.1 Bond Risk

Risks are systematic and unsystematic risks. In the macro sense, there are systematic risks. In micro sense, there are unsystematic risks. These risks are measured by the variability or standard deviation from the mean of the return. The source of all systematic risks is: purchasing power changes and interest rate changes, (involving price changes and reinvestment income changes.) Interest rate risk has these two dimensions, namely price risk and reinvestment risk.

Inflation or purchasing power risk

Return expected on Government securities has two components namely riskless return plus some compensation for purchasing power risk. Inflation and expected inflation determine the second component. Riskless return is the Treasury bill return of the Government, which has no risk in practice. In India, in the year 2000, the Treasury bill return was around 9.5% and inflation rate was about 5%. Then, the short-term bond should have a return of 9.5 + 5 = 14.5%. However, the average inflation rate in the past and expected inflation rate in the future also influence the interest rates and the yields ranged from 14% to 18% in the case of corporate bonds in India, in 2000. Inflation rate over the last decade averaged at around 8% and the riskless return plus average inflation rate will give a total return of around 20%.

Expectations also play an important part. Thus, in fiscal 1999-2000, the inflation rate was around 5%, but the expected long-term trend is 8%, due to the fact that in some years, the inflation rate touched around 10% to 13% in the past. Inflationary potential as judged by the central Government budget deficit, administered price changes, money supply changes, etc., and a host of other factors determine the expectations of inflation rates in India. Actual inflation rates were around 1.5% to 3% during 2001 and 2002, but the rate of growth of the economy slowed down during these years. Later the inflation ranged around 5% p.a. during 2003 to 2006.

Interest rate risk

Volatility of bond prices depends on the changes in interest rates. Firstly, income and capital gain or loss will be affected, by changes in interest rates. Secondly, income from bonds reinvested will have also different income due to interest rate changes. The first is the price risk and second is the reinvestment risk, which are discussed below.

Price risk-volatility of bond prices

Price changes in bonds occur due to changes in maturity of bond. Given the same coupon rate and face value Rs. 100, changes in the required yield or in interest rates will lead to different changes in prices depending upon the years to maturity. The longer term maturities will suffer larger capital depreciation with rise in yields than those with shorter term maturities. The capital appreciation will behave in the same manner, if there is a fall in interest rates. As maturity becomes larger, the greater is the bond price volatility. Again, the lower the coupon rate, the greater is the volatility of bond prices. If interest rate rises, the percentage fall in prices will be larger in low coupon bonds than with high coupon bonds. If interest rate falls, the percentage rise in prices will be larger with low coupon bonds than with high coupon bonds. The starting level of yields will also influence the bond price volatility. The higher the yield level, from which yield fluctuation starts, the greater is the price volatility.

6.7 Bond Analysis at Macro Level

Bond analysis at macro-level is discussed in the paragraphs given below.

6.7.1 Credit Rating System

Debt instruments are generally rated, but even equity can be rated at the time of Initial Public Offer (IPO) based in the project appraisal and projected financial parameters. Credit rating refers to the rating of risk, involved in an instrument issued by a company. All debt instruments whether short-term or a long-term are to be compulsorily rated, if they are issued to the public. As rating is at a point of time, it has the validity for a short period of 3 to 6 months and rating has to be updated from time-to-time.

Comparative FD Rating Symbols:
Symbols which investors must consider before placing a fixed deposit CRISIL

Investment Grades

FAAA	Highest safety
FAA	High safety
FA	Adequate safety

Speculative grades

FB	Inadequate safety
FC	High risk
FD	Default

ICRA

MAAA	Highest safety
MAA	High safety
MA	Adequate safety
MB	Inadequate safety
MC	High risk
MD	Default

CARE

CARE AAA	Best quality
CARE AA	High quality
CARE A	Adequate safety
CARE BBB	Sufficient safety
CARE BB	Speculative
CARE B	Susceptible to default
CARE C	High investment risk
CARE D	Default

6.7.2 Risk Factors

In influencing the fixed prices, there are two categories of factors to be examined namely risk factors and non-risk factors. They are broadly listed below:

Risk Factors	**Non-risk Factors**
Terms of issue offer or provision I Debenture Trust deed	Legal and procedural difficulties
Earning power	Market and marketability
Liquidity	Incentives and call factors
Management	Tax factors

6.7.3 Trust Deeds

In terms of the Company Law, debentures which are secured and registered can be issued to the public. However, this requirement does not apply to Government and public sector companies and financial institutions. All debenture issues made by the companies to the public which are not convertible within 18 months should be supported by a Debenture Trustee, say a bank or financial institution and a Trust Deed to be executed within six months of the issue to the public. Such public issue of debentures has to be supported by a rating by an Indian Credit Rating Agency, as per the SEBI Guidelines. Credit rating agencies are also controlled through a code of conduct, rules and regulations

by SEBI. Debenture Trust Deed lay down the terms, rights and obligations of the trustee and the company, the security of assets against the instruments issued, sinking fund arrangements, payment of interest and principal, and action to be taken by debenture trustee in case of complaints of registered holders of Debentures for failure of the company to meet its obligation and other matters.

The trust deed lays down in particular the restrictions on the mortgage or further mortgage of the assets, or sale of the assets, which constitute the security for the debenture issue, on raising the level of debt, creditor rights in the event of any arrears of interest and principal, etc. These terms also include the method of repayment of principal, premium or discount at which they are to be redeemed and the exact date or date of interest payment and principal repayment. These terms partly determine the price of the bond and yield there on, as they determine the extent of the risk, as laid/down in the original terms of issue and incorporated in trust deed.

Earning power

The earning power is a single important factor determining the fundamentals of the corporate issuing debentures. The price of a bond is determined by the fundamentals of the issuer, through the following:

- Earnings level
- Earnings variability
- Leverage, reflected by the debt equity ratio
- Interest coverage of earnings
- Market for the debt issue, listed or not and the demand for such debt

The earnings power also depends on the sales and the ratio of sales of gross block, operating profit margin, prior commitments through off balance sheet guarantees and commitments, cost of debts vis-a-vis, the earnings, current ratio, and working capital management involving current solvency, leverage enjoyed by equity through debt, extent of preferred stock having prior claims, reflecting the long-term solvency of the company, etc.

6.7.4 SEBI Guidelines

For a corporate unit to issue bonds in India, SEBI has issued many guidelines since 1992. Briefly, they are set out below:

- Minimum debt-equity ratio should not exceed 2:1 and current ratio to be 1:1.33.
- The working capital debenture amount should not exceed 20% of the total gross current assets.
- Rate of interest paid as debenture is free to be decided by the Company since August 1991.
- Credit rating is compulsory for debt issues, even if they are convertible into equity within 18 months and they are issued to public, through offer of sale.
- Debentures have to be redeemed after expiry of 7 years and a premium of 5% is permitted on NCD at the time of redemption.
- Buy back arrangements and price support operations are permitted for NCDs.
- Debentures and bonds of any type including new financial products are permitted, convertible, non-convertible, with warrants or loyalty coupons, etc.
- Debenture trustee and making of a trust deed are compulsory and to be completed within six months of the issue of debenture certificates.
- Debt instruments, issued with a credit rating are not to be vetted by SEBI, but by the merchant bankers only.
- Put and call options can be had, if their terms are specified clearly for all bonds convertible after 36 months.

Earnings potential essentially rests on the management efficiency, financial prudence and future plans, Government policy and a host of fundamental factors, discussed in another chapter. More importantly, one has to look for stability of earnings their composition into sales income, trading income and speculative income or through sale of assets or revaluation of assets, etc. The quality of assets is a very important determinant of the solvency and liquidity of the company and hence their earning power.

6.7.5 Non-risk Factors

In addition to risk factors referred to above, there are other factors also which affect the bond prices. Some examples of non-risk factors which influence bond prices are terms of the issue, say issue at a discount, redemption at a premium, attached coupons, options and warrants call features, etc. These affect favourably or unfavourably the bond prices. Marketability of a bond is an important feature influencing its price. The bonds listed and well-traded or those with a repurchase facility have a good demand. Bonds with a market maker have good liquidity. The laws of the land facilitating or obstructing trade in bonds are another factor to be considered. Thus, in India stamp duty on issue of debentures and on transfers is a state subject and the rates are as high as Rs. 3 per 100 face value or market value, whichever is higher. The difficulties of securing bonds in retail and in marketable lots are another set of problems.

Debentures when first issued will be at a face value of say Rs. 100 and reflecting market yields after listing they fall in prices. Tax factors are another set of problems to the Indian bond market. There will be tax deduction at source for all interest income above Rs. 2,500 per annum. The interest income is taxable at the normal rates of income tax, where the capital gains of long-term nature (after holding for more than 12 mouths) are taxable at a lower rate. However for companies, interest paid on debt enjoys the privilege of tax exemption as it is taken as an expense item. Thus, next to manufacturing expenses, all the interest payments on long-term debt, bank borrowing and other short-term debt is adjustable expense item to arrive at the net profits. However, the same privilege is not available to the fixed dividend payable on preference shares.

There is prior commitment to the company, before the residual profits are available to equity holders. However, to serve the preference shareholders at the present fixed rate of dividend of 14%, the company will have to earn a pre-tax return of 20% at the prevailing corporate tax rate of say 30% for domestic companies. In the case of bondholders, the company needs to earn only the rate of interest payable on them, which in 2007 varied from 12.5% to 18%, depending upon the credit rating of the company, terms of offer, conversion or warrants or other incentives and add-ons like premiums and discounts. The interest rates to be offered on debentures are now freed from all controls. The company is free to offer any rates that it thinks that investors will accept depending on their assessment of the credit-worthiness of the company. To some extent, the rating of credit rating agencies will help the investors to assess the company. However, to a large extent, investors have to study the risk and non-risk factors that influence the market prices referred to above.

Summary

- Bonds are not as attractive as equity for reasons of lack of high risk-high return profile and no capital appreciation and bonus, rights and other privileges of ownership.
- Bonds have fixed interest returns and less variability of returns.
- Bonds are not as attractive as equity for reasons of lack of high risk-high return profile and no capital appreciation and bonus, rights and other privileges of ownership.
- Debt instruments used to carry lower rates than the free market rates and have no chance of capital appreciation and hence are not welcome to individual investors.
- During 1995 and 1996, the largest amount of funds was raised by the P.S.U.s and public financial institutions, through the bond route.
- Companies borrowing through the ICD (Inter Corporate Deposit route) have to pay as high a rate as 30 to 60% in times of tight liquidity.
- Asset based securities and bonds issued in the place of receivables held by a company, with a highly diversified portfolio.
- Risks are systematic and unsystematic risks.
- Inflation and expected inflation determine the second component.
- Volatility of Bond prices depend on the changes in interest rates.
- Price changes in bonds occur due to changes in maturity of bond.
- Debt Instruments are generally rated but even equity can be rated at the time of Initial Public Offer (IPO) based in the project appraisal and projected financial parameters.
- Credit rating refers to the rating of risk, involved in an instrument issued by a company.
- In terms of the Company Law, debentures which are secured and registered can be issued to the public.
- Marketability of a bond is an important feature influencing its price.
- The interest rates to be offered on debentures are now freed from any controls.

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Self Assessment

1. Bonds have _____ interest returns and less variability of returns.
   a. variable
   b. inconsistent
   c. fixed
   d. predicted

2. What are bonds that usually pay fixed periodic interest instalments called?
   a. Coupon payments
   b. Current income
   c. Collaterals
   d. Secured bonds

3. Match the following

1. Non-interest bearing bonds	A. Bonds on which interest is paid when and only when earned by the issuing firm.
2. Deferred interest bonds	B. Bonds issued at a discount.
3. Income bonds	C. Bonds where the values of principal and the payout rise with inflation or the value of the underlying commodity
4. Indexed bonds	D. Bonds paying interest at a later date

   a. 1-D, 2-B, 3-C, 4-A
   b. 1-A, 2-C, 3-B, 4-D
   c. 1-C, 2-A, 3-D, 4-B
   d. 1-B, 2-D, 3-A, 4-C

4. Which of the following bonds issue, all or part of which may be redeemed by the issuing corporation under definite conditions, before the issue reaches maturity?
   a. Non-callable bonds
   b. Internal bonds
   c. Callable bonds
   d. External bonds

5. The term _____ is often applied to these bonds that are offered outside the country of the borrower and outside the country in whose currency the securities are denominated.
   a. Eurobond
   b. Gilt-edged
   c. Public utility
   d. Municipal

6. Which of the following statement is true?
   a. The callable bonds are dominant in the fixed-income market.
   b. The government bonds are dominant in the fixed-income market.
   c. The non-callable bonds are dominant in the fixed-income market.
   d. The internal bonds are dominant in the fixed-income market.

7. Debentures, which are not convertible into equity or redeemable within _____ months, should be compulsorily rated by a credit rating agency for the issue to the public.
   a. 12
   b. 4
   c. 18
   d. 6

8. Which of the following statement is false?
   a. The lower the yield level, from which yield fluctuation starts, the greater is the price volatility.
   b. Risks are systematic and unsystematic risks.
   c. Inflation and expected inflation determine the second component.
   d. Volatility of Bond prices depend on the changes in interest rates.

9. Which of the following occur due to changes in maturity of bond?
   a. Debt Instruments
   b. Interest Rate Risk
   c. Credit rating
   d. Price changes

10. _____ rating refers to the rating of risk, involved in an instrument issued by a company.
   a. Debit
   b. Credit
   c. Bond
   d. Minimum

Chapter VII

Forward and Futures

Aim

The aim of this chapter is to:

- introduce forward and futures
- explain index futures and valuation of index futures
- explicate motives of trading

Objectives

The objectives of this chapter are to:

- explain forward prices
- elucidate value of contract
- explicate commodities

Learning outcome

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

- identify difference between options and futures
- understand derivative trading in securities
- recognise NSE proposals

7.1 Introduction

Forwards and futures are both contracts, which involve the delivery of a specific asset at an agreed date in the future at a fixed price. They differ from options contracts in the fact that there is no choice involved as to whether the contract is exercised. With both forwards and futures, the agreed price must be paid and delivery undertaken. Despite this, the underlying approach to valuation remains the same.

