SECURITY VALUATION

LEARNING OUTCOMES

After reading this chapter student shall be able to understand:
- Theory of Valuation
- Return Concepts
- Equity Risk Premium
- Required Return on Equity
- Discount Rate Selection in Relation to Cash Flows
- Approaches to Valuation of Equity Shares
- Valuation of Preference Shares
- Valuation of Debentures/ Bonds
- Arbitrage Pricing Theory

1. OVERVIEW OF VALUATION

The definition of an investment is a fund commitment to obtain a return that would pay off the investor for the time during which the funds are invested or locked, for the expected rate of inflation over the investment horizon, and for the uncertainty involved. Most investments are expected to have cash flows and a stated market price (e.g., common stock), and one must estimate a value for the investment to determine if its current market price is consistent with his estimated intrinsic value. Investment returns can take many forms, including earnings, cash flows, dividends, interest payments, or capital gains (increases in value) during an investment horizon.
Knowing what an asset is worth and what determines its value is a pre-requisite for making intelligent decisions while choosing investments for a portfolio or in deciding an appropriate price to pay or receive in a business takeover and in making investment, financing and dividend choices when running a business. We can make reasonable estimates of value for most assets, and that the fundamental principles determining the values of all types of assets whether real or financial, are the same. While some assets are easier to value than others, for different assets, the details of valuation and the uncertainty associated with value estimates may vary. However, the core principles of valuation always remain the same.

2. RETURN CONCEPTS

A sound investment decision depends on the correct use and evaluation of the rate of return. Some of the different concepts of return are given as below:

2.1 Required Rate of Return

Required rate of return is the minimum rate of return that the investor is expected to receive while making an investment in an asset over a specified period of time. This is also called opportunity cost or cost of capital because it is the highest level of expected return forgone which is available elsewhere from investment of similar risks. Many times, required rate of return and expected return are used interchangeably. But, that is not the case. Expected return reflects the perception of investors. If the investors expect a return of a particular share higher than the required return, then the share is undervalued. The reason is that the share will sell for less than its intrinsic value. On the other hand, if the investors expect a return of a particular share lower than its required rate of return, then the share is overvalued. The reason is that it will sell for a higher price than its intrinsic value.

The difference between expected return and required return is called expected alpha, and the difference between actual holding period return and contemporaneous required return is called realized alpha. The source of expected alpha is mispricing. If true mispricing is present in any security, the price of the security will eventually converge to its intrinsic value, thus expected alpha will be realized. We can derive expected return given what we know about required return and mispricing. Thus, expected return equals the sum of required return plus return from convergence of the price over the period of time:

$$E(R_t) = r_t + \frac{V_0 - P_0}{P_0}$$

where $E(R_t)$ is expected return, $r_t$ is required return, $V_0$ is the intrinsic value and $P_0$ is the day's market price. The second term in this equation represents a return from the price convergence over the holding period; thus, adding this with the required return for holding period, we obtain the expected return on asset.
Example: Suppose that the current price of the shares of ABC Ltd. is ₹30 per share. The investor estimated the intrinsic value of ABC Ltd.’s share to be ₹35 per share with required return of 8% per annum. Estimate the expected return on ABC Ltd.

Answer: Intel's expected convergence return is \((35 - 30)/30 \times 100 = 16.67\%\), and let's suppose that the convergence happens over one year. Thus, adding this return with the 8% required return, we obtain an expected return of 24.67%.

Explanation: The intrinsic value estimate of ₹35 and required return of 8% imply that you expect the share price to rise to ₹37.80, which is up by 26.00% (rough estimate of 24.67%) from the current price of 30.

2.2 Discount Rate

Discount Rate is the rate at which present value of future cash flows is determined. Discount rate depends on the risk free rate and risk premium of an investment. Actually, each cash flow stream can be discounted at a different discount rate. This is because of variation in expected inflation rate and risk premium at different maturity levels. This can be explained with the help of term structure of interest rates. For instance, in upward sloping term structure of interest rates, interest rates increase with the maturity. It means longer maturity period have higher interest rates. However, in practice, one discount rate is used to determine present value of a stream of cash flows. But, this is not illogical. When a single discount rate is applied instead of many discount rates, many individual interest rates can be replaced with an equivalent single interest rate which eventually gives the same present value.

Example: Cash flows and discount rates for each year of cash flows at different maturities have been given as below:

<table>
<thead>
<tr>
<th></th>
<th>1st year</th>
<th>2nd year</th>
<th>3rd year</th>
<th>4th year</th>
<th>5th year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash flows</td>
<td>₹100</td>
<td>₹200</td>
<td>₹300</td>
<td>₹400</td>
<td>₹500</td>
</tr>
<tr>
<td>Discount rates</td>
<td>2.0%</td>
<td>3.2%</td>
<td>3.6%</td>
<td>4.8%</td>
<td>5.0%</td>
</tr>
</tbody>
</table>

The present value of this stream of cash flows, by discounting each cash flow with the respective discount rate, is ₹1,278.99.

The single discount rate equates the present value of the stream of cash flows to approximately ₹1278.99 at 4.4861% (any difference is due to rounding).

2.3 Internal Rate of Return

Internal Rate of Return is defined as the discount rate which equates the present value of future cash flows to its market price. The IRR is viewed as the average annual rate of return that investors earn over their investment time period assuming that the cash flows are reinvested at the IRR. This can be explained with the help of an example:
Suppose you are recommended to invest $20,000 now in an asset that offers a cash flow $3000 one year from now and $23,000 two years from now. You want to estimate the IRR of the investment. For this purpose you must find the discount rate that equates the present value of cash inflows to $20,000, the value of the initial investment.

<table>
<thead>
<tr>
<th>Cash flows</th>
<th>Time 0</th>
<th>1st year</th>
<th>2nd year</th>
</tr>
</thead>
<tbody>
<tr>
<td>$20,000</td>
<td>$3,000</td>
<td>$23,000</td>
<td></td>
</tr>
</tbody>
</table>

We solve the following equation for r which denotes IRR, and get 15%.

\[
20000 = \frac{3000}{(1+r)} + \frac{23000}{(1+r)^2}
\]

\[
=> r = 15\%
\]

Thus our IRR is 15%, which implies that we earn 15% IRR on the investment per annum. Now let’s assume that when we receive $3000, we reinvest it at 10% for one year and after one year we receive total $26300, $3300 of which is attributable to reinvestment of $3000. Since we receive total cash $26300 we can estimate the IRR of the investment.

\[
\frac{26300}{20000}^{\frac{1}{2}} - 1 = 0.1467 \text{ or } 14.67\%
\]

Annual return is now at 14.67% if reinvested at 10%, which is actually less than what was expected to be earned before investment. The reason is that the cash flow was reinvested at a rate (10%) which is less than our expected IRR (15%).

If we had a chance to reinvest $3000 at 15%, we would receive $26450 at the end of 2nd year, and the IRR of the investment would be equal to exactly 15% as calculated below:

\[
\frac{26450}{20,000}^{\frac{1}{2}} - 1 = 0.15 \text{ or } 15\%
\]

### 3. EQUITY RISK PREMIUM

Equity risk premium is the excess return that investment in equity shares provides over a risk free rate, such as return from tax free government bonds. This excess return compensates investors for taking on the relatively higher risk of investing in equity shares of a company. The size of the premium will change depending upon the level of risk in a particular portfolio and will also change over time as market risk fluctuates. Generally, high-risk investments are compensated with a higher premium.

The equity risk premium is based on the idea of the risk-reward tradeoff. However, equity risk premium is a theoretical concept because it is very difficult to predict that how a particular stock or the stock market as a whole will perform in the future. It can only be estimated by observing stock market and government bond market over a specified period of time, for instance from 1990 to the present period. Further, estimates may vary depending on the time frame and method of calculation.
3.1 Explanation of Equity Risk Premium

Investment in equity shares of a company is a high risk investment. If an investor is providing money to invest in equity shares of a company, he wants some premium over the risk free investment avenues such as government bonds. For example, if an investor could earn a 7% return on a government bond (which is generally considered as risk free investment), a company’s share should earn 7% return plus an additional return (the equity risk premium) in order to attract the investor.

Equity investors try to achieve a balance between risk and return. If a company wants to pursue investors to put their money into its stock, it must provide a stimulus in the form of a premium to attract the equity investors. If the stock gives a 15% return, in the example mentioned in the previous paragraph, the equity risk premium would be 8% (15% - 7% risk free rate). However, practically, the price of a stock, including the equity risk premium, moves with the market. Therefore, the investors use the equity risk premium to look at historical values, risks, and returns on investments.

