11

# Valuation of Securities and Portfolio Analysis

## Learning Objectives

- *To understand the meaning of valuation*
- *To study various methods to value bonds*
- *To learn equity valuation model*
- *To know theories of equity share valuation*
- *To study the importance of portfolio analysis*

## 11.1 Introduction

We have learnt the importance of valuation of each type of source of finance. A company compute cost of capital of each source of finance individually, followed by combined affect of all securities in their weighted proportion. The supplier of source of funds are investors who made investments in companies either in bonds, debentures, or equities. In order to analyse the value of their securities they adopt various techniques. Moreover, as they are aware about return and associated risk

thereon, therefore, they choose selected securities which have potential to increase their total return in commensurate to risk proportion. The collection of securities of an investor is called portfolio. An investor may have different portfolios consisting variety of securities. But no investor puts all security in one basket. Similar kind of securities may result into higher rate of risk and no return. The proverb 'don't put your all eggs in one basket' is commonly used in investment decisions or specifically in portfolio management. It means, a portfolio must include different types of securities, e.g., government securities, debt securities, equities, mutual funds, shares in foreign companies etc. so that in case of loss arises in one type of security may be set-off by other securities in the same portfolio.

Now question arises, how to make valuation of securities. In this chapter, concepts on valuation of securities, particularly debt and equities are discussed. It is essential to know the basic features of the securities, before making evaluation thereof. As we have already made discussion in previous chapter on features of deb securities, equity shares etc., therefore, are not repeated in this chapter. Similarly, we have studied topic on time value of money, discounted rate etc. the same terminology are used here also.

## 11.2 Meaning of Valuation

Valuation is the process of determining how much a security is worthy. The valuation process involves various factors to determine the present or expected value of a security. These factors may be internal or external to a firm in which investor has made investment. However, the key basis of valuation is risk and return of the security. Risk and return are also get affected from external factors, but these are the cogent and having direct connection with valuation. It is to emphasised that both risk and return gives the present value of investment or expected future value of investment after taking the impact of time value of money on consideration.

It is, generally, believe that every security has its intrinsic capability to yield income or appreciation in the value. If the intrinsic value of a security is higher than the market value, then it is worthy to purchase such security. This situation indicates that the price of such security is under-priced and would be profitable for investor to buy at lesser price. On the other hand, if intrinsic value comes down in comparison of market value, then such security must be sold out. Such security is called as over-priced security. In case where market value and intrinsic value are equal then it's a situation of equilibrium and has not expectation of gain. This process is shown in following figure 11.1

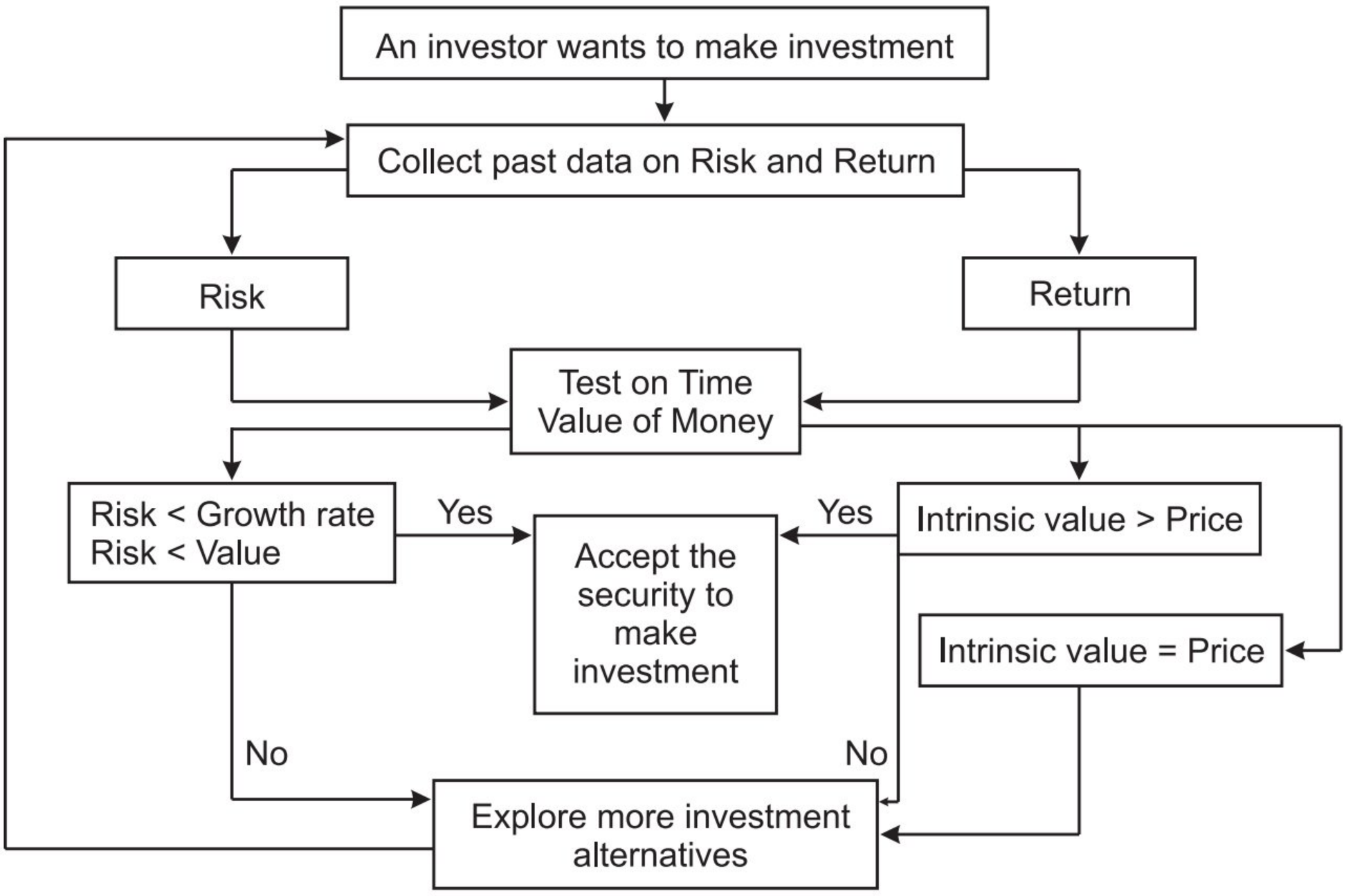


**Figure 11.1:** Process of Valuation

The historical data play an important role in valuation of securities. The data on risk and return is tested on the scale of time value of money, especially, the return data, and risk data is augmented if circumstances so warrant. The rate of risk is compared with growth rate. If growth rate is less than risk in such security then it is not wise to make investment therein. On the other hand, the computed intrinsic value of the security is more than the market value then it is acceptable to buy such security. In contrary case it is suggestive to sell such security. In an equilibrium situation where intrinsic and market values are equal then no suggestion is advanced, rather some more alternative investment opportunities should be explored. Thus, valuation is not a one-time activity, rather it is continuous process.