Forward contracts, which are no more than commitments to a future trade, have been in use for a very long time. One piece of evidence to this effect is that the agreement to purchase dates whilst the dates were still unripe on the tree (a forward contract) was prohibited in the early Islamic period. Commodity futures also have a fairly long history. They were first introduced onto an exchange by the Chicago Board of Trade in the 1860s to assist with the reduction in trading risk for the agricultural industry. Financial futures (which differ in significant ways from commodity futures) are a much more recent innovation. The motives for trading and potential trading strategies will be analysed. Finally, the valuation of the contracts will be considered.

7.1.1 Forwards and Futures

Forwards and futures are two variants of the same basic transaction, but there are some important operational differences between them. These differences are reflected in the valuations of the contracts. The forward contract is the simpler form and this is described first.

As an example of a forward contract, consider a farmer growing wheat and a baker who requires wheat as an ingredient. Assume that wheat is harvested in September. A forward contract would be written, if the farmer and the baker committed in May to the baker purchasing 2 tons of wheat at $1000 per ton, when the wheat is harvested in September. The essential elements here are the commitment to trade at a future date for a fixed price and quantity. No money is exchanged, when the forward contract is agreed. Money only changes hands, when the commodity is delivered. The financial question that arises is the determination of the price (in this example $1000) written into the contract. A futures contract has the almost all the features of forward contract. In a futures contract, there is also a commitment to trade and agreed quantity at a fixed price at a future date.

Where differences arise between forwards and futures is in the timing of institutional arrangement and the timing of payment.

- A forward is an over-the-counter agreement between two individuals. In contrast, a future is a trade organised by an exchange.
- A forward is settled on the delivery date. That is, there is a single payment made when the contract is delivered. The profit or loss on a future is settled on a daily basis.

To understand the process of daily settlement, assume a futures contract is agreed for delivery of a commodity in three months. Label the day the contract is agreed as day 1 and the day of delivery as day 90. Let the delivery price written into the contract on day 1 be $30. Now assume that on day 2, new contracts for delivery on day 90 have a delivery price of $28 written into them.

Those who are holding contracts with an agreement to pay $30 are in a worse position than those holding $28 contracts. The daily settlement process requires them to pay $2 (the value by which their position has deteriorated) to those who have sold the contract. The delivery price of $28 on day 2, is then taken as the starting point for day 3. If the delivery price in new contracts rises to $29 on day 3, then the holder of the futures contract from day 2 receives $1. This process is repeated every day until day 90. Effectively, daily settlement involves the futures contract being re-written each day with a new contract price.

From this brief description, it can be seen that a futures contract involves a continuous flow of payments over the life of the contract. In contrast, a forward contract has a single payment at the end of the contract. This difference in the timing of payments implies that the contracts need not have the same financial valuation. With a futures contract the exchange acts as an intermediary between the two parties on different sides of the contract. The process of daily settlement is designed to avoid the development of excessive negative positions and the possibility of default. To

further reduce the chance of default, exchanges insist upon the maintenance of margin. Margin must be maintained by both parties to a sufficient level to cover daily price changes. The reason for focusing on forward contracts is that the single payment involved makes valuation a very much simpler process. Finally, a contrast will be drawn between the valuation of a forward contract and the valuation of a futures contract.

7.2 Difference Between Options and Futures

Following table illustrates the difference between options and futures:

Futures	Options
Futures contract is an agreement to buy or sell specified quantity of the underlying assets at a price agreed upon by the buyer and seller, on or before a specified time. Both the buyer and seller are obliged to buy/sell the underlying asset.	In options, the buyer enjoys the right and not the obligation, to buy or sell the underlying asset.
Unlimited upside and downside for both buyer and seller	Limited downside (to the extent of premium paid) for buyer and unlimited upside. For seller (writer) of the options, profits are limited, whereas losses can be unlimited.
Futures contracts prices are affected mainly by the prices of the underlying asset.	Prices of options are however, affected by: • Prices of the underlying asset • Time remaining for the expiry of the contract • Volatility of the underlying asset

Table 7.1 Difference between futures and options

(Source: http://www.slideshare.net/altacitglobal/futures-and-options-11397021)

7.3 Index Futures and Valuation of Index Futures

Index futures and valuation of index futures discussed in the paragraphs given below.

7.3.1 Index Futures

Suppose the future contracts are based Nifty Index. The NSE 50 is quoting early on March 10, 2000 at 1,646. Each point in the index is valued at Rs. 50, one futures contract on NSE Index will cost Rs. 60,000; if at the end of one month, the index rose to 1,666 then on the settlement day a cash payment of Rs. 50 x 20 = Rs. 1,000 is to be paid by the seller to the buyer. All the traders in the futures are to be members and each trader is expected to put in 'good faith' margin deposit depending upon the value of the total contracts. These margin moneys are marked to the market value on a daily basis. The margins to be kept on futures are less than for normal deliveries, as index futures do not involve full-value payments. Thus, an index futures contract is an obligation to deliver at settlement an amount of cost, equal to a number of times (say 100 or 500) of the difference between the stock index value at the close of the last trading day (1,666) of the contract and the price at which the future contract was originally struck (1,646). The terms of the contract, underlying the futures trading will determine the number of times the difference is to be multiplied. Margin money has to be kept and other conditions are to be observed for any contingent event of failure to make the additional deposit marked to the market value of the contract and the possible failure to honour the contract by either party. The trading hours, and contracting months (normally 3, 6, 9 and 12 months are allowed) minimum price fluctuation and the last day of trading and settlement date, etc., are all set out in the original futures trading system; as laid down by the controlling authority, say the NSE authorities or the SSE authorities, and SESI.

7.3.2 Valuation of Index Futures

If an investor invests in SSE 30 index, he will collect dividends on the scrips he holds and his principal value may go up or down depending on the index. In the case of the futures index, the investor will get the same outcome as if he invests all his money in riskless treasury bills and enters into a futures contract for future delivery of the index. The futures then must sell at a price equal to today's price of the index plus a premium equal to risk-free return plus dividend on the index shares. To show this symbolically let Fe be the price of the futures, Fs is today's price of futures Is current price of the Index and D is dividend on the index shares, and Ie is the index price at the expiration date.

Return to Index = Index price at Expiration – Current Index Price + Dividend
$= Ie - I_B + D$ (1)

Return to futures = Future price at Expiration – Current future price + Interest on Risk free asset.
$= Fe - F_B + R_F$ (2)

As I_E will equal Fe at expiration, using the above equations, we can derive, FB as = $I_B + (R_F - D)$

The above equation means that the present price of futures, will equal present price of Index plus the 'cost of carry' which equals (Rf - D), namely the interest obtainable on risk-free asset (Rf) minus dividend on Index Shares (D). The cost of purchasing the Index Shares is substantially higher than the cost of buying the futures contract for the same index. The money used to buy the futures will involve interest cost and by not buying the shares, dividends are lost. Assume that the money used to purchase the index shares is invested in treasury bills to give risk free return (Rf). If Rf is less than the dividends lost, the futures price will be below the Index price (that is $F_B < I_B$) and ($R_F < D$).

7.4 Commodity Futures and Financial Futures

Commodity futures and financial futures are explained in the paragraphs given below.

7.4.1 Commodity Futures

Commodity futures are trades in actual commodities. Many significant agricultural products are covered by futures contracts including wheat, pork and orange juice plus other commodities, such as timber. Futures contracts originated in an organised way with the Chicago Board of Trade and have since been offered by numerous other exchanges.

Example: The Chicago Board of Trade was established in 1848. It has more than 3,600 members who trade 50 different futures and options products through open auction and/or electronically. Volume at the exchange in 2003 was 454 million contracts. Initially, only agricultural commodities, such as corn, wheat, oats and soybeans were traded. Futures contracts have developed to include non-storable agricultural commodities and non-agricultural products such as gold and silver. The first financial futures contract was launched in October 1975 based on Government National Mortgage Association mortgage-backed certificates. Further futures, including U.S. Treasury bonds and notes, stock indexes have been introduced since then. Options on futures were introduced in 1982.

A contract with the Board of Trade, which is similar in structure to contracts on other exchanges, specifies the follows:

- The quality of the product: The quality has to be very carefully defined, so that the parties to the contract know exactly what will be traded. This is important, when there are many different varieties and qualities of the same product.
- The quantity of a trade: The quantity that is traded is specified in the contract. This is usually large in order to make delivery an economically viable exercise. However, it does mean that these contracts are 'lumpy', so that the assumption of divisibility is not easily applied. The high transport costs that can be involved in shipping the commodities around.
- The date of delivery (or interval in which delivery is to be made): This is essential for the contract to function.
- The price: This is the basic feature of the contract upon which profit and loss is determined. The price is what will be paid at the delivery time.

These specifications have to be very precise and complete in order to ensure that there can be no dispute about whether the correct product is ultimately delivered.

Example: Soybeans Futures

- Contract Size 5,000 bu.
- Deliverable Grades No. 2 Yellow at par, No. 1 yellow at 6 cents per bushel over contract price and No. 3 yellow at 6 cents per bushel under contract price *No. 3 Yellow
- Soybeans are only deliverable when all factors equal U.S. No. 2 or better except foreign material. See Soybean Futures in the Rules & Regulations section.
- Tick Size 1/4 cent/bu ($12.50/contract)
- Price Quote Cents and quarter-cents/bu
- Contract Months Sep, Nov, Jan, Mar, May, Jul and Aug
- Last Trading Day: The business day prior to the 15th calendar day of the contract month.
- Last Delivery Day: Second business day following the last trading day of the delivery month.
- Trading Hours Open Auction: 9:30 a.m.-1:15 p.m. Central Time, Mon-Fri. Electronic: 7:31 p.m.-6:00 a.m. Central Time, Sun-Fri. Trading in expiring contracts closes at noon on the last trading day.
- Ticker Symbols Open Auction: S, Electronic: ZS
- Daily Price Limit: 50 cents/bu ($2,500/contract) above or below the previous day's settlement price.

No limit in the spot month (limits are lifted two business days before the spot month begins). Although the contracts specify delivery of a commodity, most contracts are closed, before the delivery date. Less than 1% are delivered or settled in cash.

7.4.2 Financial Futures

Financial futures are contracts drawn up on the basis of some future price or index, such as the interest rate or a stock index. Generally, no 'good' is delivered at the completion of the contract and only a financial exchange takes place. Generally is used, because there are exceptions involving bond contracts. Financial futures become possible, when it is observed that the actual commodity need not be delivered at the end of the contract only the 'profit' over the current spot price is paid. For example, assume the futures contract price is $3 and the spot price is $2. Then, the buyer of futures contract pays $1 to the seller and no transfer of asset needs to take place.

A financial future can also be formed by converting an index into a monetary equivalent. For instance, a stock index future can be constructed by valuing each 10 points at $1. Thus, an index of 6100 would trade at a price of $610. If the index fell to 6000, the futures price would become $60. Using such a mechanism, it becomes possible to construct such contracts on any future price. Example of exchanges in the US, where financial futures are traded are the Chicago Board of Trade, Mid-America Commodity Exchange and New York Board of Trade.

Example: NYSE Composite Index® Futures
Contract REVISED NYSE Composite Index®_ Futures Small Contract Size
$5 × NYSE Composite Index (e.g., $5 × 5000.00 = $25,000) Symbol Value of
Minimum Move MU $2.50
Contract REVISED NYSE Composite Index® Futures Reg. Contract Size
$50 × NYSE Composite Index R_ (e.g., $50 × 5000.00 = $250,000) Symbol
Value of Minimum Move YU $25.00
Price Quotation: Index Points where 0.01 equals $0.50
Daily Price Limits: Please contact the Exchange for information on daily price limits for these contracts.
Position Limits: NYSE Regular (on a 10:1 basis) are converted into NYSE Small positions for limit calculation purposes. Any One Month Limit 20,000
All Months Combined Limit 20,000
Cash Settlement: Final settlement is based upon a special calculation of the third Friday's opening prices of all the stocks listed in the NYSE Composite Index®
In the UK, futures contracts are traded on LIFFE, the London International
Financial Futures Exchange which was opened in 1982.

Example: LIFFE offers a range of futures and options; ad provides an arena for them to be traded. The Exchange brings together different parties, such as financial institutions, corporate treasury departments and commercial investors, as well as private individuals, some of whom want to offset risk, hedgers and others who are prepared to take on risk in the search for profit.

The following mergers with the London Traded Options Market (LTOM) in 1992 and with the London Commodity Exchange (LCE) in 1996, LIFFE added equity options and a range of soft and agricultural commodity products to its existing financial portfolio. Trading on LIFFE was originally conducted by what's known as 'open outcry'. Traders would physically meet in the Exchange building to transact their business. Each product was traded in a designated area called a pit, where traders would stand and shout the price at which they were willing to buy or sell. In 1998, LIFFE embarked on a programme to transfer all its contracts from this traditional method of trading, to an electronic platform. This transition is now complete. The distribution of LIFFE CONNECTTM stands at around 450 sites, more than any other trading system in the world, and covers all major time zones. This distribution continues to grow.

There are three major types of futures traded on LIFFE.

- Contracts on short-term interest rates: These are based on the three-month money market rate and are priced as 100 - interest rate. Consequently, when the interest rate goes up, it implies that the price of the futures contract goes down.
- Bond futures: Bond future represents long-term interest rate futures. They are settled by delivery of bonds, with adjustment factors to take account of the range of different bonds that may be delivered. This is a financial future which is settled by actual delivery of the commodity.
- Equity index futures: Equity index futures are cash settled and are priced per index point.

7.5 Motives of Trading

Two motives can be identified for trading forwards and futures. These are hedging and speculation. These motives are now discussed in turn.

7.5.1 Hedging, Speculation and Arbitrage

Hedging, speculation and arbitrage are discussed in the paragraphs given below.

Hedging

Hedging is the use of the contracts to reduce risk. Risk can arise from either taking, demanding or supplying a commodity at some time in the future. The current price is known, but the price at the time of demand or supply will not be known. A strategy of hedging can be used to guard against unfavourable movements in the product price. Two examples of the way in which hedging can be employed are now given.

