4

Financing Decisions

UNIT – I: COST OF CAPITAL

Learning Objectives
After studying this chapter you will be able to:

• Understand the concept of “Cost of Capital” that impacts the capital investments decisions for a business.
• Understand what are the different sources of capital (Debt, Equity Shares, Preference Shares etc.)?
• Understand what is the cost of employing each of these sources of capital?
• Know what is weighted average cost of capital (WACC) (overall cost of capital) for a business and also what is marginal cost of capital?
• Summarize how cost of capital is important in Financial Management?

Overview
This chapter covers the concept and significance of cost of capital, capital structure decisions and leverages. Cost of capital has relevance in almost every type of financial decision making. Leverages help in understanding what change in a firm’s policy in terms of say increase or reduction in the number of units it is producing or whether the firm should rely more or less heavily on borrowed money, etc affect the risk and return scenario of the firm. The concept of financing mix has utility while deciding upon the hurdle rate for capital budgeting decisions under Chapter Six on Investment Decisions. Needless to say, this chapter too has applications in real life situations and requires thorough understanding of the concepts underlying each topic. Being a practically-oriented chapter, you need to practice a lot.

1.1 Introduction
The financing decision relates to the composition of relative proportion of various sources of finance. The sources could be:-
1. **Shareholders Fund**: Equity Share Capital, Preference Share Capital, Accumulated Profits

2. **Borrowing From Outside Agencies**: Debentures, Loans from Financial Institutions

The financial management weighs the merits and demerits of different sources of finance while taking the financing decision. Whether the companies choose shareholders funds or borrowed funds or a combination of both (which is generally the case), each type of fund carries a cost.

The **cost of equity** is the minimum return the shareholders would have received if they had invested elsewhere. **Borrowed funds cost** involve interest payment.

Both types of funds incur cost and this is the cost of capital to the company. This means, cost of capital is the minimum return expected by the company.

Whenever funds are to be raised to finance investments, capital structure decision is involved. A demand for raising funds generates a new capital structure since a decision has to be made as to the quantity and forms of financing. The process of financing or capital structure decision is depicted in the figure below.

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**Financing Decision Process**

- **Capital Budgeting Decision**
- **Need to Raise Funds**
- **Capital Structure Decision**
- **Existing Capital Structure**
- **Desired Debt Equity Mix**
- **Payout Policy**
  - **Replacement**
  - **Modernisation**
  - **Expansion**
  - **Diversification**
  - **Internal funds**
  - **Debt**
  - **External equity**
  - **Effect of Return**
  - **Effect of Risk**
  - **Effect on Cost of Capital**
  - **Optimum Capital Structure**
  - **Value of the Firm**
1.2 Definition of Cost of Capital

In simple terms, Cost of Capital refers to the discount rate that is used in determining the present value of the estimated future cash proceeds of the business/new project and eventually deciding whether the business/new project is worth undertaking or not.

It is also the minimum rate of return that a firm must earn on its investment which will maintain the market value of share at its current level.

It can also be stated as the opportunity cost of an investment, i.e. the rate of return that a company would otherwise be able to earn at the same risk level as the investment that has been selected. For example, when an investor purchases stock in a company, he/she expects to see a return on that investment. Since the individual expects to get back more than his/her initial investment, the cost of capital is equal to this minimum return that the investor expects to receive (also termed as investor opportunity cost).

The cost of each source of capital (Equity Share or Debt) is called specific cost of capital. When these specific costs are combined for all the sources of capital for a business, then we arrive at overall cost of capital for a business.

We will first discuss the specific cost of capital for each source of capital before discussing and defining the overall cost of capital.

1.3 Measurement of Cost of Capital

In order to calculate the specific cost of each type of capital, recognition should be given to the explicit and the implicit cost. The cost of capital can be either explicit or implicit.

The explicit cost of any source of capital may be defined as the discount rate that equates the present value of the funds received by the firm net of underwriting costs, with the present value of the expected cash outflows. These outflows maybe interest payment, repayment of principal or dividend. It can also be stated as the internal rate of return a firm pays for financing.

Example of Explicit Cost

Suppose a company XYZ raised a sum of ₹ 10 lakhs by way of debentures carrying an interest of 9% and payable after 20 years. Now the cash inflow will be ₹ 10 lakhs. But, the annual cash outflow will be ₹ 90,000 for 20 years. The explicit cost will be that internal rate of return which equates ₹ 10 lakhs, i.e. the initial cash inflow with ₹ 90,000 payable every year for 20 years and ₹ 10 lakhs at the end of 20 years.

Implicit cost is the rate of return associated with the best investment opportunity for the firm and its shareholders that will be foregone if the project presently under consideration by the firm was accepted. Opportunity costs are technically referred to as implicit cost of capital.

The distinction between explicit and implicit costs is important from the point of view of the computation of the cost of capital.
The first step in the measurement of the cost of the capital of the firm is the calculation of the cost of individual sources of raising funds. From the viewpoint of capital budgeting decisions, the long term sources of funds are relevant as they constitute the major sources of financing the fixed assets. In calculating the cost of capital, therefore the focus is on long-term funds which are:

i. Long term debt (including Debentures)
ii. Preference Shares
iii. Equity Capital
iv Retained Earnings

1.3.1 Cost of Debt: The calculation of the cost of debt is relatively easy. A debt may be in the form of Bond or Debenture.

A bond is a long term debt instrument or security. Bonds issued by the government do not have any risk of default. The government honours obligations on its bonds. Bonds of the public sector companies in India are generally secured, but they are not free from the risk of default.

The private sector companies also issue bonds, which are also called debentures in India. A company in India can issue secured or unsecured debentures.

The chief characteristics of a bond or debenture are as follows:

Face value: Face value is called par value. A bond or debenture is generally issued at a par value of ₹ 100 or ₹ 1,000, and interest is paid on face value.

Interest rate: Interest rate is fixed and known to bondholders or debenture holders. Interest paid on a bond or debenture is tax deductible. The interest rate is also called coupon rate. Coupons are detachable certificates of interest.

Maturity: A bond or debenture is generally issued for a specified period of time. It is repaid on maturity.

Redemption value: The value that a bondholder or debenture holder will get on maturity is called redemption or maturity value. A bond or debenture may be redeemed at par or at premium (more than par value) or at discount (less than par value).

Market value: A bond or debenture may be traded in a stock exchange. The price at which it is currently sold or bought is called the market value of the bond or debenture. Market value may be different from par value or redemption value.

1.3.1.1 Cost of Debentures: The cost of debentures and long term loans is the contractual interest rate adjusted further for the tax liability of the company. For a company, the higher the interest charges, the lower the amount of tax payable by the company. An illustration will help you in understanding this point.
Illustration 1: Consider two companies X and Y:

<table>
<thead>
<tr>
<th></th>
<th>Company X</th>
<th>Company Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earnings before interest and taxes (EBIT)</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Interest (I)</td>
<td>-</td>
<td>40</td>
</tr>
<tr>
<td>Profit before tax (PBT)</td>
<td>100</td>
<td>60</td>
</tr>
<tr>
<td>Tax (T)</td>
<td>35</td>
<td>21</td>
</tr>
<tr>
<td>Profit after tax (PAT)</td>
<td>65</td>
<td>39</td>
</tr>
</tbody>
</table>

Assume an effective rate of tax of 35 percent

Solution

A comparison of the two companies shows that an interest payment of 40 in company Y results in a tax shield of 14 - that is 40 multiplied by 0.35, the corporate tax rate.

The important point to remember, while calculating the average cost of capital, is that the post-tax cost of debt must be used and not the pre-tax cost of debt.

1.3.1.1.1 Cost of Irredeemable Debentures: Cost of debentures not redeemable during the life time of the company.

\[ K_d = \frac{1}{NP} (1-t) \]

Where,

- \( K_d \) = Cost of debt after tax
- \( I \) = Annual interest payment
- \( NP \) = Net proceeds of debentures
- \( t \) = Tax rate

Suppose a company issues 1,000, 15% debentures of the face value of ₹ 100 each at a discount of ₹ 5. Suppose further, that the under-writing and other costs are ₹ 5,000/- for the total issue. Thus ₹ 90,000 is actually realised, i.e., ₹ 1,00,000 minus ₹ 5,000 as discount and ₹ 5,000 as under-writing expenses. The interest per annum of ₹ 15,000 is therefore the cost of ₹ 90,000, actually received by the company. This is because interest is a charge on profit and every year the company will save ₹ 7,500 as tax, assuming that the income tax rate is 50%. Hence the after tax cost of ₹ 90,000 is ₹ 7,500 which comes to 8.33%.

Illustration 2: Five years ago, Sona Limited issued 12 per cent irredeemable debentures at ₹ 103, a ₹ 3 premium to their par value of ₹ 100. The current market price of these debentures is ₹ 94. If the company pays corporate tax at a rate of 35 per cent what is its current cost of debenture capital?

Solution

\[ K_d = \frac{12}{94} = 12.8 \text{ per cent} \]
K_d (after tax) = 12.8 \times (1 - 0.35) = 8.32\%.

1.3.1.1.2 Cost of Redeemable Debentures: If the debentures are redeemable after the expiry of a fixed period, the cost of debentures would be:

\[ K_d = \frac{I(1-t) + (RV - NP)/N}{2(NP + RV/2)} \]

Where,
- \( I \) = Annual interest payment
- \( NP \) = Net proceeds of debentures
- \( RV \) = Redemption value of debentures
- \( t \) = Tax rate
- \( N \) = Life of debentures.

Illustration 3: A company issued 10,000, 10% debentures of `100 each on 1.4.2013 to be matured on 1.4.2018. The company wants to know the current cost of its existing debt and the market price of the debentures is `80. Compute the cost of existing debentures assuming 35% tax rate.

Solution

\[ K_d = \frac{I(1-t) + (RV - NP)/N}{2(NP + RV/2)} \]

\[ K_d = \frac{10(1-.35) + \left(\frac{100 - 80}{5}\right)}{100 + 80}\]

\[ K_d = \frac{6.5 + 4}{90} = 0.1166 = 0.12 = 12\% \]

1.3.1.2 Value of Bonds: It is comparatively easier to find out the present value of a bond since its cash flows and the discount rate can be determined easily. If there is no risk of default, then there is no difficulty in calculating the cash flows associated with a bond. The expected cash flows consist of annual interest payments plus repayment of principal. The appropriate capitalisation or discount rate would depend upon the risk of the bond. The risk in holding a government bond is less than the risk associated with a debenture issued by a company. Therefore, a lower discount rate would be applied to the cash flows of the government bond and a higher rate to the cash flows of the company debenture.

1.3.1.2.1 Amortisation of Bond: A bond may be amortised every year i.e. principal is repaid every year rather than at maturity. In such a situation, the principal will go down with annual payments and interest will be computed on the outstanding amount. The cash flows of the bonds will be uneven.
The formula for determining the value of a bond or debenture that is amortised every year is as follows:

\[ V_b = \frac{C_1}{(1+k_d)^1} + \frac{C_2}{(1+k_d)^2} + \ldots + \frac{C_n}{(1+k_d)^n} \]

\[ V_b = \sum_{i=1}^{n} \frac{C_i}{(1+k_d)^i} \]

**Illustration 4:** Reserve Bank of India is proposing to sell a 5-year bond of ₹ 5,000 at 8 per cent rate of interest per annum. The bond amount will be amortised equally over its life. What is the bond’s present value for an investor if he expects a minimum rate of return of 6 per cent?

**Solution**

The amount of interest will go on declining as the outstanding amount of bond will be reducing due to amortisation. The amount of interest for five years will be:

First year: ₹ 5,000 × 0.08 = ₹ 400;
Second year: (₹ 5,000 − ₹ 1,000) × 0.08 = ₹ 320;
Third year: (₹ 4,000 − ₹ 1,000) × 0.08 = ₹ 240;
Fourth year: (₹ 3,000 − ₹ 1,000) × 0.08 = ₹ 160; and
Fifth year: (₹ 2,000− ₹ 1,000) × 0.08 = ₹ 80.

The outstanding amount of bond will be zero at the end of fifth year.

Since Reserve Bank of India will have to return ₹ 1,000 every year, the outflows every year will consist of interest payment and repayment of principal:

First year: ₹ 1000 + ₹ 400 = ₹ 1,400;
Second year: ₹ 1000 + ₹ 320 = ₹ 1,320;
Third year: ₹ 1000 + ₹ 240 = ₹ 1,240;
Fourth year: ₹ 1000 + ₹ 160 = ₹ 1,160; and
Fifth year: ₹ 1000 + ₹ 80 = ₹ 1,080.

Referring to the present value table at the end of the study material, the value of the bond is calculated as follows:

\[ V_b = \frac{1,400}{(1.06)^1} + \frac{1,320}{(1.06)^2} + \frac{1,240}{(1.06)^3} + \frac{1,160}{(1.06)^4} + \frac{1,080}{(1.06)^5} \]

\[ = 1,400 \times 0.943 + 1,320 \times 0.890 + 1,240 \times 0.840 + 1,160 \times 0.792 + 1,080 \times 0.747 \]

\[ = 1,320.20 + 1,174.80 + 1,041.60 + 918.72 + 806.76 = ₹ 5,262.08 \]
1.3.2 Cost of Preference Shares: The cost of preference share capital is the dividend expected by its holders. Though payment of dividend is not mandatory, non-payment may result in exercise of voting rights by them.

The payment of preference dividend is not adjusted for taxes as they are paid after taxes and is not deductible.

The cost of preference share capital is calculated by dividing the fixed dividend per share by the price per preference share.

Illustration 5: If Reliance Energy is issuing preferred stock at ₹100 per share, with a stated dividend of ₹12, and a floatation cost of 3% then, what is the cost of preference share?

Solution

\[ K_p = \frac{\text{Preferred stock dividend}}{\text{Market price of preferred stock (1 – floatation cost)}} = \frac{₹ 12}{₹ 100(1 – 0.03)} = 12.4\% \]

1.3.2.1 Cost of Irredeemable Preference Shares:

Cost of irredeemable preference shares = \( \frac{PD}{PO} \)

Where,

PD = Annual preference dividend

PO = Net proceeds in issue of preference shares.