## 11.3 Valuation of Bonds

Bonds are debt securities carrying, generally, a pre-decided coupon rate. Payment of interest on bonds is mandatory requirement for the company, in contrast to dividend to equity shareholders. The features of bonds are alike debentures. Only few selective features of bonds are given here under in brief for revision and better understanding.

(i) Bonds are interest bearing security. The interest is a fixed charge on the profit of a company, and generally, legal obligations. Thus, investments made in bonds are considered as most safe investment. Though, its yield also changes due to market conditions such as inflation rate etc.

(ii) Bonds have fixed life or required to be redeemed after a certain period, unless otherwise is not mentioned in the debt document. Bonds may be convertible into debenture or shares. Even if these are convertible even then these have certain life. The difference is, in case of normal redemption, investor gets the cash back, and in case of conversion, other form of securities are issued. The market value of such security on the date of conversion may be treated as cash inflow.

(iii) Some bonds are secured bonds. It means the issuer company mortgage a specific class of assets against issue of such bonds, if company fails to pay either interest or principal amount then such assets may be realised into cash to pay-off debt obligations.

(iv) Call-able and put-able bonds are the variety of bonds which allows either company or investor to redeem the value of bonds before to maturity period, respectively.

(v) In case of some bonds, the accrued interest is tax-free. In other words, no income tax is imposed on interest on few bonds, generally known as tax-free bonds.

(vi) Otherwise and unless contrary is stated in the instrument, bonds have fixed interest rate. But it may carry floating rate in case of floating rate bonds. In case of such bonds, a minimum rate is fixed and additional rate is floating or linked with some other function e.g., percentage in monetary policy, repo rate etc.

## Methods of Valuation of Bonds

### (i) Current Yield

It is evaluated that the value of each bond comes equal to the value of redemption value as the maturity period reduces. And on maturity date the value of the bond is equal to redemption value. Thus, bonds are valued on current yield. In this method coupon interest is analysed in relation to market price of the bond, as expressed below.

$$\text{Current Yield} = \frac{Int}{P_0}$$

Where,

Int = Interest amount of the current year

$P_0$ = Market price of the bonds

The decision criterion to purchase bonds follows yield criterion i.e., (i) purchase the bond in case current yield is more than coupon rate, (ii) sell the bond (or not purchase bond) in case current yield is less than coupon rate.

**Illustration 1:** A bond of ₹1000 at interest rate of 10% and is selling in current market of ₹900, compute current yield of the bond. Would you advice someone to purchase this bond?

**Solution:**

$$\text{Current Yield} = \frac{Int}{P_0}$$

$$\text{Current Yield} = \frac{100}{900} = 0.1111 \text{ or } 11.11\%$$

The current yield (11.11%) is more than coupon rate (10%) therefore it is advisable to purchase this bond.

The limitation of this method is that it does not take into account the other two factors, (i) reinvestment opportunity of income, and (ii) capital gain on maturity period. For example, if in above case, investor buy this bond for ₹900, then on maturity he will get an advantage of ₹100 (₹1000 – ₹900).

**Intrinsic Value of Bonds:** Since the life of a bond is fixed as well as interest. Therefore, it can be said that the earning capacity of a bond is sum of discounted value of all future cash inflow in the form of interest, and present value of the redemption amount to be received on maturity period.

Intrinsic value of a Bond = P.V. of interest + P.V. of redemption value

The investment decision criterion is based on intrinsic value and market value of bonds. It is shown below in summarised manner.

| Sr. No. | Criterion/Rule | Decision |
|---|---|---|
| 1. | Intrinsic Value > Market Value | Buy |
| 2. | Intrinsic Value < Market Value | Sell |
| 3. | Intrinsic Value = Market Value | Indifferent situation |

In case where intrinsic value is equal to market value of the bond, investor may explore more alternative investment opportunities to add better security in his portfolio.

### (ii) Annual Interest and Realisable Value

Since, the interest on bonds are paid annually, thus the intrinsic value of a bond on annual basis will be:

$$P_0 = \frac{I_t}{(1+K_d)^t} + \frac{RV}{(1+K_d)^N}$$

Or,
$$P_0 = \sum_{t=1}^{N} \frac{I_t}{(1+K_d)^t} + \frac{RV}{(1+K_d)^N}$$

Where,

$P_0$ = Price of the bond at present price level, or intrinsic value.

$I_t$ = Annual interest on bonds on time t

$K_d$ = Required rate of return

RV = Realizable value on the maturity period.

The above equation can be re-estimated with this notion that the annual interest rate on bonds are not subject to changes. Thus, present value of annuity may be considered to compute intrinsic value, as shown in equation 2.

$$P_0 = Int * PVFA_{K_d, N} + RV * PVF_{K_d, N} \quad \ldots \text{(eq. 2)}$$

Where,

Int = annual interest rate

PVFA = present value factor of annuity at Kd

$K_d$ = discount factor

N = number of years

RV = realizable value.

**Illustration 2:** Mr. Kishore made investment in 12% bonds, face value of ₹100 maturity period is 5 years. The opportunity cost rate is 12%. Bonds will be realized after 5 years at a premium of ₹20 per bond. Compute the intrinsic value of a bond. Would you prefer to purchase this bond at ₹115.