Example: Consider a bakery which needs wheat in three months. It can:

- Wait to buy on the spot market.
  Or
- Buy a future now.

If the baker followed second option, they would be a long hedger, this is the investor who has committed to accept delivery.

Example: Consider a company in the UK, who will be paid in three months time in Euros. It can:

- Sell a future on the Euros now.
  Or
- Wait to receive the Euros and sell them on the spot market.

If the firm followed first option they would be a short hedger, the investor who commits to supply the commodity.

The advantage of a futures contract is that it fixes the price and guards against price changes. For someone who has to buy in the future, it can be used to insure against price increases while for someone who has to sell in the future it can insure against price-falls. A company that is due to sell an asset at a particular time in the future can hedge by taking a short futures position. They then hold a short hedge. A company that is due to buy an asset at a particular time in the future can hedge by taking a long futures position, a long hedge.

Hedging through the use of futures contracts reduces risk by fixing a delivery or purchase price. This insures against adverse price movements, but also means that profit is lost from favourable price movements. The optimal degree of hedging determines the best trade-off between these. In effect, it is usually best to cover some exposure by hedging, but leave some uncovered in order to profit from favourable price movements. The hedge ratio is the size of the position in futures relative to size of exposure.

One way of analysing the optimal degree of hedging is to consider the strategy that minimises the variance in a position. The optimal hedge ratio can be determined by considering the variation in the spot price and the futures price. Let ΔS be change in spot price S over length of hedge and ΔF be change in futures price F over length of hedge. The standard deviation of ΔS is denoted by σ_S and the standard deviation of ΔF by σ_F . Let ρ be coefficient of correlation between ΔS and ΔF and let the hedge ratio be denoted by h.

Consider a position which is long in the asset, but short in future. With h denoting the hedge ratio, the change in the value of the position over the life of the hedge is:

$$\Delta P = \Delta S - h\Delta F$$

Conversely, when long in the future, but short in the asset the change in value of position is:

$$\Delta P = h\Delta F - \Delta S$$

For both of these positions, the variance of change in the value of hedged position is:

$$var(\Delta P) = E(\Delta P - E(\Delta P))^2$$
$$= E(\Delta S - h\Delta F - E(\Delta S - h\Delta F))^2$$

Computing the expectation gives:

$$var(\Delta P) = \sigma_S^2 + h^2\sigma_F^2 - 2h\rho\sigma_S\sigma_F$$

One definition of an optimal policy is to choose the hedge ratio to minimise this variance. The necessary condition for the hedge ratio is:

$$\frac{dvar(\Delta P)}{dh} = 2h\sigma_F^2 - 2\rho\sigma_S\sigma_F = 0$$

Solving this condition, the hedge ratio that minimises the variance is:

$$h = \rho\frac{\sigma_S}{\sigma_F}$$

Given data on these standard deviations and the correlation, this optimal hedge ratio is simple to compute.

Example: A company must buy 1m gallons of aircraft oil in 3 months. The standard deviation of the oil price is 0.032. The company hedges by buying futures contracts on heating oil. The standard deviation is 0.04 and the correlation coefficient is 0.8. The optimal hedge ratio is:

$$0.8 \times \frac{0.032}{0.040} = 0.64$$

One heating oil futures contract is for 42000 gallons. The company should buy

$0.64 \times \frac{1000000}{42000} = 15.2$ contracts, which is 15 when rounded.

The example illustrates that the hedge does not have to be in the same commodity, but only in a similar commodity whose price is highly correlated with the one being hedged. In addition, it also shows that optimal hedging does not necessarily imply that all of the exposure has to be covered. In the example, the company has an exposure of 1m gallons, but buys futures contracts of 630000 gallons.

Speculation

The second reason for trading in futures is speculation. If the spot price is expected to change, a trader can engage in speculation through futures. A speculator has no interest in taking delivery of the commodity or of supplying it, but is simply interested in obtaining profit through trade. Consequently, any trade they make must ultimately be matched by a reversing trade to ensure that they do not need to receive or deliver.

For an expected price rise a speculator will:

- Buy futures now.
- Enter a reversing trade to sell later after the price has risen.

Conversely, for an expected price fall, the speculator will:

- Sell futures now.
- Enter a reversing trade to buy later after the price has fallen.

Clearly, even though the quantity of commodity to be traded is limited to the amount produced, any number of speculative trades can be supported, if there are speculators on both sides of the market.

7.6 Forward Prices

The valuation issue involved with forward contracts is to determine the delivery price, or forward price, that is written into the contract at its outset. At the time the two parties on either side of a contract agree the trade, no payment is made. Instead, the forward price is set so that the contract is 'fair' for both parties. To be fair, the contract must have a value of zero at the time it is agreed. It is this fact that allows the delivery price to be determined.

As we will see, the forward price in the contract and the spot price of the underlying asset at the time the contract is agreed are related. This relationship is now developed as the basis for determining the forward price. This section develops the valuation of forward contracts. Forwards are considered since the daily settlement involved in futures contracts makes their analysis more complex. A later section explores the extent of the differences between the values of the two contracts.

The focus of this section is upon investment assets. The important feature of these is that it is possible to go short in these assets or reduce a positive holding, if it is advantageous to do so. This allows us the flexibility to apply an arbitrage argument to obtain the forward price. A number of cases are considered which differ in whether or not the asset pays an income.

7.6.1 Investment Asset with No Income

The process of valuation using arbitrage involves searching for profitable opportunities by combining the assets that are available. To determine the fair futures price, it is assumed that the assets available consist of a risk-free asset, the asset underlying the forward contract and the forward contract. If the forward price is not correctly set, it becomes possible to produce arbitrage profits by combining these assets. The construction of an arbitrage portfolio is illustrated by the following example.

7.6.2 Investment Asset with Known Income

Many financial assets provide an income to the holder. The holder of a forward on the asset does not receive this income, but the price of the underlying asset decreases to reflect the payment of the income. This observation allows the payment of income to be incorporated into the binomial tree. If the asset pays an income with present value of I just prior to the delivery date in the forward contract, the value of the asset will be reduced to uS0 –IR on the upper branch of the tree and dS0−IR on the lower branch.

The application of risk-neutral valuation gives:

$$V_0^f = \frac{1}{R}\left[q[F_0 - uS_0 + IR] + (1-q)[F_0 - dS_0 + IR]\right] = 0$$

Solving this using the definitions of the risk-neutral probabilities provides the forward price:

$$F_0 = [S_0 - I]R$$

As before, this can be extended naturally to the continuous case as:

$$F_0 = [S_0 - I]e^{rT}$$

Therefore, if the asset pays an income this reduces the forward price, because the person who is long in the forward contract does not receive this income, but is affected by the fall in the assets price immediately after the income is paid.

7.6.3 Continuous Dividend Yield

Rather than making a single payment of income, an asset may have a continuous flow of dividends. Let the rate of flow of dividends be q. Then the previous result can be modified to:

$$F_0 = S_0 e^{(r-q)T}$$

A continuous flow of dividends has the effect of continually reducing the asset price, so reduces the forward price.

7.6.4 Storage Costs

Storage costs are the opposite of income. They can be added into the expressions directly.
Let U be present value of storage costs, then:

$$F_0 = [S_0 + U]e^{rT}$$

7.7 Value of Contract

It has already been noted that at the outset of the contract, the forward price is chosen to ensure that the value of the contract is zero. As time progresses, the spot price of the underlying asset will change as will the forward price in new contracts. The contract can then either have a positive value, if the price change moves in its favour and negative, if it moves against.

To determine this value, let F_t be forward price at time t, and F_0 the forward price in a contract agreed at time 0. With time $T - t$ to the delivery date, the value, f, of the forward contract is then given by:

$$V_t^f = [F_t - F_0]e^{-r[T-t]}$$

As already noted, at the time the contract is written its value is zero. Now since $F_t = S_t e^{r[T-t]}$ it follows that the value of the contract at time t is:

$$V_t^f = S_t - F_0 e^{-r[T-t]}$$

With an income from the asset, this value becomes:

$$V_t^f = S_t - I - F_0 e^{-r[T-t]}$$

And with a dividend:

$$f = S_0 e^{-qT} - F_0 e^{-r[T-t]}$$

7.8 Commodities

Considering forward contracts on commodities does make a difference to these results. The features of commodities are that there may be no chance to sell. This means the pricing relations have to be revised. Returning to the basic strategies, it is possible to borrow money, buy the underlying asset, go short in a forward, hold the asset until the delivery date and then deliver and repay the loan. This must not be profitable. Let U be present value of storage costs, the strategy is not profitable if:

$$F_0 \leq [S_0 + U]e^{rT}$$

This relation puts an upper bound on the forward price. A lower bound cannot be applied without the possibility of short sales or of sales from stocks. If the good cannot be stored, then U can be thought of as the cost of actually producing the commodity.

7.9 Future Compared to Forward

In general, futures and forwards will not have the same price, because of the daily settlement. This leads the two assets have different flows of payments. When the risk-free interest rate is constant, then:

$$Forward\ price = Future\ price$$

This identity arises because with the constant interest rate the timing of the payments does not matter, since they have the same present value. Prices need not be the same when interest rates vary because of daily settlement. Consider a situation where the spot price, S, is positively correlated with the interest rate. With a long position, an increase in S earns a daily profit. Positive correlation ensures this is invested, when r is high. Conversely, a decrease in S earns a loss which is covered, when interest rates are low. This implies the future is more profitable. Despite the observations, the difference in price may be small in practice.

7.10 Backwardation and Contango

The final issue to address is the relationship between the futures price and the expected spot price. There are three possibilities that may hold.

7.10.1 Unbiased Predictor.

In this case, the futures price is equal to the expected spot price at the delivery date of the contract. Hence:

$$F_0 = E[S_T]$$

7.10.2 Normal Backwardation.

The argument for normal backwardation follows from assuming that:

- Hedgers will want to be short in futures
- Will have to offer a good deal to speculators

Together these imply that

$$F_0 < E[S_T]$$

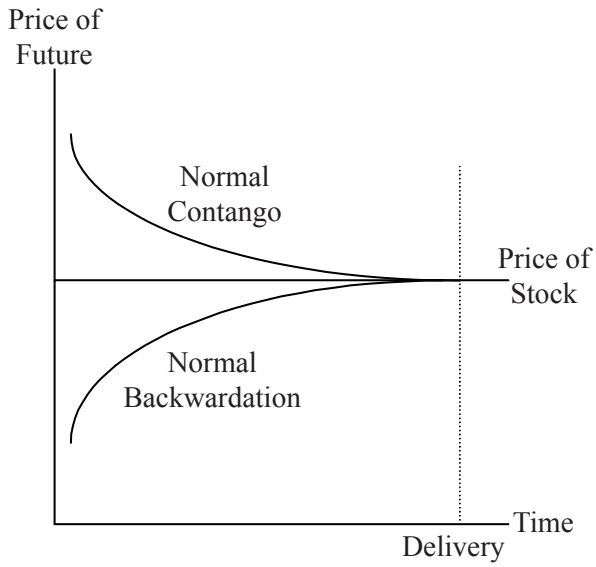

Fig. 7.1 Backwardation and contango
(Source: http://people.exeter.ac.uk/gdmyles/Books/IA.pdf)

7.10.3 Normal Contango.

The argument for normal backwardation follows from assuming that:

- Hedgers will want to be long on average.
- Must encourage speculators to be short.

Together these imply that:

$$F_0 > E[S_T]$$

The empirical evidence on this issue seems to suggest that generally $F_0 < E[S_T]$, so that normal backwardation holds.

7.11 Derivative Trading in Securities

The Securities Laws (Amendment) Act of 1999 has allowed the trading in derivative products in India. As a further step to widen and deepen the securities markets, the government has notified on March 2, 2000 that with effect from March 1, 2000, the ban on forward trading in shares and securities is lifted to facilitate trading in forwards and futures.

It may be recalled that the ban on forward trade in securities was imposed in 1968 to curb certain unhealthy trade practices and trends in the securities market and unhealthy speculation by unscrupulous operators. During the past few years, thanks to the economic and financial reforms, there have been many healthy developments in the markets, which necessitated sophistication and fine tuning of the capital and stock markets.

The Government notification delineated the areas of responsibilities between the RBI and SEBI. “The contracts for sale and purchase of government securities and gold-related securities, money market securities and securities from these securities and ready forward contracts in debt securities will be regulated by the RBI. Such contracts will however be regulated by SEBI in a manner that is consistent with the RBI guidelines.” The RBI has notified that forward trading in gilted securities will not be allowed except Repos. Trade Cycles of T and T + 1 for direct deals and T + 5 for NSE deals will however continue. Repos are now allowed for varying periods for one day to 14 days. These are in the form of ready forward contracts in treasury bills and government securities.

The lifting of the ban on forward deals in securities helped to develop index futures and other types of derivatives and futures on stocks. This is a step in the right direction to promote sophisticated market segments as in Western Developed Countries. Sensex futures and Nifty futures for one to three months are now regularly traded and their quotations are published in the Daily Press. The traded quantity, number of contracts and their value are the details of data published. Futures trading in selected scripts both on BSE and NSE are also taking place and their details are also published in the Daily Press, under the head of Derivatives Trading.

7.12 NSE Proposals

The NSE has proposed to start futures and options by end of the year 1996, (o & F Section) but (started in June 2000 and 2001. This section is for corporate members only. Members trading only and those who will write options are the two classes of members in o & F Section. The former will have a net worth of Rs. 3 crores and the latter Rs. 5 crores. They have to pay additional cash deposits with NSE and National Securities Clearing Corporation (NSCCL) separately.

The membership of o & F Section is also thrown open to non-NSE members, if they satisfy all the requirements of net worth and cash deposits with NSE and NSCCL. The new o & F members have to be members of the Equity market of NSE also, as they can take positions in the cash and futures markets at different times. Existing NSE members opting as trading members in the o & F Section will have to hike their net worth from Rs. 1 crore to Rs. 3 crores and make an additional cash deposit of Rs. 28lakhs. For NSCCL, they will have to pay cash deposit of Rs. 25 lakhs and provide a bank guarantee of Rs. 25 lakhs.