Cost of irredeemable preference shares where Dividend Tax is paid over the actual dividend payment = \( \frac{PD}{PO} (1 + D_t) \)

Where,

PD = Annual preference dividend

PO = Net proceeds in issue of preference shares.

D_t = Tax on preference dividend.

Illustration 6: XYZ & Co. issues 2,000 10% preference shares of ₹ 100 each at ₹ 95 each. Calculate the cost of preference shares.

Solution

\[ K_p = \frac{PD}{PO} \]

\[ K_p = \frac{10 \times 2,000}{95 \times 2,000} = \frac{10}{95} = 0.1053 = 10.53\% \]
1.3.2.2 Cost of Redeemable Preference Shares: If the preference shares are redeemable after the expiry of a fixed period the cost of preference shares would be:

\[ K_p = \frac{PD + (RV - NP)/N}{RV + NP} \]

Where,
- PD = Annual preference dividend
- RV = Redemption value of preference shares
- NP = Net proceeds on issue of preference shares
- N = Life of preference shares.

However, since dividend of preference shares is not allowed as deduction from income for income tax purposes, there is no question of tax advantage in the case of cost of preference shares.

The cost of redeemable preference share could also be calculated as the discount rate that equates the net proceeds of the sale of preference shares with the present value of the future dividends and principal payments.

It would, thus, be seen that both in the case of debt as well as preference shares, cost of capital is calculated by reference to the obligations incurred and proceeds received.

**Illustration 7:** Referring to the earlier question but taking into consideration that if the company proposes to redeem the preference shares at the end of 10th year from the date of issue. Calculate the cost of preference share?

**Solution**

\[ K_p = \frac{PD + (RV - NP)/N}{RV + NP} \]

\[ K_p = \frac{10 + \left(\frac{100 - 95}{10}\right)}{100 + 95} = 0.1077 \text{(approx.)} = 10.77\% \]

1.3.3 Cost of Equity: It may prima facie appear that equity capital does not carry any cost. But this is not true. The market share price is a function of return that equity shareholders expect and get. If the company does not meet their requirements, it will have an adverse effect on the market share price. Also, it is relatively the highest cost of capital. Since expectations of equity holders are high, higher cost is associated with it.

In simple words, cost of equity capital is the rate of return which equates the present value of expected dividends with the market share price. In theory, the management strives to maximize the position of equity holders and the effort involves many decisions.
The calculation of equity capital cost raises a lot of problems. Different methods are employed to compute the cost of equity capital.

(a) Dividend Price Approach: Here, cost of equity capital is computed by dividing the current dividend by average market price per share. However, this method cannot be used to calculate cost of equity of units suffering losses.

This dividend price ratio expresses the cost of equity capital in relation to what yield the company should pay to attract investors. It is used to estimate the cost of companies having no-growth or zero-growth.

\[ K_e = \frac{D_1}{P_o} \]

Where,

- \( K_e \) = Cost of equity
- \( D_1 \) = Annual dividend
- \( P_o \) = Market value of equity (ex dividend)

This model assumes that dividends are paid at a constant rate to perpetuity. It ignores taxation.

*Earnings and dividends do not remain constant and the price of equity shares is also directly influenced by the growth rate in dividends. Where earnings, dividends and equity share price all grow at the same rate, the cost of equity capital may be computed as follows:*

\[ K_e = \left( \frac{D_1}{P_0} \right) + G \]

Where,

- \( D_1 \) = \([D_0 \times (1+G)]\) i.e. next expected dividend
- \( P_0 \) = Current Market price per share
- \( G \) = Constant Growth Rate of Dividend.

Cost of newly issued shares, \( K_n \), is estimated with the constant dividend growth model so as to allow for flotation costs.

\[ K_n = \left( \frac{D_1}{P_0 - F} \right) + G \]

Where,

- \( F \) = Amount of flotation cost per share

**Illustration 8:** A company has paid dividend of Re. 1 per share (of face value of ₹ 10 each) last year and it is expected to grow @ 10% next year. Calculate the cost of equity if the market price of share is ₹ 55.
Solution

\[ K_e = \frac{D_t}{P_0} + G \]

\[ = \frac{1(1+.10)}{55} + .10 \]

\[ = 0.12 = 12\% \]

(b) Earning/ Price Approach: The advocates of this approach co-relate the earnings of the company with the market price of its share.

Accordingly, the cost of ordinary share capital would be based upon the expected rate of earnings of a company. The argument is that each investor expects a certain amount of earnings, whether distributed or not from the company in whose shares he invests.

Thus, if an investor expects that the company in which he is going to subscribe for shares should have at least a 20% rate of earning, the cost of ordinary share capital can be construed on this basis. Suppose the company is expected to earn 30% the investor will be prepared to pay ₹ 150 \( \frac{30}{20} \times 100 \) for each share of ₹ 100.

So, cost of equity will be given by:

\[ K_e = \frac{E}{P} \]

Where,

- \( E \) = Current earnings per share
- \( P \) = Market share price

Since practically earnings do not remain constant and the price of equity shares is also directly influenced by the growth rate in earning, we need to modify the above calculation with an element of growth.

So, cost of equity will be given by:

\[ K_e = \frac{E}{P} + G \]

Where,

- \( E \) = Current earnings per share
- \( P \) = Market share price
- \( G \) = Annual growth rate of earnings.

The calculation of ‘G’ (the growth rate) is an important factor in calculating cost of equity capital. The past trend in earnings and dividends may be used as an approximation to predict the future growth rate if the growth rate of dividend is fairly stable in the past.

\[ G = 1.0 \times (1+G)^n \text{ where } n \text{ is the number of years} \]
The Earning Price Approach is similar to the dividend price approach; only it seeks to nullify the effect of changes in the dividend policy.

(c) **Realized Yield Approach**: According to this approach, the average rate of return realized in the past few years is historically regarded as ‘expected return’ in the future. It computes cost of equity based on the past records of dividends actually realised by the equity shareholders. The yield of equity for the year is:

\[
Y_t = \frac{D_t + P_{t-1}}{P_t}
\]

Where,

- \(Y_t\) = Yield for the year \(t\)
- \(D_t\) = Dividend per share at the end of the year \(t\)
- \(P_t\) = Price per share at the end of the year \(t\)
- \(P_{t-1}\) = Price per share at the beginning and at the end of the year \(t\)

Though, this approach provides a single mechanism of calculating cost of equity, it has unrealistic assumptions like risks faced by the company remain same; the shareholders continue to expect the same rate of return; and the reinvestment opportunity cost (rate) of the shareholders is same as the realised yield. If the earnings do not remain stable, this method is not practical.

**Illustration 9**

Mr. Mehra had purchased a share of Alpha Limited for `1,000. He received dividend for a period of five years at the rate of 10 percent. At the end of the fifth year, he sold the share of Alpha Limited for `1,128. You are required to compute the cost of equity as per realised yield approach.

**Solution**

We know that as per the realised yield approach, cost of equity is equal to the realised rate of return. Therefore, it is important to compute the internal rate of return by trial and error method. This realised rate of return is the discount rate which equates the present value of the dividends received in the past five years plus the present value of sale price of Rs. 1,128 to the purchase price of Rs. 1,000. The discount rate which equalises these two is 12 percent approximately. Let us look at the table given for a better understanding:

<table>
<thead>
<tr>
<th>Years</th>
<th>Dividend</th>
<th>Sale Proceeds</th>
<th>Discount Factor @ 12%</th>
<th>Present Value Rs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>100</td>
<td>-</td>
<td>0.893</td>
<td>89.3</td>
</tr>
<tr>
<td>2</td>
<td>100</td>
<td>-</td>
<td>0.797</td>
<td>79.7</td>
</tr>
<tr>
<td>3</td>
<td>100</td>
<td>-</td>
<td>0.712</td>
<td>71.2</td>
</tr>
<tr>
<td>4</td>
<td>100</td>
<td>-</td>
<td>0.636</td>
<td>63.6</td>
</tr>
</tbody>
</table>
We find that the purchase price of Alpha limited’s share was Rs. 1,000 and the present value of the past five years of dividends plus the present value of the sale price at the discount rate of 12 percent is Rs. 1,000.076. Therefore, the realised rate of return may be taken as 12 percent. This 12 percent is the cost of equity.

(d) Capital Asset Pricing Model Approach (CAPM): CAPM model describes the risk-return trade-off for securities. It describes the linear relationship between risk and return for securities. The risks to which a security is exposed are divided into two groups, diversifiable and non-diversifiable.

The diversifiable risk can be eliminated through a portfolio consisting of large number of well diversified securities.

The non-diversifiable risk is attributable to factors that affect all businesses. Examples of such risks are:-

- Interest Rate Changes
- Inflation
- Political Changes etc.

As diversifiable risk can be eliminated by an investor through diversification, the non-diversifiable risk is the risk which cannot be eliminated; therefore a business should be concerned as per CAPM method, solely with non-diversifiable risk.

The non-diversifiable risks are assessed in terms of beta coefficient (b or $\beta$) through fitting regression equation between return of a security and the return on a market portfolio.

\[ K_e = R_t + b \left( R_m - R_f \right) \]

**Cost of Equity under CAPM**

Thus, the cost of equity capital can be calculated under this approach as:

\[ K_e = R_t + b \left( R_m - R_f \right) \]
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Where,

\[ K_e = \text{Cost of equity capital} \]
\[ R_f = \text{Rate of return on security} \]
\[ b = \text{Beta coefficient} \]
\[ R_m = \text{Rate of return on market portfolio} \]
\[ (R_m - R_f) = \text{Market premium} \]

Therefore, required rate of return = risk free rate + risk premium

The idea behind CAPM is that investors need to be compensated in two ways- time value of money and risk.

- The time value of money is represented by the risk-free rate in the formula and compensates the investors for placing money in any investment over a period of time.
- The other half of the formula represents risk and calculates the amount of compensation the investor needs for taking on additional risk. This is calculated by taking a risk measure (beta) which compares the returns of the asset to the market over a period of time and compares it to the market premium.

The CAPM says that the expected return of a security or a portfolio equals the rate on a risk-free security plus a risk premium. If this expected return does not meet or beat the required return, then the investment should not be undertaken.

The shortcomings of this approach are:

(a) Estimation of betas with historical data is unrealistic; and
(b) Market imperfections may lead investors to unsystematic risk.
Despite these shortcomings, the capital asset pricing approach is useful in calculating cost of equity, even when the firm is suffering losses.

The basic factor behind determining the cost of ordinary share capital is to measure the expectation of investors from the ordinary shares of that particular company. Therefore, the whole question of determining the cost of ordinary shares hinges upon the factors which go into the expectations of particular group of investors in a company of a particular risk class.

**Illustration 10:** Calculate the cost of equity capital of H Ltd., whose risk free rate of return equals 10%. The firm’s beta equals 1.75 and the return on the market portfolio equals to 15%.

**Solution**

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

\[ K_e = 0.10 + 1.75 (0.15 - 0.10) \]

\[ = 0.10 + 1.75 (0.05) \]

\[ = 0.1875 \]

1.3.4 Cost of Retained Earnings: Like another source of fund, retained earnings involve cost. It is the opportunity cost of dividends foregone by shareholders.

The given figure depicts how a company can either keep or reinvest cash or return it to the shareholders as dividends. (Arrows represent possible cash flows or transfers.) If the cash is reinvested, the opportunity cost is the expected rate of return that shareholders could have obtained by investing in financial assets.

**Cost of Retained Earnings**

There are two approaches to measure this opportunity cost. One approach is by using discounted cash flow (DCF) method and the second approach is by using capital asset pricing model.

(a) *By DCF*: \( K_s = \frac{D_s}{P_s} + G \)
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Where,
\[ D_1 = \text{Dividend} \]
\[ P_0 = \text{Current market price} \]
\[ G = \text{Growth rate}. \]

(b) **By CAPM:** \[ K_s = R_f + b (R_m - R_f) \]

Where,
\[ K_s = \text{Cost of equity capital} \]
\[ R_f = \text{Rate of return on security} \]
\[ b = \text{Beta coefficient} \]
\[ R_m = \text{Rate of return on market portfolio} \]
\[ (R_m - R_f) = \text{Market premium} \]

**Illustration 11:** *ABC Company provides the following details:*

\[ D_0 = \text{ ₹ 4.19} \quad P_0 = \text{ ₹ 50} \quad G = 5\% \]

*Calculate the cost of retained earnings based on DCF method.*

**Solution**

\[ K_s = \frac{D_1}{P_0} + G = \frac{D_0(1+G)}{P_0} + G \]

\[ = \frac{\text{Rs. 4.19} (1.05)}{\text{Rs. 50}} + 0.05 \]

\[ = 0.088 + 0.05 \]

\[ = 13.8\% \]

**Illustration 12:** *ABC Company provides the following details:*

\[ R_f = 7\% \quad b = 1.20 \quad R_M - R_f = 6\% \]

*Calculate the cost of retained earnings based on CAPM method.*

**Solution**

\[ K_s = R_f + b (R_m - R_f) \]

\[ = 7\% + 1.20 (6\%) \]

\[ = 7\% + 7.20 \]

\[ K_s = 14.2\% \]

1.3.5 **Cost of Depreciation:** Depreciation provisions may be considered in a similar manner to retained earnings - they have an opportunity cost and represent an increased stake in the firm by its shareholders. However, a distribution of depreciation provisions would produce a capital reduction, probably
requiring outstanding debts to be repaid due to the depletion of the capital base, the security against which the debt was obtained.

This indicates a proportional combination between the cost of debt repaid and the cost of retained earnings to calculate the cost of capital in the form of depreciation provisions.

1.4 Weighted Average Cost of Capital (WACC)

WACC (weighted average cost of capital) represents the investors' opportunity cost of taking on the risk of putting money into a company.

Since every company has a capital structure i.e. what percentage of funds comes from retained earnings, equity shares, preference shares, debt and bonds, so by taking a weighted average, it can be seen how much cost/interest the company has to pay for every rupee it borrows/invest. This is the weighted average cost of capital.