**Solution:** Int = ₹12; $K_d$ = 12%; RV = 100 + 20 = ₹120; T = 5 years.

$$P_0 = 12 * PVFA_{12\%, 5} + 120 * PV_{12\%, \text{5th year}}$$

$$P_0 = 12 * 3.6048 + 120 * 0.567$$

$$P_0 = 43.25 + 68.04$$

$$= 111.29$$

The intrinsic value of the bond is ₹111.29. Since the intrinsic value of the bond is less than market value thus, it is not preferred to purchased such bonds. If such bonds are in the portfolio then must be sold out.

**Illustration 3:** What would be your opinion on the information given in illustration 2, if following changes occur; (i) discount rate 10%, (ii) market value is ₹115. Would you like to buy it?

**Solution:**

$$P_0 = Int \times PFVA_{10\%, 5} + RV \times PVF_{10\%, 5}$$

$$P_0 = 12 \times 3.7908 + 120 \times 0.6209$$

$$P_0 = 45.49 + 75.51$$

$$P_0 = ₹120$$

In this case when discount rate is 10%, and intrinsic value of the bond is ₹120 which is available at ₹115 in the market, may be purchased.

### (iii) Accrual of Coupon Interest More Than One Time in a Year

In case when interest on bond accrues more than one time, say bi-annual, quarterly, etc. then compounding will be done according to equal term period in a year. For example, in case of bi-annual or semi-annual, the interest are paid in two equal instalments

i.e., Interest/2, and compounding will be made with 2. Similarly, in case of quarterly payment, there will be 4 equal instalment of interest and compounding of discount rate will be computed with 4.

**Bi-Annual Interest**

$$P_0 = \sum_{N=1}^{2N} \frac{Int/2}{\left(1+\frac{K_d}{2}\right)^{2N}} + \frac{RV}{\left(1+\frac{K_d}{2}\right)^{2N}}$$

Or, $$P_0 = \frac{Int}{2} \times PVFA_{\frac{K_d}{2}, 2N} + RV \times PVF_{\frac{K_d}{2}, 2N}$$

**Quarterly Interest**

$$P_0 = \frac{Int}{4} \times PVFA_{\frac{K_d}{4}, 4N} + RV \times PVF_{\frac{K_d}{4}, 4N}$$

**Illustration 4:** Mr. X wants to make investment in bonds in given alternative situations, stated below, you are required to advise him in selecting the best option.

Bond Price = ₹500

Coupon Rate = 8%

Life of the bond = 5 years

Redemption value = ₹500

Rate of Return = 10%

Options:

1. Interest accrued annually,
2. Interest accrued bi-annually,
3. Interest accrued quarterly.

**Solution:**

**Option-1:** ***Interest accrued annually***

$$P_0 = Int \times PVFA_{10\%, 5} + RV \times PVF_{10\%, 5}$$

$$P_0 = 40 \times 3.7908 + 500 \times 0.6209$$

$$P_0 = 151.63 + 310.45$$

$$P_0 = 462.08$$

**Option-2:** ***Interest accrued bi-annually***

$$P_0 = \frac{Int}{2} \times PVFA_{\frac{10\%}{2}, 2\times5} + RV \times PVF_{\frac{10\%}{2}, 2\times5}$$

$$P_0 = \frac{Int}{2} \times PVFA_{5\%, 10} + RV \times PVF_{5\%, 10}$$

$$P_0 = \frac{40}{2} \times 7.7217 + 500 \times 0.6139$$

$$P_0 = 154.43 + 306.95$$

$$P_0 = 461.38$$

**Option-3:** ***Interest accrued quarterly***

$$P_0 = \frac{Int}{4} \times PVFA_{\frac{10\%}{4}, 4\times5} + RV \times PVF_{\frac{10\%}{4}, 4\times5}$$

$$P_0 = 10 \times 15.589 + 500 \times 0.6102$$

$$P_0 = 155.89 + 305.1$$

$$P_0 = 461$$

From the results it can be observed that option-1 is the best proposal as it yield highest return among the given options. It is also noted that as the cumulative number increases the expected return declines, given the other factors remain constant.

**Illustration 5:** Mr. X is evaluating alternative investment opportunities to make investment bonds. The details are as follow.

| Particulars | Bond Price | Coupon Rate | Life of Bond (in Years) | Redemption Value | Frequency of Interest | Rate of Return |
|---|---|---|---|---|---|---|
| **Option-1** | 1000 | 8% | 5 | At par | Annually | 10% |
| **Option-2** | 1000 | 10% | 5 | At par | Annually | 8% |
| **Option-3** | 1000 | 8% | 5 | At par | Bi-annual | 10% |
| **Option-4** | 1000 | 10% | 5 | At par | Bi-annual | 8% |
| **Option-5** | 1000 | 8% | 8 | At par | Annual | 10% |
| **Option-6** | 1000 | 8% | 5 | At 10% premium | Annual | 10% |

Observe and comment.

**Solution:**

| Particulars | Criterion | Value of Bond |
|---|---|---|
| **Option-1** | $Int \times PVFA_{10\%, 5} + RV \times PVF_{10\%, 5}$<br>$80 \times 3.7908 + 1000 \times 0.6209$<br>$303.26 + 620.9$ | 924.16 |
| **Option-2** | $Int \times PVFA_{8\%, 5} + RV \times PVF_{8\%, 5}$<br>$100 \times 3.992 + 1000 \times 0.6805$<br>$399.2 + 680.5$ | 1079.7 |

| Particulars | Criterion | Value of Bond |
|---|---|---|
| **Option-3** | $\frac{80}{2} \times PVFA_{\frac{10\%}{2}, 2\times5} + 1000 \times PVF_{\frac{10\%}{2}, 2\times5}$<br>$\frac{80}{2} \times PVFA_{5\%, 10} + 1000 \times PVF_{5\%, 10}$<br>$40 \times 7.7217 + 1000 \times 0.6139$ | 922.98 |
| **Option-4** | $\frac{100}{2} \times PVFA_{4\%, 10} + 1000 \times PVF_{4\%, 10}$<br>$50 \times 8.1109 + 1000 \times 0.67556$<br>$405.54 + 675.56$ | 1081.10 |
| **Option-5** | $80 \times \text{PVFA}_{10\%, 8} + 1000 \times PVF_{10\%, 8}$<br>$80 \times 5.3349 + 1000 \times 0.4665$<br>$426.79 + 466.5$ | 893.29 |
| **Option-6** | $80 \times 3.7908 + 1100 \times 0.6209$<br>$303.26 + 682.99$ | 986.25 |

From above it can be observed that:

(i) A lesser rate of return in comparison to coupon rate increases the value of bond.