Existing members of NSE opting to be writers of ‘Futures’ or ‘Options’, will hike their net worth to Rs. 5 crores and pay a cash deposit of Rs. 56 lakhs to NSE. For NSCCL, they would make a cash deposit of Rs. 50 lakhs and provide a bank guarantee of Rs. 50 lakhs. The other terms and details are finalised by the NSE, and approved by SEBI. These terms and conditions are variable.

Even by end March 2000, NSE did not succeed in starting futures due to teething problems in starting futures and due to the difficulties of members to bring in additional funds. Reference was already made to the recommendations of the Committee on Derivatives, set up by SEBI. In March 2000, when the ban on Forward Trading on Securities was lifted, both the NSE and BSE were considering the launch of the Futures, based on the Index of securities to start with. Index futures and options were started in 2000 and in stocks in 2001.

Summary

- Forwards and futures are both contracts which involve the delivery of a specific asset at an agreed date in the future at a fixed price.
- Forward contracts, which are no more than commitments to a future trade, have been in use for a very long time.
- Forwards and futures are two variants of the same basic transaction, but there are some important operational differences between them.
- The terms of the contract, underlying the futures trading will determine the number of times the difference is to be multiplied.
- Commodity futures are trades in actual commodities.
- Many significant agricultural products are covered by futures contracts including wheat, pork and orange juice plus other commodities, such as timber.
- Futures contracts originated in an organised way with the Chicago Board of Trade and have since been offered by numerous other exchanges.
- Financial futures are contracts drawn up on the basis of some future price or index, such as the interest rate or a stock index.
- A financial future can also be formed by converting an index into a monetary equivalent.
- Two motives can be identified for trading forwards and futures.
- Hedging is the use of the contracts to reduce risk.
- The second reason for trading in futures is speculation.
- A speculator has no interest in taking delivery of the commodity or of supplying it, but is simply interested in obtaining profit through trade.
- The valuation issue involved with forward contracts is to determine the delivery price, or forward price, that is written into the contract at its outset.
- The process of valuation using arbitrage involves searching for profitable opportunities by combining the assets that are available.
- In general, futures and forwards will not have the same price because of the daily settlement.
- The Securities Laws (Amendment) Act of 1999 has allowed the trading in derivative products in India.
- The NSE has proposed to start Futures and options by end of the year 1996, (0 & F Section) but (started in June 2000 and 2001.

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Self Assessment

1. Forwards and futures are both contracts which involve the delivery of a specific asset at an agreed date in the future at a _____ price.
   a. fixed
   b. high
   c. low
   d. market

2. Which of the following were first introduced in an exchange by the Chicago Board of Trade in the 1860s to assist with the reduction in trading risk for the agricultural industry?
   a. Index futures
   b. Forward futures
   c. Financial futures
   d. Commodity futures

3. Match the following

1. Commodity futures	A. Trades in actual commodities.
2. Financial futures	B. This is second reason for trading in futures.
3. Hedging	C. They are contracts drawn up on the basis of some future price or index, such as the interest rate or a stock index.
4. Speculation	D. It is the use of the contracts to reduce risk.

   a. 1-C, 2-B, 3-A, 4-D
   b. 1-A, 2-C, 3-D, 4-B
   c. 1-B, 2-D, 3-C, 4-A
   d. 1-D, 2-A, 3-B, 4-C

4. The cost of _____ the index shares is substantially higher than the cost of buying the futures contract for the same index.
   a. selling
   b. importing
   c. purchasing
   d. exporting

5. What is an agreement to buy or sell specified quantity of the underlying assets at a price agreed upon by the buyer and seller, on or before a specified time?
   a. Financial contract
   b. Index contract
   c. Forward contract
   d. Futures contract

6. Which of the following statement is true?
   a. A forward is an over-the-counter agreement between two individuals.
   b. A future is an over-the-counter agreement between two individuals.
   c. An index is an over-the-counter agreement between two individuals.
   d. A commodity is an over-the-counter agreement between two individuals.

7. The process of daily settlement is designed to avoid the development of excessive negative positions and the possibility of _____.
   a. default
   b. failure
   c. success
   d. accomplishment

8. What represents long-term interest rate futures?
   a. Contracts
   b. Bond future
   c. Equity index futures
   d. Hedging

9. The process of valuation using _____ involves searching for profitable opportunities by combining the assets that are available.
   a. hedging
   b. speculation
   c. arbitrage
   d. future

10. Which of the following statement is false?
    a. Prices need not be the same when interest rates vary because of daily settlement.
    b. A future is a trade organised by an exchange.
    c. A forward is settled on the delivery date.
    d. The profit or loss on a future is settled on a weekly basis.

Chapter VIII

Options and Swaps

Aim

The aim of this chapter is to:

- introduce options
- explain call, put and trading options
- explicate put call parity

Objectives

The objectives of this chapter are to:

- enlist types of derivatives
- elucidate valuation of European options
- explain introduction to swaps

Learning outcome

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

- identify currency swap
- understand swap market
- recognise valuation of swaps

8.1 Introduction

An option is a contract that gives the holder the right to undertake a transaction, if they wish to do so. It also gives them the choice to not undertake the transaction. Possessing this freedom of choice is beneficial to the holder of the option, since they can avoid being forced to make an undesirable trade. Options, therefore have value and the rights attached to them and are marketable. The issue that the investment analyst must confront, when faced with options is to determine their value. It is not possible to trade successfully, without knowing the value of what is being traded. This applies equally to the financial options traded on established markets and to more general instruments, such as employment contracts, which have option-like features built in. This chapter will describe the standard forms of option contract and then gradually build towards a general formula for their valuation. The individual steps of the building process have independent worth, since they provide a methodology for tackling a range of valuation issues.

8.2 Options

There are two basic types of options. A call option gives the right to buy an asset at a specific price within a specific time period. A put option gives the right to sell an asset at a specific price within a specific time period. The price at which the trade can take place is called the exercise or strike price. The asset for which there is an option to buy or sell is often called the underlying asset. If the underlying asset is a common stock, then the standard call and put options are called plain vanilla options. This distinguishes them from other more complex options which, for example, can provide the option to buy another option. If the option is used, for example, the holder of a call option chooses to buy the underlying stock, the option is said to have been exercised.

8.2.1 Call, Put and Trading Options

Call, put and trading options are discussed in the paragraphs given below.

Call option

A plain vanilla call option is the right to buy specific shares for a given price within a specified period. The premium on an option is the price paid by the investor to purchase the option contract.

The contract for a plain vanilla call option specifies:

- The company whose shares are to be bought.
- The number of shares that can be bought.
- The purchase (or exercise) price at which the shares can be bought.
- The date when the right to buy expires (expiration date).

A European call can only be exercised at the time of expiration. This means that the purchaser of the option must hold it, until the expiration date is reached and only then can choose whether or not to exercise the option. In contrast, an American call can be exercised at any time up to the point of expiration. If an investor purchases a call option, they must have some expectation that they will wish to exercise the option. Whether they will wish to do so depends critically upon the relationship between the exercise price in the contract and the price of the underlying asset. Clearly they will never exercise the right to buy, if the price of the underlying asset is below the exercise price. In such a case, they could purchase the underlying assets more cheaply on the standard market.

For a European call, the option will always be exercised, if the price of the underlying asset is above the exercise price at the date of expiration. Doing so allows the investor to purchase an asset for less than its trading price and so must be beneficial. With an American call, the issue of exercise is more complex, since there is also the question of when to exercise, which does not arise with European options. Putting a detailed analysis of this aside until later, it remains correct that an American option will only be exercised, if the price of the underlying is above the exercise price and will certainly be exercised, if this is true at the expiration date.

Put option

A plain vanilla put option is the right to sell specific shares for a given price within a specified period.

The contract for a plain vanilla put option specifies:

- The company whose shares are to be sold.
- The number of shares that can be sold.
- The selling (or exercise) price at which the shares can be sold.
- The date when the right to sell expires (expiration date).

As with calls, a European put can only be exercised at the expiration date, whereas an American put can be exercised at any date up to the expiration date. The difference in value between American puts and European puts will be explored later. However, it can be noted immediately that since the American put is more flexible than the European put, its value must be at least as high.

Trading options

Options are traded on a wide range of exchanges. Most prominent amongst those in the US are the Chicago Board Options Exchange, the Philadelphia Stock Exchange, the American Stock Exchange and the Pacific Stock Exchange.

Important exchanges outside the US include the Eurex in Germany and Switzerland and the London International Financial Futures and Options Exchange. Options contracts are for a fixed number of stocks. For example, an options contract in the US is for 100 stocks. The exercise or strike prices are set at discrete intervals (a $2.50 interval for stock with low prices, up to a $10 interval for stock with high prices). At the introduction of an option, two contracts are written, one with an exercise prices above the stock price and one with an exercise price below. If the stock price goes outside this range, new contracts can be introduced. As each contract reaches its date of expiry, new contracts are introduced for trade.

Quotes of trading prices for options contracts can be found in both The Wall Street Journal and the Financial Times. These newspapers provide quotes for the call and put contracts whose exercise prices are just above and just below the closing stock price of the previous day. The price quoted is for a single share, so to find the purchase price of a contract this must be multiplied by the number of shares in each contract. More detailed price information can also be found on Yahoo which lists the prices for a range of exercise values, the volume of trade and the number of open contracts. Market makers can be found on each exchange to ensure that there is a market for the options. The risk inherent in trading options requires that margin payments must be must in order to trade.

8.2.2 Put Call Parity

There is a relationship between the value of a call option and the value of a put option. In fact, if one value is known, the other can be derived directly. This relationship is determined by analysing a particular portfolio of call, put and the underlying asset. Consider a portfolio that consists of holding one unit of the underlying asset, one put option on that asset, and the sale of one call option, with the put and call having the same exercise price. If V^p is the value of the put option and V^p the value of the call, the value of the portfolio, P, is:

$$P = S + V^p - V^p$$

At the expiration date, the final values for the two options can be used to write the portfolio value as:

$$P = S + \max\{E - S, 0\} - \max\{S - E, 0\}$$

If S<E at the expiration date, then the put option is exercised but not the call. The value of the portfolio is:

$$P = S + E - S = E$$

Conversely, if S>E the call options is exercised, but not the put. This gives the value of the portfolio as:

$$P = S - S + E = E$$

Hence, whatever the price of the underlying asset at the expiration date, the value of the portfolio is:

$$P = E$$

So the portfolio has the same value, whatever happens to the stock price. As the value of the portfolio is constant for all S, the portfolio is a safe asset and must pay the rate of return earned on the risk-free asset. If this return is r, with continuous compounding the initial value of the portfolio, if there are t units of time until the date of expiry is equal to the discounted value of the exercise price, so:

$$S + V^p - V^p = Ee^{-rt}$$

Therefore, at any time up to the expiration date, if either V p or V c is known, the other can be derived directly. This relationship is known as put-call parity.

8.3 Types of Derivatives

The security or asset classes on which the derivatives depend are:

- Debt or bonds
- Equities
- Indexes
- Commodities
- Currencies

8.4 Valuation of European Options

The problem faced in pricing an option before the expiration date is that, we do not know what the price of the underlying asset will be on the date the option expires. In order to value an option before expiry, it is necessary to add some additional information. The additional information that we use takes the form of a model of asset price movements. The model that is chosen will affect the calculated price of the option, so it is necessary to work towards a model that is consistent with the observed behaviour of asset prices. The initial model that is considered makes very specific assumptions upon how the price of the underlying asset may move. These assumptions may seem to be too artificial to make the model useful. Ultimately though, they form the foundation for a very general and widely applied formula for option pricing.

The method of valuation is based on arbitrage arguments. The analysis of Arbitrage Pricing Theory emphasised the force of applying the idea that two assets with the same return must trade at the same price to eliminate arbitrage opportunities. To apply this to the valuation problem, the process is to construct a portfolio, with the option to be valued as one of the assets in the portfolio, in such a way that the portfolio has the same return as an asset with known price. In essence, the returns on the portfolio are matched to the returns on another asset.

The portfolio must then trade at the same price as the asset whose returns it matches. Knowing the prices of all the components of the portfolio, except for the option then implies we can infer the value of the option. This simple methodology provides exceptionally powerful valuing options and will be used repeatedly in what follows. The analysis given in this section is for European options on an underlying stock that does not pay any dividends. Dividends can be incorporated using the same methodology, but space limitations prevent this extension being undertaken here.

8.4.1 The Basic Binomial Model

To begin the study of option pricing, we first consider the simplest model for which the valuation problem has any substance. Although simple, solving this teaches us that we need to know to progress to a very general solution. Assume that when the option is purchased, there is a single period to the expiration date. No restriction needs to be placed on the length of this period, as long as the rates of returns are defined appropriately for that period. When the contract is purchased, the current price of the underlying stock is known. What we do not know is the price of the underlying at the expiration date. If we did, we could calculate the profit from the option, discount, it back to the date at which the contract is purchased and determine a precise value. It is this missing piece of information about the future price of the underlying stock that we must model. The modelling consists of providing a statistical distribution for the possible prices at the expiration date. The fundamental assumption of the basic binomial model is that the price of the stock may take one of two values at the expiration date.

Letting the initial price of the underlying stock be S, then the binomial assumption is that the price at the expiration date will either be:

- Equal to uS, an outcome which occurs with probability p;
  Or
- Equal to dS, an outcome which occurs with probability 1 − p.

The labelling of these two events is chosen so that u > d _ 0, meaning that the final price uS is greater than the price dS. Consequently, the occurrence of the price uS can be called the 'good' or 'up' state and price dS the 'bad' or 'down' state.