The weighted average cost of capital for a firm is of use in two major areas:-

1. In consideration of the firm's position;
2. Evaluation of proposed changes necessitating a change in the firm's capital. Thus, a weighted average technique may be used in a quasi-marginal way to evaluate a proposed investment project, such as the construction of a new building.

Thus, weighted average cost of capital is the weighted average after tax costs of the individual components of firm's capital structure. That is, the after tax cost of each debt and equity is calculated separately and added together to a single overall cost of capital.

\[ K_0 = \% D_{mkt} \times (K_i) \times (1 - t) + \% P_{smkt} \times K_p + \% C_s \times Ke \]

Where,

- \( K_0 \) = Overall cost of capital
- \( K_i \) = Before tax cost of debt
- \( 1 - t \) = 1 – Corporate tax rate
- \( K_p \) = Cost of preference capital
- \( Ke \) = Cost of equity
- \( \% D_{mkt} \) = % of debt in capital structure
- \( \% P_{smkt} \) = % of preference share in capital structure
- \( \% C_s \) = % of equity share in capital structure.

The cost of weighted average method is preferred because the proportions of various sources of funds in the capital structure are different. To be representative, therefore, cost of capital should take into account the relative proportions of different sources of finance.

Securities analysts employ WACC all the time when valuing and selecting investments. In discounted cash flow analysis, WACC is used as the discount rate applied to future cash flows.
for deriving a business's net present value. WACC can be used as a hurdle rate against which to assess return on investment capital performance. It also plays a key role in economic value added (EVA) calculations.

**Investors use WACC** as a tool to decide whether or not to invest. The WACC represents the minimum rate of return at which a company produces value for its investors. Let's say a company produces a return of 20% and has a WACC of 11%. By contrast, if the company's return is less than WACC, the company is shedding value, which indicates that investors should put their money elsewhere.

Therefore, WACC serves as a useful reality check for investors.

**1.4.1 Calculation of WACC**

<table>
<thead>
<tr>
<th>Capital Component</th>
<th>Cost</th>
<th>Times</th>
<th>% of capital structure</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retained Earnings</td>
<td>10%</td>
<td>X</td>
<td>25%</td>
<td>2.50%</td>
</tr>
<tr>
<td>Common Stocks</td>
<td>11%</td>
<td>X</td>
<td>10%</td>
<td>1.10%</td>
</tr>
<tr>
<td>Preferred Stocks</td>
<td>9%</td>
<td>X</td>
<td>15%</td>
<td>1.35%</td>
</tr>
<tr>
<td>Bonds</td>
<td>6%</td>
<td>X</td>
<td>50%</td>
<td>3.00%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td>7.95%</td>
</tr>
</tbody>
</table>

So the WACC of this company is 7.95%.

But there are problems in determination of weighted average cost of capital. These mainly relate to:-

1. Computation of equity capital and;
2. Assignment of weights to the cost of specific source of financing. Assignment of weights can be possible either on the basis of historical weighting or marginal weighting.

**Historical Weighting**: The basis here is the funds already employed by the firm. This basis is based on the assumption that the business's existing capital structure is optimal and therefore should be maintained in the future. In historical weighting, there is a choice between the book value weights and market value weights. While the book value weights may be operationally convenient, the market value basis is theoretically more consistent, sound and a better indicator of firm's capital structure. The desirable practice is to employ market weights to compute the firm's cost of capital. This rationale rests on the fact that the cost of capital measures the cost of issuing securities – stocks as well as bonds – to finance projects, and that these securities are issued at market value, not at book value.

**Illustration 13**: Calculate the WACC using the following data by using:

(a) Book value weights
(b) Market value weights

The capital structure of the company is as under:
Financing Decisions 4.19

The market prices of these securities are:
- Debenture: ₹ 105 per debenture
- Preference: ₹ 110 per preference share
- Equity: ₹ 24 each.

Additional information:
1. ₹ 100 per debenture redeemable at par, 10% coupon rate, 4% floatation costs, 10 year maturity.
2. ₹ 100 per preference share redeemable at par, 5% coupon rate, 2% floatation cost and 10 year maturity.
3. Equity shares have 4 floatation cost and market price ₹ 24 per share.

The next year expected dividend is ₹ 1 with annual growth of 5%. The firm has practice of paying all earnings in the form of dividend.

Corporate tax rate is 50%.

Solution

Cost of equity: 
\[ K_e = \frac{1}{20} + 0.05 = 0.05 + 0.05 = 0.10 \]

Cost of debt: 
\[ K_d = \frac{10(1 - 0.5) + \frac{100 - 96}{10}}{\frac{(100 + 96)}{2}} = \left( \frac{5 + 0.4}{196} \right) \times 2 = 0.055 \text{ (approx.)} \]

Cost of preference shares: 
\[ K_p = \left( \frac{5 + \frac{2}{10}}{\frac{198}{2}} \right) = \left( \frac{5.2}{99} \right) = 0.053 \text{ (approx.)} \]

Calculation of WACC using book value weights

<table>
<thead>
<tr>
<th>Source of capital</th>
<th>Book Value</th>
<th>Specific cost (K%)</th>
<th>Total cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>10% Debentures</td>
<td>5,00,000</td>
<td>0.055</td>
<td>27,500</td>
</tr>
<tr>
<td>5% Preference shares</td>
<td>5,00,000</td>
<td>0.053</td>
<td>26,500</td>
</tr>
</tbody>
</table>
4.20 Financial Management

<table>
<thead>
<tr>
<th>Source of capital</th>
<th>Market Value</th>
<th>Specific cost (K%)</th>
<th>Total cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>10% Debentures</td>
<td>5,25,000</td>
<td>0.055</td>
<td>28,875</td>
</tr>
<tr>
<td>5% Preference shares</td>
<td>5,50,000</td>
<td>0.053</td>
<td>29,150</td>
</tr>
<tr>
<td>Equity shares</td>
<td>24,00,000</td>
<td>0.10</td>
<td>2,40,000</td>
</tr>
<tr>
<td></td>
<td>34,75,000</td>
<td></td>
<td>2,98,025</td>
</tr>
</tbody>
</table>

\[ K_e = \frac{\text{\textcurrency 1,54,000}}{\text{\textcurrency 20,00,000}} = 0.077 \text{ (approx.)} \]

Calculation of WACC using market value weights

\[ K_e = \frac{\text{\textcurrency 2,98,025}}{\text{\textcurrency 34,75,000}} = 0.08576 \text{ (approx.)} \]

Illustration 14: Determine the cost of capital of BestLuck Limited using the book value (BV) and market value (MV) weights from the following information:

<table>
<thead>
<tr>
<th>Sources</th>
<th>Book Value</th>
<th>Market Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equity shares</td>
<td>1,20,00,000</td>
<td>2,00,00,000</td>
</tr>
<tr>
<td>Retained earnings</td>
<td>30,00,000</td>
<td>—</td>
</tr>
<tr>
<td>Preference shares</td>
<td>9,00,000</td>
<td>10,40,000</td>
</tr>
<tr>
<td>Debentures</td>
<td>36,00,000</td>
<td>33,75,000</td>
</tr>
</tbody>
</table>

Additional information:

I. Equity: Equity shares are quoted at \textcurrency 130 per share and a new issue priced at \textcurrency 125 per share will be fully subscribed; flotation costs will be \textcurrency 5 per share.

II. Dividend: During the previous 5 years, dividends have steadily increased from \textcurrency 10.60 to \textcurrency 14.19 per share. Dividend at the end of the current year is expected to be \textcurrency 15 per share.

III. Preference shares: 15% Preference shares with face value of \textcurrency 100 would realise \textcurrency 105 per share.

IV. Debentures: The company proposes to issue 11-year 15% debentures but the yield on debentures of similar maturity and risk class is 16%; flotation cost is 2%.

V. Tax: Corporate tax rate is 35%. Ignore dividend tax.

Solution

\[ K_e = \frac{D_1}{P_0(1-f)+g} = \frac{\textcurrency 10.6(1+0.15)^5 = \textcurrency 14.19 \text{ (or \textcurrency 1 compounds to 1.338)}}{\textcurrency 1} \]
Table (compound) suggests that Re 1 compounds to ₹ 1.338 in 5 years at the compound rate of 6 percent. Therefore, g is 6 per cent.

Ke = (₹ 15/₹ 120)+0.06 = 18.5 per cent
Kr = (D1/P0)+g = (₹ 15/125) + 0.06 = 18 per cent
Kp = D1/P0(1-f) = ₹ 15/105 = 14.3 per cent
Kd = [(I(1-t)+(RV-SV)/n)] ÷ (RV+SV)/2 = [(₹ 15(0.65) + ₹ 100-91.75*)/11] (₹100 + ₹ 91.75)/2
= 11 per cent

*Since yield on similar type of debentures is 16 per cent, the company would be required to offer debentures at discount.

Market price of debentures = Coupon rate/Market rate of interest = ₹ 15/0.16 = ₹ 93.75.
Sale proceeds from debentures = ₹ 93.75 – ₹ 2 (i.e., floatation cost) = ₹ 91.75

Cost of capital [BV weights and MV weights] (amount in lakh of rupees)

<table>
<thead>
<tr>
<th>Source of capital</th>
<th>Weights</th>
<th>Specific Cost</th>
<th>Total cost</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>BV</td>
<td>MV</td>
<td>(BVxK)</td>
</tr>
<tr>
<td>Equity</td>
<td>120</td>
<td>160*</td>
<td>0.185</td>
</tr>
<tr>
<td>Retained Earnings</td>
<td>30</td>
<td>40*</td>
<td>0.18</td>
</tr>
<tr>
<td>Preference Shares</td>
<td>9</td>
<td>10.4</td>
<td>0.143</td>
</tr>
<tr>
<td>Debentures</td>
<td>36</td>
<td>33.75</td>
<td>0.11</td>
</tr>
</tbody>
</table>

*MV of equity has been apportioned in the ratio of BV of equity and retained earnings
K0(BV weights) = (₹ 32.85/195)x100 = 16.85 per cent
K0(MV weights) = (₹ 42/244.15)x100 = 17.20 per cent.

### 1.5 Marginal Cost of Capital

The marginal cost of capital may be defined as the cost of raising an additional rupee of capital.
Since the capital is raised in substantial amount in practice, marginal cost is referred to as the cost incurred in raising new funds. Marginal cost of capital is derived, when the average cost of capital is calculated using the marginal weights.
The marginal weights represent the proportion of funds the firm intends to employ. Thus, the problem of choosing between the book value weights and the market value weights does not arise in the case of marginal cost of capital computation.
To calculate the marginal cost of capital, the intended financing proportion should be applied...
as weights to marginal component costs. The marginal cost of capital should, therefore, be calculated in the composite sense. When a firm raises funds in proportional manner and the component’s cost remains unchanged, there will be no difference between average cost of capital (of the total funds) and the marginal cost of capital. The component costs may remain constant upto certain level of funds raised and then start increasing with amount of funds raised.

For example, the cost of debt may remain 7% (after tax) till ₹ 10 lakhs of debt is raised, between ₹ 10 lakhs and ₹ 15 lakhs, the cost may be 8% and so on. Similarly, if the firm has to use the external equity when the retained profits are not sufficient, the cost of equity will be higher because of the floatation costs. When the components cost start rising, the average cost of capital will rise and the marginal cost of capital will however, rise at a faster rate.

Illustration 15: ABC Ltd. has the following capital structure which is considered to be optimum as on 31st March, 2013.

<table>
<thead>
<tr>
<th>Capital Structure</th>
<th>₹</th>
</tr>
</thead>
<tbody>
<tr>
<td>14% debentures</td>
<td>30,000</td>
</tr>
<tr>
<td>11% Preference shares</td>
<td>10,000</td>
</tr>
<tr>
<td>Equity (10,000 shares)</td>
<td>1,60,000</td>
</tr>
<tr>
<td>Total</td>
<td>2,00,000</td>
</tr>
</tbody>
</table>

The company share has a market price of ₹ 23.60. Next year dividend per share is 50% of year 2013 EPS. The following is the trend of EPS for the preceding 10 years which is expected to continue in future.

<table>
<thead>
<tr>
<th>Year</th>
<th>EPS (₹)</th>
<th>Year</th>
<th>EPS (₹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>1.00</td>
<td>2009</td>
<td>1.61</td>
</tr>
<tr>
<td>2005</td>
<td>1.10</td>
<td>2010</td>
<td>1.77</td>
</tr>
<tr>
<td>2006</td>
<td>1.21</td>
<td>2011</td>
<td>1.95</td>
</tr>
<tr>
<td>2007</td>
<td>1.33</td>
<td>2012</td>
<td>2.15</td>
</tr>
<tr>
<td>2008</td>
<td>1.46</td>
<td>2013</td>
<td>2.36</td>
</tr>
</tbody>
</table>

The company issued new debentures carrying 16% rate of interest and the current market price of debenture is ₹ 96.

Preference share ₹ 9.20 (with annual dividend of ₹ 1.1 per share) were also issued. The company is in 50% tax bracket.

(A) Calculate after tax:

(i) Cost of new debt

(ii) Cost of new preference shares
(iii) New equity share (consuming new equity from retained earnings)

(B) Calculate marginal cost of capital when no new shares are issued.

(C) How much can be spent for capital investment before new ordinary shares must be sold. Assuming that retained earnings for next year’s investment are 50 percent of 2013.

(D) What will the marginal cost of capital when the funds exceeds the amount calculated in (C), assuming new equity is issued at ₹ 20 per share?