(ii) An increase in frequency of interest on bond decreases its value.

(iii) A bond with longer maturity has lesser value.

(iv) A bond redeem at premium has higher value in comparison of redemption at par.

### (iv) Bond Value at Different Period

As observed above that life of the bond also impact value of the bond. If an investor wants to examine the value of bonds of two classes of bonds one with longer life, and second with short life, then the selection can be made on the basis of its valuation. Let's understand this problem with the help of following illustration.

**Illustration 6:** Mr. X has made investment in 10% Redeemable Bonds (face value ₹100). The life of bonds is 10 years. The rate of return is 12%. Mr. X wants to compute the life of redeemable bond at different time interval, say,

(a) 10 years to maturity,

(b) 8 years to maturity,

(c) 5 years to maturity,

(d) 2 years to maturity,

(e) 1 year to maturity, and

(f) in the year of maturity.

**Solution:**

| Years to Maturity | Criterion $P_0 = Int \times PVFA_{K_d \times N} + RV \times PVF_{K_d \times N}$ | Value of Bond |
|---|---|---|
| **10 Years** | $100 \times 5.6502 + 1000 \times 0.32197$<br>$565.02 + 321.97$ | 886.99 |
| **8 Years** | $100 \times 4.967 + 1000 \times 0.40388$<br>$496.7 + 403.88$ | 900.58 |
| **5 Years** | $100 \times 3.6048 + 1000 \times 0.5674$<br>$360.48 + 567.4$ | 927.88 |
| **2 Years** | $100 \times 1.6901 + 1000 \times 0.7971$<br>$169.01 + 797.1$ | 966.11 |
| **1 Year** | $100 \times 0.8928 + 1000 \times 0.8928$<br>$89.28 + 892.8$ | 982.08 |
| **Maturity Year** | $P_0 = 0 \times PVFA_{K_d, 0} + 1000 \times PVF_{12\%, 0}$<br>$0 \times 1 + 1000 \times 1$ | 1000 |

From the above illustration, it can be noticed that the value of bond moves towards maturity value as the time lapses or redemption period comes to mature.

### (v) Valuation of Convertible Bonds

The valuation of bonds those are convertible in shares after a certain life or at the time of maturity involves regular interest and value of security in which bonds are to be converted. It means, before maturity/conversion, the investor will get interest on security, and on maturity, the securities will be allotted. There may be some cases, where conversion is partial instead of full conversion. In such case, a part payment will be made in cash and remaining amount by way converting debenture into securities. The expected market value security in which bonds are to converted is relevant for determining value of bonds at conversion.

**Fully Convertible Bonds/Debentures**

The value of bonds can be computed with the help of following formula assuming at maturity date, 't', bonds will be converted into some number of equity shares:

$$P_0 = \sum_{i=1}^{N} \frac{Int_i}{(1+K_d)^i} + \frac{nPs}{(1+K_e)^t}$$

**Partly Convertible, Partly Payable**

In such a case, bonds are not fully convertible, rather redemption amount is set off by issuing and alloting shares on maturity period in a defined ratio, and remaining amount is paid in cash.

$$P_0 = \sum_{i=1}^{N} \frac{Int_i}{(1+K_d)^i} + \frac{nPs}{(1+K_e)^N} + \frac{RV}{(1+K_d)^N}$$

Where,

Int = interest rate

$K_d$ = required rate of return

RV = Redemption Value

$K_e$ = Cost of capital

N = number of years, or maturity period

T = the time in which debt is converted, generally, at the end of maturity.

nPs = value of shares to be alloted on maturity period.

### (vi) Valuation of Zero-Coupon Bonds

Since there is no interest rate on bonds, therefore the valuation of zero-coupon bonds depends upon redemption value and life of the bonds at a given rate of return. Thus, value of zero-coupon bond is:

$$P_0 = \frac{RV}{(1+K_d)^N}$$

### Valuation of Debt on the Basis of Yield

When the coupon interest or maturity value is analysed in relation to market value, such analysis classify valuation of debt on yield basis. The two measures are as follows.

$$\text{Current Yield} = \frac{\text{Coupon Interest Per Year}}{\text{Current Market Value}}$$

**Illustration 7:** 15% Debenture of face value ₹1000, and currently selling price in market is 1100. Find the current yield.

**Solution:**

$$\text{Current Yield} = \frac{150}{1100} = 13.63\%$$

Current yield is a better measure to coupon rate because it is based on the current market price. However, it does not account the difference between the capital gain arises on maturity date, i.e., (maturity value – purchase price).

### Yield to Yield to Maturity (YTM)

YTM refers to promised compounded rate of return that an investor will receive from a bond purchased at the current market price and held to maturity. Computing YTM involves equating the current market price of a bond with the discounted value of future interest payments and the terminal principal repayment. Thus, YTM may be expressed as:

$$\text{MP} = \sum_{t=1}^{N} \frac{Int_t}{(1+YTM)^t} + \frac{RV}{(1+YTM)^N}$$

Where,

MP = Market price of the security

Int = Interest or coupon amount

YTM = Yield to maturity

N = Life of the bond

RV = Redemption value

YTM is calculated on trial and error method to compute value of bond at maturity. To avoid technical jargons, YTM can be approximated using the following formula:

$$\text{Approximate YTM} = \frac{\text{Coupon Interest} + \dfrac{\left(MP_n - MP_t\right)}{N}}{\dfrac{\left(MP_n + MP_t\right)}{2}}$$

Where,

$MP_n$ = Market Price at maturity,

$MP_t$ = Market price at the beginning.

## 11.4 Approaches to Valuation of Equity Shares

Share price are affected by a large number of factors such as economic, political, industrial, past records, future information etc. However, determining of magnitude of each factor is difficult to measure as it vary from situation to situation, case to case. On the basis of factors affecting share value, three schools of thought have emerged advocating three prominent theories of security portfolio, *viz.,* fundamental analysis, technical analysis, efficient market hypothesis.