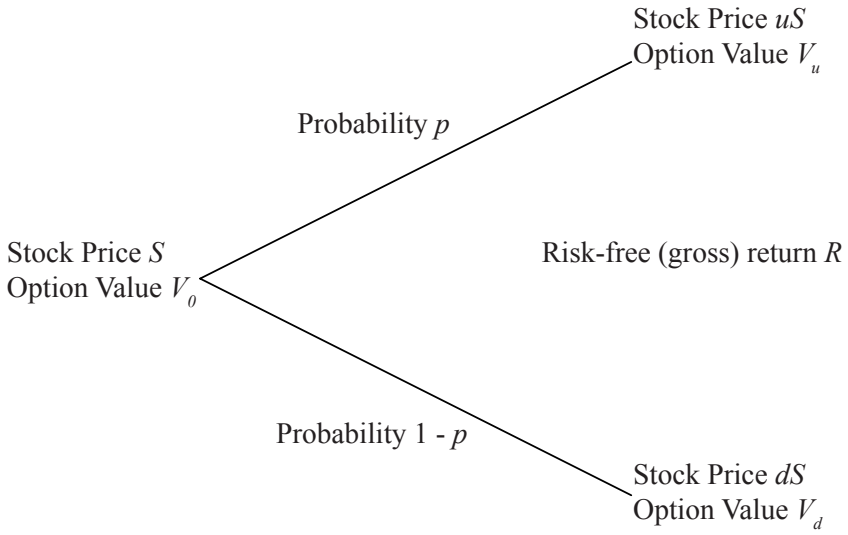

Fig. 8.1 Binomial tree for option pricing
(Source: http://people.exeter.ac.uk/gdmyles/Books/IA.pdf)

It can be seen how this model captures the idea that the price of the underlying stock at expiration is unknown, when the option is purchased. The final component of the model is to assume that a risk-free asset with return r is also available. Defining the gross return, R, on the risk-free asset by R ≡ 1 + r, it must be seen that the return on the risk-free asset satisfies:

$$u > R > d$$

This must hold since if R > u, the risk-free asset would always provide a higher return than the underlying stock. As the stock is risky, this implies that no one would hold the stock. Similarly, if d > R no one would hold the risk-free asset. In either of these cases, arbitrage possibilities would arise. For example, if the stock price rises to uS, the value of a call option is max $\{uS - E, 0\}$ and that of a put option is max $\{E - uS, 0\}$. For the present, it is enough to observe that we can calculate the value of the option at the expiration date given the price of the underlying. The value of the option at expiration is denoted Vu, when the underlying stock price is uS and Vd, when it is dS.

The information that has been described can be summarised in binomial tree diagram. Consider Fig. 8.1. At the left of the diagram is the date the option is purchased denoted time 0. At this time, the underlying stock price is S and the option has value V_0. It is this value V_0 that is to be calculated. The upper branch of the tree represents the outcome, when the underlying price is uS at expiration and the lower branch, when it is dS. We also note the risk-free return on the tree.

To use this model for valuation, note that there are three assets available:

- The underlying stock
- The option
- The risk-free asset

Constructing a portfolio of any two of these assets, which has the same return as the third allows the application of the arbitrage argument. Consequently, consider a portfolio that consists of one option and $-\Delta$ units of the underlying stock. The number of units of the underlying stock is chosen, so that this portfolio has the same value when the underlying has price uS at the expiration date as it does, when it has price dS. This then allows us to apply the arbitrage argument, since the portfolio has a fixed value and so must pay the same return as the risk-free asset. The portfolio constructed in this way is often referred to as the 'delta hedge' for the option. The cost of this portfolio at the date, the option contract is purchased is:

$$P_0 = V_0 - \Delta S$$

Where, V_0 is the unknown which is to be determined. At the expiration date the value of the portfolio is either:

$$P_u = V_u - \Delta uS$$

Or

$$P_d = V_d - \Delta dS$$

The value of Δ is chosen to ensure a constant value for the portfolio at the expiration date. Hence Δ must satisfy:

$$V_u - \Delta uS = V_d - \Delta dS$$

Giving:

$$\Delta = \frac{V_u - V_d}{S[u-d]}$$

Substituting this value of Δback into:

$$P_u = P_d = \frac{uV_u - dV_d}{u-d}$$

So, it does give a constant value as required. The arbitrage argument can now be applied. The portfolio of one option and $-\Delta$ units of the underlying stock provides a constant return. Therefore, it is equivalent to holding a risk-free asset. Given this, it must pay the same return as the risk-free or else one could be arbitraged against the other. Hence, the gross return on the portfolio must be R which implies:

$$P_u = P_d = RP_0$$

Now, substituting for P_0 and P_u gives:

$$\frac{uV_u - dV_d}{u-d} = R[V_0 - \Delta S]$$

Using the solution for Δ and then solving for V0:

$$V_0 = \frac{1}{R}\left[\frac{R-d}{u-d}V_u + \frac{u-R}{u-d}V_d\right]$$

This result gives the fair value for the option that eliminates arbitrage opportunities. In an efficient market, this would be the premium charged for the option. The valuation formula is defined for general values of Vu and V_d. What distinguishes calls and puts are the specific forms that these values take. These can be called the boundary values.

8.4.2 The Two-period Binomial

The single-period binomial model introduced a methodology for valuing options, but does not represent a very credible scenario. Where it is lacking is that the underlying stock will have more than two possible final prices.

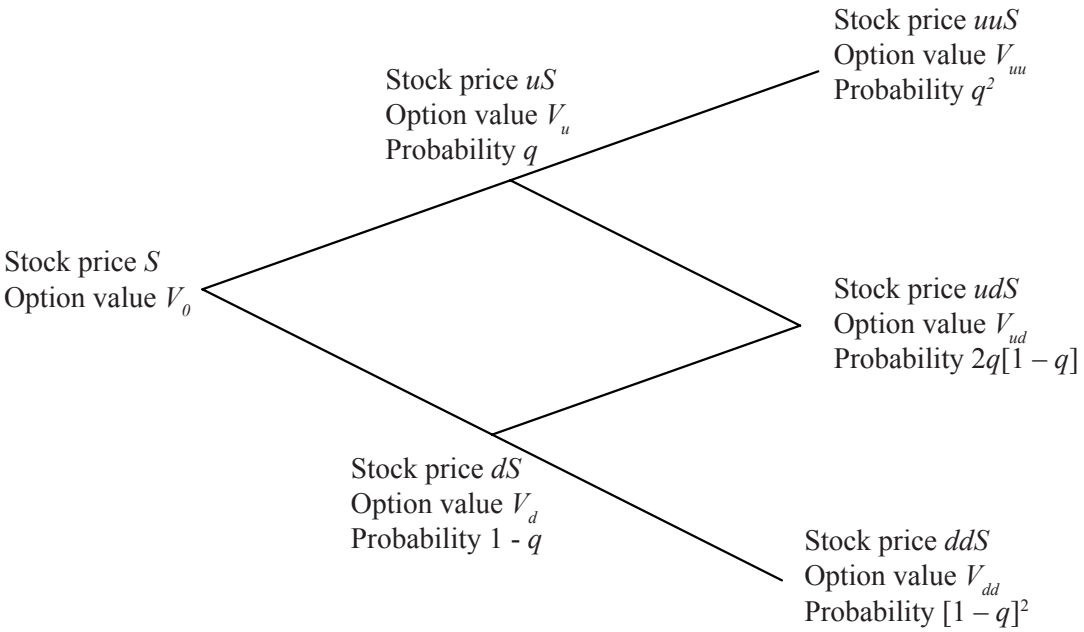

Fig. 8.2 Binomial with two sub-intervals

(Source: http://people.exeter.ac.uk/gdmyles/Books/IA.pdf)

Having introduced the method of risk-neutral valuation, the task of relaxing this restriction and moving to a more convincing environment is not at all difficult.

A wider range of final prices can be obtained by breaking the time period between purchase of the option and the expiration date into smaller sub-intervals and allowing the stock price to undergo a change over each sub-interval. As long as the rate of return for the risk-free asset and the proportional changes in the stock price are defined relative to the length of each sub-interval, the use of risk-neutral valuation can be directly extended to this setting.

Consider Fig. 8.2 which shows the period between purchase and expiration broken into two sub-intervals. Starting with an underlying stock price of S, at the end of the first sub-interval the price will either be uS or dS. In terms of the risk-neutral probabilities, these will occur with probabilities q and $1-q$ respectively. Starting from the price uS, it is possible to reach a final price at the end of the second interval of either uuS or udS. As the probability of another u is q and of a d is 1 − q, these final prices must have probabilities q2 and $q\ [1-q]$ respectively. Similarly, starting from dS, another d occurs with probability 1−q and a u with probability q. Hence, the final price ddS is reached with probability $[1-q]2$ and duS with probability$[1-q]\ q$. However, $udS = duS$, so the central price at the expiration date can be reached in two different ways with total probability of arrival given by $2q\ [1-q]$. The risk-free (gross) return, R, is defined as the return over each sub-interval. Hence the return over the period is R2. This completes the construction of the figure.

The value of the option V_0 can be obtained in two different ways. The first way is to use a two-step procedure which employs risk-neutral valuation to find V_u and V_d using the expiration values, and then uses these to find V_0. Although not strictly necessary for a European option, it is worth working through these two steps since this method is necessary when American options are valued. The second way to value the option is to apply risk-neutral valuation directly to the expiration values using the compound probabilities. Both give the same answer. To apply the two-step procedure, assume we are at the end of the first subinterval. The price of the underlying stock is either uS or dS. If it is uS, then applying the value of the option must be:

$$V_u = \frac{1}{R}\left[qV_{uu} + [1-q]V_{ud}\right]$$

Similarly, if the price of the underlying stock at the end of the first sub-interval is $dSdS$, the value of the option is:

$$V_d = \frac{1}{R}\left[qV_{ud} + [1-q]V_{dd}\right]$$

Now move to the very beginning of the tree. At the end of the first sub-interval the option is worth either V_u or V_d . Applying risk-neutral valuation, the value of the option at the purchase date must be:

$$V_d = \frac{1}{R}\left[qV_u + [1-q]V_d\right]$$

Substituting this expression gives:

$$V_0 = \frac{1}{R^2}[q^2V_{uu} + 2q[1-q]V_{ud} + [1-q^2]V_{dd}]$$

This is the fair value of the option at the purchase date. It should also be clear that this is the result that would have been obtained by applying risk-neutral valuation directly to the values at the expiration date, using the risk-neutral probabilities given in the binomial tree.

8.4.3 The General Binomial

The process of either working back through the tree or applying risk-neutral valuation directly to the expiration values can be applied to a binomial tree with any number of sub-intervals. A general variant of the binomial formula is now obtained that applies whatever number of sub-intervals the period is divided into. To derive this, note that in the occurrence of a q in the expression matches the occurrence of a u (and a $1 - q$ matches a d). Furthermore, the coefficients on the values at expiration are 1, 1 for the one-interval case and 1, 2, 1 for the two-interval case. These are the terms in the standard binomial expansion. Using these observations, the valuation formula for a period divided into n sub-intervals can be immediately derived as:

$$V_0 = \frac{1}{R^n}\left[\sum_{j=0}^{n}\left[\frac{n!}{j!\,[n-j]!}\right]q^j[1-q]^{n-j}V_{u^j d^{n-j}}\right]$$

It is easy to check that for n = 1 and n = 2 this gives the results already derived directly.

8.4.4 Matching to Data

The next question to be addressed is how to make the formula into a result that can be applied in a practical context. To evaluate the formula, we need to supply values for S, E, R, n and q. The underlying stock price S and the risk-free return R can be obtained directly from market data. The exercise price E is written into the option contract. The number of intervals, n, is chosen to trade-off accuracy against ease of computation. All that is unknown is q, the probability in the binomial tree.

To motivate the approach taken to providing a value for q, recollect that the basic idea of the binomial tree is that the price of the underlying stock is random. Given a value of R, the value of q is determined by u and d. The values of u and d must be chosen to result in behaviour of the underlying stock price that mirrors that observed in the market place. This leads to the idea of fixing u and d to provide a return and variance of the underlying stock price in the binomial model that equals the observed variance of the stock in market data.

Let the observed expected return on the stock be r and its variance be σ^2. Each of these is defined over the standard period of time. If the time length of each interval in the binomial tree is Δt, the expected return and variance on the stock over an interval are $\bar{r}\Delta t$ and $\sigma^2\Delta t$. If at the start of an interval the stock price is S, the expected price at the end of the interval using the observed return is $Se^{\bar{r}\Delta t}$. Matching this to the expected price in the binomial model gives:

$$puS + [1-p]dS = Se^{\bar{r}\Delta t}$$

Here it should be noted that, these are the probabilities of the movements in the statistical model and not the risk-neutral probabilities. Solving this shows that to match the data:

$$p = \frac{e^{\bar{r}\Delta t} - d}{u - d}$$

Over an interval in the binomial tree, the return on the underlying stock is $u - 1$ with probability p and $d - 1$ with probability $1 - p$. The expected return is therefore, $pu + [1 - p]\, d - 1$. The variance in the binomial model, _sb, can then be calculated as $\sigma_b^S = pu^2 + [1-p]d^2 - [pu + [1-p]d]^2$. Equating this variance is to the observed market variance gives:

$$pu^2 + [1-p]d^2 - [pu + [1-p]d]^2 = \sigma^2\Delta t$$

Substituting for p and ignoring terms involving powers of Δt^2 and higher, a solution of the resulting equation is:

$$u = e^{\sigma\sqrt{\Delta t}}$$

$$d = e^{-\sigma\sqrt{\Delta t}}$$

These values can then be used to parameterise the binomial model to match observed market data.

8.5 Options in Futures Contracts

Another financial derivative product traded in New York and London for example is options on future contracts. These contracts are presently traded in Europe and America, in Treasury bonds, Treasury Notes and Euro-dollar deposits. Calls and puts in the above futures are traded. A call position if exercised, will lead to a long position in the cash market. A put option, if exercised will lead to a short position in the cash market. If not exercised, only cash differences are paid and received by the buyer and seller respectively. The cost of such deals includes the premium paid and the limited margins that have to be deposited for dealing in Futures. By using options trading, the futures market provides high risk speculation for those whose speculative instinct is high. Futures market has an element of speculation although lack of delivery by itself is not speculative, but that futures prices may differ widely from its price in cash market at the time of settlement, is itself risky and speculative.