Solution

(A) (i) Cost of new debt

\[ K_d = \frac{I(1-t)}{N} \]

\[ = \frac{16 (1-0.5)}{96} = 0.0833 \]

(ii) Cost of new preference shares

\[ K_p = \frac{P}{O} \]

\[ = \frac{1.1}{9.2} = 0.12 \]

(iii) Cost of new equity shares

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

\[ = \frac{1.18}{23.60} + 0.10 = 0.05 + 0.10 = 0.15 \]

Calculation of \( D_1 \)

\[ D_1 = 50\% \text{ of } 2013 \text{ EPS} = 50\% \text{ of } 2.36 = ₹ 1.18 \]

(B)

<table>
<thead>
<tr>
<th>Type of Capital</th>
<th>Proportion</th>
<th>Specific Cost</th>
<th>Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(2) x (3) = (4)</td>
</tr>
<tr>
<td>Debt</td>
<td>0.15</td>
<td>0.0833</td>
<td>0.0125</td>
</tr>
<tr>
<td>Preference</td>
<td>0.05</td>
<td>0.12</td>
<td>0.0060</td>
</tr>
<tr>
<td>Equity</td>
<td>0.80</td>
<td>0.15</td>
<td>0.1200</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Marginal cost of capital</td>
</tr>
</tbody>
</table>

(C) The company can spend the following amount without increasing marginal cost of capital and without selling the new shares:

Retained earnings = (0.50) (2.36 × 10,000) = ₹ 11,800
The ordinary equity (Retained earnings in this case) is 80% of total capital

11,800 = 80% of Total Capital

\[ \therefore \text{Capital investment before issuing equity} = \frac{11,800}{0.80} = 14,750 \]

(D) If the company spends in excess of ₹ 14,750 it will have to issue new shares.

The cost of new issue will be

\[ = \frac{1.18}{20} + 0.10 = 0.159 \]

The marginal cost of capital will be:

<table>
<thead>
<tr>
<th>Type of Capital</th>
<th>Proportion</th>
<th>Specific Cost</th>
<th>Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>Debt</td>
<td>0.15</td>
<td>0.0833</td>
<td>0.0125</td>
</tr>
<tr>
<td>Preference</td>
<td>0.05</td>
<td>0.1200</td>
<td>0.0060</td>
</tr>
<tr>
<td>Equity (New)</td>
<td>0.80</td>
<td>0.1590</td>
<td>0.1272</td>
</tr>
</tbody>
</table>

Illustration 16: Gamma Limited has in issue 5,00,000 ₹ 1 ordinary shares whose current ex-dividend market price is ₹ 1.50 per share. The company has just paid a dividend of 27 paise per share, and dividends are expected to continue at this level for some time. If the company has no debt capital, what is the weighted average cost of capital?

Solution

Market value of equity, \( E = 5,00,000 \times 1.50 = ₹ 7,50,000 \)

Market value of debt, \( D = Nil \)

Cost of equity capital, \( K_e = \frac{\text{Dividend}}{\text{market value of share}} = \frac{27}{150} = 0.18 \)

Since there is no debt capital, \( \text{WACC} = K_e = 18 \text{ per cent.} \)

Illustration 17: Masco Limited wishes to raise additional finance of ₹ 10 lakhs for meeting its investment plans. It has ₹ 2,10,000 in the form of retained earnings available for investment purposes. Further details are as following:

<table>
<thead>
<tr>
<th>(1)</th>
<th>Debt / equity mix</th>
<th>30% / 70%</th>
</tr>
</thead>
<tbody>
<tr>
<td>(2)</td>
<td>Cost of debt</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Upto ₹ 1,80,000</td>
<td>10% (before tax)</td>
</tr>
<tr>
<td></td>
<td>Beyond ₹ 1,80,000</td>
<td>16% (before tax)</td>
</tr>
<tr>
<td>(3)</td>
<td>Earnings per share</td>
<td>₹ 4</td>
</tr>
</tbody>
</table>
Financing Decisions 4.25

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(4)</td>
<td>Dividend pay out</td>
<td>50% of earnings</td>
</tr>
<tr>
<td>(5)</td>
<td>Expected growth rate in dividend</td>
<td>10%</td>
</tr>
<tr>
<td>(6)</td>
<td>Current market price per share</td>
<td>₹ 44</td>
</tr>
<tr>
<td>(7)</td>
<td>Tax rate</td>
<td>50%</td>
</tr>
</tbody>
</table>

You are required:

(a) To determine the pattern for raising the additional finance.

(b) To determine the post-tax average cost of additional debt.

(c) To determine the cost of retained earnings and cost of equity, and

(d) Compute the overall weighted average after tax cost of additional finance.

Solution

(a) Pattern of raising additional finance

<table>
<thead>
<tr>
<th>Description</th>
<th>Percentage</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equity Capital</td>
<td>70%</td>
<td>₹ 7,00,000</td>
</tr>
<tr>
<td>Debt</td>
<td>30%</td>
<td>₹ 3,00,000</td>
</tr>
</tbody>
</table>

The capital structure after raising additional finance:

<table>
<thead>
<tr>
<th>Shareholders' funds</th>
<th>₹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equity Capital</td>
<td>(7,00,000–2,10,000)</td>
</tr>
<tr>
<td>Retained earnings</td>
<td>2,10,000</td>
</tr>
<tr>
<td>Debt (Interest at 10% p.a.)</td>
<td>1,80,000</td>
</tr>
<tr>
<td>(Interest at 16% p.a.)</td>
<td>(3,00,000–1,80,000)</td>
</tr>
<tr>
<td>Total Funds</td>
<td>10,00,000</td>
</tr>
</tbody>
</table>

(b) Determination of post-tax average cost of additional debt

\[ K_D = I (1 - T) \]

Where,

\[ I = \text{Interest Rate} \]
\[ T = \text{Corporate tax-rate} \]

On ₹ 1,80,000 = 10% (1 – 0.5) = 5% or 0.05
On ₹ 1,20,000 = 16% (1 – 0.5) = 8% or 0.08

Average Cost of Debt

\[
\frac{(₹ 180,000 	imes 0.05) + (₹ 120,000 	imes 0.08)}{₹ 3,00,000} \times 100 = 6.2\%
\]
(c) Determination of cost of retained earnings and cost of equity applying Dividend growth model:

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

Where,
- \( K_E \) = Cost of equity
- \( D_1 = D_0(1+g) \)
- \( D_0 \) = Dividend payout (i.e., 50% earnings = 50% × ₹ 4 = ₹ 2)
- \( g \) = Growth rate
- \( P_0 \) = Current market price per share

Then, \[ K_E = \frac{2(1.1)}{44} + 10\% = \frac{2.2}{44} + 10\% = 5\% + 10\% = 15\% \]

(d) Computation of overall weighted average after tax cost of additional finance

<table>
<thead>
<tr>
<th>Particular</th>
<th>₹</th>
<th>Weights</th>
<th>Cost of funds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equity (including retained earnings)</td>
<td>7,00,000</td>
<td>0.70</td>
<td>15%</td>
</tr>
<tr>
<td>Debt</td>
<td>3,00,000</td>
<td>0.30</td>
<td>6.2%</td>
</tr>
</tbody>
</table>

\[ \text{WACC} = (\text{Cost of Equity} \times \%\text{ Equity}) + (\text{Cost of debt} \times \%\text{ Debt}) \]
\[ = (15\% \times 0.70) + (6.2\% \times 0.30) = 10.5\% + 1.86\% = 12.36\%. \]

1.6 Conclusion

The determination of cost of capital is, thus, beset with a number of problems in dynamic world of today. Conditions which are present now may not remain static in future. Therefore, howsoever cost of capital is determined now, it is dependent on certain conditions or situations which are subject to change.

Firstly, the firm’s internal structure and character change. For instance, as the firm grows and matures, its business risk may decline resulting in new structure and cost of capital.

Secondly, capital market conditions may change, making either debt or equity more favourable than the other.

Thirdly, supply and demand for funds may vary from time to time leading to change in cost of different components of capital.

Fourthly, the company may experience subtle change in capital structure because of retained earnings unless its growth rate is sufficient to call for employment of debt on a continuous basis.

Because of these reasons the firm should periodically re-examine its cost of capital before determining annual capital budget.
UNIT – II : CAPITAL STRUCTURE DECISIONS

Learning Objectives
After studying this chapter you will be able to:
• Define and explain in detail the term capital structure.
• Discuss what is an optimal capital structure for a business?
• Understand different theories relating to the valuation of a firm.
• Understand EBIT-EPS break even or indifference analysis and how to construct and interpret an EBIT-EPS chart.
• Understand the concept of capitalization, over-capitalization and under-capitalisation.

2.1 Meaning of Capital Structure
Capital structure refers to the mix of a firm’s capitalisation (i.e. mix of long term sources of funds such as debentures, preference share capital, equity share capital and retained earnings for meeting total capital requirement).

Capital Structure decision refers to deciding the forms of financing (which sources to be tapped), their actual requirements (amount to be funded) and their relative proportions (mix) in total capitalisation.

Normally, a finance manager tries to choose a pattern of capital structure which minimises cost of capital and maximises the owners’ return.

2.2 Designing Capital Structure
A firm has the choice to raise funds for financing its investment proposals from different sources in different proportions. It can:
(a) Exclusively use debt, or
(b) Exclusively use equity capital, or
(c) Exclusively use preference capital, or
(d) Use a combination of debt and equity in different proportions, or
(e) Use a combination of debt, equity and preference capital in different proportions, or
(f) Use a combination of debt and preference capital in different proportions.

The choice of the combination of these sources is called capital structure mix. But the question is which of the pattern should the firm choose?

Factors Governing Capital Structure
Well, while choosing a suitable financing pattern, certain fundamental principles should be kept in mind, which are discussed below:

(a) Cost Principle: According to this principle, an ideal pattern or capital structure is one that minimises cost of capital structure and maximises earnings per share (EPS). For
4.28 Financial Management

e.g. Debt capital is cheaper than equity capital from the point of its cost and interest being deductible for income tax purpose, whereas no such deduction is allowed for dividends.

(b) **Risk Principle:** According to this principle, reliance is placed more on common equity for financing capital requirements than excessive use of debt. Use of more and more debt means higher commitment in form of interest payout. This would lead to erosion of shareholders value in unfavourable business situation. There are two risks associated with this principle:

(i) **Business risk:** It is an unavoidable risk because of the environment in which the firm has to operate and it is represented by the variability of earnings before interest and tax (EBIT). The variability in turn is influenced by revenues and expenses. Revenues and expenses are affected by demand of firm products, variations in prices and proportion of fixed cost in total cost.

(ii) **Financial risk:** It is a risk associated with the availability of earnings per share caused by use of financial leverage. It is the additional risk borne by the shareholders when a firm uses debt in addition to equity financing.

Generally, a firm should neither be exposed to high degree of business risk and low degree of financial risk or vice-versa, so that shareholders do not bear a higher risk.

(c) **Control Principle:** While designing a capital structure, the finance manager may also keep in mind that existing management control and ownership remains undisturbed. Issue of new equity will dilute existing control pattern and also it involves higher cost. Issue of more debt causes no dilution in control, but causes a higher degree of financial risk.

(d) **Flexibility Principle:** By flexibility it means that the management chooses such a combination of sources of financing which it finds easier to adjust according to changes in need of funds in future too. While debt could be interchanged (If the company is loaded with a debt of 18% and funds are available at 15%, it can return old debt with new debt, at a lesser interest rate), but the same option may not be available in case of equity investment.

(e) **Other Considerations:** Besides above principles, other factors such as nature of industry, timing of issue and competition in the industry should also be considered. Industries facing severe competition also resort to more equity than debt.

Thus a finance manager in designing a suitable pattern of capital structure must bring about satisfactory compromise between the above principles. The compromise can be reached by assigning weights to these principles in terms of various characteristics of the company.

### 2.3 Key Concepts for Designing Optimal Structure

The capital structure decisions are so significant in financial management, as they influence debt – equity mix which ultimately affects shareholders return and risk.
Since cost of debt is cheaper, firm prefers to borrow rather than to raise from equity. So long as return on investment is more than the cost of borrowing, extra borrowing increases the earnings per share. However, beyond a limit, it increases the risk and share price may fall because shareholders may assume that their investment is associated with more risk.

For an appropriate debt-equity mix, let us discuss some key concepts:

**2.3.1 Leverages:** There are two leverages associated with the study of capital structure, namely operating leverage and financial leverage.

**Operating leverage:** Operating leverage exists when a firm has a fixed cost that must be defrayed regardless of volume of business. It can be defined as the firm’s ability to use fixed operating costs to magnify the effects of changes in sales on its earnings before interest and taxes. In simple words, the percentage change in profits accompanying a change in volume is greater than the percentage change in volume.

Operating leverage can also be defined in terms of Degree of Operating Leverage (DOL). When proportionate change in EBIT as a result of a given change in sales is more than the proportionate change in sales, operating leverage exists. The greater the DOL, the higher is the operating leverage.

Therefore, DOL exists when \( \frac{\text{Percentage change in EBIT}}{\text{Percentage change in Sales}} > 1 \)

**Financial leverage:** Financial leverage involves the use of fixed cost of financing and refers to the mix of debt and equity in the capitalisation of a firm. Financial leverage is a superstructure built on the operating leverage. It results from the presence of fixed financial charges in the firm’s income stream. They are to be paid regardless of the amount of EBIT available to pay them. After paying them, the operating profits (EBIT) belong to the ordinary shareholders.

In simple words, financial leverage involves the use of funds obtained at a fixed cost in the hope of increasing the return to the shareholders.

Positive Financial Leverage occurs when the firm earns more on the assets purchased with the funds, than the fixed cost of their use. Financial Leverage is also called as “Trading on Equity”.

The degree of financial leverage can be found out as:

\[
\frac{\text{Percentage change in Earnings per share (EPS)}}{\text{Percentage change in Earnings before interest and tax (EBIT)}}
\]

Positive Financial Leverage occurs when the result of above is greater than 1.

**Operating Leverage vis-à-vis Financial Leverage:** A company having higher operating leverage should be accompanied by a low financial leverage and vice versa, otherwise it will face problems of insolvency and inadequate liquidity. Thus, a combination of both the leverages is a challenging task.

However, the determination of optimal level of debt is a formidable task and is a major policy
decision. Determination of optimal level of debt involves equalising between return and risk. EBIT-EPS analysis is a widely used tool to determine level of debt in a firm. Through this analysis, a comparison can be drawn for various methods of financing by obtaining indifference point. It is a point to the EBIT level at which EPS remains unchanged irrespective of level of debt-equity mix. The concepts of leverages and EBIT-EPS analysis would be dealt in detail separately for better understanding.