3.2 Calculating the Equity Risk Premium

To calculate the equity risk premium, we can begin with the capital asset pricing model (CAPM), which is usually written:

$$R_x = R_f + \beta_x (R_m - R_f)$$

Where:

- $R_x$ = expected return on investment in "x"(company x)
- $R_f$ = risk-free rate of return
- $\beta_x$ = beta of "x"
- $R_m$ = expected return of market

As indicated above in the context of the equity risk premium, x is an investment in the equity shares of company x, such as 10000 shares of a blue-chip company. Now, if we assume that (x = m), then $R_x = R_m$. Beta is a measure of a stock’s volatility to that of the market; the market's volatility is set to 1, so if x = m, then $\beta_x = \beta_m = 1$. Whereas $R_m - R_f$ is known as the market premium; $R_x - R_f$ is the risk premium of a particular stock only. If x is an equity investment, then $R_x - R_f$ is the equity risk premium; if x = m, then the market premium and the equity risk premium are the same.

Therefore, the equity risk premium is basically a remodeling of the CAPM model:

$$\text{Equity Risk Premium} = R_x - R_f = \beta_x (R_m - R_f)$$
4. REQUIRED RETURN ON EQUITY

If equity risk premium is calculated as indicated above, required rate of return can be easily calculated with the help of Capital Asset Pricing Model (CAPM). The main insight of the model is that the investors evaluate the risk of an asset in terms of the asset's contribution to the systematic risk (cannot be reduced by portfolio diversification) of their total portfolio. CAPM model provides a relatively objective procedure for required return estimation; it has been widely used in valuation.

So, the required return on the share of particular company can be computed as below:

Return on share ‘A' = Risk free return + β x Market Risk Premium

Example:
Risk free rate 5%,
β 1.5
and, Market risk premium 4.5%

Calculate Required return on equity.

Solution
Required return on share A = Risk free return + β x Market Risk Premium
= 0.05 + 1.5 (0.045)
= 0.1175 or 11.75%

5. DISCOUNT RATE SELECTION IN RELATION TO CASH FLOWS

Cash flows are discounted at a suitable rate to arrive at the present value of cash flows which will be available in the future. Cash flows are required by any organization to settle their debt claims and taxes. Whatever amount remains are the cash flows available to equity shareholders. When cashflows to be available to equity shareholders are discounted, the required rate of return is an appropriate discount rate. Further, when cash flows are available to meet the claims of all of company’s equity shareholders, then the cost of capital is the appropriate discount rate.

5.1 Concept of Nominal Cash Flow and Real Cash Flow

Nominal cash flow is the amount of future revenues the company expects to receive and expenses it expects to pay out, without any adjustments for inflation. For instance, a company which wants to invest in a utility plant wants to forecast its future revenues and expenses it has to incur while earning its income (i.e. wages to labour, electricity, water, gas pipeline etc).
On the other hand, Real cash flow shows a company's cash flow with adjustments for inflation. Since inflation reduces the spending power of money over time, the real cash flow shows the effects of inflation on a company's cash flow.

In the short term and under conditions of low inflation, the nominal and real cash flows are almost identical. However, in conditions of high inflation rates, the nominal cash flow will be higher than the real cash flow.

5.2 Discount rate selection in Equity Valuation

From the above discussion, it can be concluded that cash flows can be nominal or real. When cash flows are stated in real terms, then they are adjusted for inflation. However, in case of nominal cash flow, inflation is not adjusted.

For nominal cash flow, nominal rate of discount is used. And, for real cash flow, real rate of discount is used. While valuing equity shares, only nominal cash flows are considered. Therefore, only nominal discount rate is considered. The reason is that the tax applying to corporate earnings is generally stated in nominal terms. Therefore, using nominal cash flow in equity valuation is the right approach because it reflects taxes accurately.

Moreover, when the cash flows are available to equity shareholders only, nominal discount rate is used. And, the nominal after tax weighted average cost of capital is used when the cash flows are available to all the company’s capital providers.

6. VALUATION OF EQUITY SHARES

In order to undertake equity valuations, an analyst can use different approaches, some of which are classified as follows:

(1) Dividend Based Models
(2) Earning Based Models
(3) Cash Flows Based Model

6.1 Dividend Based Models

As we know that dividend is the reward for the provider of equity capital, the same can be used to value equity shares. Valuation of equity shares based on dividend are based on the following assumptions:

a. Dividend to be paid annually.

b. Payment of first dividend shall occur at the end of first year.

c. Sale of equity shares occur at the end of the first year and that to at ex-dividend price.
The value of any asset depends on the discounted value of cash streams expected from the same asset. Accordingly, the value of equity shares can be determined on the basis of stream of dividend expected at required rate of return or opportunity cost i.e. $K_e$ (cost of equity).

Value of equity share can be determined based on holding period as follows:

1. **Valuation Based holding period of One Year:** If an investor holds the share for one year then the value of equity share is computed as follows:

$$P_0 = \frac{D_1}{(1 + K_e)^1} + \frac{P_1}{(1 + K_e)^1}$$

**Example:** Share of X Ltd. is expected to be sold at Rs. 36 with a dividend of Rs. 6 after one year. If required rate of return is 20% then what will be the share price.

**Answer**

The expected share price shall be computed as follows:

$$P_0 = \frac{6}{(1 + 0.20)^1} + \frac{36}{(1 + 0.20)^1} = Rs. 35$$

2. **Valuation Based on Multi Holding Period:** In this type of holding following three types of dividend pattern can be analyzed.

1. **Zero Growth:** Also, called as No Growth Model, as dividend amount remains same over the years infinitely. The value of equity can be found as follows:

$$P_0 = \frac{D}{(K_e)}$$

2. **Constant Growth:** Constant Dividend assumption is quite unrealistic assumption. Accordingly, one very common model is based on Constant Growth in dividend. In such situation, the value of equity share can be found by using following formula:

$$P_0 = \frac{D_1}{K_e - g} \text{ or } \frac{D_0(1 + g)}{(K_e - g)}$$

It is important to observe that the above formula is based on Gordon Growth Model of Calculation of Cost of Capital.

3. **Variable Growth in Dividend:** Just like the constant growth assumption this assumption also appears to be unrealistic. Accordingly, valuation of equity shares can also be done on the basis of variable growth in dividends. It should however be noted that though we can assume multiple growth rates but when one growth rate shall be assumed to be for infinity only then we can find value of equity shares.
Although stages of Company’s growth fall into following categories such as Growth, Transition and Maturity Phase but for Valuation the multiple dividend growth can be divided into following two categories.

(a) Two Stage Dividend Discount Model: While simple two stage model assumes extraordinary growth (or supernormal growth) shall continue for finite number of years he normal growth shall prevail for infinite period. Accordingly, the formula for computation of Share Price or equity value shall be as follows:

\[
P_0 = \frac{D_0(1 + g_1)}{(1 + K_e)^1} + \frac{D_0(1 + g_1)^2}{(1 + K_e)^2} + \cdots + \frac{D_0(1 + g_1)^n}{(1 + K_e)^n} + \frac{P_n}{(1 + K_e)^n}
\]

\[
P_n = \frac{D(1 + g_1)(1 + g_2)}{(K_e - g_2)}
\]

Where,
- \(D_0\) = Dividend Just Paid
- \(g_1\) = Finite or Super Growth Rate
- \(g_2\) = Normal Growth Rate
- \(K_e\) = Required Rate of Return on Equity
- \(P_n\) = Price of share at the end of Super Growth i.e. beginning of Normal Growth Period

(b) Three Stage Dividend Discount Model: As per one version there are three phases for valuations: explicit growth period, transition period and stable growth period.

In the initial phase, a firm grows at an extraordinarily high rate, after which its advantage gets depleted due to competition leading to a gradual decline in its growth rate. This phase is the transition phase, which is followed by the phase of a stable growth rate.

Accordingly, the value of equity share shall be computed, as in case of two stage growth mode by adding discounted value of Dividends for two growth periods and finally discounted value of share price at the beginning of sustainable or stable growth period.

There is another version of three stage growth model called H Model. In the first stage dividend grows at high growth rate for a constant period, then in second stage it declines for some constant period and finally grow at sustainable growth rate.

H Model is based on the assumption that before extraordinary growth rate reach to normal growth it declines lineally for period 2H.

Though the situation is complex but the formula for calculation of equity share shall be as follows which is sum of value on the normal growth rate and premium due to abnormal growth rate:

\[
P_0 = \frac{D_0(1 + g_n)}{r - g_n} + \frac{D_0H_n(g_c - g_n)}{r - g_n}
\]

Where \(g_n\) = Normal Growth Rate Long Run
4.10 STRATEGIC FINANCIAL MANAGEMENT

\[ g_c = \text{Current Growth Rate i.e. initial short term growth rate} \]

\[ H_1 = \text{Half-life of high growth period} \]

These variants of models can also be applied to Free Cash Flow to Equity Model discussed later.