8.6 Introduction to Swaps

In 1981, IBM and the World Bank undertook an exchange of fixed rate debt for floating rate debt. This exchange was the start of the interest rate swap industry. It is now estimated that the market is worth over $50 trillion per year. However, it is difficult to provide a precise valuation of the size of the market because the market is not regulated and swaps are arranged between individual parties and not through exchanges. The financial swaps, we will consider are agreements to exchange one sequence of cash flows over a fixed period for another sequence of cash flows over the same period. This is precisely what IBM and the World Bank did. The two sequences of cash flows are tied to either to a debt instrument or to a currency.

This gives the two main types of swaps:

- Interest rate swaps
- Currency rate swaps

The emergence of swaps

The first swaps were conducted in the late 1970s to avoid UK currency controls. These controls limited the value of currency that could be exchanged, but this could easily be avoided by swapping rather than exchanging. These were followed by the IBM and World Bank swap in 1981. By 2001, it was estimated that $57 trillion in underlying value was outstanding in swap agreements.

8.6.1 Interest Rate Swap

A swap requires two parties to participate. For the purpose of the discussion, call these, party A and party B. On one side of the swap, party A agrees to pay a sequence of fixed rate interest payments and to receive a sequence of floating rate payments. A is called the pay-fixed party. On the other side of the swap, party, B agrees to pay a sequence of floating rate payments and to receive a sequence of fixed rate payments. B is called the receive-fixed party. The tenor is the length of time the agreement lasts and the notional principal is the amount on which the interest payments are based. With a plain vanilla swap, interest is determined in advance and paid in arrears.

8.6.2 Currency Swaps

A currency swap involves two parties exchanging currencies. It will occur, when two parties each hold one currency, but desire another. This could be for reasons of trade or because they aim to profit out of the swap based on expectations of exchange rate movements. The parties swap principal denominated in different currencies, but which is of equivalent value given the initial exchange rate.

The interest rate on either principal sum may be fixed or floating. As an example, consider two parties C and D. Assume that C holds Euros, but wants to have dollars. For instance, C may have to settle an account in dollars. In contrast, D holds dollars, but wants to have Euros instead. The two parties can engage in a swap and trade the dollars for Euros. Unlike an interest rate swap, the principal is actually exchanged at the start of the swap. It is also exchanged again at the end of the swap to restore the currency to the original holder.

The fact that the interest rates can be fixed or floating on either currency means that there are four possible interest schemes:

- C pays a fixed rate on dollars received; D pays a fixed rate on Euros received
- C pays a floating rate on dollars received; D pays a fixed rate on Euros received
- C pays a fixed rate on dollars received; D pays a floating rate on Euros received
- C pays a floating rate on dollars received; D pays a floating rate on Euros received

The predominant form of contract is the second. If party D is a US firm, then with a plain vanilla currency swap, the US firm will pay a fixed rate on the currency it receives.

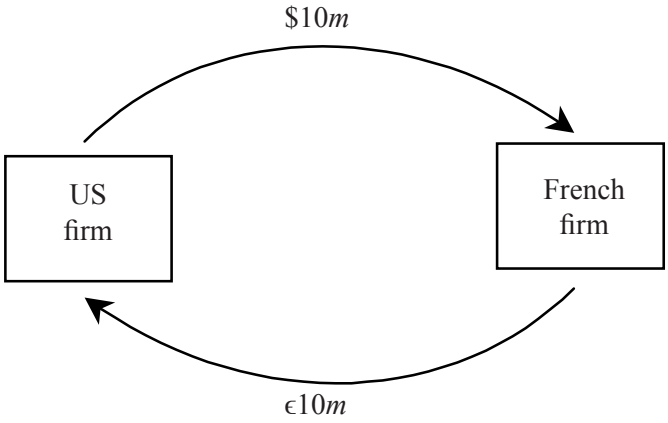

Fig. 8.3 Currency swaps
(Source: http://people.exeter.ac.uk/gdmyles/Books/IA.pdf)

To show how a currency swap functions, consider a swap of type 1 which involves exchanging fixed-for-fixed. The cash flows that occur with this swap are as follows:

- The initial swap of currency at initiation
- The periodic interest payments
- The swap of principal at termination

A currency swap involves interest payments which are made in the currency received. Consequently, since the two payments are in different currencies, there is no netting of the interest payments.

8.7 Uses of Swaps

There are three major reasons why swaps may be used. These are now considered in turn.

8.7.1 Market Inefficiency

The first reason for using swaps is to overcome market inefficiency. For example, it could be the case that firms located in a country are able to borrow at a lower rate in that country than firms located abroad. This creates a position in which firms have a comparative advantage in borrowing in their country's currency. Given such a position of comparative advantage, it is possible for two parties to find a mutually advantageous trade. Such a trade is illustrated in Table 8.1,s where the US firm can borrow dollars at 9%, but the UK firm must pay 10% to borrow dollars. The opposite position holds for borrowing in the UK.

	US $ rate	**UK £ rate**
US firms	9%	8%
UK firms	10%	7%

Table 8.1 Interest rates of UK and US firms

Assume that the UK firm wants dollars and the US firm wants Sterling. If they were to borrow directly at the rates in the table, the US firm would pay a rate of interest of 8% on its sterling and the UK firm a rate of 10% on its dollars. If the firms were to borrow in their own currency and then swap, this would reduce the rate faced by the US firm to 7% and that faced by the UK to 9%. This swap is illustrated in Fig. 8.4. The exploitation of the comparative advantage is beneficial to both parties. The existence of the comparative advantage depends on there being a market inefficiency that gives each firm an advantage, when borrowing in its home market. If the market were efficient, there would be a single ranking of the riskiness of the firms and this would be reflected in the rates of interest they pay in both countries. The internalisation of financial markets makes it unlikely that there will be significant inefficiencies to be exploited in this way.

8.7.2 Management of Financial Risk

Swaps can be used to manage financial risk. This is clearest when assets and liabilities are mismatched. The US Savings and Loans provide a good example of the possibility of risk management using swaps. These institutions receive deposits from savers and use the funds to provide loans for property. The savings and loans pay floating rate interest on deposits, but they receive fixed rate interest on the loans they grant. As the loans are for property, they are generally very long-term.

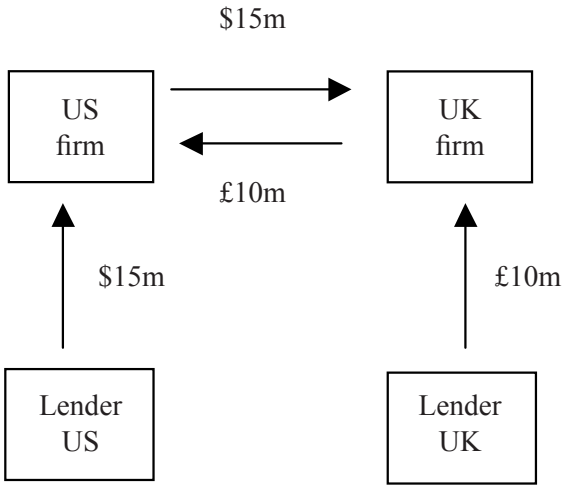

Fig. 8.4 Exploiting comparative advantage
(Source: http://people.exeter.ac.uk/gdmyles/Books/IA.pdf)

This places the savings and loans in a position, where they are exposed to risk if the floating interest rate rises. Such a rise would create an increase in their payments to depositors, but would not be accompanied by any increase from the long-term loans. Precisely this position was responsible, at least in part, for the collapse of a number of these institutions in the 1980s.

8.7.3 Speculation

Expressed in the simplest terms, a swap is a no more than a bet on the direction of interest rate and/or exchange rate movements. If the movement is in the right direction, a profit can be earned. Swaps can therefore be used for purely speculative reasons.

8.8 Swap market

This section discusses the major features of the swap market and the participants in that market.

8.8.1 Features

The major features of the swap market are as follows:

- There is no publicly observable marketplace. Swaps are transactions that take place either between individuals directly, between individuals with the intermediation of a broker, or with a swap dealer. Brokers and dealers are discussed further below.
- There is limited government regulation. As there is no marketplace, it is difficult for any government to provide regulation. There has been some recent discussion of regulation.

8.8.2 Dealers and Brokers

For anyone wishing to conduct a swap, there is the problem of finding the counterparty. For other derivatives, such as options and futures, this is less of a problem since there are organised exchanges to assist with transactions. In the early days of the swap market, counterparties to a swap were originally found via a broker. The market has developed, so that swaps are now generally conducted through dealers. This has increased the efficiency of the swap market.

Swap broker

A swap broker acts as an intermediary in the market. Their role is to match swap parties who have complementary needs. A broker maintains a list of clients who are interested in entering into swap deals and tries to match the needs of the clients. However, because it is necessary for a broker to find matching clients before any trade can take place, the organisation of a market through brokers does not make for a very efficient market.

Swap dealer

A swap dealer acts as counter-party to a swap. They can be on either side of the deal. The profit of a swap dealer is obtained by charging a spread between the two sides of the deal. The dealer accumulates a swap book. The book is constructed with the aim of balancing trades to limit risk. The risks faced by a swap dealer are as follows:

- Default risk: The party on the other side of a swap may default.
- Basis risk: The basis risk arises from movements in interest rates.
- Mismatch risk: Mismatch risk arises from the two sides of the dealers swap book not being balanced.

8.9 Valuation of Swaps

The process of valuation relates to answering two related questions. How a swap is correctly priced? How can the deal be fair for both parties? As an example, consider a plain vanilla interest rate swap. The party on one side of this swap will pay the floating LIBOR rate, while the party on the other side pays a fixed rate of interest. The only variable in this transaction that can be adjusted to make the deal fair for both parties is the fixed rate. By making this higher, they receive-fixed party benefits. Make it lower and they pay-fixed party benefits.

The fundamental issue is to determine what fixed rate should be used to make the deal fair. Here, fair means that both parties see the swap as equally advantageous at the time at which it is agreed. Before proceeding to determine the fixed rate, it is worth looking at how swaps are related to bond portfolios. The reasoning is the same as that applied to options and forwards. The swap is constructed, so that there are no arbitrage opportunities. Both of the earlier derivatives were priced by constructing a replicating portfolio that gave the same payoffs as the derivative. Applying the arbitrage argument then means the price of the derivative must be the same as the cost of the replicating portfolio. The same basic logic can be applied to swaps, where bonds can be used to replicate the position of a party who has entered a swap deal.

8.9.1 Replication and Implications

Replication and implications are discussed in the paragraphs given below.

Replication

Definition: A floating rate note is a bond that pays a floating rate of interest (LIBOR for this analysis)

- Interest rate swaps
  - Plain vanilla receive-fixed. This is equivalent to:
    -a long position in a bond
    -a short position in a floating rate note

Example: A 6% corporate bond with annual coupon maturity 4 years, market value of $40m trading at par. A floating rate note, $40m principal, pays LIBOR annually, 4 year maturity. These flows match those for a swap with notional principal of $40m and a fixed rate of 6%.

- Plain Vanilla Pay-Fixed. The swap is equivalent to:
  - Sell bond (go short) a fixed-coupon bond
  - Buy bond (go long) a floating rate note

- Currency Swaps
  - Fixed-for-Fixed Currency Swap
    -buy a bond in one currency
    -issue bond denominated in another
  - Plain Vanilla Currency Swap
    -One bond fixed coupon
    -One floating rate note

Implications

The implication of currency swaps are as follows:

- Motive for swaps: Economise on cost of these bond portfolios
- Pricing of swaps: Since they can be replicated by bonds, must be related to interest rates on bonds

8.10 Interest Rate Swap Pricing

The essential item to be determined in pricing an interest rate swap is to set the fixed interest rate so, given that the other party pays LIBOR, the swap is fair. To see how the argument functions, consider a plain vanilla interest rate swap. The receive-fixed party pays LIBOR. The fixed rate has to be set, so that there are no arbitrage opportunities. Define the SFR as the Swap Fixed Rate. This is the fixed rate that will be constructed to make the swap fair. For there to be no arbitrage, the two flows of payments over the life of the swap must have the same present value. This present value has to be computed using the rates of interest observed in the market. Fundamental to this process is the term structure and the implied forward rates. The term structure is the set of spot interest rates for spot loans of different lengths.

Consider a swap with notional principal of $1m and a tenor of 4 years. The floating interest rate in each year is predicted by the forward rate. Note that these rates are all observed at the time the swap is organised and contracts can be made to borrow and lend at these rates of interest. They need not and almost certainly will not be the rates, that actually hold when the future periods are reached, but they are the best predictor at the start of the swap.

Year	Floating Rate	Fixed Rate
1	$f_{0,1}$	SFR
2	$f_{1,2}$	SFR
3	$f_{2,3}$	SFR
4	$f_{3,4}$	SFR

Table 8.2 Floating and fixed interest rates

Using the interest rates in Table 8.2, the present value of the cash flows must be equal. Given that the value of the notional principal is $1m, the present value of the series of floating interest payments is:

$$PV(floating) = \frac{f_{0,1}}{1+s_1} + \frac{f_{1,2}}{[1+s_2]^2} + \frac{f_{2,3}}{[1+s_3]^3} + \frac{f_{3,4}}{[1+s_4]^4}$$

The present value of the fixed interest payments is:

$$PV(fixed) = \frac{SFR}{1+s_1} + \frac{SFR}{[1+s_2]^2} + \frac{SFR}{[1+s_3]^3} + \frac{SFR}{[1+s_4]^4}$$

Equating these two present values and solving, the SFR can be found to be:

$$SFR = \frac{\sum_{n=0}^{3} \frac{f_{n,n+1}}{[1+s_{n+1}]^{n+1}}}{\sum_{m=0}^{4} \frac{1}{[1+s_m]^m}}$$

This is the swap fixed rate that leads to no arbitrage being possible, since it equates the present values. Note further that the relation between spot rates and forward rates makes it possible to translate between the two. In particular:

$$1 + s_1 = 1 + f_{0,1}$$

$$[1 + s_2]^2 = [1 + f_{0,1}][1 + f_{1,2}]$$

$$[1 + s_3]^3 = [1 + f_{0,1}][1 + f_{1,2}][1 + f_{2,3}]$$

$$[1 + s_3]^4 = [1 + f_{0,1}][1 + f_{1,2}][1 + f_{2,3}][1 + f_{3,4}]$$

Using these relations, SFR can be expressed either:

- In terms of spot rates.
  Or
- In terms of forward rates.