1. **Fundamental Analysis:** This approach underlines that share price of security is affected by economic factors, industry factors and company's factors. Fundamental theory assumes that share prices have a tendency to regress towards intrinsic values. At any point in time, an individual security has an intrinsic value be equal to the present value of the future stream of income from that security, discounted at an appropriate rate of return. Thus, actual price of a security is considered as a function of set of anticipated returns and anticipated capitalization rates corresponding to future time period. Fundamental analysis is based on relevant facts, is a logical way to estimate the true value of a growing concern. However, it must be noted that under an ideal condition, fundamental analysis can suggest only a range of prices rather than specific value.

2. **Technical Analysis:** Technical analysis involves studying the history of share price with an objective of tracking the future behaviour of a share or group of shares. This theory assumes that movement of share price makes some pattern, and in future same pattern are repeated. On the basis of such trend and behavioural patterns, one can estimate the stock price of the share. This theory is also called as charists theory. Technical analysis is based on the premise that security prices depend on supply of and demand for securities in the market and has no relationship with intrinsic value. A technician believes that supply and demand for shares is known in the market. The basic assumption of

technical theory is that history tends to repeat itself, thus stock price relies upon successive price changes. The technical analysis is based on charts and graphs. The major criticism of technical analysis is that it is subjective in nature, and it is not necessary that past prices patterns could predict the future prices.

The key differences between Fundamental analysis and Technical analysis are as follows:

(i) Technical analysis mainly seeks to predict short-term price movements, whereas fundamental analysis tries to establish long term values.

(ii) The focus of technical analysis is mainly on internal market data, particularly price and volume data. The focus of fundamental analysis is on fundamental factors relating to the economy, the industry and the firm.

(iii) Technical analysis appeals mostly to short term traders, whereas fundamental analysis appeals primarily to long-term investors.

3. **Efficient Market Hypothesis:** Efficient market hypothesis (EMH) is also known as random walk theory. The EMH states that current stock prices fully reflect all available information. However, it has no empirically testable implications. Most of the researches done in this area were under the assumption that the conditions of market equilibrium can be stated in terms of expected returns. The theory assumes that in an efficient market, securities are correctly priced and the prices fully reflect all variable information. The propounded of this model Eugene Fama has expressed the efficiency in terms of 'fair game' model according to which if security prices fully reflect all variable information in an efficient market then any trading system based on the information already impounded in prices will be a fair game.

## 11.5 Valuation of Equity Shares

Equity shares are considered as the highly risk bearing securities, the distinct features of equity shares have already been discussed in chapter-2. The three approaches, discussed above, under which equity shares may be valued. However, the valuation of equity shares discussed here under has limited scope and covers only fundamental analysis. The valuation of equity shares may be divided into three broad categories as shown in figure 11.2 below.

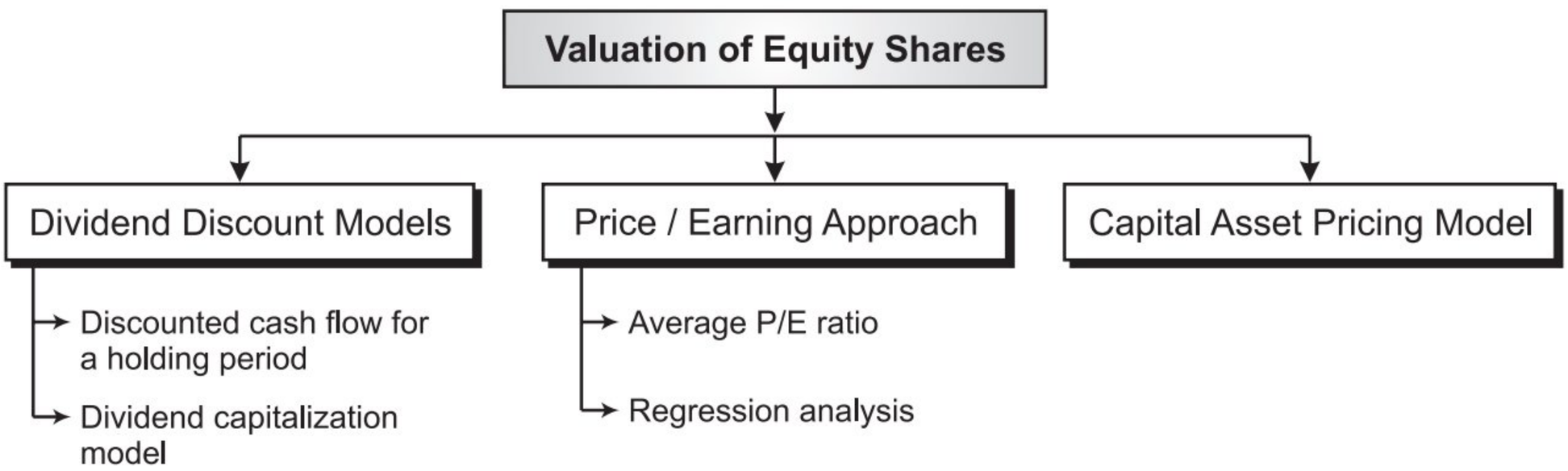


**Figure 11.2:** Techniques of Valuation of Equity Shares

## 11.5.1 Discounted Cash Flow Model

These valuation models used to estimate the intrinsic value of a share on the basis of present value. The valuation is made, following fundamental analysis, is centred on present value, which is computed as the discount value of future stream of dividends. The decision criterion either to hold/buy or sell depends upon intrinsic value. It is interpreted as same as we have discussed in bond valuation, i.e., if the intrinsic value is more than market value then investor should hold or buy it. In contrary situation, the security should be sold out. If investor is not holding these shares, then must explore alternative investment opportunities.

The valuation is made on the basis of holding period of security. It may be held either for one year or for multiple period. During the holding period, investor earns dividend, and on sale of these shares, he received cash, or sale value. Putting these two inflows on the time frame and expected rate of return, we may compute present value of the share, as shown below.

### One Year Holding Period

$$P_o = \frac{(D_1 + P_1)}{(1 + K_e)}$$

Where,

$P_o$ = Market price per share at the beginning of the period, or prevailing market price of a share

$D_1$ = Dividend to be received at the end of the period.

$P_1$ = Market price at the end of the period

$K_e$ = Cost of equity capital, or rate of capitalization.