6.2 Earning Based Models

Above mentioned models are based on Dividends. However, nowadays an investor might be willing to forego cash dividend in lieu of higher earnings on retained earning ultimately leading to higher growth in dividend.

Hence, these investors may be interested in determination of value of equity share based on Earning rather than Dividend. The different models based on earnings are as follows:

(a) **Gordon’s Model:** This model is based on following broad assumptions:
   
   (i) Return on Retained earnings remains the same.
   
   (ii) Retention Ratio remains the same.

   Valuation as per this model shall be
   
   \[ \frac{EPS(1-b)}{Ke - br} \]

   Where, \( r = \text{Return on Retained Earnings} \)

   \( b = \text{Retention Ratio} \)

(b) **Walter’s Approach:** This approach is based on Walter Model discussed at Intermediated Level in the Financial Management Paper. As per this model, the value of equity share shall be:

   \[ \frac{D + (E - D)\frac{r}{Ke}}{Ke} \]

(c) **Price Earning Ratio or Multiplier Approach:** This is one of the common valuation approaches followed. Since, Price Earning (PE) Ration is based on the ratio of Share Price and EPS, with a given PE Ratio and EPS, the share price or value can simply be determined as follows:

   \[ \text{Value} = \text{EPS \times PE Ratio} \]

Now, the question arises how to estimate the PE Ratio. This ratio can be estimated for a similar type of company or of industry after making suitable adjustment in light of specific features pertaining to the company under consideration. It should further be noted that EPS should be of equity shares. Accordingly, it should be computed after payment of preference dividend as follows:

\[ \text{EPS} = \frac{\text{Profit after tax – Preference Dividend}}{\text{Number of Equity Shares}} \]
6.3 Cash Flow Based Models

In the case of dividend discounting valuation model (DDM) the cash flows are dividend which is to be distributed to equity shareholders. This cash flow does not take into consideration the cash flows which can be utilised by the business to meet its long term capital expenditure requirements and short term working capital requirement. Hence dividend discount model does not reflect the true free cash flow available to a firm or the equity shareholders after adjusting for its capex and working capital requirement.

Free cash flow valuation models discount the cash flows available to a firm and equity shareholders after meeting its long term and short term capital requirements. Based on the perspective from which valuations are done, the free cash flow valuation models are classified as:

- Free Cash Flow to Firm Model (FCFF)
- Free Cash Flow to Equity Model (FCFE)

In the case of FCFF model, the discounting factor is the cost of capital \( K_o \) whereas in the case of FCFE model the cost of equity \( K_e \) is used as the discounting factor.

FCFE along with DDM is used for valuation of the equity whereas FCFF model is used to find out the overall value of the firm.

6.3.1 Calculation of Free Cash Flow to Firm (FCFF): FCFF can be calculated as follows:

(a) Based on its Net Income:

\[
\text{FCFF} = \text{Net Income} + \text{Interest expense} \times (1 - \text{tax}) + \text{Depreciation} -/+ \text{Capital Expenditure} -/+ \text{Change in Non-Cash Working Capital}
\]

(b) Based on Operating Income or Earnings Before Interest and Tax (EBIT):

\[
\text{FCFF} = \text{EBIT} \times (1 - \text{tax rate}) + \text{Depreciation} -/+ \text{Capital Expenditure} -/+ \text{Change in Non-Cash Working Capital}
\]

(c) Based on Earnings before Interest, Tax, Depreciation and Amortisation (EBITDA):

\[
\text{FCFF} = \text{EBITDA} \times (1 - \text{Tax}) + \text{Depreciation} \times (\text{Tax Rate}) -/+ \text{Capital Expenditure} -/+ \text{Change in Non-Cash Working Capital}
\]

(d) Based on Free Cash Flow to Equity (FCFE):

\[
\text{FCFF} = \text{FCFE} + \text{Interest} \times (1 - \text{t}) + \text{Principal Prepaid} - \text{New Debt Issued} + \text{Preferred Dividend}
\]

(e) Based on Cash Flows:

\[
\text{FCFF} = \text{Cash Flow from Operations (CFO)} + \text{Interest} \times (1 - \text{t}) -/+ \text{Capital Expenditure}
\]
Capital Expenditure or Capex for a single year is calculated as Purchase of Fixed Asset current year - Sale of Fixed Asset current year taken from Cash Flow from Investing Activities.

Change in Non- Cash Working Capital is calculated as:

**Step 1:** Calculate Working Capital for the current year: Working Capital = Current Asset - Current Liability

**Step 2:** Calculate Non-Cash Working Capital for the current year: Working Capital – Cash and Bank Balance

**Step 3:** In a similar way calculate Working Capital for the previous year

**Step 4:** Calculate change in Non-Cash Working Capital as: Non-Cash Working Capital for the current year - Non-Cash Working Capital for the previous year

**Step 5:** If change in Non-Cash Working Capital is positive, it means an increase in the working capital requirement of a firm and hence is reduced to derive at free cash flow to a firm.

Based on the type of model discussed above the value of Firm can be calculated as follows:

(a) For one stage Model: Intrinsic Value = Present Value of Stable Period Free Cash Flows to Firm

(b) For two stage Model: Intrinsic Value = Present value of Explicit Period Free Cash Flows to Firm + Present Value of Stable Period Free Cash Flows to a Firm, or

Intrinsic Value = Present Value of Transition Period Free Cash Flows to Firm + Present Value of Stable Period Free Cash Flows to a Firm


**6.3.2 Calculation of Free Cash Flow to Equity (FCFE):** Free Cash flow to equity is used for measuring the intrinsic value of the stock for equity shareholders. The cash that is available for equity shareholders after meeting all operating expenses, interest, net debt obligations and re-investment requirements such as working capital and capital expenditure. It is computed as:

Free Cash Flow to Equity (FCFE) = Net Income - Capital Expenditures + Depreciation - Change in Non-cash Working Capital + New Debt Issued - Debt Repayments

or

FCFE = Net Profit + depreciation - ∆NWC - CAPEX + New Debt - Debt Repayment.

∆NWC = changes in Net Working Capital.

CAPEX = Addition in fixed assets to sustain the basis.

FCFE can also be used to value share as per multistage growth model approach.
6.4 Dividend Discount Model versus Free Cash Flow to Equity Model

In the dividend discount model the analyst considers the stream of expected dividends to value the company’s stock. It is assumed that the company follows a consistent dividend payout ratio which can be less than the actual cash available with the firm.

Dividend discount model values a stock based on the cash paid to shareholders as dividend.

A stock’s intrinsic value based on the dividend discount model may not represent the fair value for the shareholders because dividends are distributed from cash. In case the company is maintaining healthy cash in its balance sheet then dividend pay-outs will be low which could result in undervaluation of the stock.

In the case of free cash flow to equity model a stock is valued on the cash flow available for distribution after all the reinvestment needs of capex and incremental working capital are met. Thus using the free cash flow to equity valuation model provides a better measure for valuations in comparison to the dividend discount model.

6.5 Enterprise Value

Enterprise value is the true economic value of a company. It is calculated by adding market capitalization, Long term Debt, Minority Interest minus cash and cash equivalents. (Also Minus like Equity investments like affiliates, investment in any company and also Long term investments.

Enterprise value is of three types: total, operating and core EV. Total enterprise value is the value of all the business activities; it is the summation of market capitalization, Debt (Interest Bearing), Minority Interest “minus “cash. The operating Enterprise value is the value of all operating activities, and to get this we have to deduct “market value of non-operating assets” which includes Investments and shares (in associates) from the total enterprise value.
Core enterprise value is the value which does not include the value of operations (which are not the part of activities). To get this we deduct the value of non-core assets from the operating enterprise value.

Enterprise value measures the business as a whole and gives its true economic value. It is more comprehensive than equity multiples. Enterprise value considers both equity and debt in its valuation of the firm, and is least affected by its capital structure. Enterprise multiples are more reliable than equity multiples because Equity multiples focus only on equity claim.

There are different enterprise value multiples which can be calculated as per the requirement (which requirement). If we take the EV as numerator then the denominator must represent the claims of all the claimholders on enterprise cash flow.

6.5.1 **Enterprise Value to Sales**: This multiple is suitable for the corporates who maintain negative cash flows or negative earnings as cyclical firms. Corporate like technological firms generally use this multiple. Sales are the least manipulative top line(?) any business and least affected by accounting policies.