2.3.2 Coverage Ratio: The ability of the firm to use debt in the capital structure can also be judged in terms of coverage ratio namely EBIT/Interest. Higher the ratio, greater is the certainty of meeting interest payments.

2.3.3 Cash flow Analysis: It is a good supporting tool for EBIT-EPS analysis in framing a suitable capital structure. To determine the debt capacity, cash flow under adverse conditions should be examined. A high debt equity ratio is not risky if the company has the ability to generate cash flows. It would, therefore, be possible to increase the debt until cash flows equal the risk set out by debt.

The main drawback of this approach is that it fails to take into account uncertainty due to technological developments or changes in political climate.

These approaches as discussed above do not provide solution to the problem of determining an appropriate level of debt. However, with the information available a range can be determined for an optimum level of debt in the capital structure.

2.4 Optimal Capital Structure

The theory of optimal capital structure deals with the issue of the right mix of debt and equity in the long term capital structure of a firm. This theory states that if a company takes on debt, the value of the firm increases up to a point. Beyond that point if debt continues to increase then the value of the firm will start to decrease. Similarly if the company is unable to repay the debt within the specified period then it will affect the goodwill of the company in the market and may create problems for collecting further debt. Therefore, the company should select its appropriate capital structure with due consideration to the factors mentioned earlier.

2.5 EBIT-EPS Analysis

The basic objective of financial management is to design an appropriate capital structure which can provide the highest earnings per share (EPS) over the firm's expected range of earnings before interest and taxes (EBIT).

EPS measures a firm's performance for the investors. The level of EBIT varies from year to year and represents the success of a firm's operations. EBIT-EPS analysis is a vital tool for designing the optimal capital structure of a firm.

The objective of this analysis is to find the EBIT level that will equate EPS regardless of the financing plan chosen.
Financial Break-even and Indifference Analysis

Financial break-even point is the minimum level of EBIT needed to satisfy all the fixed financial charges i.e. interest and preference dividends. It denotes the level of EBIT for which the firm’s EPS equals zero.

If the EBIT is less than the financial breakeven point, then the EPS will be negative but if the expected level of EBIT is more than the breakeven point, then more fixed costs financing instruments can be taken in the capital structure, otherwise, equity would be preferred.

EBIT-EPS breakeven analysis is used for determining the appropriate amount of debt a firm might carry.

Another method of considering the impact of various financing alternatives on earnings per share is to prepare the EBIT chart or the range of Earnings Chart. This chart shows the likely EPS at various probable EBIT levels. Thus, under one particular alternative, EPS may be ₹ 2 at a given EBIT level. However, the EPS may go down if another alternative of financing is chosen even though the EBIT remains at the same level. At a given EBIT, earnings per share under various alternatives of financing may be plotted. A straight line representing the EPS at various levels of EBIT under the alternative may be drawn. Wherever this line intersects, it is known as break-even point. This point is a useful guide in formulating the capital structure. This is known as EPS equivalency point or indifference point since this shows that, between the two given alternatives of financing (i.e., regardless of leverage in the financial plans), EPS would be the same at the given level of EBIT.

The equivalency or indifference point can also be calculated algebraically in the following manner:

\[
\frac{(EBIT - I_1)(1 - T)}{E_1} = \frac{(EBIT - I_2)(1 - T)}{E_2}
\]

Where,

- \( EBIT \): Indifference point
- \( E_1 \): Number of equity shares in Alternative 1
- \( E_2 \): Number of equity shares in Alternative 2
- \( I_1 \): Interest charges in Alternative 1
- \( I_2 \): Interest charges in Alternative 2
- \( T \): Tax-rate

Alternative 1= All equity finance
Alternative 2= Debt-equity finance.

The indifference point can also be depicted graphically as:
Illustration 1: Best of Luck Ltd., a profit making company, has a paid-up capital of ₹ 100 lakhs consisting of 10 lakhs ordinary shares of ₹ 10 each. Currently, it is earning an annual pre-tax profit of ₹ 60 lakhs. The company’s shares are listed and are quoted in the range of ₹ 50 to ₹ 80. The management wants to diversify production and has approved a project which will cost ₹ 50 lakhs and which is expected to yield a pre-tax income of ₹ 40 lakhs per annum. To raise this additional capital, the following options are under consideration of the management:

(a) To issue equity capital for the entire additional amount. It is expected that the new shares (face value of ₹ 10) can be sold at a premium of ₹ 15.
(b) To issue 16% non-convertible debentures of ₹ 100 each for the entire amount.
(c) To issue equity capital for ₹ 25 lakhs (face value of ₹ 10) and 16% non-convertible debentures for the balance amount. In this case, the company can issue shares at a premium of ₹ 40 each.

You are required to advise the management as to how the additional capital can be raised, keeping in mind that the management wants to maximise the earnings per share to maintain its goodwill. The company is paying income tax at 50%.

Solution

Calculation of Earnings per share under the three options:

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Option I</th>
<th>Option II</th>
<th>Option III</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Equity Shares (lakhs):</td>
<td>(₹ in lakhs)</td>
<td>(₹ in lakhs)</td>
<td>(₹ in lakhs)</td>
</tr>
<tr>
<td>(Issue of equity only)</td>
<td>(Issue of debentures only)</td>
<td>(Issue of equity and debentures equally)</td>
<td></td>
</tr>
</tbody>
</table>

© The Institute of Chartered Accountants of India
Existing | 10 | 10 | 10.00  
Now issued | 2 | - | 0.50  
Total | 12 | 10 | 10.50  
16% debentures | Nil | ₹ 50 lakhs | ₹ 25 lakhs  

Estimated total income:
From current operations | 60 | 60 | 60  
From new projects | 40 | 40 | 40  
100 | 100 | 100  
Less: Interest on 16% debentures | - | 8 | 4  
Profit before tax | 100 | 92 | 96  
Tax at 50% | 50 | 46 | 48  
Profit after tax | 50 | 46 | 48  
EPS | ₹ 4.17 | ₹ 4.60 | ₹ 4.57  

Advise: Option II i.e. issue of 16% debentures is most suitable to maximize the earnings per share.

Illustration 2: Shahji Steels Limited requires ₹ 25,00,000 for a new plant. This plant is expected to yield earnings before interest and taxes of ₹ 5,00,000. While deciding about the financial plan, the company considers the objective of maximizing earnings per share. It has three alternatives to finance the project - by raising debt of ₹ 2,50,000 or ₹ 10,00,000 or ₹ 15,00,000 and the balance, in each case, by issuing equity shares. The company's share is currently selling at ₹ 150, but is expected to decline to ₹ 125 in case the funds are borrowed in excess of ₹ 10,00,000. The funds can be borrowed at the rate of 10 percent upto ₹ 2,50,000, at 15 percent over ₹ 2,50,000 and upto ₹ 10,00,000 and at 20 percent over ₹ 10,00,000. The tax rate applicable to the company is 50 percent. Which form of financing should the company choose?

Solution

Plan I = Raising debt of ₹ 2.5 lakhs + Equity of ₹ 22.5 lakhs.
Plan II = Raising debt of ₹ 10 lakhs + Equity of ₹ 15 lakhs.
Plan III = Raising debt of ₹ 15 lakhs + Equity of ₹ 10 lakhs.

Earnings per share (EPS) under proposed financial alternatives are:

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Financial Alternatives to Raise ₹ 25 Lakhs</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Plan I (₹)</td>
<td>Plan II (₹)</td>
</tr>
<tr>
<td>Expected EBIT</td>
<td>5,00,000</td>
<td>5,00,000</td>
</tr>
<tr>
<td>Less: Interest (a)</td>
<td>25,000</td>
<td>1,37,500</td>
</tr>
</tbody>
</table>
### Financial Management

<table>
<thead>
<tr>
<th>Earnings before taxes</th>
<th>4,75,000</th>
<th>3,62,500</th>
<th>2,62,500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less: Taxes</td>
<td>2,37,500</td>
<td>1,81,250</td>
<td>1,31,250</td>
</tr>
<tr>
<td>Earnings after taxes (EAT)</td>
<td>2,37,500</td>
<td>1,81,250</td>
<td>1,31,250</td>
</tr>
<tr>
<td>Number of shares (b)</td>
<td>15,000</td>
<td>10,000</td>
<td>8,000</td>
</tr>
<tr>
<td>Earnings per share (EPS)</td>
<td>15.83</td>
<td>18.13</td>
<td>16.41</td>
</tr>
</tbody>
</table>

**Recommendation:** Financing Option II (i.e. Raising debt of ₹ 10 lakhs and issue of equity share capital of ₹ 15 lakhs) is the best option as it maximises earnings per share.

**Working Notes:**

(a) **Determination of Interest**

| Plan I | (₹ 2,50,000×10%) | ₹ 25,000 |
| Plan II | (₹ 2,50,000×10%) | ₹ 25,000 |
|         | (7,50,000×15%)   | 1,12,500 |
| Plan III | (₹ 2,50,000×10%) | ₹ 25,000 |
|         | (7,50,000×15%)   | 1,12,250 |
|         | (5,00,000×20%)   | 1,00,000 |
|         |                   | 2,37,500 |

(b) **Number of equity shares to be issued**

| Plan I: | ₹ 22,50,000 |
|        | ₹ 150 (Market price of share) |
|        | = 15,000 |

| Plan II: | ₹ 15,00,000 |
|         | ₹ 150 |
|         | = 10,000 |

| Plan III: | ₹ 10,00,000 |
|          | ₹ 125 |
|          | = 8,000 |

**Illustration 3:** Ganesha Limited is setting up a project with a capital outlay of ₹ 60,00,000. It has two alternatives in financing the project cost.

- **Alternative (a):** 100% equity finance
- **Alternative (b):** Debt-equity ratio 2:1

The rate of interest payable on the debts is 18% p.a. The corporate tax rate is 40%. Calculate the indifference point between the two alternative methods of financing.

**Solution**

**Alternatives in Financing and its Financial Charges**

(a) By issue of 6,00,000 equity shares of ₹ 10 each amounting to ₹ 60 lakhs. No financial charges are involved.

(b) By raising the funds in the following way:
Debt = ₹ 40 lakhs  
Equity = ₹ 20 lakhs (2,00,000 equity shares of ₹ 10 each)

Interest payable on debt = \(\frac{40,00,000 \times 18}{100} = ₹ 7,20,000\)

The difference point between the two alternatives is calculated by:

\[
\frac{(EBIT - I_1)(1-T)}{E_1} = \frac{(EBIT - I_2)(1-T)}{E_2}
\]

Where,  
EBIT = Earnings before interest and taxes  
\(I_1\) = Interest charges in Alternative (a)  
\(I_2\) = Interest charges in Alternative (b)  
\(T\) = Tax rate  
\(E_1\) = Equity shares in Alternative (a)  
\(E_2\) = Equity shares in Alternative (b)

Putting the values, the break-even point would be as follows:

\[
\frac{(EBIT - 0)(1-0.40)}{6,00,000} = \frac{(EBIT - 7,20,000)(1-0.40)}{2,00,000}
\]

\[
\frac{(EBIT)(0.60)}{6,00,000} = \frac{(EBIT - 7,20,000)(0.60)}{2,00,000}
\]

\[
\frac{EBIT(0.60)}{3} = \frac{0.60(EBIT - 7,20,000)}{1}
\]

EBIT = 3EBIT – 21,60,000

\(-2\) EBIT = –21,60,000

EBIT = \(\frac{21,60,000}{2}\)

EBIT = 10,80,000

Therefore, it can be seen that the EBIT at indifference point explains that the earnings per share for the two alternatives is equal.

Illustration 4: Ganpati Limited is considering three financing plans. The key information is as follows:

(a) Total investment to be raised ₹ 2,00,000

(b) Plans of Financing Proportion:
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<table>
<thead>
<tr>
<th>Plans</th>
<th>Equity</th>
<th>Debt</th>
<th>Preference Shares</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>100%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>B</td>
<td>50%</td>
<td>50%</td>
<td>-</td>
</tr>
<tr>
<td>C</td>
<td>50%</td>
<td>-</td>
<td>50%</td>
</tr>
</tbody>
</table>

(c) Cost of debt 8%
Cost of preference shares 8%

(d) Tax rate 50%

(e) Equity shares of the face value of ₹ 10 each will be issued at a premium of ₹ 10 per share.

(f) Expected EBIT is ₹ 80,000.

You are required to determine for each plan:

(i) Earnings per share (EPS)

(ii) The financial break-even point.

(iii) Indicate if any of the plans dominate and compute the EBIT range among the plans for indifference.

Solution

(i) Computation of Earnings per share (EPS)

<table>
<thead>
<tr>
<th>Plans</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earnings before interest and tax (EBIT)</td>
<td>80,000</td>
<td>80,000</td>
<td>80,000</td>
</tr>
<tr>
<td>Less: Interest charges</td>
<td>-</td>
<td>8,000</td>
<td>-</td>
</tr>
<tr>
<td>Earnings before tax (EBT)</td>
<td>80,000</td>
<td>72,000</td>
<td>80,000</td>
</tr>
<tr>
<td>Less: Tax (@ 50%)</td>
<td>40,000</td>
<td>36,000</td>
<td>40,000</td>
</tr>
<tr>
<td>Earnings after tax (EAT)</td>
<td>40,000</td>
<td>36,000</td>
<td>40,000</td>
</tr>
<tr>
<td>Less: Preference Dividend</td>
<td>-</td>
<td>-</td>
<td>8,000</td>
</tr>
<tr>
<td>Earnings available for Equity shareholders</td>
<td>40,000</td>
<td>36,000</td>
<td>32,000</td>
</tr>
<tr>
<td>No. of Equity shares</td>
<td>10,000</td>
<td>5,000</td>
<td>5,000</td>
</tr>
<tr>
<td>EPS (₹)</td>
<td>4</td>
<td>7.20</td>
<td>6.40</td>
</tr>
</tbody>
</table>

(ii) Calculation of Financial Break-even point

The firm will achieve its financial break-even where its earnings are able to meet its fixed interest /preference dividend charges. Now, the financial break-even point (FBP) of three firms can be calculated as follows:

Firm A = 0
Firm B = ₹ 8,000 (Interest charges)
Firm C = ₹ 16,000 (i.e. earnings required for payment of preference dividend is ₹ 8,000/0.5 = ₹ 16,000. The earnings required to meet both tax @ 50% and payment of preference dividend, a total profit before interest and tax required is ₹ 16,000).