### Multiple Years Holding Period or Long-term Investments

$$P_o = \sum_{t=1}^{N} \frac{Dt}{(1 + K_e)^t} + \frac{Pn}{(1 + K_e)^N}$$

Where,

$P_n$ = Expected selling price at the end of nth period.

**Illustration 8:** From the following information compute present value of equity share in a company.

| | |
|---|---|
| Face value of share | = ₹100 |
| Dividend | = ₹12 |
| Expected Rate of share after one year | = ₹130 |
| Rate of return | = 10% |

**Solution:**

$$P_o = \frac{(D_1 + P_1)}{(1 + K_e)}$$

$$P_o = \frac{(12 + 130)}{(1 + 0.10)}$$

$$P_o = \frac{142}{1.10} = 129.09$$

Thus, if market value of this share is below ₹129.09 then investor should buy/hold the security, otherwise sell out this security.

**Illustration 9:** What would be your opinion, on illustration 8, if investor wants to hold this security for three years. The expected market price of this share after 3 years is ₹170.

**Solution:**

$$P_o = \sum_{t=1}^{N} \frac{Dt}{(1+K_e)^t} + \frac{Pn}{(1+K_e)^N}$$

$$P_o = \sum_{t=1}^{3} \frac{12}{(1+0.10)^3} + \frac{170}{(1+0.10)^3}$$

$$P_o = 12*\text{PVFA}_{10\%,\,3} + 170*\text{PVF}_{10\%,\,3}$$

$$= 12*2.4868 + 170*0.7513$$

$$= 29.84 + 127.72$$

$$= 157.561$$

Thus, if the market value of the security is below 157. 561 then investor should buy/hold the security, otherwise sell out this security.

## No Dividend is Paid

In case, company does not pay dividend, or from the historical data, it is evident that the dividend pay-out ratio is negligible, in such case the valuation of security is dependent only on market price of the share which may be expressed as below.

$$P_o = \frac{P_1}{(1+K_e)}$$

The other approach of making valuation of equity share, where dividend is not paid, is based on Earnings Per Share (EPS), the formula is given below.

$$P_o = \frac{EPS}{K_e}$$

An observation from the above formula that it is derived from cost of equity, where cost of equity is a function of EPS and current market price of the share, known as EPS yield. Recall $K_e = EPS / P_0$.

**Illustration 10:** A company has not been paying dividend to its shareholders from last ten years. The face value of equity share is ₹100, but market price of the share is

expected to be ₹360 after 2 years, compute present value of the share, if required rate of return is 10%, and EPS is ₹35

**Solution:**

$$P_o = \frac{P_3}{(1+K_e)^3}$$

$$P_o = \frac{360}{(1+0.10)^3}$$

$$= \frac{360}{(1.1)^3}$$

$$= \frac{360}{1.331} = ₹270.5$$

On EPS basis

$$P_o = \frac{EPS}{K_e}$$

$$P_o = \frac{35}{0.10} = ₹350$$

## 11.5.2 Dividend Discount Models

A detail discussion on dividend discount model has been made in Chapter-8. Kindly refer Chapter-8. This approach includes MM-Model, Walter's Approach, and Gordon's Approach.

## 11.5.3 Price-Earnings Model or P/E Model

P/E model overcomes the limitation of discounted techniques model. In other words, P/E model is easy to calculate and are more realistic. The information used for P/E model is not assumed or expected rather can be obtained from financial statement of a company. The most serious work in discounted technique is to find out discount rate followed by expected future price of the security. Both of these are not required in P/E model. P/E model expresses a ratio of price of the equity and latest earnings available per equity shareholder (EPS), as shown below.

$$\text{P/E Ratio} = \frac{\text{Market Price of the Share}}{\text{Earnings Per Share}}$$

The major limitation of this method is that it reveals a ratio, instead of estimating a fair value of the equity share. To find out a fair value of equity share on the basis of P/E ratio, investor requires expected earning in order to find out future price of the equity share or a 'fair price'. It can be expressed as shown below.

Fair Value of Equity Share = P/E Ratio × Expected EPS

The value of EPS can be expected by using two methods (i) average method, and (ii) regression method. In average method, mean value of historical EPS is taken as expected EPS. In regression analysis, expected EPS of a company is computed by taking P/E ratio of market index as independent variable in relation to P/E ratio of company as dependent variable.

## 11.5.4 Capital Asset Pricing Model and Equity Valuation

We have made theoretical discussion on capital asset pricing model (CAPM) in Chapter-7, its basic assumption, limitation and applications. CAPM describes the relationship between systematic risk and expected return on assets. It is widely used for the pricing of risky securities, generating expected returns for assets given the associated risk, and calculating costs of capital. The CAPM formula requires only three pieces of information: the rate of return for the general market, the beta value of the stock in question, and the risk-free rate. The CAPM is shown below:

$$E(Ri) = Rf + \beta i * [E(Rm) - Rf]$$

Where,

$E(Ri)$ = Expected return on equity

$Rf$ = Risk free rate of return

$\beta i$ = Beta of equity security

$E(Rm)$ = Expected market return

The rate of return refers to the returns generated by the market in which the company's stock is traded. This is the rate used in the CAPM formula to determine the cost equity financing.

The beta of the stock refers to the risk level of the individual security relative to the wider market. A beta value of '1' indicates the stock equal moves equally as stock market moves. A higher beta indicates a more volatile stock and a lower beta reflects greater stability.

The risk-free rate is generally defined as the (more or less guaranteed) rate of return on short-term debt security because the value of this type of security is extremely stable and the return. So, the risk of losing invested capital is virtually zero, and a certain amount of profit is guaranteed.