6.5.2 **Enterprise Value to EBITDA**: EBITDA, which is commonly known as the proxy of cash flow, is the amount available to debt and equity holders of a company. This multiple is used for valuing capital intensive companies, which generally have substantial depreciation and amortization expenses. This multiple is used for acquisitions as it incorporates debts as well equity of the business. An analyst prefers this multiple because it is not affected by depreciation policy and changes in capital structure. The inverse of this multiple explains cash return on total investment.

6.6 **Valuation of Rights**

As we know that company offers right shares to the existing shareholders. Immediately after the right issue, the price of share is called Ex Right Price or Theoretical Ex-Right Price (TERP) which is computed as follows:

\[ \frac{nP_o + S}{n + n_1} \]

- \( n \) = No. of existing equity shares
- \( P_o \) = Price of Share Pre-Right Issue
- \( S \) = Subscription amount raised from Right Issue
- \( n_1 \) = No. of new shares offered

However, theoretical value of a right can be calculated as follows:

\[ P_o - S \]

Value of Per Shareholding = \( \frac{P_o - S}{n} \)
7. VALUATION OF PREFERENCE SHARES

Preference shares, like debentures, are usually subject to fixed rate of dividend. In case of non-redeemable preference shares, their valuation is similar to perpetual bonds.

Valuation of Redeemable preference share

The value of redeemable preference share is the present value of all the future expected dividend payments and the maturity value, discounted at the required return on preference shares. Therefore,

Value of Redeemable Preference Share

\[
\text{Value of Redeemable Preference Share} = \frac{\text{Dividend}_1}{(1+r)^1} + \frac{\text{Dividend}_2}{(1+r)^2} + \cdots + \frac{(\text{Dividend}_n + \text{Maturity value})}{(1+r)^n}
\]

Value of Non-Redeemable Preference Share

\[
\text{Irredeemable Preference share value} = \frac{\text{Dividend}}{\text{Required return on Preference share}}
\]

Example:

The face value of the preference share is 10000 and the stated dividend rate is 10%. The shares are redeemable after 3 years period. Calculate the value of preference shares if the required rate of return is 12%.

Annual dividend = ₹10000 x 10% = ₹1000

\[
\text{Redeemable Preference share value} = \frac{1,000}{(1 + 0.12)^1} + \frac{1,000}{(1 + 0.12)^2} + \frac{1,000 + 10000}{(1 + 0.12)^3}
\]

\[
= \frac{1,000}{(1.12)} + \frac{1,000}{(1.12)^2} + \frac{11,000}{(1.12)^3}
\]

\[
= 892.86 + 797.19 + 7829.18
\]

\[
= 9519.23
\]

Solving the above equation, we get the value of the preference shares as ₹9519.23

8. VALUATION OF DEBENTURES AND BONDS

8.1 Some Basics of a Bond

(a) Par Value: Value stated on the face of the bond. of maturity.
4.16 STRATEGIC FINANCIAL MANAGEMENT

(b) **Coupon Rate and Frequency of Payment**: A bond carries a specific interest rate known as the coupon rate.

(c) **Maturity Period**: Total time till maturity.

(d) **Redemption**: Bullet i.e. one shot repayment of principal at par or premium.

### 8.2 Bond Valuation Model

The value of a bond is:

\[ V = \sum_{t=1}^{n} \frac{I}{(1+k_d)^t} + \frac{F}{(1+k_d)^n} \]

\[ V = I \left( PVIFA_{k_d, n} \right) + F \left( PVIF_{k_d, n} \right) \]

Where,

- **V** = value of the bond
- **I** = annual interest payable on the bond
- **F** = principal amount (par value) of the bond repayable at the time of maturity
- **N** = maturity period of the bond.

### 8.3 Bond Value Theorems

Some basic rules which should be remembered with regard to bonds are:

<table>
<thead>
<tr>
<th><strong>CAUSE</strong></th>
<th><strong>EFFECT</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Required rate of return = coupon rate</td>
<td>Bond sells at par value</td>
</tr>
<tr>
<td>Required rate of return &gt; coupon rate</td>
<td>Bond sells at a discount</td>
</tr>
<tr>
<td>Required rate of return &lt; coupon rate</td>
<td>Bond sells at a premium</td>
</tr>
<tr>
<td>Longer the maturity of a bond</td>
<td>Greater the bond price change with a given change in the required rate of return.</td>
</tr>
</tbody>
</table>

### 8.4 Yield to Maturity (YTM)

The YTM is defined as that value of the discount rate ("k_d") for which the Intrinsic Value of the Bond equals its Market Price.

### 8.5 Bond Values with Semi-Annual Interest

The basic bond valuation equation thus becomes:

\[ V = \frac{I}{2} \sum_{i=1}^{2n} \left( \frac{I/2}{(1+k_{d/2})^i/2} \right) + \frac{F}{(1+k_{d/2})^{2n}} \]

\[ V = I/2 \left( PVIFA_{k_d/2, 2n} \right) + F \left( PVIF_{k_d/2, 2n} \right) \]
Where,

\[ V = \text{Value of the bond} \]
\[ \frac{I}{2} = \text{Semi-annual interest payment} \]
\[ \frac{K_d}{2} = \text{Discount rate applicable to a half-year period} \]
\[ F = \text{Par value of the bond repayable at maturity} \]
\[ 2n = \text{Maturity period expressed in terms of half-yearly periods} \]

8.6 Price Yield Relationship
- A basic property of a bond is that its price varies inversely with yield.
- The reason is simple. As the required yield increases, the present value of the cash flow decreases; hence the price decreases and vice versa.

8.7 Relationship between Bond Price and Time
Since the price of a bond must equal its par value at maturity (assuming that there is no risk of default), bond prices change with time.

8.8 Duration of Bond
The concept of duration is straightforward. Duration is nothing but the average time taken by an investor to collect his/her investment. If an investor receives a part of his/her investment over the time on specific intervals before maturity, the investment will offer him the duration which would be lesser than the maturity of the instrument. Higher the coupon rate, lesser would be the duration.

It measures how quickly a bond will repay its true cost. The longer the time it takes the greater exposure the bond has to changes in the interest rate environment. Following are some of factors that affect bond’s duration:

(i) **Time to maturity:** The shorter-maturity bond would have a lower duration and less price risk and vice versa.

(ii) **Coupon rate:** Coupon payment is a key factor in calculation of duration of bonds. The higher the coupon, the lower is the duration and vice versa.

Although there are many formulae to calculate the duration. However, following are commonly used methods:

(a) **Macaulay Duration:** This formula measures the number of years required to recover the true cost of a bond, considering the present value of all coupon and principal payments received in the future. The formula for Macaulay duration is as follows:
4.18 STRATEGIC FINANCIAL MANAGEMENT

Macaulay Duration = \[
\sum_{t=1}^{n} \frac{t \cdot c}{(1+i)^t} + \frac{n \cdot M}{(1+i)^n}
\]

Where,
- \(n\) = Number of cash flows
- \(t\) = Time to maturity
- \(C\) = Cash flows
- \(i\) = Required yield
- \(M\) = Maturity (par) value
- \(P\) = Bond price

(b) **Modified Duration**: This is a modified version of Macaulay duration which takes into account the interest rate changes because the changes in interest rates affect duration as the yield gets affected each time the interest rate varies.

The formula for modified duration is as follows:

\[
\text{Modified Duration} = \left[ \frac{\text{Macaulay Duration}}{1 + \frac{\text{YTM}}{n}} \right]
\]

Where
- \(n\) = Number of compounding periods per year
- \(\text{YTM}\) = Yield to Maturity

Some of the terms associated with Bond Valuation are as follows:

8.9 **Immunization**

We know that when interest rate goes up although return on investment improves but value of bond falls and vice versa. Thus, the price of Bond is subject to following two risk:

(a) **Price Risk**

(b) **Reinvestment Rate Risk**

Further, with change in interest rates these two risks move in opposite direction. Through the process of immunization selection of bonds shall be in such manner that the effect of above two risks shall offset each other.
8.10 Yield Curve

The term structure of interest rates, popularly known as Yield Curve, shows how yield to maturity is related to term to maturity for bonds that are similar in all respects, except maturity.

Consider the following data for Government securities:

<table>
<thead>
<tr>
<th>Face Value</th>
<th>Interest Rate</th>
<th>Maturity (years)</th>
<th>Current Price</th>
<th>Yield to Maturity</th>
</tr>
</thead>
<tbody>
<tr>
<td>10,000</td>
<td>0</td>
<td>1</td>
<td>8,897</td>
<td>12.40</td>
</tr>
<tr>
<td>10,000</td>
<td>12.75</td>
<td>2</td>
<td>9,937</td>
<td>13.13</td>
</tr>
<tr>
<td>10,000</td>
<td>13.50</td>
<td>3</td>
<td>10,035</td>
<td>13.35</td>
</tr>
<tr>
<td>10,000</td>
<td>13.50</td>
<td>4</td>
<td>9,971</td>
<td>13.60</td>
</tr>
<tr>
<td>10,000</td>
<td>13.75</td>
<td>5</td>
<td>9,948</td>
<td>13.90</td>
</tr>
</tbody>
</table>

The yield curve for the above bonds is shown in the diagram. It slopes upwards indicating that long-term rates are greater than short-term rates.