8.11 Currency Swap

With a currency swap, there is the additional feature of changes in the exchange rate. This requires an extension to the analysis. The extension has to relate the swap fixed rates in the two countries to the term structure in both countries and the exchange rates.

8.11.1 Interest Rate Parity

Consider two countries, A and B. The information that is available at the initiation of the swap consists of:

- The term structure in A
- The term structure in B
- The rates for foreign exchange between the currencies of the two countries.

A		B
$(1 + S_t^A)^t$	${}_{AB}e_{0,0}$	Conversion to *B*
	$\times (1+ S_t^B)^t$	Interest in *B*
	$\times {}_{BA}e_{0,t}$	Conversion to *A*

Fig. 8.5 Interest rate parity
(Source: http://people.exeter.ac.uk/gdmyles/Books/IA.pdf)

Under (3), we observe both the spot exchange rates and the forward exchange rates. Forward exchange rates give the rate now for an agreed currency exchange at a fixed date in the future. The notation is to use ${}_{AB}e_{0,0}$ to denote the value at time 0 for currency A in terms of currency B for delivery at 0. This is the spot exchange rate. For instance, if £1(currency A) = $1.5 (currency B) then ${}_{AB}e_{0,0} = 1.5$.

Similarly, the notation ${}_{BA}e_{0,t}$ denotes the value contracts made at time 0 for currency A in terms of currency B for delivery of the currency at time t. This is a forward exchange rate. These exchange rates do not stand alone, but are related via the spot rates of interest. This is a consequence of the fact that transactions can be undertaken to trade the currencies at spot and forward rates.

Consider the following two investment strategies:

- Invest 1m in country A for t years
- Convert 1m to currency of country B and invest for t years and enter forward to convert back

The basis of this strategy is that all the interest rates and exchange rates are known at time 0, so the cash flows are certain. The fact that everything is certain implies that the payoffs of the two strategies must be the same. If they were not, then arbitrage would take place. The two strategies are shown in Fig. 8.7.

$$(1 + s_t^A)^t =_{AB} e_{0,0}(1 + s_t^B)^t_{BA} e_{0,t}$$

To eliminate the possibility of arbitrage, it must be the case that given the spot rates, it is possible to calculate the currency forward rates. These currency forward rates can then be used these to obtain the present value of a swap deal at the initiation of the swap. The claim made here is that interest rate parity connects SFR^A to SFR^B. If it did not, then there would be arbitrage between the currencies of the two countries. Therefore it is possible to use the SFR in each country as the fixed rate in a currency swap.

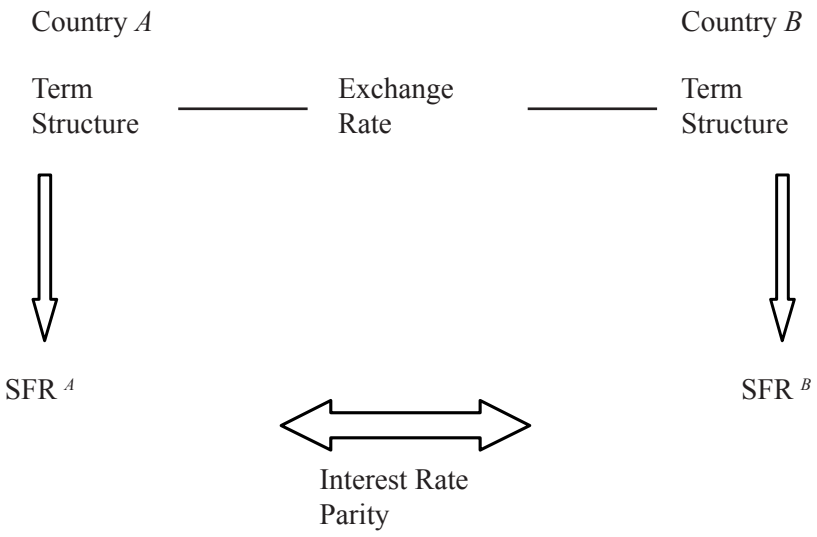

Fig. 8.6 Interest rates and exchange rates
(Source: http://people.exeter.ac.uk/gdmyles/Books/IA.pdf)

8.11.2 Fixed-For-Fixed

Consider a fixed-for-fixed swap involving an exchange of dollars for a 'foreign' currency. Let A be the party that receives dollars and pays a fixed rate on these dollars. Let B be the party that receives the 'foreign' currency and also pays a fixed rate on this foreign currency. To determine the fair value of the swap, the issue is to determine what fixed rates should be used. The answer that will be demonstrated is that:

- Party A: pays dollar SFR, the SFR on a corresponding dollar plain vanilla interest rate swap.
- Party B: pays 'foreign' SFR, the SFR on a corresponding 'foreign' plain vanilla interest rate swap.

Doing this ensures that the present value of expected cash flows for A and B are zero. Two demonstrations of this are given. The first is taken from the text by Kolb and involves adopting a set of numbers and evaluating an example. The second demonstration shows the result algebraically for a swap with a very short tenor.

8.11.3 Pricing Summary

This use of the SFR in a fixed-for-fixed swap provides the insight necessary to understand the interest rates used in other swaps. A convenient summary of the results is the following:

- Fixed-for-Fixed: Both parties pay the SFR for the currency received.
- Floating-for-Fixed: The pay-floating party pays LIBOR, and the pay-fixed pays SFR (The LIBOR rate is that on the currency received).
- Fixed-for-Floating: The pay-fixed party pays SFR, and the pay-floating pays LIBOR (The LIBOR rate is that on the currency received).
- Floating-for-Floating: Both parties pay the LIBOR on the currency received.

Summary

- An option is a contract that gives the holder the right to undertake a transaction, if they wish to do so.
- Options have value and the rights to them are marketable.
- There are two basic types of options.
- The price at which the trade can take place is called the exercise or strike price.
- A plain vanilla call option is the right to buy specific shares for a given price within a specified period.
- A European call can only be exercised at the time of expiration.
- A plain vanilla put option is the right to sell specific shares for a given price within a specified period.
- Options are traded on a wide range of exchanges.
- The method of valuation is based on arbitrage arguments.
- The single-period binomial model introduced a methodology for valuing options, but does not represent a very credible scenario.
- In 1981, IBM and the World Bank undertook an exchange of fixed rate debt for floating rate debt.
- The first swaps were conducted in the late 1970s to avoid UK currency controls.
- A swap requires two parties to participate.
- A currency swap involves two parties exchanging currencies.
- Swaps can be used to manage financial risk.
- A swap broker acts as an intermediary in the market.

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Self Assessment

1. Which of the following is a contract that gives the holder the right to undertake a transaction, if they wish to do so?
   a. A swap
   b. An option
   c. Market
   d. Debt or Bonds

2. There are _____ basic types of options.
   a. two
   b. four
   c. five
   d. three

3. Match the following

1. A plain vanilla call option	A. Acts as counter-party to a swap.
2. A plain vanilla put option	B. Acts as an intermediary in the market.
3. A swap broker	C. It is the right to sell specific shares for a given price within a specified period.
4. A swap dealer	D. It is the right to buy specific shares for a given price within a specified period.

   a. 1-A, 2-D, 3-C, 4-B
   b. 1-B, 2-A, 3-D, 4-C
   c. 1-C, 2-B, 3-A, 4-D
   d. 1-D, 2-C, 3-B, 4-A

4. What is the price at which the trade can take place called?
   a. The basic or optional price
   b. The exercise or strike price
   c. The standard c or put price
   d. The complex or underlying price

5. The asset for which there is an option to buy or sell is often called the _____ asset.
   a. underlying
   b. basic
   c. complex
   d. main

6. In which year, the IBM and the World Bank undertook an exchange of fixed rate debt for floating rate debt?
   a. 1956
   b. 1901
   c. 1981
   d. 1974

7. Which of the following statement is true?
   a. The first swaps were conducted in the late 1970s to avoid currency UK currency controls.
   b. The first swaps were conducted in the late 1940s to avoid currency UK currency controls.
   c. The first swaps were conducted in the late 1930s to avoid currency UK currency controls.
   d. The first swaps were conducted in the late 1920s to avoid currency UK currency controls.

8. A currency swap involves _____ parties exchanging currencies.
   a. three
   b. two
   c. four
   d. six

9. Which of the following arises when the two sides of the dealers swap book is not balanced?
   a. Basis risk
   b. Default risk
   c. Mismatch risk
   d. Non-payment risk

10. Which of the following statement is false?
    a. A swap requires four parties to participate.
    b. A currency swap involves interest payments which are made in the currency received.
    c. Swaps can be used to manage financial risk.
    d. The basis risk arises from movements in interest rates.

Case Study I

An Analysis of Small Savings Schemes in India

Abstract
This case study aims at providing insights into the prevailing small savings schemes in India. At the same time, it also takes a look at the financial aspect of the schemes based on their tax rebate, post-tax returns, tenure of the schemes, etc. The decision, which scheme to invest in depends totally upon the liquidity needs of the investor. The decision to invest is also determined by the return offered by the scheme and its tax implications. Every scheme has its benefits for the investor.

Issues
Issues are listed below:

- Understand all the aspects of post office savings schemes in India.
- Get some insight into which scheme is better for which age group, keeping their investment amount and time horizon in consideration.
- Understand the tax implications and the post-tax effective rate of return.
- Have an idea about how these schemes are interrelated.

Introduction
In India, there are multiple investment avenues available to meet the differing needs of investors. These investment options differ from each other based on their returns, maturity period, and the risk-taking capacity of the investors, among other things. In terms of their returns, they can be classified into high-return and low-return classes. However, risk and returns go hand-in-hand, the higher the risk involved, the higher the returns to be expected. Investors who aspire for higher returns have to bear a high-level of risk as well. An example is an investment made in the highly volatile stock market. As far as the time aspect of the investment is concerned, there are financial instruments which are short-term in nature and these include savings bank accounts, money market or liquid funds, and fixed deposits with banks. On the other hand, there are some financial instruments which offer a long-term horizon for investment. These include post office savings, Public Provident Fund (PPF), company fixed deposits, bonds and mutual funds.

Small savings schemes in India are framed and enacted by the central government under the Government Savings Bank Act, 1873 and Government Savings Certificate Act, 1959. Small savings schemes came into existence after independence with the objective of providing safe and simple investment opportunities to the lower and middle income groups. These schemes were channelised and administered by government institutions, such as post offices and nationalised banks. With the same objective, the PPF was established in 1968 for individuals to save for their investments.

There are various schemes offered by the Government of India (GoI) through post offices across the country. These schemes include the post-office Savings Account, the post-office Recurring Deposit Account, the post-office Time Deposit Account, the post-office Monthly Income Account, the post-office Public Provident Fund Account, the Kisan Vikas Patra, the National Savings Certificate, and the Senior Citizens Savings Scheme. The maturity period of these schemes varies from very short as in the case of a savings deposit to over 15 years as in the case of PPF. However, all these investment options come under the same risk class as all of them have fixed returns and are guaranteed by the GoI. The returns vary between schemes based on their features and maturity period.

The responsibility of promoting and mobilising small savings schemes rests with the National Savings Institute (NSI), a division of the ministry of finance. The NSI markets the small savings schemes on a nationwide basis and provides the government with feedback from customers.

The small savings scheme program aims at promoting the savings habit and providing safe investment avenues to people with limited income and savings potential. These schemes are operated through about 160,000 post offices across the country. The PPF scheme is also operated through more than 8000 branches of public sector banks.

Monthly Income Scheme (MIS)
The post office Monthly Income Scheme (MIS) provides for monthly payment of interest income to investors.

Recurring Deposit (RD)
A Post Office Recurring Deposit Account (RDA) is a banking service offered by India Post at all post office counters in the country.

Kisan Vikas Patra
The Kisan Vikas Patra (KVP) is another safe and secure avenue for investment floated by the GoI under the post office schemes, according to analysts.

Public Provident Fund (PPF)
PPF is one of the investment plans that suit salaried as well as self-employed people, according to experts.

National Savings Certificate (NSC)
The National Savings Certificate scheme is another option in the government savings schemes, which offers a tax advantage to investors.

Conclusion
The decision regarding which scheme to invest in depends totally upon the liquidity-needs of the investor.

(Source: *An Analysis of Small Savings Schemes in India.* [Pdf] Available at: <http://www.icmrindia.org/casestudies/catalogue/Finance/FINC067.htm> [Accessed 04 July 2014]).

Questions

1. What are the issues of small saving schemes?

   Answer

   Issues are as follows:

   - Understand all the aspects of post office savings schemes in India.
   - Get some insight into which scheme is better for which age group, keeping their investment amount and time horizon in consideration.
   - Understand the tax implications and the post-tax effective rate of return.
   - Have an idea about how these schemes are interrelated.

2. Who frames and enacts small savings schemes in India?

   Answer

   Small savings schemes in India are framed and enacted by the central government under the Government Savings Bank Act, 1873, and Government Savings Certificate Act, 1959.

3. What are the various schemes offered by the Government of India (GoI) through post offices across the country?

   Answer

   There are various schemes offered by the Government of India (GoI) through post offices across the country. These schemes include the post-office Savings Account, the post-office Recurring Deposit Account, the post-office Time Deposit Account, the post-office Monthly Income Account, the post-office Public Provident Fund Account, the Kisan Vikas Patra, the National Savings Certificate and the Senior Citizens Savings Scheme.

Case Study II

Calculating the Risks in Making Investment Decisions

Introduction

Investment decisions involve weighing up the risks and the likely rewards of various options. It is often the riskiest alternatives that yield the highest possible gains, while the least risky options may yield smaller rewards. Business decision-makers therefore have to weigh up risk so as to provide the most suitable rewards for stakeholders including shareholders and customers. The starting point is a company's overall aim, which then filters down into a strategy, creating a balanced portfolio made up of numerous investments.