The CAPM model helps in finding cost of equity, and estimated value of equity on the basis of CAPM will be:

$$\text{Value of equity share} = \frac{D}{K_e - g}$$

Where,

D = Dividend

$K_e$ = Cost of equity found with the help of CAPM

G = Growth of the company which is equal to = retention ratio × rate of capitalization

**Illustration 11:** From the following information compute value of equity using CAPM.

| | |
|---|---|
| Face value of the equity share | = ₹20 |
| Dividend paid | = ₹5 per share |
| Interest on Govt. Bonds | = 8% |
| Beta | = 1.3 |
| Market index | = 15% |
| Growth rate of the company | = 5% |

**Solution:**

$$E(Ri) = Rf + \beta i * [E(Rm) - Rf]$$

$$E(Ri) = 4 + 1.3 * [15 - 4]$$

$$E(Ri) = 4 + 14.3 = 18.3\%$$

$$\text{Expected value of equity share} = \frac{5}{(0.183 - 0.05)} = ₹37.60$$

## 11.6 Portfolio Analysis

In the preceding part of the chapter, we have studied the valuation of individual securities, especially, bonds and equity shares. But an investor does not make investment in one type of security only rather a collection of securities of different nature, bearing different risks, and expecting variety of return, including secured income to highly risky security are taken into account to maximise wealth. Portfolio refers to appropriate mix of or collection of investments held by an institution or a private individual. Thereby, portfolio management is the art and science of making decisions about investment mix and policy, matching investments to objectives, asset allocation for individuals and institutions, and balancing risk vis-à-vis maintaining performance.

A balance portfolio must have three key attributes as listed below.

**(a) Safety and security of the fund invested:** risk management

**(b) Profitability:** through interest, dividend and capital appreciation

**(c) Liquidity:** Convertibility into cash as and when required.

The portfolio management is on-going process involving the following basic tasks:

(i) Identification of the investor's objectives, constraints and preferences.

(ii) Strategies are to be developed and implemented in tune with investment policy formulated.

(iii) Review and monitoring of the performance of the portfolio.

(iv) The evaluation of the portfolio and make some adjustments for the future.

### 11.6.1 Objectives of Portfolio Management

The prime objective of portfolio is to reduce risk by diversification and maximize gains. The more salient objectives are given below.

1. **Security/Safety of Principal:** Security does not involves keeping the principal sum intact but also keeping its purchasing power intact also. Safety means protection for investment against loss under reasonable variations. In order to provide safety, a careful review of economic and industry trends is necessary. In other words, errors in portfolio are unavoidable and it requires extensive diversification. Even investor wants that his basic amount of investment should remain safe.
2. **Stability of Income:** So as to facilitate planning more accurately and systematically the reinvestment consumption of income is important.
3. **Capital Growth:** This can be attained by reinvesting in growth securities or through purchase of growth securities. Capital appreciation is the most important investment principle. Investors seek growth in stocks which provides a capital appreciation by way of rights, bonus and appreciation in the market price of a share.
4. **Marketability:** It is the case with which a security can be bought or sold. This is essential for providing flexibility to investment portfolio.
5. **Liquidity i.e. Nearness to Money:** It is desirable that a sufficient amount of liquidity is maintained or be available at a short-notice, whenever arises. It is also a necessity to take advantage of available attractive opportunities.
6. **Diversification:** The basic objective of building a portfolio is to reduce risk of loss of capital and/or income by investing in various types of securities and over a wide range of industries.
7. **Favourable Tax status (Tax Incentives):** The effective yield an investor gets form his investment depends on the tax to which it is subjected. By minimizing the tax burden, yield can be effectively improved. Investors try to minimise their tax liabilities from the investments. The portfolio manager has to keep a list of such investment avenues along with the return risk, profile, tax implications, yields and other returns. Investment programmers without considering tax implications may be costlier to the investor.

## 11.6.2 Need and Importance of Portfolio Management

Portfolio management is a process encompassing many activities of investment in assets and securities. It involves construction of a portfolio based upon the investor's objectives, constraints, preferences for risk and returns and tax liability. The portfolio is reviewed and adjusted from time to time in tune with the market conditions. The portfolio construction refers to the allocation of surplus funds in hand among a variety of financial assets open for investment. Portfolio theory concerns itself with the principles governing such allocation.

A combination of securities held together will give a beneficial result if they grouped in a manner to secure higher returns after taking into consideration the risk elements. The modern theory is in the view that by diversification risk can be reduced.

Diversification can be made by the investor either having a large number of shares of companies in different regions, in different industries or those producing different types of product lines. Modern theory believes in the perspective combination of securities under constraints of risk and returns.

## 11.6.3 Types of Portfolio

There are different types of investment portfolios. Perhaps the most common type's individuals are exposed to are: Conservative, Balanced and Aggressive Growth.

1. **Aggressive Investment Portfolio**: Aggressive investment portfolio aimed to earn highest possible return. Such portfolios are most appropriate for investors who have a high-risk tolerance and a longer time horizon. Aggressive portfolios generally have a higher investment in equities. Aggressive investment portfolios are for the investors who do not afraid of high risk. This type of portfolio may incorporate mutual funds that aim for high capital gain, equities, stocks, bonds, cash and maybe some commodities. In the short-term, growth will be very small, and loss may also occur. As a result, aggressive portfolios perform better in the long term – about five years or longer. An actively traded aggressive portfolio will typically gain maximum returns for the investor. An aggressive portfolio contains high growth investments that will hopefully appreciate in value. This strategy attempts to achieve high long-term growth by investing in often profitable but risky.
2. **Balanced or Moderate Investment Portfolio:** A moderately aggressive portfolio is meant for individuals with a longer time horizon and an average risk tolerance. Investors who find these types of portfolios attractive are seeking to balance the amount of risk and return contained within the fund. The portfolio would consist of approximately 50-55% equities, 35-40% bonds, 5-10% cash and equivalents. The Moderate Portfolio's primary investment objective is to seek long-term capital appreciation and earning regular income.
3. **Conservative Investment Portfolio:** The conservative investment strategies, which put safety at a high priority, are most appropriate for investors who are risk averse and have a shorter time horizon. Conservative portfolios will generally consist mainly of cash and cash equivalents, or high-quality fixed-income instruments. The main goal of a conservative portfolio strategy is to maintain the real value of the portfolio, or to protect the value of the portfolio against inflation. Such portfolio yield a high amount of current income and capital appreciation in long-period. The conservative investment portfolio is geared towards preserving capital. A minimal risk investment strategy is used. This type of portfolio is ideal for retirees who are focused more on having assets available than a stream of income from interest. Since the primary goal is to preserve capital, investors can dip into their principal to supplement living expenses instead of relying on the portfolio's earned income.

The Conservative Portfolio's primary investment objective is to seek preservation of capital and current income. Under normal market conditions, the Conservative Portfolio will invest approximately 65% of its total assets in fixed income securities and cash and approximately 35% of its total assets in equity securities.