Yield curves, however, do not have to necessarily slope upwards. They may follow any pattern. Four patterns are depicted in the given diagram:

Types of Yield Curve
Another perspective on the term structure of interest rates is provided by the forward interest rates, viz., the interest rates applicable to bonds in the future.

To get forward interest rates, begin with the one-year Treasury bill:

$$8,897 = 10,000 / (1 + r_1)$$

Where,

- $r_1$ is the one-year spot rate i.e. the discount rate applicable to a risk less cash flow receivable a year hence.

Solving for $r_1$, we get $r_1 = 0.124$.

Next, consider the two-year government security and split its benefits into two parts, the interest of ₹ 1,275 receivable at the end of year 1 and ₹ 11,275 (representing the interest and principal repayment) receivable at the end of year 2. The present value of the first part is:

$$1,134 = \frac{1,275}{1 + r_1}$$

To get the present value of the second year’s cash flow of ₹ 11,275, discount it twice at $r_1$ (the discount rate for year 1) and $r_2$ (the discount rate for year 2)

$$\frac{1,275}{(1 + r_1)(1 + r_2)} = \frac{1,275}{1.124(1 + r_2)}$$

$r_2$ is called the ‘forward rate’ for year two, i.e., the current estimate of the next year’s one-year spot interest rate. Since $r_1$, the market price of the bond, and the cash flow associated with the bond are known the following equation can be set up:

$$9,937 = \frac{1,275}{1.124} + \frac{11,275}{1.124(1 + r_2)}$$

$$9,937(1.124)(1 + r_2) = 1,275 (1 + r_2) + 11,275$$

$$11,169 + 11,169 r_2 = 1,275 + 1,275 r_2 + 11,275$$

$$11,169 r_2 - 1,275 r_2 = 11,275 - 11,169 + 1,275$$

$$9,894 r_2 = 1,381$$

$$r_2 = \frac{1,381}{9,894} = 0.1396$$

To get the forward rate for year 3($r_3$), set up the equation for the value of the three year bond:
\[
10,035 = \frac{1,350}{(1 + r_1)} + \frac{1,350}{(1 + r_1)(1 + r_2)} + \frac{11,350}{(1 + r_1)(1 + r_2)(1 + r_3)}
\]

\[
10,035 = \frac{1,350}{1.124} + \frac{1,350}{(1.124)(1.140)} + \frac{11,350}{(1.124)(1.140)(1 + r_3)}
\]

\[
10,035 = \frac{1,350}{1.124} + \frac{1,350}{1.28136} + \frac{11,350}{1.28136(1 + r_3)}
\]

\[
10,035 = 1,201 + 1,054 + \frac{11,350}{1.28136(1 + r_3)}
\]

\[
7781 = \frac{11,350}{1.28136(1 + r_3)}
\]

\[
1 + r_3 = 1.134845
\]

\[
r_3 = 0.13845
\]

Solving this equation we get \(r_3 = 0.13845\). This is the forward rate for year three. Continuing in a similar fashion, set up the equation for the value of the four-year bond:

\[
9,971 = \frac{1,350}{(1 + r_1)} + \frac{1,350}{(1 + r_1)(1 + r_2)} + \frac{1,350}{(1 + r_1)(1 + r_2)(1 + r_3)} + \frac{11,350}{(1 + r_1)(1 + r_2)(1 + r_3)(1 + r_4)}
\]

Solving this equation we get \(r_4 = 0.1458\). The following diagram plots the one-year spot rate and forward rates \(r_2, r_3, r_4\). It can be noticed that while the current spot rate and forward rates are known, the future spot rates are not known – they will be revealed as the future unfolds.
Thus on the basis of above it can be said that though YTM and Forward Rates are two distinct measures but used equivalent way of evaluating a riskless cash flows.

Discount at the yield to maturity: \[ (R_t) \] \( PV \{ CF(t) \} = \frac{CF(t)}{(1+R_t)^t} \)

Discount by the product of spot rate plus the forward rates

\[ PV \{ CF(t) \} = \frac{CF(t)}{(1+r_1)(1+r_2)...(1+r_t)} \]

8.11 Term Structure Theories

The term structure theories explains the relationship between interest rates or bond yields and different terms or maturities. The different term structures theories are as follows:

(a) **Unbiased Expectation Theory:** As per this theory the long-term interest rates can be used to forecast short-term interest rates in the future on the basis of rolling the sum invested for more than one period.

(b) **Liquidity Preference Theory:** As per this theory forward rates reflect investors’ expectations of future spot rates plus a liquidity premium to compensate them for exposure to interest rate risk. Positive slope may be a result of liquidity premium.

(c) **Preferred Habitat Theory:** Premiums are related to supply and demand for funds at various maturities – not the term to maturity and hence this theory can be used to explain almost any yield curve shape.

8.12 Convexity Adjustment

As mentioned above duration is a good approximation of the percentage of price change for a small change in interest rate. However, the change cannot be estimated so accurately of convexity effect as duration base estimation assumes a linear relationship.

This estimation can be improved by adjustment on account of ‘convexity’. The formula for convexity is as follows:

\[ C^* \times (\Delta y)^2 \times 100 \]

\( \Delta y = \text{Change in Yield} \)

\[ C^* = \frac{V_+ + V_- - 2V_0}{2V_0(\Delta y^2)} \]

\( V_0 = \text{Initial Price} \)

\( V_+ = \text{price of Bond if yield increases by } \Delta y \)

\( V_- = \text{price of Bond if yield decreases by } \Delta y \)
8.13 Convertible Debentures

Convertible Debentures are those debentures which are converted in equity shares after certain period of time. The equity shares for each convertible debenture are called Conversion Ratio and price paid for the equity share is called ‘Conversion Price’.

Further, conversion value of debenture is equal to Price per Equity Share x Converted No. of Shares per Debenture.

8.14 Valuation of Warrants

A warrant is a right that entitles a holder to subscribe equity shares during a specific period at a stated price. These are generally issued to sweeten the debenture issue.

Although both convertible Debentures and Warrants appeared to one and same thing but following are major differences.

(i) In warrant, option of conversion is detachable while in convertible it is not so. Due to this reason, warrants can be separately traded.

(ii) Warrants are exercisable for cash payment while convertible debenture does not involve any such cash payment. Theoretical value of warrant can be found as follows:

\[
(Mp - E) \times n
\]

MP = Current Market Price of Share

E = Exercise Price of Warrant

n = No. of equity shares convertible with one warrant

8.15 Zero Coupon Bond

As name indicates these bonds do not pay interest during the life of the bonds. Instead, zero coupon bonds are issued at discounted price to their face value, which is the amount a bond will be worth when it matures or comes due. When a zero coupon bond matures, the investor will receive one lump sum (face value) equal to the initial investment plus interest that has been accrued on the investment made. The maturity dates on zero coupon bonds are usually long term. These maturity dates allow an investor for a long range planning. Zero coupon bonds issued by banks, government and private sector companies. However, bonds issued by corporate sector carry a potentially higher degree of risk, depending on the financial strength of the issuer and longer maturity period, but they also provide an opportunity to achieve a higher return.

9. ARBITRAGE PRICING THEORY

Arbitrage pricing theory (APT) is used as an alternative to Capital Assets Pricing Model (CAPM). While the CAPM formula helps to calculate the market's expected return, APT uses the risky asset's expected return and the risk premium of a number of macroeconomic factors.
In the 1970's Mr. Stephen Alan Ross, professor and economist, introduced the concept of 'multiple factors' that can influence the risk component – motley of 'macro-economic factors'. So, the basic idea is to breakdown risks into individual identifiable elements that influence the overall risk in a proportion (called 'factor'), and each factor gets assigned its own beta; and the sum total of all the assets’ ‘sensitivities’ to ‘n’ factors will give the ‘expected rate of return for the asset’.

In a simplistic way, if a particular asset, say a stock, has its major influencers as the ‘interest rate fluctuations’ and the ‘sectoral growth rate’, then the stocks’ return would be calculated by using the Arbitrage Pricing Theory (APT) in the following manner:

(a) Calculate the risk premium for both these two risk factors (beta for the risk factor 1 – interest rate, and beta of the risk factor 2 – sector growth rate; and,

(b) Adding the risk free rate of return.