(iii) Computation of indifference point between the plans.

The indifference between two alternative methods of financing is calculated by applying the following formula.

\[
\frac{(EBIT - I_1)(1 - T)}{E_1} = \frac{(EBIT - I_2)(1 - T)}{E_2}
\]

Where,
- \( EBIT \) = Earning before interest and tax.
- \( I_1 \) = Fixed charges (interest or pref. dividend) under Alternative 1
- \( I_2 \) = Fixed charges (interest or pref. dividend) under Alternative 2
- \( T \) = Tax rate
- \( E_1 \) = No. of equity shares in Alternative 1
- \( E_2 \) = No. of equity shares in Alternative 2

Now, we can calculate indifference point between different plans of financing.

I. Indifference point where EBIT of Plan A and Plan B is equal.

\[
\frac{(EBIT - 0)(1 - 0.5)}{10,000} = \frac{(EBIT - 8,000)(1 - 0.5)}{5,000}
\]

0.5 EBIT (5,000) = (0.5 EBIT – 4,000) (10,000)
0.5 EBIT = EBIT – 8,000
0.5 EBIT = 8,000
EBIT = ₹ 16,000

II. Indifference point where EBIT of Plan A and Plan C is equal.

\[
\frac{(EBIT - 0)(1 - 0.5)}{10,000} = \frac{(EBIT - 0)(1 - 0.5) - 8,000}{5,000}
\]

0.5 EBIT = 0.5 EBIT – 8,000
0.25 EBIT = 8,000
EBIT = ₹ 32,000
III. Indifference point where EBIT of Plan B and Plan C are equal.

\[
\frac{(EBIT - 8,000)(1 - 0.5)}{5,000} = \frac{(EBIT - 0)(1 - 0.5) - 8,000}{5,000}
\]

0.5 EBIT – 4,000 = 0.5 EBIT – 8,000

There is no indifference point between the financial plans B and C.

Analysis: It can be seen that Financial Plan B dominates Plan C. Since, the financial break-even point of the former is only ₹ 8,000 but in case of latter it is ₹ 16,000.

Illustration 5: Touchscreen Limited needs ₹ 10,00,000 for expansion. The expansion is expected to yield an annual EBIT of ₹ 1,60,000. In choosing a financial plan, Touchscreen Limited has an objective of maximizing earnings per share. It is considering the possibility of issuing equity shares and raising debt of ₹ 1,00,000 or ₹ 4,00,000 or ₹ 6,00,000. The current market price per share is ₹ 25 and is expected to drop to ₹ 20 if the funds are borrowed in excess of ₹ 5,00,000. Funds can be borrowed at the rates indicated below: (a) upto ₹ 1,00,000 at 8%; (b) over ₹ 1,00,000 up to ₹ 5,00,000 at 12%; (c) over ₹ 5,00,000 at 18%.

Assume a tax rate of 50 per cent. Determine the EPS for the three financing alternatives.

Solution

The EPS is determined as follows:

<table>
<thead>
<tr>
<th>Alternatives</th>
<th>I (₹ 1,00,000 debt)</th>
<th>II (₹ 4,00,000 debt)</th>
<th>III (₹ 6,00,000 debt)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBIT</td>
<td>1,60,000</td>
<td>1,60,000</td>
<td>1,60,000</td>
</tr>
<tr>
<td>Interest</td>
<td>8,000</td>
<td>44,000</td>
<td>74,000</td>
</tr>
<tr>
<td>PBT</td>
<td>1,52,000</td>
<td>1,16,000</td>
<td>86,000</td>
</tr>
<tr>
<td>Taxes at 50%</td>
<td>76,000</td>
<td>58,000</td>
<td>43,000</td>
</tr>
<tr>
<td>PAT</td>
<td>76,000</td>
<td>58,000</td>
<td>43,000</td>
</tr>
<tr>
<td>No. of shares</td>
<td>36,000</td>
<td>24,000</td>
<td>20,000</td>
</tr>
<tr>
<td>EPS</td>
<td>2.11</td>
<td>2.42</td>
<td>2.15</td>
</tr>
</tbody>
</table>

The second alternative maximizes EPS; therefore, it is the best financial alternative in the present case.

The interest charges for Alternative II and III are calculated as follows:

Interest calculation, Alternative II

<table>
<thead>
<tr>
<th>₹</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,00,000 @ 8%</td>
</tr>
<tr>
<td>3,00,000 @ 12%</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>
Interest calculation, Alternative III

<table>
<thead>
<tr>
<th></th>
<th>₹</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,00,000 @ 8%</td>
<td>8,000</td>
</tr>
<tr>
<td>4,00,000 @ 12%</td>
<td>48,000</td>
</tr>
<tr>
<td>1,00,000 @ 18%</td>
<td>18,000</td>
</tr>
<tr>
<td>Total</td>
<td>74,000</td>
</tr>
</tbody>
</table>

The number of shares is found out by dividing the amount to be raised through equity issue by the market price per share. The market price per share is ₹ 25 in case of first two alternatives and ₹ 20 in case of last alternative.

Illustration 6: Yoyo Limited presently has ₹ 36,00,000 in debt outstanding bearing an interest rate of 10 per cent. It wishes to finance a ₹ 40,00,000 expansion programme and is considering three alternatives: additional debt at 12 per cent interest, preference shares with an 11 per cent dividend, and the sale of equity shares at ₹ 16 per share. The company presently has 8,00,000 shares outstanding and is in a 40 per cent tax bracket.

(a) If earnings before interest and taxes are presently ₹ 15,00,000, what would be earnings per share for the three alternatives, assuming no immediate increase in profitability?

(b) Develop an indifference chart for these alternatives. What are the approximate indifference points? To check one of these points, what is the indifference point mathematically between debt and common?

(c) Which alternative do you prefer? How much would EBIT need to increase before the next alternative would be best?

Solution

(a)

<table>
<thead>
<tr>
<th></th>
<th>Debt</th>
<th>Preference Shares</th>
<th>Equity Shares (in thousands)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBIT</td>
<td>1,500</td>
<td>1,500</td>
<td>1,500</td>
</tr>
<tr>
<td>Interest on existing debt</td>
<td>360</td>
<td>360</td>
<td>360</td>
</tr>
<tr>
<td>Interest on new debt</td>
<td>480</td>
<td></td>
<td>480</td>
</tr>
<tr>
<td>Profit before taxes</td>
<td>660</td>
<td>1,140</td>
<td>1,140</td>
</tr>
<tr>
<td>Taxes</td>
<td>264</td>
<td>456</td>
<td>456</td>
</tr>
<tr>
<td>Profit after taxes</td>
<td>396</td>
<td>684</td>
<td>684</td>
</tr>
<tr>
<td>Preference shares dividend</td>
<td>-</td>
<td>440</td>
<td>440</td>
</tr>
<tr>
<td>Earnings available to equity shareholders</td>
<td>396</td>
<td>244</td>
<td>684</td>
</tr>
<tr>
<td>Number of shares</td>
<td>800</td>
<td>800</td>
<td>1,050</td>
</tr>
<tr>
<td>Earnings per share</td>
<td>0.495</td>
<td>0.305</td>
<td>0.651</td>
</tr>
</tbody>
</table>
(b) Approximate indifference points: Debt and equity shares, ₹ 24 lakhs, preference and equity shares, ₹ 33 lakhs in EBIT; Debt dominates preferred by the same margin throughout, there is no difference point. Mathematically, the indifference point between debt and equity shares is (in thousands):

\[
\frac{\text{EBIT}^* - \text{₹} 840}{800} = \frac{\text{EBIT}^* - \text{₹} 360}{1,050}
\]

\[
\text{EBIT}^* (1,050) - \text{₹} 840(1,050) = \text{EBIT}^* (800) - \text{₹} 360 (800)
\]

\[
250\text{EBIT}^* = \text{₹} 5,94,000
\]

\[
\text{EBIT}^* = \text{₹} 2,376
\]

Note that for the debt alternative, the total before-tax interest is ₹ 840, and this is the intercept on the horizontal axis. For the preferred stock alternative, we divide ₹ 440 by \((1 - 0.40)\) to get ₹ 733. When this is added to ₹ 360 in interest on existing debt, the intercept becomes ₹ 1,093.

(c) For the present EBIT level, equity shares is clearly preferable. EBIT would need to increase by ₹ 2,376 - ₹ 1,500 = ₹ 876 before an indifference point with debt is reached. One would want to be comfortably above this indifference point before a strong case for debt should be made. The lower the probability that actual EBIT will fall below the indifference point, the stronger the case that can be made for debt, all other things remain the same.

2.6 Cost of Capital, Capital Structure and Market Price of Share

The financial leverage has a magnifying effect on earnings per share, such that for a given level of percentage increase in EBIT, there will be more than proportionate change in the
same direction in the earnings per share. The financing decision of the firm is one of the basic conditions oriented to the achievement of maximisation for the shareholders wealth. The capital structure should be examined from the view point of its impact on the value of the firm. If the capital structure affects the total value of the firm, a firm should select such a financing mix (a combination of debt and equity) which will maximise the market value of the firm. Such an optimum leverage not only maximises the value of the company and wealth of its owners, but also minimises the cost of capital. As a result, the company is able to increase its economic rate of investment and growth.

In theory, capital structure can affect the value of the firm by affecting either its expected earnings or cost of capital or both. While financing mix cannot affect the total earnings, it can affect the share of earnings belonging to the share holders. But financial leverage can largely influence the value of the firm through the cost of capital.

### 2.7 Capital Structure Theories

The following approaches explain the relationship between cost of capital, capital structure and value of the firm:

(a) Net income approach
(b) Net operating income approach
(c) Modigliani-Miller approach
(d) Traditional approach.

However, the following assumptions are made to understand this relationship.

- There are only two kinds of funds used by a firm i.e. debt and equity.
- Taxes are not considered.
- The payout ratio is 100%.
- The firm’s total financing remains constant.
- Business risk is constant over time.
- The firm has perpetual life.

#### 2.7.1 Net Income Approach (NI): According to this approach, capital structure decision is relevant to the value of the firm.

An increase in financial leverage will lead to decline in the weighted average cost of capital, while the value of the firm as well as market price of ordinary share will increase. Conversely, a decrease in the leverage will cause an increase in the overall cost of capital and a consequent decline in the value as well as market price of equity shares.
From the above diagram, $k_e$ and $k_d$ are assumed not to change with leverage. As debt increases, it causes weighted average cost of capital to decrease.

The value of the firm on the basis of Net Income Approach can be ascertained as follows:

$$V = S + D$$

Where,

- $V$ = Value of the firm
- $S$ = Market value of equity
- $D$ = Market value of debt

Market value of equity ($S$) = \[ \frac{NI}{K_e} \]

Where,

- $NI$ = Earnings available for equity shareholders
- $K_e$ = Equity Capitalisation rate

Under, NI approach, the value of the firm will be maximum at a point where weighted average cost of capital is minimum. Thus, the theory suggests total or maximum possible debt financing for minimising the cost of capital. The overall cost of capital under this approach is:

$$\text{Overall cost of capital} = \frac{\text{EBIT}}{\text{Value of the firm}}$$

Thus according to this approach, the firm can increase its total value by decreasing its overall cost of capital through increasing the degree of leverage.
The significant conclusion of this approach is that it pleads for the firm to employ as much debt as possible to maximise its value.

Illustration 7: Rupa Company’s EBIT is ₹ 5,00,000. The company has 10%, 20 lakh debentures. The equity capitalization rate i.e. $K_e$ is 16%.

You are required to calculate:

(i) Market value of equity and value of firm
(ii) Overall cost of capital.

Solution

(i) Statement showing value of firm

<table>
<thead>
<tr>
<th>Net operating income/EBIT</th>
<th>₹ 5,00,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less: Interest on debentures (10% of ₹ 20,00,000)</td>
<td>2,00,000</td>
</tr>
<tr>
<td>Earnings available for equity holders i.e. NI</td>
<td>3,00,000</td>
</tr>
<tr>
<td>Equity capitalisation rate ($K_e$)</td>
<td>16%</td>
</tr>
<tr>
<td>Market value of equity ($S$)</td>
<td>( \frac{3,00,000 \times 100}{16.00} )</td>
</tr>
<tr>
<td>Market value of debt ($D$)</td>
<td>20,00,000</td>
</tr>
<tr>
<td>Total value of firm $V = S + D$</td>
<td>38,75,000</td>
</tr>
</tbody>
</table>

(ii) Overall cost of capital = \( \frac{EBIT}{Value\ of\ firm} = \frac{5,00,000}{38,75,000} = 12.90\% \)

2.7.2 Net Operating Income Approach (NOI): NOI means earnings before interest and tax. According to this approach, capital structure decisions of the firm are irrelevant.

Any change in the leverage will not lead to any change in the total value of the firm and the market price of shares, as the overall cost of capital is independent of the degree of leverage. As a result, the division between debt and equity is irrelevant.

As per this approach, an increase in the use of debt which is apparently cheaper is offset by an increase in the equity capitalisation rate. This happens because equity investors seek higher compensation as they are opposed to greater risk due to the existence of fixed return securities in the capital structure.
The above diagram shows that $K_0$ (Overall capitalisation rate) and $(\text{debt} - \text{capitalisation rate})$ are constant and $K_e$ (Cost of equity) increases with leverage.

**Illustration 8:** Amita Ltd’s operating income is ₹ 5,00,000. The firm’s cost of debt is 10% and currently the firm employs ₹ 15,00,000 of debt. The overall cost of capital of the firm is 15%.

You are required to determine:

(i) Total value of the firm.
(ii) Cost of equity.