## 11.7 Construction of Portfolio

The construction of portfolio involves two major discussion, first, weighted average investment and return thereon, second, diversification of risk through portfolio. Let consider a portfolio of two securities *viz.,* A security and B security with expected rate of return 20% and 12%. If 60% of total funds are invested in security A, and remaining in B. what would be expected return from the portfolio.

### Return of a Portfolio

To compute above stated problem, a weighted average will be computed as given below:

$$r_p = \sum_{i=1}^{n} x_i r_i$$

Where,

$R_p$ = return on portfolio

$R_i$ = return on individual assets

$X_i$ = weight of investments

N = number of securities in the portfolio.

Thus,

$(0.60*20) + (0.40*12) = 16.8\%$

### Risk of a Portfolio

The term variance or standard deviation are alternative measure to scale the risk in investment. In a portfolio the risk of two or more securities depend upon the interactive relation between investments. Interactive relation means if there is a change in return of one security how it affects another security. In statistical measure it can be computed with the help of covariance. In other words, the way security returns vary with each other affects the overall risk of the portfolio. The covariance is expressed as follow

$$Cov_{xy} = \frac{\sum_{i=1}^{n} R_x - \bar{R}_x][R_y - \bar{R}_y]}{N}$$

Where,

$Cov_{xy}$ = Covariance between x and y

Rx = Return on security x

Ry = return on security y

Rx hat = Mean return of security x

Ry hat = mean return of security y

N = number of observations

**Illustration 12:** From the following information compute covariance of x any y.

| **Year** | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| **Rx** | 10 | 12 | 16 | 18 | 19 |
| **Ry** | 18 | 14 | 10 | 8 | 5 |

**Solution:**

| **Year** | **Rx** | **Ry** | **Deviation (Rx – Mean Rx)** | **Deviation (Ry – Mean Ry)** | **Product of deviation (Rx * Ry)** |
|---|---|---|---|---|---|
| 1 | 10 | 18 | –5 | 7 | –35 |
| 2 | 12 | 14 | –3 | 3 | –9 |
| 3 | 16 | 10 | 1 | –1 | –1 |
| 4 | 18 | 8 | 3 | –3 | –9 |
| 5 | 19 | 5 | 4 | –6 | –24 |
| | Mean = 15 | Mean = 11 | | | Sum of product = –78 |

$$Cov_{xy} = \frac{-78}{5} = 15.6$$

The covariance is a measure of how returns of two securities move with affect of each other. If the returns of two securities moves together or in positive direction then covariance would be positive. If the return of two securities moves in opposite direction then value of covariance would be negative. If the movement is independent then the value of covariance will be close to zero.

Covariance gives absolute value. The risk in relative terms, of two securities, can be measured with the help of following expression.

$$\sigma^2_p = X^2_1\sigma^2_1 + X^2_2\sigma^2_2 + 2X_1X_2\,(r_{12}\sigma_1\sigma_2)$$

Where,

$\sigma^2_p$ = Portfolio variance

$\sigma^2_1$ = Variance of first security

$\sigma^2_2$ = Variance of second security

$X_1$ = weight of investment in first security

$X_2$ = weight of investment in second security

$r_{12}$ = correlation coefficient between the returns of two securities

$\sigma_1$ = standard deviation of first security

$\sigma_2$ = standard deviation of second security.

The risk can be measured of a portfolio in different covariance situation as shown in table below.

| Situations | Formula to Measure Portfolio Risk |
|---|---|
| Securities returns are positively correlated | $\sigma_p = X_1\sigma_1 + X_2\sigma_2$ |
| Securities returns are Negatively Correlated | $\sigma_p = X_1\sigma_1 - X_2\sigma_2$ |
| Securities returns are unrelated | $\sigma_p = \sqrt{X_1\sigma_1 + X_2\sigma_2}$ |

Using the above stated formulas, firstly, covariance is calculated in order to observe the direction of covariance, and then to minimise the risk the formulas given in table above is applies. The portfolio manager makes changes in security in order to minimise the risk of portfolio and maximise return of the portfolio.

## Review Questions

1. What do you understand from portfolio? How does valuation process make contribution in making better portfolio?
2. State the impact of coupon rate, discount rate, maturity period, frequency of interest payment on value of Bond. Illustrate.
3. Explain the theories of equity valuation. Draw key differences among these theories.
4. "Don't put all eggs in one basket". Explain the statement with reference to portfolio management. Also give key attributes of portfolio management.
5. What are the objectives of portfolio management?
6. Explain types of portfolio management.
7. Mr. X owns a ₹1000 face value bond with five years maturity. The annual interest rate is 9%. The current market price of the bond is 960. The required rate of return is 12%. Should the investor hold or sell the bond?
8. Mr. A owns a ₹1000 face value bond with 8 years maturity. The annual interest rate is 12%. The current market price is ₹910 of this class of bonds. The required rate of return is 10%. Should the investor hold or sell the bond?
9. Mr. X bought zero coupon bond at ₹100, the maturity value is ₹1000 after five years. The required rate of return is 8%. Compute value of the bond.
10. Mr. B bought a bond of ₹5000 with maturity period of 3 years and the redemption value is 7500, compute rate of return.
11. An investor wants to buy 10 shares in a Petroleum Company to hold for next five years. It is expected that company will pay dividend at ₹10 per share for first three years, and ₹12 for remaining years, the same shares can be sold out for ₹150 at the end of fifth year. What is the current value of equity share, if required rate of return is 10%?
12. A share is currently selling for ₹75. The company is expected to pay dividend or ₹4.50 at the end of year. The resale value of share is ₹98, and required rate of return is 12%. Find out the intrinsic value of equity share.

13. Equity Shares in A Co. Ltd. has current market value ₹120. The expected dividend is ₹6 after one year, growth rate is 12%. Find out the cost of capital.
14. Mr. X has required rate of return is 14%. He has made investment in shares in A Co. Ltd. The EPS is ₹12, return on investment (ROI) = 18% and retention ratio is 40%. Compute value of share using Gordon's Model.
15. From the following information compute value of equity using CAPM.

| | |
|---|---|
| Face value of the equity share | = ₹100 |
| Dividend paid | = ₹25 per share |
| Interest on Govt. Bonds | = 10% |
| Beta | = 1.23 |
| Market index | = 14% |
| Growth rate of the company | = 6% |

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