Thus, the formula for APT is represented as –

\[ R(f) + B_1(RP_1) + B_2(RP_2) + \ldots B_j(RP_n) \]

It is thereby clear that APT strives to model \( E(R) \) as ‘a linear function of various macro-economic factors’ where sensitivity to changes in each factor is represented by a factor-specific beta coefficient. Note that the APT by itself doesn’t provide for the macro-economic factors that will be needed to be tested for its sensitivity – however these have to be judicially developed by the financial analysts keeping in mind the economy they are put in.

TEST YOUR KNOWLEDGE

Theoretical Questions

1. Why should the duration of a coupon carrying bond always be less than the time to its maturity?

2. Write short notes on Zero coupon bonds.

Practical Questions

1. A company has a book value per share of ₹ 137.80. Its return on equity is 15% and it follows a policy of retaining 60% of its earnings. If the Opportunity Cost of Capital is 18%, what is the price of the share today?

2. ABC Limited’s shares are currently selling at ₹ 13 per share. There are 10,00,000 shares outstanding. The firm is planning to raise ₹ 20 lakhs to Finance a new project.

Required:

What are the ex-right price of shares and the value of a right, if

(i) The firm offers one right share for every two shares held.
(ii) The firm offers one right share for every four shares held.

(iii) How does the shareholders’ wealth change from (i) to (ii)? How does right issue increases shareholders’ wealth?

3. On the basis of the following information:

<table>
<thead>
<tr>
<th>Current dividend (Do)</th>
<th>= ₹ 2.50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discount rate (k)</td>
<td>= 10.5%</td>
</tr>
<tr>
<td>Growth rate (g)</td>
<td>= 2%</td>
</tr>
</tbody>
</table>

(i) Calculate the present value of stock of ABC Ltd.

(ii) Is its stock overvalued if stock price is ₹ 35, ROE = 9% and EPS = ₹ 2.25? Show detailed calculation.

4. Piyush Loonker and Associates presently pay a dividend of Re. 1.00 per share and has a share price of ₹ 20.00.

(i) If this dividend were expected to grow at a rate of 12% per annum forever, what is the firm’s expected or required return on equity using a dividend-discount model approach?

(ii) Instead of this situation in part (i), suppose that the dividends were expected to grow at a rate of 20% per annum for 5 years and 10% per year thereafter. Now what is the firm’s expected, or required, return on equity?

5. Capital structure of Sun Ltd., as at 31.3.2003 was as under:

<table>
<thead>
<tr>
<th></th>
<th>(₹ in lakhs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equity share capital</td>
<td>80</td>
</tr>
<tr>
<td>8% Preference share capital</td>
<td>40</td>
</tr>
<tr>
<td>12% Debentures</td>
<td>64</td>
</tr>
<tr>
<td>Reserves</td>
<td>32</td>
</tr>
</tbody>
</table>

Sun Ltd., earns a profit of ₹ 32 lakhs annually on an average before deduction of income-tax, which works out to 35%, and interest on debentures.

Normal return on equity shares of companies similarly placed is 9.6% provided:

(a) Profit after tax covers fixed interest and fixed dividends at least 3 times.

(b) Capital gearing ratio is 0.75.

(c) Yield on share is calculated at 50% of profits distributed and at 5% on undistributed profits.
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Sun Ltd., has been regularly paying equity dividend of 8%.

Compute the value per equity share of the company.

6. A Company pays a dividend of ₹ 2.00 per share with a growth rate of 7%. The risk free rate is 9% and the market rate of return is 13%. The Company has a beta factor of 1.50. However, due to a decision of the Finance Manager, beta is likely to increase to 1.75. Find out the present as well as the likely value of the share after the decision.

7. Shares of Voyage Ltd. are being quoted at a price-earning ratio of 8 times. The company retains 45% of its earnings which are ₹ 5 per share.

You are required to compute

(1) The cost of equity to the company if the market expects a growth rate of 15% p.a.
(2) If the anticipated growth rate is 16% per annum, calculate the indicative market price with the same cost of capital.
(3) If the company's cost of capital is 20% p.a. & the anticipated growth rate is 19% p.a., calculate the market price per share.

8. M/s X Ltd. has paid a dividend of ₹ 2.5 per share on a face value of ₹ 10 in the financial year ending on 31st March, 2009. The details are as follows:

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current market price of share</td>
<td>₹ 60</td>
</tr>
<tr>
<td>Growth rate of earnings and dividends</td>
<td>10%</td>
</tr>
<tr>
<td>Beta of share</td>
<td>0.75</td>
</tr>
<tr>
<td>Average market return</td>
<td>15%</td>
</tr>
<tr>
<td>Risk free rate of return</td>
<td>9%</td>
</tr>
</tbody>
</table>

Calculate the intrinsic value of the share.

9. Saranam Ltd. has issued convertible debentures with coupon rate 12%. Each debenture has an option to convert to 20 equity shares at any time until the date of maturity. Debentures will be redeemed at ₹ 100 on maturity of 5 years. An investor generally requires a rate of return of 8% p.a. on a 5-year security. As an investor when will you exercise conversion for given market prices of the equity share of (i) ₹ 4, (ii) ₹ 5 and (iii) ₹ 6.

Cumulative PV factor for 8% for 5 years : 3.993
PV factor for 8% for year 5 : 0.681

10. ABC Ltd. has ₹ 300 million, 12 per cent bonds outstanding with six years remaining to maturity. Since interest rates are falling, ABC Ltd. is contemplating of refunding these bonds with a ₹ 300 million issue of 6 year bonds carrying a coupon rate of 10 per cent. Issue cost of the new bond will be ₹ 6 million and the call premium is 4 per cent. ₹ 9 million
being the unamortized portion of issue cost of old bonds can be written off no sooner the old bonds are called off. Marginal tax rate of ABC Ltd. is 30 per cent. You are required to analyse the bond refunding decision.

ANSWERS/SOLUTIONS

Answers to Theoretical Questions
1. Please refer paragraph 8.9
2. Please refer paragraph 8.16

Answers to the Practical Questions
1. The company earnings and dividend per share after a year are expected to be:
   \[
   \text{EPS} = ₹ \times 0.15 = ₹ 20.67
   \]
   Dividend = 0.40 \times 20.67 = ₹ 8.27
   The growth in dividend would be:
   \[
   g = 0.6 \times 0.15 = 0.09
   \]
   Perpetual growth model Formula:
   \[
   P_0 = \frac{\text{Dividend}}{K_a - g}
   \]
   \[
   P_0 = \frac{8.27}{0.18 - 0.09} = ₹ 91.89
   \]

Alternative Solution:
However, in case a student follows Walter’s approach as against continuous growth model given in previous solution the answer of the question works out to be different. This can be shown as follow:

Given data:

Book value per share = ₹ 137.80
Return on equity = 15%
Dividend Payout = 40%
Cost of capital = 18%
∴ EPS = ₹ 137.80 \times 15%
   = ₹ 20.67

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\[ \therefore \text{Dividend} = 20.67 \times 40\% = 8.27 \]

Walter’s approach showing relationship between dividend and share price can be expressed by the following formula

\[
V_c = \frac{D + \frac{R_a}{R_c} (E - D)}{R_c}
\]

Where,

- \( V_c \) = Market Price of the ordinary share of the company.
- \( R_a \) = Return on internal retention i.e. the rate company earns on retained profits.
- \( R_c \) = Capitalisation rate i.e. the rate expected by investors by way of return from particular category of shares.
- \( E \) = Earnings per share.
- \( D \) = Dividend per share.

Hence,

\[
V_c = \frac{8.27 + \frac{18}{15} (20.67 - 8.27)}{18} = 18.60
\]

\[ = 103.35 \]

2. (i) Number of shares to be issued: 5,00,000

Subscription price \( \frac{20,00,000}{5,00,000} = 4 \)

Ex-right Price = \( \frac{130,00,000 + 20,00,000}{15,00,000} = 10 \)

Value of a Right = \( 10 - 4 = 6 \)

Value of a Right Per Share Basis = \( \frac{10 - 4}{2} \)

(ii) Subscription price \( \frac{20,00,000}{2,50,000} = 8 \)

Ex-right Price = \( \frac{130,00,000 + 20,00,000}{12,50,000} = 12 \)

Value of a Right = \( 12 - 8 = 4 \)

Value of a Right Per Share Basis = \( \frac{12 - 8}{4} \)
Calculation of effect of right issue on wealth of Shareholder’s wealth who is holding, say 100 shares.

(a) When firm offers one share for two shares held.

Value of Shares after right issue \( (150 \times \text{\textcurrency}{10}) \) \textcurrency{1,500}

Less: Amount paid to acquire right shares \( (50\times\text{\textcurrency}{4}) \) \textcurrency{200}

\textcurrency{1,300}

(b) When firm offers one share for every four shares held.