**Solution**

(i) **Statement showing value of the firm**

<table>
<thead>
<tr>
<th>Net operating income/EBIT</th>
<th>₹</th>
</tr>
</thead>
<tbody>
<tr>
<td>5,00,000</td>
<td></td>
</tr>
<tr>
<td>Less: Interest on debentures (10% of ₹ 15,00,000)</td>
<td>1,50,000</td>
</tr>
<tr>
<td>Earnings available for equity holders</td>
<td>3,50,000</td>
</tr>
<tr>
<td>Total cost of capital ($K_0$) (given)</td>
<td>15%</td>
</tr>
<tr>
<td>Value of the firm $V = \frac{\text{EBIT}}{K_0} = \frac{5,00,000}{0.15}$</td>
<td>33,33,333</td>
</tr>
</tbody>
</table>

(ii) **Calculation of cost of equity**

$$K_e = \frac{\text{Earnings available for equity holders}}{\text{Value of equity(s)}}$$
Market value of debt (D) 15,00,000
Market value of equity (s) S = V − D = 33,33,333 − 15,00,000 18,33,333

Cost of equity \( (K_e) = \frac{\text{Earnings available for equityholders}}{\text{Market value of equity}} \)

Or, \( = \frac{\text{EBIT} - \text{Interest paid on debt}}{\text{Market value of equity}} \)

\[
= \frac{5,00,000 - 1,50,000}{18,33,333} = \frac{\text{\ ₹} 3,50,000}{18,33,333} = 19.09\%
\]

\[K_e = K_a \left( \frac{S}{V} \right) + K_d \left( \frac{D}{V} \right)\]

\[= 0.15 \left( \frac{33,33,333}{18,33,333} \right) - 0.10 \left( \frac{15,00,000}{18,33,333} \right)\]

\[= \frac{1}{18,33,333} \left[ (0.15 \times 33,33,333) - (0.10 \times 15,00,000) \right]\]

\[= \frac{1}{18,33,333} \left[ 5,00,000 - 1,50,000 \right] = 19.09\%\]

2.7.3 Modigliani-Miller Approach (MM): The NOI approach is definitional or conceptual and lacks behavioural significance. It does not provide operational justification for irrelevance of capital structure.

However, Modigliani-Miller approach provides behavioural justification for constant overall cost of capital and, therefore, total value of the firm.

The approach is based on further additional assumptions like:

- Capital markets are perfect. All information is freely available and there are no transaction costs.
- All investors are rational.
- Firms can be grouped into ‘Equivalent risk classes’ on the basis of their business risk.
Non-existence of corporate taxes.

Based on the above assumptions, Modigliani-Miller derived the following three propositions:

(i) Total market value of a firm is equal to its expected net operating income dividend by the discount rate appropriate to its risk class decided by the market.

(ii) The expected yield on equity is equal to the risk-free rate plus a premium determined as per the following equation: 

$$K_e = K_o + (K_o - K_d) \frac{B}{S}$$

(iii) Average cost of capital is not affected by financial decision.

It is evident from the above diagram that the average cost of the capital ($K_o$) is a constant and not affected by leverage.

The operational justification of Modigliani-Miller hypothesis is explained through the functioning of the arbitrage process and substitution of corporate leverage by personal leverage. Arbitrage refers to buying asset or security at lower price in one market and selling it at a higher price in another market. As a result, equilibrium is attained in different markets. This is illustrated by taking two identical firms of which one has debt in the capital structure while the other does not. Investors of the firm whose value is higher will sell their shares and instead buy the shares of the firm whose value is lower. They will be able to earn the same return at lower outlay with the same perceived risk or lower risk. They would, therefore, be better off.

The value of the levered firm can neither be greater nor lower than that of an unlevered firm according this approach. The two must be equal. There is neither advantage nor disadvantage in using debt in the firm’s capital structure.
The approach considers capital structure of a firm as a whole pie divided into equity, debt and other securities. No matter how the capital structure of a firm is divided (among debt, equity etc.), there is a conservation of investment value. Since the total investment value of a corporation depends upon its underlying profitability and risk, it is invariant with respect to relative changes in the firm’s financial capitalisation.

According to MM, since the sum of the parts must equal the whole, therefore, regardless of the financing mix, the total value of the firm stays the same as shown in the figures below:

![Diagram showing conservation of investment value](image)

The shortcoming of this approach is that the arbitrage process as suggested by Modigliani-Miller will fail to work because of imperfections in capital market, existence of transaction cost and presence of corporate income taxes.

Impact of Taxes: However in their 1963 article, they recognised that the value of the firm will increase or cost of capital will decrease where corporate taxes exist. As a result, there will be some difference in the earnings of equity and debt holders in levered and unlevered firm and value of levered firm will be greater than the value of unlevered firm by an amount equal to amount of debt multiplied by corporate tax rate.

**Illustration 9: When value of levered firm is more than the value of unlevered firm**

There are two firms N and M, having same earnings before interest and taxes i.e. EBIT of ₹ 20,000. Firm M is levered company having a debt of ₹ 1,00,000 @ 7% rate of interest. The cost of equity of N company is 10% and of M company is 11.50%.

Find out how arbitrage process will be carried on?

**Solution**

<table>
<thead>
<tr>
<th>Firms</th>
<th>N</th>
<th>M</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOI/EBIT</td>
<td>₹ 20,000</td>
<td>₹ 20,000</td>
</tr>
<tr>
<td>Debt</td>
<td>–</td>
<td>₹ 1,00,000</td>
</tr>
</tbody>
</table>
4.48 Financial Management

\[
\begin{array}{c|c|c}
\text{Ke} & 10\% & 11.50\% \\
\hline
\text{Kd} & - & 7\%
\end{array}
\]

Value of equity (\(S\)) = \(\frac{\text{NOI} - \text{Interest}}{\text{Cost of equity}}\)

\[
S_N = \frac{20,000}{10\%} = ₹ 2,00,000
\]

\[
S_U = \frac{20,000 - 7,000}{11.50\%} = ₹ 1,13,043
\]

\[
V_N = ₹ 2,00,000
\]

\[
V_M = 1,13,043 + 1,00,000 \ (V = S + D)
\]

\[
= ₹ 2,13,043
\]

Assume you have 10% share of levered company. i.e. M. Therefore, investment in 10% of equity of levered company = 10% × 1,13,043 = ₹ 11,304.3

Return will be 10% of (20,000 – 7,000) = ₹ 1,300.

Alternate Strategy will be:

Sell your 10% share of levered firm for ₹ 11,304.3 and borrow 10% of levered firms debt i.e. 10% of ₹ 1,00,000 and invest the money i.e. 10% in unlevered firms stock:

Total resources /Money we have = 11,304.3 + 10,000 = 21,304.3 and you invest 10% of 2,00,000 = ₹ 20,000

Surplus cash available with you is = 21,304.3 – 20,000 = ₹ 1,304.3

Your return = 10% EBIT of unlevered firm – Interest to be paid on borrowed funds

i.e. = 10% of ₹ 20,000 – 7% of ₹ 10,000 = 2,000 – 700 = ₹ 1,300

i.e. your return is same i.e. ₹ 1,300 which you are getting from 'N' company before investing in 'M' company. But still you have ₹ 1,304.3 excess money available with you. Hence, you are better off by doing arbitrage.

Illustration 10: When value of unlevered firm is more than the value of levered firm

There are two firms U and L having same NOI of ₹ 20,000 except that the firm L is a levered firm having a debt of ₹ 1,00,000 @ 7% and cost of equity of U & L are 10% and 18% respectively.

Show how arbitrage process will work.
Solution

<table>
<thead>
<tr>
<th></th>
<th>Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$U$</td>
</tr>
<tr>
<td>NOI/EBIT</td>
<td>₹ 20,000</td>
</tr>
<tr>
<td>Debt capital</td>
<td>–</td>
</tr>
<tr>
<td>$K_d$</td>
<td>–</td>
</tr>
<tr>
<td>$K_s$</td>
<td>10%</td>
</tr>
<tr>
<td>Value of equity capital $(s) = (\frac{EBIT - Interest}{K_s})$</td>
<td>= ₹ 20,000</td>
</tr>
<tr>
<td></td>
<td>= ₹ 2,00,000</td>
</tr>
<tr>
<td>Total value of the firm $V = S + D$</td>
<td>₹ 2,00,000</td>
</tr>
<tr>
<td></td>
<td>= ₹ 1,72,222</td>
</tr>
</tbody>
</table>

Assume you have 10% shares of unlevered firm i.e. investment of 10% of ₹ 2,00,000 = ₹ 20,000 and Return @ 10% on ₹ 20,000. Investment will be 10% of earnings available for equity i.e. 10% × 20,000 = ₹ 2,000.

Alternative strategy:

Sell your shares in unlevered firm for ₹ 20,000 and buy 10% shares of levered firm’s equity plus debt

i.e. 10% equity of levered firm = 7,222
10% debt of levered firm = 10,000
Total investment = 17,222

Your resources are ₹ 20,000

Surplus cash available = Surplus – Investment = 20,000 – 17,222 = ₹ 2,778

Your return on investment is:

7% on debt of ₹ 10,000 = 700
10% on equity i.e. 10% of earnings available for equity holders i.e. (10% × 13,000) = 1,300
Total return = 2,000

i.e. in both the cases the return received is ₹ 2,000 and still you have excess cash of ₹ 2,778.

Hence, you are better off i.e you will start selling unlevered company shares and buy levered company’s shares thereby pushing down the value of shares of unlevered firm and increasing the value of levered firm till equilibrium is reached.

Illustration 11: One-third of the total market value of Sanghmani Limited consists of loan
stock, which has a cost of 10 per cent. Another company, Samsui Limited, is identical in every respect to Sanghmani Limited, except that its capital structure is all-equity, and its cost of equity is 16 per cent. According to Modigliani and Miller, if we ignored taxation and tax relief on debt capital, what would be the cost of equity of Sanghmani Limited?

Solution

Here we are assuming that the world of Miller and Modigliani’s first paper (Miller and Modigliani’s first model argues that no optimal capital structure exists and supports this proposition with arbitrage theory) exists. Therefore, the two companies should have similar WACCs. Because Samsui Limited is all-equity financed, its WACC is the same as its cost of equity finance, i.e. 16 per cent. It follows that Sanghmani Limited should have WACC equal to 16 per cent also.

Therefore, \[
\frac{1}{3} \times 10\text{ per cent} + \frac{2}{3} \times K_e = 16\text{ per cent}
\]

Hence, \[K_e = 19\text{ per cent}.
\]

2.7.4 Traditional Approach: This approach favours that as a result of financial leverage up to some point, cost of capital comes down and value of firm increases. However, beyond that point, reverse trends emerge.

The principle implication of this approach is that the cost of capital is dependent on the capital structure and there is an optimal capital structure which minimises cost of capital.

At the optimal capital structure, the real marginal cost of debt and equity is the same. Before the optimal point, the real marginal cost of debt is less than real marginal cost of equity and beyond this optimal point the real marginal cost of debt is more than real marginal cost of equity.

The above diagram suggests that cost of capital is a function of leverage. It declines with \(K_d\) (debt) and starts rising. This means that there is a range of capital structure in which cost of capital is minimised.
Optimum capital structure occurs at the point where value of the firm is highest and the cost of capital is the lowest.

According to net operating income approach, capital structure decisions are totally irrelevant. Modigliani-Miller supports the net operating income approach but provides behavioural justification. The traditional approach strikes a balance between these extremes.

**Main Highlights of Traditional Approach**

(a) The firm should strive to reach the optimal capital structure and its total valuation through a judicious use of the both debt and equity in capital structure. At the optimal capital structure, the overall cost of capital will be minimum and the value of the firm will be maximum.

(b) Value of the firm increases with financial leverage up to a certain point. Beyond this point the increase in financial leverage will increase its overall cost of capital and hence the value of firm will decline. This is because the benefits of use of debt may be so large that even after offsetting the effect of increase in cost of equity, the overall cost of capital may still go down. However, if financial leverage increases beyond an acceptable limit, the risk of debt investor may also increase, consequently cost of debt also starts increasing. The increasing cost of equity owing to increased financial risk and increasing cost of debt makes the overall cost of capital to increase.

**Illustration 12:** Indra company has EBIT of ₹ 1,00,000. The company makes use of debt and equity capital. The firm has 10% debentures of ₹ 5,00,000 and the firm’s equity capitalization rate is 15%.

You are required to compute:

(i) Current value of the firm
(ii) Overall cost of capital.

**Solution**

(i) **Calculation of total value of the firm**

<table>
<thead>
<tr>
<th></th>
<th>₹</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBIT</td>
<td>1,00,000</td>
</tr>
<tr>
<td>Less: Interest (10% @ 5,00,000)</td>
<td>50,000</td>
</tr>
<tr>
<td>Earnings available for equity holders</td>
<td>50,000</td>
</tr>
<tr>
<td>Equity capitalization rate i.e. $K_e$</td>
<td>15%</td>
</tr>
</tbody>
</table>

\[
\text{Value of equity holders} = \frac{\text{Earnings available for equity holders}}{K_e}
\]

\[
= \frac{50,000}{0.15} = ₹ 3,33,333
\]
Value of Debt (given) \( D \)  
Total value of the firm \( V = D + S \)  

\[
(5,00,000 + 3,33,333) = 8,33,333
\]

(ii) Overall cost of capital = \( K_o = K_s \left( \frac{S}{V} \right) + K_d \left( \frac{D}{V} \right) \)

\[
= 0.15 \left( \frac{3,33,333}{8,33,333} \right) + 0.10 \left( \frac{5,00,000}{8,33,333} \right)
\]

\[
= \frac{1}{8,33,333} \left[ 50,000 + 50,000 \right] = 12.00\%
\]

**Illustration 13**: Alpha Limited and Beta Limited are identical except for capital structures. Alpha has 50 per cent debt and 50 per cent equity, whereas Beta has 20 per cent debt and 80 per cent equity. (All percentages are in market-value terms). The borrowing rate for both companies is 8 per cent in a no-tax world, and capital markets are assumed to be perfect.