This case study examines the processes involved in weighing up risks in order to create a balanced portfolio at BG Group, one of the leading energy businesses in the UK. The case study illustrates typical stages involved in deciding whether to bid for the right to explore for and develop new gas fields and, importantly, how much to bid. Before weighing up the risks, ethics is an integral part of BG Group's considerations, i.e., making morally correct decisions, whether these be concerned with environmental issues, health and safety or any other decision involving the difference between 'right and wrong' behaviour. In other words, the 'best' investment decision will balance economic, social and environmental considerations.

More than just finance

Ethical decisions are integral in making investment decisions. BG Group's Statement of Business Principles sets out the fundamental values and ethical principles within which the Company operates. BG Group will only enter countries, where the Company can operate in accordance with its Business Principles. The following example gives an outline of the important statistical and financial procedures involved in making an investment decision. However, it is important to emphasise the weight given to non-financial factors involved in decision-making. Gas is the cleanest fossil fuel, but any form of energy production involves some form of environmental cost, e.g., the sight of wind farms located in fields, or harmful release of greenhouse gases, when burning fossil fuels. BG Group will only bid to explore, if it can operate within its ethical guidelines. The company always seeks to apply its business principles. This can sometimes be difficult, since natural gas resources are found in countries at different stages of economic, environmental, political and social development.

BG Group

The gas industry is today in the private and public sector and there are a number of companies competing in the industry. Some of these companies are government-owned. Others are owned by private shareholders who appoint directors to represent their interest. The directors appoint professional managers to run the business. Like electricity and telecommunications, gas is a 'network industry'. In the case of gas, consumers are linked to a central network of gas pipelines. Group is an integrated business in that it has activities across the whole range of gas operations, from the reservoir to the customer. BG Group's Exploration and Production (E&P) business finds and develops gas reserves. Natural gas is delivered to customers either by BG Group's Transmission and Distribution (T&D) business using pipelines or by the Liquefied Natural Gas (LNG) business via LNG ships. BG Group's power business focuses on the creation of electricity by natural gas-fired power generation plants. The illustration shows the gas chain indicating the various links in an integrated business involved in bringing gas to final consumers.

Demand for gas is projected to grow at an increasing rate over the next decade, outstripping the growth in demand for other major sources of energy. As an energy source, gas is a relatively clean fossil fuel, abundant and is increasingly becoming the fuel of choice for consumers, on both environmental and economic grounds.

Field development

The gas business has a number of characteristics that are particularly important in relation to investment decision-making:

- It is very capital-intensive, so that decisions may typically involve spending several hundred million pounds.
- There are long lead times between the start of a project and the receipt of earnings from that project, typically over five years from first investment to first revenue.
- The taxation and contract structure is unique to the energy industry and is complex. Gas is a finite resource for a nation. Its exploitation is of strategic importance to the host government for some time.

Government owns the rights to minerals found on land (onshore) and under water (offshore) in their countries. Governments divide the ground into exploration 'blocks' and invite energy companies to bid for the right to explore for oil and gas in those blocks. To earn the right to explore a block, the energy company commits to a work programme, which describes the steps it will take in order to find oil/gas. The energy company's investment and expertise helps governments access the mineral wealth beneath the ground. BG Group makes important decisions as to whether or not to apply for the right to explore for new gas fields and how much to bid.

Key risks

Shown below are some of the key risks in a typical gas project and the experts responsible for addressing those risks:

- Geologists and geophysicists evaluate the risks around volume and the chance of finding those volumes.
- Engineers examine facility and well design, costs, production rates.
- HSSE managers assess health, safety, security and environmental risks.
- Economists analyse market demand and price, government and partner commercial terms.

Investment appraisal

Discounted cash flow is an important technique for investment appraisal. The discounted cash flow approach is a way of valuing the future returns on investment by assessing the values of these returns in terms of their value today. It places emphasis on the cost of funds tied up in a project by considering the timing of cash flows. For example, we all instinctively know that £1 in the hand today is worth more than a promise of £1 in the future. This is because:

- Inflation may lower the real value of money.
- The money cannot be put to constructive use in the meantime (i.e., earning interest in the bank or applied to another project).
- There is always the risk that unforeseen circumstances will prevent you receiving the amount you have been promised.

Appraising investments using the discounted cash flow method allows the Company to undertake a capital allocation process, which involves ranking projects and selecting those that add the most value to the Company. It therefore incurs the opportunity cost of those projects that add value, but cannot be financed as sufficient funds are not available to undertake them.

Ultimately, the value of any investment is the present value of the future free cash flows, Net Present Value (NPV) that the investment is expected to generate. Therefore, it is necessary to forecast the economic cash flows and discount them appropriately to allow for the fact that they will not be received, until sometime in the future. BG Group uses a discount rate that reflects the return its investors (shareholders and banks) expect for investing in a non-risk free activity (compared to depositing money in a bank account). The NPV calculation always assumes the project is a success. However, there is a chance that no oil or gas is present (geological risk), this risk must therefore be reflected in the valuation. This is achieved by assigning probabilities to the values of successful and unsuccessful outcomes. The sum of these risked values is the Expected Monetary Value (EMV).

EMV calculation can be illustrated by a decision tree. Decision trees are a simple way of choosing from alternative courses of action when faced with uncertainty. The basic procedure for constructing a decision tree is to set out a series of alternative branches of the tree and then to calculate the probability of the event occurring and the likely money value of the return. In a decision tree, it is possible to distinguish between points of decision and points where chance and probability (uncertainty) may come into play. For example, this process can be used to illustrate possible returns from drilling a well and then exploiting a gas field.

The inputs from geologists, engineers and others underpin the economic analysis and ultimately the calculation of value. These inputs relate to both internal and external data:

- Internal-technical data relating to the costs involved in developing the block, e.g., the costs of building and developing the gas platforms, likely volume and quality of hydrocarbons.
- External-commercial data about the future demand for, and price of, gas as well as likely tax changes, and information about local markets and other data.

Economists can then develop models projecting the likely costs and revenues of developing new fields. Essential components of these models are as follows:

- Revenues (price x volume)
- Costs
- Government take (e.g., taxes because the blocks that companies bid for are government property). Revenues less costs, less government take = the net cash flows which are discounted to give the NPV.

BG Group then uses all of this information to calculate the EMV of decisions. The EMV is equal to: EMV = (NPV of success x chance of success) plus (NPV of failure x chance of failure)

The following example uses estimated returns expected from BG Group committing itself to drilling one exploration well. The net present cost will be £16m. There is a 16% chance that the three year project will be a success, yielding a return at NPV of £114m.

- First of all, we work forward across the diagram from the decision fork, where the choice is: ‘drill exploration well’ or ‘don’t drill exploration well’.
- Next, we set out the probabilities of gas being discovered and the NPV of success or failure (these are based on the geologists’ and economists’ calculations).
- If the well is not drilled, there will be a return of £0. If the exploration well is drilled and no gas is found there will be a loss of £16m. There is an 84% chance of this being the case.
- If the exploration well is drilled and gas is found there will be a gain of £114m. There is a 16% chance of this happening.

We can now work out the EMV, if the decision is made to go ahead with exploiting the field. Therefore, on a risked basis drilling the well is attractive on economic grounds in that it generates a positive EMV. The opportunity would be presented to management to compete for funds in the capital allocation process.

Portfolio considerations

At this phase of the investment decision, a number of factors must be considered. The overriding goal of the company is to create shareholder value. In order to achieve the optimal growth for an acceptable level of risk, the company invests on a portfolio basis. This means that it will invest in a number of different wells and at times share the costs and working interest with partners in order to improve the risk/reward balance and stay within a budget.

As the returns of these individual wells are likely to be uncorrelated or weakly correlated (e.g., failure in one exploration well is unlikely to affect the chance of success of another), the risk of the overall portfolio is lower than that of an individual well. This is especially important at the exploration stage due to the high risk of failure. In addition to this idea of investing in projects which help to reduce the overall risk profile of the Company, decision makers must consider the strategic fit to the current business and where the company’s skills and expertise lie. Only after considering all of these factors can a decision be made on whether or not to invest in a particular project.

Conclusion

The gas market is an exciting one to be involved in. The world's demand for energy is growing rapidly and it is imperative that it is supplied with clean energy reserves by principled companies. BG Group is a major world player in this market and it constantly needs to make the right sorts of investment decisions, which balance the needs of global consumers, its shareholders, the communities in which it operates governments and other stakeholders.

(Source: *Calculating the Risks in Making Investment Decisions.* [Pdf] Available at: <http://businesscasestudies.co.uk/bg-group/calculating-the-risks-in-making-investment-decisions/introduction.html#axzz379chmYsh> [Accessed 11 July 2014]).

Questions

1. What do investment decisions involve?
2. What does this case study examine?
3. What are the key risks in a typical gas project and who are the experts responsible for addressing those risks?

Case Study III

Investment Management at Harvard Management Company

Abstract
The case examines the investment management strategies adopted by the Harvard Management Company (HMC). HMC managed Harvard University's endowment funds, the largest in the industry. The case explains the hybrid fund management strategy followed at HMC and how the strategy led to phenomenal growth of Harvard's endowment funds over the decades. The case describes the investment performance of the endowment fund, asset allocation, portfolio mix and risk management strategies under various fund managers of HMC, since its inception. The case also explains the recent problems faced by HMC due to the frequent changes in its leadership and the sub-prime crisis that emerged in the US in late 2007 resulting in significant losses for Harvard's endowment fund.

Issues
Issues are given below:

- Analyse the investment management strategies followed at HMC.
- Appreciate the importance of asset-allocation and portfolio-diversification in investment management.
- Study the risk management practices at HMC.
- Understand the pros and cons of hybrid investment management strategy.

Introduction
On February 17, 2009, 1,600 non-faculty employees of Harvard University (Harvard) received a crimson folder containing details of the early retirement benefits offered to them. Earlier, on February 11, 2009, Harvard had announced the eligibility4 criteria for those employees who would be offered early retirement.

The objective of the move was to save on operating expenses. The University also announced other cost-cutting measures that included budget cuts varying between 10% and 15% in all Harvard departments. Besides, it announced a 3.5% increase in tuition fees for the academic year 2009-10.

The University attributed these cost-cutting measures to the losses incurred by Harvard Management Company (HMC). HMC managed Harvard's endowment funds, the largest in the industry. As of June 30, 2008, it managed assets worth US$ 36.9 billion. Harvard reported that the value of the assets had fallen by 22% in the four months of fiscal 2008-09 that ended on October 31, 2008. The losses reported in this case did not include HMC's investments in real assets and private equity. Harvard depended on its endowment to fund more than one-third of its operational budget every year.

It withdrew US$ 1.6 billion from its endowment fund in the fiscal year 2008 that ended on June 30, 2008. This marked HMC's largest ever endowment payout to the university. Harvard estimated a loss of 30% on the assets of HMC for the current fiscal year that would end on June 30, 2009. This would be the worst loss reported by HMC, since 1974, when it had posted a loss of 12.2%. HMC announced that it would lay off 25% of its 200 employees as a part of its reorganisation and rebalancing strategy.

HMC was regarded as one of the most profitable managers of endowment funds (Refer to Table I for returns generated by top four endowments in the US for the financial years 2005 to 2008).

It consistently outperformed the average returns posted by the industry, which invested in similar asset classes in which HMC invested. For instance, HMC posted a positive return of 8.6% on its funds for the year ended June 2008 as compared to a 13% negative return posted by the S&P 500 index5 during the same period. HMC was renowned for its asset-allocation strategy. It followed a hybrid model in managing its funds.

Background note

HMC was incorporated in 1974 to manage the endowments, pension assets, working capital, and non-cash gifts of Harvard. Its objective was to provide financial support to the operations of Harvard. To conform to that objective, HMC's Board and the management laid down the investment philosophy to allocate assets across various markets and asset classes in their efforts to generate the optimum rate of return in line with Harvard's risk tolerance level. HMC also worked on the premise that in addition to earning income to support the activities of the University, it had to generate capital appreciation on the assets it held over a long-term.

Asset allocation

HMC had managed the largest university endowment fund in the world, since its inception. (Refer to Exhibit IV for Top Ten University Endowments in the US by the End of June 2008). It followed a well-diversified asset-allocation strategy. For instance, for the fiscal ended June 2008, HMC had investments in 12 non-cash asset classes.

Fund management at HMC

Walter Cabot (Cabot) was nominated as the first President and CEO for HMC in 1974. HMC's assets grew from US$ 1.3 billion in 1974 to US$ 4.7 billion in 1990 under his leadership. Cabot resigned from HMC after his 16-year tenure in 1990, when Meyer was nominated as his successor. Meyer led HMC between 1990 and 2005 and grew HMC's asset value from US$ 4.7 billion to US$ 22.6 billion. HMC nominated Mohammed El-Erian (El-Erian) as successor to Meyer.

(Source: *Investment Management at Harvard Management Company.* [Pdf] Available at: <http://icmrindia.org/casestudies/catalogue/Finance/FINC056.htm> [Accessed 04 July 2014]).

Questions

1. What does the case examine?
2. What are the various issues of HMC?
3. When did Harvard University receive a crimson folder containing details of the early retirement benefits offered to them?

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Self Assessment Answers

Chapter I

1. b
2. a
3. a
4. d
5. c
6. a
7. d
8. b
9. d
10. b

Chapter II

1. a
2. b
3. b
4. d
5. a
6. c
7. d
8. c
9. d
10. b

Chapter III

1. c
2. a
3. a
4. d
5. b
6. a
7. d
8. b
9. c
10. a

Chapter IV

1. b
2. c
3. c
4. a
5. d
6. b
7. b
8. a
9. d
10. c

Chapter V

1. b
2. a
3. a
4. d
5. d
6. c
7. b
8. c
9. a
10. c

Chapter VI

1. c
2. a
3. d
4. c
5. a
6. b
7. c
8. a
9. d
10. b

Chapter VII

1. a
2. d
3. b
4. c
5. d
6. a
7. a
8. b
9. c
10. d

Chapter VIII

1. b
2. a
3. d
4. b
5. a
6. c
7. a
8. b
9. c
10. a