Value of Shares after right issue \( (125 \times \text{\textcurrency}{12}) \) \textcurrency{1,500}

Less: Amount paid to acquire right shares \( (25\times\text{\textcurrency}{8}) \) \textcurrency{200}

\textcurrency{1,300}

(c) Wealth of Shareholders before Right Issue \textcurrency{1,300}

Thus, there will be no change in the wealth of shareholders from (i) and (ii).

3. (i) **Present Value of the stock of ABC Ltd. Is:-**

\[ V_0 = \frac{2.50(1.02)}{0.105 - 0.02} = \text{\textcurrency}{30/-}. \]

(ii) **Value of stock under the PE Multiple Approach**

<table>
<thead>
<tr>
<th>Particulars</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual Stock Price</td>
<td>\textcurrency{35.00}</td>
</tr>
<tr>
<td>Return on equity</td>
<td>9%</td>
</tr>
<tr>
<td>EPS</td>
<td>\textcurrency{2.25}</td>
</tr>
<tr>
<td>PE Multiple (1/Return on Equity)</td>
<td>11.11</td>
</tr>
<tr>
<td>Market Price per Share</td>
<td>\textcurrency{25.00}</td>
</tr>
</tbody>
</table>

Since, Actual Stock Price is higher, hence it is overvalued.

(iii) **Value of the Stock under the Earnings Growth Model**

\[ \text{Market Price per Share} = \frac{\text{EPS} \times (1+g)}{(K_e - g)} \]

\[ = \frac{2.25 \times 1.02}{0.07} = \text{\textcurrency}{32.79} \]

Since, Actual Stock Price is higher, hence it is overvalued.
4. (i) **Firm’s Expected or Required Return On Equity**

(Using a dividend discount model approach)

According to Dividend discount model approach the firm’s expected or required return on equity is computed as follows:

\[ K_e = \frac{D_1}{P_0} + g \]

Where,

- \( K_e \) = Cost of equity share capital or (Firm’s expected or required return on equity share capital)
- \( D_1 \) = Expected dividend at the end of year 1
- \( P_0 \) = Current market price of the share.
- \( g \) = Expected growth rate of dividend.

Now, \( D_1 = D_0 \times (1 + g) \) or \( \frac{20 \times (1 + 0.12)}{1.12} \) or \( 1.12 \), \( P_0 = 20 \) and \( g = 12\% \) per annum

Therefore, \( K_e = \frac{1.12}{20} + 12\% \)

Or, \( K_e = 17.6\% \)

(ii) **Firm’s Expected or Required Return on Equity**

(If dividends were expected to grow at a rate of 20% per annum for 5 years and 10% per year thereafter)

Since in this situation if dividends are expected to grow at a super normal growth rate \( g_s \), for \( n \) years and thereafter, at a normal, perpetual growth rate of \( g_n \) beginning in the year \( n + 1 \), then the cost of equity can be determined by using the following formula:

\[ P_0 = \sum_{t=1}^{n} \frac{Div_0 \times (1 + g_s)^t}{(1 + K_e)^t} + \frac{Div_{n+1} \times (1 + K_e)^n}{K_e - g_n \times (1 + K_e)^n} \]

Where,

- \( g_s \) = Rate of growth in earlier years.
- \( g_n \) = Rate of constant growth in later years.
- \( P_0 \) = Discounted value of dividend stream.
Ke = Firm’s expected, required return on equity (cost of equity capital).

Now,  
\[ g_s = 20\% \text{ for 5 years, } g_n = 10\% \]

Therefore,  
\[
P_0 = \sum_{t=1}^{n} \frac{D_0(1+0.20)^t}{(1+K_e)^t} + \frac{\text{Div}_5 + 1}{K_e - 0.10} \times \frac{1}{(1+K_e)^t}
\]

\[
0 = \frac{1.20}{(1+0.10)^1} + \frac{1.44}{(1+0.10)^2} + \frac{1.73}{(1+0.10)^3} + \frac{2.07}{(1+0.10)^4} + \frac{2.49}{(1+0.10)^5} - 0.10 \times \frac{1}{(1+0.10)^5}
\]

or 
\[
P_0 = \text{Rs. 1.20 (PVF}_1, K_e) + \text{Rs. 1.44 (PVF}_2, K_e) + \text{Rs. 1.73 (PVF}_3, K_e) + \text{Rs. 2.07 (PVF}_4, K_e) + \text{Rs. 2.49 (PVF}_5, K_e) \text{ on } K_e - 0.10
\]

By trial and error we are required to find out K_e

Now, assume K_e = 18% then we will have
\[
P_0 = \text{Rs. 1.20 (0.8475) + Rs. 1.44 (0.7182) + Rs. 1.73 (0.6086) + Rs. 2.07 (0.5158) + Rs. 2.49 (0.4371) × 1} \text{ over } \text{0.18 - 0.10}
\]

\[
= \text{Rs. 1.017 + Rs. 1.034 + Rs. 1.053 + Rs. 1.068 + Rs. 1.09 + Rs. 14.97 = Rs. 20.23}
\]

Since the present value of dividend stream is more than required it indicates that Ke is greater than 18%.

Now, assume K_e = 19% we will have
\[
P_0 = \text{Rs. 1.20 (0.8403) + Rs. 1.44 (0.7061) + Rs. 1.73 (0.5934) + Rs. 2.07 (0.4986) + Rs. 2.49 (0.4190) × 1} \text{ over } \text{0.19 - 0.10}
\]

\[
= \text{Rs. 1.008 + Rs. 1.017 + Rs. 1.026 + Rs. 1.032 + Rs. 1.043 + Rs. 12.76}
\]

\[
= \text{Rs. 17.89}
\]

Since the market price of share (expected value of dividend stream) is Rs. 20.

Therefore, the discount rate is closer to 18% than it is to 19%, we can get the exact rate by interpolation by using the following formula:
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\[ K_e = LR + \frac{NPV \text{ at } LR}{NPV \text{ at } LR - NPV \text{ at } HR} \times \Delta r \]

Where,
- \( LR \) = Lower Rate
- \( NPV \text{ at } LR \) = Present value of share at LR
- \( NPV \text{ at } HR \) = Present value of share at Higher Rate
- \( \Delta r \) = Difference in rates

\[ K = 18\% + \frac{(\$20.23 - \$20)}{\$20.23 - \$17.89} \times 1\% \]

\[ = 18\% + \frac{0.23}{2.34} \times 1\% = 18\% + 0.10\% = 18.10\% \]

Therefore, the firm’s expected, or required, return on equity is 18.10%. At this rate the present discounted value of dividend stream is equal to the market price of the share.

5. (a) Calculation of Profit after tax (PAT)

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount (₹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profit before interest and tax (PBIT)</td>
<td>32,00,000</td>
</tr>
<tr>
<td>Less: Debenture interest (₹ 64,00,000 × 12/100)</td>
<td>7,68,000</td>
</tr>
<tr>
<td>Profit before tax (PBT)</td>
<td>24,32,000</td>
</tr>
<tr>
<td>Less: Tax @ 35%</td>
<td>8,51,200</td>
</tr>
<tr>
<td>Profit after tax (PAT)</td>
<td>15,80,800</td>
</tr>
<tr>
<td>Less: Preference Dividend (₹ 40,00,000 × 8/100)</td>
<td>3,20,000</td>
</tr>
<tr>
<td>Equity Dividend (₹ 80,00,000 × 8/100)</td>
<td>6,40,000</td>
</tr>
<tr>
<td>Retained earnings (Undistributed profit)</td>
<td>6,20,800</td>
</tr>
</tbody>
</table>

Calculation of Interest and Fixed Dividend Coverage

\[ \text{Coverage} = \frac{\text{PAT} + \text{Debenture interest}}{\text{Debenture interest} + \text{Preference dividend}} \]

\[ = \frac{15,80,800 + 7,68,000}{7,68,000 + 3,20,000} = \frac{23,48,800}{10,88,000} = 2.16 \text{ times} \]

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(b) **Calculation of Capital Gearing Ratio**

Capital Gearing Ratio = \( \frac{\text{Fixed interest bearing funds}}{\text{Equity shareholders' funds}} \)

\[
= \frac{\text{Preference Share Capital} + \text{Debentures}}{\text{Equity Share Capital} + \text{Reserves}} = \frac{40,00,000 + 64,00,000}{80,00,000 + 32,00,000} = \frac{1,04,00,000}{1,12,00,000} = 0.93
\]

(c) **Calculation of Yield on Equity Shares:**

Yield on equity shares is calculated at 50% of profits distributed and 5% on undistributed profits:

\[
\begin{align*}
50\% \text{ on distributed profits} \times (\text{₹ } 6,40,000 \times \frac{50}{100}) & = 3,20,000 \\
5\% \text{ on undistributed profits} \times (\text{₹ } 6,20,800 \times \frac{5}{100}) & = 31,040 \\
\text{Yield on equity shares} & = 3,51,040 \\
\text{Yield on equity shares \%} & = \frac{\text{Yield on shares}}{\text{Equity share capital}} \times 100 \\
& = \frac{3,51,040}{80,00,000} \times 100 = 4.39\% \text{ or } 4.388\%.
\end{align*}
\]

**Calculation of Expected Yield on Equity shares**

**Note:** There is a scope for assumptions regarding the rates (in terms of percentage for every one time of difference between Sun Ltd. and Industry Average) of risk premium involved with respect to Interest and Fixed Dividend Coverage and Capital Gearing Ratio. The below solution has been worked out by assuming the risk premium as:

(i) 1% for every one time of difference for Interest and Fixed Dividend Coverage.
(ii) 2% for every one time of difference for Capital Gearing Ratio.

(a) Interest and fixed dividend coverage of Sun Ltd. is 2.16 times but the industry average is 3 times. Therefore, risk premium is added to Sun Ltd. Shares @ 1% for every 1 time of difference.

Risk Premium \( = 3.00 – 2.16 (1\%) = 0.84 (1\%) = 0.84\% \)

(b) Capital Gearing ratio of Sun Ltd. is 0.93 but the industry average is 0.75 times. Therefore, risk premium is added to Sun Ltd. shares @ 2% for every 1 time of difference.

Risk Premium \( = (0.75 – 0.93) (2\%) \\
= 0.18 (2\%) = 0.36\% \)
4.34 STRATEGIC FINANCIAL MANAGEMENT

Normal return expected 9.60
Add: Risk premium for low interest and fixed dividend coverage 0.84
Add: Risk premium for high interest gearing ratio 0.36

Value of Equity Share

\[ \text{Value of Equity Share} = \frac{\text{Actual yield}}{\text{Expected yield}} \times \text{Paid-up value of share} = \frac{4.39}{10.80} \times 100 = ₹ 40.65 \]

6. In order to find out the value of a share with constant growth model, the value of \( K_e \) should be ascertained with the help of ‘CAPM’ model as follows:

\[ K_e = R_f + \beta (K_m - R_f) \]

Where,

- \( K_e \) = Cost of equity
- \( R_f \) = Risk free rate of return
- \( \beta \) = Portfolio Beta i.e. market sensitivity index
- \( K_m \) = Expected return on market portfolio

By substituting the figures, we get

\[ K_e = 0.09 + 1.5 (0.13 - 0.09) = 0.15 \text{ or } 15\% \]

and the value of the share as per constant growth model is

\[ P_0 = \frac{D_1}{(K_e - g)} \]

Where,

- \( P_0 \) = Price of a share
- \( D_1 \) = Dividend at the end of the year 1
- \( K_e \) = Cost of equity
- \( G \) = growth

\[ P_0 = \frac{2.00}{0.15 - 0.07} = ₹ 25.00 \]
Alternatively it can also be found as follows:

\[
2.00 \times (1.07) = 26.75 \quad \text{₹}
\]

However, if the decision of finance manager is implemented, the beta (β) factor is likely to increase to 1.75 therefore, \( K_e \) would be

\[
K_e = R_f + \beta (K_m - R_f)
\]

\[
= 0.09 + 1.75 (0.13 - 0.09) = 0.16 \text{ or } 16\%
\]

The value of share is

\[
P_0 = \frac{D_1}{(K_e - g)}
\]

\[
P_0 = \frac{2.00}{0.16 - 0.07} = 22.22 \quad \text{₹}
\]

Alternatively it can also be found as follows:

\[
2.00 \times (1.07) = 23.78 \quad \text{₹}
\]

7. (1) **Cost of Capital**

   - Retained earnings (45%)
   - Dividend (55%)
   - EPS (100%)
   - P/E Ratio
   - Market price
   - Cost of equity capital

\[
= \left( \frac{\text{Div}}{\text{Price}} \times 100 \right) + \text{Growth %} = \left( \frac{6.11}{88.88} \times 100 \right) + 15\% = 21.87\%
\]

(2) **Market Price**

\[
= \frac{\text{Dividend}}{\text{Cost of Capital(%) - Growth Rate(%)}}
\]

\[
= \frac{6.11}{21.87 - 16\%} = 104.08 \text{ per share}
\]

(3) **Market Price**

\[
= \frac{6.11}{(20-19)\%} = 611.00 \text{ per share}
\]
Alternative Solution

As in the question the sentence “The company retains 45% of its earnings which are ₹ 5 per share” amenable to two interpretations i.e. one is ₹ 5 as retained earnings (45%) and another is ₹ 5 is EPS (100%). Alternative solution is as follows:

(1) Cost of capital

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPS (100%)</td>
<td>₹ 5 per share</td>
</tr>
<tr>
<td>Retained earnings (45%)</td>
<td>₹ 2.25 per share</td>
</tr>
<tr>
<td>Dividend (55%)</td>
<td>₹ 2.75 per share</td>
</tr>
<tr>
<td>P/E Ratio</td>
<td>8 times</td>
</tr>
<tr>
<td>Market Price</td>
<td>₹ 5 × 8 = ₹ 40</td>
</tr>
</tbody>
</table>

Cost of equity capital

\[
\text{Cost of equity capital} = \left( \frac{\text{Dividend}}{\text{Market Price}} \times 100 \right) + \text{Growth} \%
\]

\[
= \left( \frac{2.75}{40.00} \times 100 \right) + 15\% = 21.87\%
\]

(2) Market Price

\[
\text{Market Price} = \frac{\text{Dividend}}{\left(\text{Cost of Capital} \% - \text{Growth Rate} \%\right)} = \frac{2.75}{(21.87 - 16)\%}
\]

= ₹ 46.85 per share

(3) Market Price

\[
\text{Market Price} = \frac{2.75}{(20 - 19)\%} = ₹ 275.00 per share
\]

8. Intrinsic Value

\[
P_0 = \frac{D_1}{k - g}
\]

Using CAPM

\[
k = R_f + \beta (R_m - R_f)
\]

\[
R_f = \text{Risk Free Rate}
\]

\[
\beta = \text{Beta of Security}
\]

\[
R_m = \text{Market Return}
\]

\[
= 9\% + 0.75 (15\% - 9\%) = 13.5\%
\]

\[
P = \frac{2.5 \times 1.1}{0.135 - 0.10} = \frac{2.75}{0.035} = ₹ 78.57
\]
9. If Debentures are not converted its value is as under:

<table>
<thead>
<tr>
<th></th>
<th>PVF @ 8 %</th>
<th>₹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest - ₹ 12 for 5 years</td>
<td>3.993</td>
<td>47.916</td>
</tr>
<tr>
<td>Redemption - ₹ 100 in 5th year</td>
<td>0.681</td>
<td>68.100</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>116.016</strong></td>
</tr>
</tbody>
</table>

Value of equity shares:

<table>
<thead>
<tr>
<th>Market Price</th>
<th>No.</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>₹ 4</td>
<td>20</td>
<td>₹ 80</td>
</tr>
<tr>
<td>₹ 5</td>
<td>20</td>
<td>₹ 100</td>
</tr>
<tr>
<td>₹ 6</td>
<td>20</td>
<td>₹ 120</td>
</tr>
</tbody>
</table>

Hence, unless the market price is ₹ 6 conversion should not be exercised.

10. Calculation of initial outlay:

   a. Face value               ₹ (million) 300
   Add: Call premium           12
   Cost of calling old bonds   312

   b. Gross proceed of new issue 300
   Less: Issue costs            6
   Net proceeds of new issue   294

   c. Tax savings on call premium
      and unamortized cost 0.30 (12 + 9) 6.3

   ∴ Initial outlay = ₹ 312 million – ₹ 294 million – ₹ 6.3 million = ₹ 11.7 million

2. Calculation of net present value of refunding the bond:

   Saving in annual interest expenses ₹ (million) 6.00
   [300 x (0.12 – 0.10)]
   Less: Tax saving on interest and amortization
   0.30 x [6 + (9-6)/6] 1.95
   Annual net cash saving           4.05

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PVIFA (7%, 6 years)  
\[ 4.766 \]
\[
\therefore \text{Present value of net annual cash saving} \\
\text{Less:- Initial outlay} \\
\text{Net present value of refunding the bond}
\]

Decision: The bonds should be refunded

\[ \text{₹ 19.30 million} \]
\[ \text{₹ 11.70 million} \]
\[ \text{₹ 7.60 million} \]