(a) (i) If you own 2 per cent of the shares of Alpha, what is your return if the company has net operating income of \( \text{₹} \) 3,60,000 and the overall capitalisation rate of the company, \( K_o \) is 18 per cent? (ii) What is the implied required rate of return on equity?

(b) Beta has the same net operating income as Alpha. (i) What is the implied required equity return of Beta? (ii) Why does it differ from that of Alpha?

**Solution**

(a) (i)

<table>
<thead>
<tr>
<th></th>
<th>₹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net operating income</td>
<td>3,60,000</td>
</tr>
<tr>
<td>÷ Overall capitalisation rate</td>
<td>0.18</td>
</tr>
<tr>
<td>Total value of firm</td>
<td>20,00,000</td>
</tr>
<tr>
<td>Market value of debt (50%)</td>
<td>10,00,000</td>
</tr>
<tr>
<td>Market value of shares (50%)</td>
<td>10,00,000</td>
</tr>
<tr>
<td>Net operating income</td>
<td>3,60,000</td>
</tr>
<tr>
<td>Interest on debt (8%)</td>
<td>80,000</td>
</tr>
<tr>
<td>Earnings to common</td>
<td>2,80,000</td>
</tr>
</tbody>
</table>

2% of ₹ 2,80,000 = ₹ 5,600.

(ii) Implied required equity return = \( \frac{\text{₹} 2,80,000}{\text{₹} 10,00,000} = 28\% \)
(b) (i)

<table>
<thead>
<tr>
<th></th>
<th>₹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total value of firm</td>
<td>20,00,000</td>
</tr>
<tr>
<td>Market value of debt (20%)</td>
<td>4,00,000</td>
</tr>
<tr>
<td>Market value of equity (80%)</td>
<td>16,00,000</td>
</tr>
<tr>
<td>Net operating income</td>
<td>3,60,000</td>
</tr>
<tr>
<td>Interest on debt (8%)</td>
<td>32,000</td>
</tr>
<tr>
<td>Earnings to common</td>
<td>3,28,000</td>
</tr>
</tbody>
</table>

Implied required equity return = \( \frac{3,28,000}{16,00,000} = 20.5\% \)

(ii) It is lower because Beta uses less debt in its capital structure. As the equity capitalisation is a linear function of the debt-to-equity ratio when we use the net operating income approach, the decline in required equity return offsets exactly the disadvantage of not employing so much in the way of “cheaper” debt funds.

**Illustration 14:** Zion Company has earnings before interest and taxes of ₹ 30,00,000 and a 40 per cent tax rate. Its required rate of return on equity in the absence of borrowing is 18 per cent.

(a) In the absence of personal taxes, what is the value of the company in an MM world (i) with no leverage? (ii) with ₹ 40,00,000 in debt? (iii) with ₹ 70,00,000 in debt?

(b) Personal as well as corporate taxes now exist. The marginal personal tax rate on common stock income is 25 per cent, and the marginal personal tax rate on debt income is 30 per cent. Determine the value of the company for each of the three debt alternatives in part (a). Why do your answers differ?

**Solution**

(a) (i) Value if unlevered (in thousands):

<table>
<thead>
<tr>
<th></th>
<th>₹</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBIT</td>
<td>30,00</td>
</tr>
<tr>
<td>Profit before taxes</td>
<td>30,00</td>
</tr>
<tr>
<td>Taxes</td>
<td>12,00</td>
</tr>
<tr>
<td>Profit after taxes</td>
<td>18,00</td>
</tr>
<tr>
<td>( \div ) required equity return</td>
<td>0.18</td>
</tr>
<tr>
<td>Value if unlevered</td>
<td>10,000</td>
</tr>
</tbody>
</table>

© The Institute of Chartered Accountants of India
(ii) Value with ₹ 40,00,000 in debt:
Value = Value if unlevered + Value of tax shield
Value = ₹ 10,000 + 0.40 (₹ 4,000) = ₹ 11,600.

(iii) Value with ₹ 70,00,000 in debt:
Value = ₹ 10,000 + 0.40 (₹ 7,000) = ₹ 12,800.

Due to the tax subsidy, the firm is able to increase its value in a linear manner with more debt.

(b) (i) Value if unlevered (in thousands): the same as before, namely, ₹ 10,000 (₹ 1 crore).

(ii) Value with ₹ 40,00,000 in debt:
Value = ₹ 10,000 + \left[ 1 - \frac{(1-0.40)(1-0.25)}{1-0.30} \right] \cdot ₹ 4,000 = ₹ 11,429

(iii) Value with ₹ 70,00,000 in debt:
Value = ₹ 10,000 + \left[ 1 - \frac{(1-0.40)(1-0.25)}{1-0.30} \right] \cdot ₹ 7,000 = ₹ 12,500

The presence of personal taxes reduces the tax advantage associated with corporate debt. As long as the personal tax on shares income is less than that on debt income, however, the net tax advantage to debt is positive. As a result, the value of the firm rises with more debt, but not as rapidly as if there were no personal taxes or if the personal tax rate on shares and debt income were the same.

### 2.8 Capital Structure and Taxation

The leverage irrelevance theorem of MM is valid if the perfect market assumptions underlying their analysis are satisfied. However, in the face of imperfections characterising the real world capital markets, the capital structure of a firm may affect its valuation.

Presence of taxes is a major imperfection in the real world. This section examines the implications of corporate and personal taxes for the capital structure.

When taxes are applicable to corporate income, debt financing is advantageous. This is because dividends and retained earnings are not deductible for tax purposes; interest on debt is a tax-deductible expense. As a result, the total income available for both stockholders and debt-holders is greater when debt capital is used.

**Illustration 15:** There are two firms Company A and B having net operating income of ₹ 15,00,000 each. Company B is a levered company whereas Company A is all equity company. Debt employed by Company B is of ₹ 7,00,000 @ 11%. The tax rate applicable to both the companies is 25%. Calculate earnings available for equity and debt for both the firms.

**Solution**

Statement of calculation of earnings available to equity holders and debt holders
Financing Decisions 4.55

<table>
<thead>
<tr>
<th></th>
<th>Company</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
</tr>
<tr>
<td>Net operating income</td>
<td>15,00,000</td>
</tr>
<tr>
<td>Less: Interest on Debt (11% of ₹ 7,00,000)</td>
<td>–</td>
</tr>
<tr>
<td>Profit before taxes</td>
<td>15,00,000</td>
</tr>
<tr>
<td>Less: Tax @ 25%</td>
<td>3,75,000</td>
</tr>
<tr>
<td>Profit after tax/Earnings available in equity holders</td>
<td>11,25,000</td>
</tr>
<tr>
<td>Total earnings available to equity holders + Debt holders</td>
<td>11,25,000</td>
</tr>
</tbody>
</table>

As we can see that the earnings in case of Company B is more than the earnings of Company A because of tax shield available to shareholders of Company B due to the presence of debt structure in Company B. The interest is deducted from EBIT without tax deduction at the corporate level; equity holders also get their income after tax deduction due to which income of both the investors increase to the extent of tax saving on the interest paid i.e. tax shield i.e. 25% × 77,000 = 19,250 i.e. difference in the income of two companies’ earnings i.e. 11,44,250 – 11,25,000 = ₹ 19,250.

2.9 Over Capitalization

It is a situation where a firm has more capital than it needs or in other words assets are worth less than its issued share capital, and earnings are insufficient to pay dividend and interest. This situation mainly arises when the existing capital is not effectively utilized on account of fall in earning capacity of the company while company has raised funds more than its requirements. The chief sign of over-capitalisation is the fall in payment of dividend and interest leading to fall in value of the shares of the company.

2.9.1 Causes of Over Capitalization: Over-capitalisation arises due to following reasons:

(i) Raising more money through issue of shares or debentures than company can employ profitably.

(ii) Borrowing huge amount at higher rate than rate at which company can earn.

(iii) Excessive payment for the acquisition of fictitious assets such as goodwill etc.

(iv) Improper provision for depreciation, replacement of assets and distribution of dividends at a higher rate.

(v) Wrong estimation of earnings and capitalization.
2.9.2 Consequences of Over-Capitalisation: Over-capitalisation results in the following consequences:

(i) Considerable reduction in the rate of dividend and interest payments.
(ii) Reduction in the market price of shares.
(iii) Resorting to "window dressing".
(iv) Some companies may opt for reorganization. However, sometimes the matter gets worse and the company may go into liquidation.

2.9.3 Remedies for Over-Capitalisation: Following steps may be adopted to avoid the negative consequences of over-capitalisation:

(i) Company should go for thorough reorganization.
(ii) Buyback of shares.
(iii) Reduction in claims of debenture-holders and creditors.
(iv) Value of shares may also be reduced. This will result in sufficient funds for the company to carry out replacement of assets.

2.10 Under Capitalization

It is just reverse of over-capitalisation. It is a state, when its actual capitalization is lower than its proper capitalization as warranted by its earning capacity.

This situation normally happens with companies which have insufficient capital but large secret reserves in the form of considerable appreciation in the values of the fixed assets not brought into the books.

According to Gerstenberg “A corporation may be under capitalized when the rate of profit is exceptionally high in relation to the return enjoyed by similar situated companies in the same industry.” He adds further that in case of such companies “The assets may be worth more than the values reflected in the books”. Other authors such as Hoagland also confirms this view by defining under capitalisation as “An excess of true asset values over the aggregate of stocks and bonds outstandings”.

2.10.1 Consequences of Under Capitalization: Under-capitalisation results in the following consequences:

(i) The dividend rate will be higher in comparison to similarly situated companies.
(ii) Market value of shares will be higher than value of shares of other similar companies because their earning rate being considerably more than the prevailing rate on such securities.
(iii) Real value of shares will be higher than their book value.
2.10.2 Effects of Under Capitalization: Under-capitalisation has the following effects:

(i) It encourages acute competition. High profitability encourages new entrepreneurs to come into same type of business.

(ii) High rate of dividend encourages the workers’ union to demand high wages.

(iii) Normally common people (consumers) start feeling that they are being exploited.

(iv) Management may resort to manipulation of share values.

(v) Invite more government control and regulation on the company and higher taxation also.

2.10.3 Remedies: Following steps may be adopted to avoid the negative consequences of under capitalization:

(i) The shares of the company should be split up. This will reduce dividend per share, though EPS shall remain unchanged.

(ii) Issue of Bonus Shares is the most appropriate measure as this will reduce both dividend per share and the average rate of earning.

(iii) By revising upward the par value of shares in exchange of the existing shares held by them.

2.10.4 Over Capitalization vis-à-vis Under Capitalization: From the above discussion it can be said that both over capitalization and under capitalisation are not good.

However, over capitalisation is more dangerous to the company, shareholders and the society than under capitalization.

The situation of under capitalization can be handled more easily than the situation of over-capitalisation.

Moreover, under capitalization is not an economic problem but a problem of adjusting capital structure.

Thus, under capitalization should be considered less dangerous but both situations are bad and every company should strive to have a proper capitalization.
UNIT – III : BUSINESS RISK AND FINANCIAL RISK

Learning Objectives
After studying this chapter you will be able to:

- Define, discuss, and quantify “business risk” and “financial risk”.
- Explain in detail operating and financial leverage and identify causes of both.
- Understand how to calculate and interpret a firm’s leverage?
- Calculate a firm’s operating break-even (quantity) point and break-even (sales) point
- Understand what is involved in determining the appropriate amount of financial leverage for a firm?

3.1 Introduction

A firm can finance its operations through common and preference shares, with retained earnings, or with debt. Usually a firm uses a combination of these financing instruments.

Capital structure refers to a firm’s debt-to-equity ratio, which provides insight into how risky a company is. Capital structure decisions by firms will have an effect on the expected profitability of the firm, the risks faced by debt holders and shareholders, the probability of failure, the cost of capital and the market value of the firm.

Risk facing the common shareholders is of two types, namely business risk and financial risk. Therefore, the risk faced by common shareholders is a function of these two risks, i.e. {Business Risk, Financial Risk}

3.1.1 Business Risk and Financial Risk

Business Risk:- It refers to the risk associated with the firm’s operations. It is the uncertainty about the future operating income (EBIT), i.e. how well can the operating incomes be predicted?

Business risk can be measured by the standard deviation of the Basic Earning Power ratio.
Financial Risk:- It refers to the additional risk placed on the firm’s shareholders as a result of debt use i.e. the additional risk a shareholder bears when a company uses debt in addition to equity financing. Companies that issue more debt instruments would have higher financial risk than companies financed mostly or entirely by equity.

Leverage refers to the ability of a firm in employing long term funds having a fixed cost, to enhance returns to the owners. In other words, leverage is the amount of debt that a firm uses to finance its assets. A firm with a lot of debt in its capital structure is said to be highly levered. A firm with no debt is said to be unlevered.

3.2 Debt versus Equity Financing

Financing a business through borrowing is cheaper than using equity. This is because:

- Lenders require a lower rate of return than ordinary shareholders. Debt financial securities present a lower risk than shares for the finance providers because they have prior claims on annual income and liquidation.
- A profitable business effectively pays less for debt capital than equity for another reason: the debt interest can be offset against pre-tax profits before the calculation of the corporate tax, thus reducing the tax paid.
- Issuing and transaction costs associated with raising and servicing debt are generally less than for ordinary shares.

These are some benefits from financing a firm with debt. Still firms tend to avoid very high gearing levels.

One reason is financial distress risk. This could be induced by the requirement to pay interest regardless of the cash flow of the business. If the firm goes through a rough period in its business activities it may have trouble paying its bondholders, bankers and other creditors their entitlement.

The relationship between Expected return (Earnings per share) and the level of gearing can be represented as:

Relationship between leverage and risk
4.60 Financial Management

Leverage can occur in either the operating or financing portions of the income statement. The effect of leverage is to magnify the effects of changes in sales volume on earnings. Let's now discuss in detail Operating, Financing and Combined Leverages.

### 3.3 Types of Leverage

The term Leverage in general refers to a relationship between two interrelated variables. In financial analysis it represents the influence of one financial variable over some other related financial variable. These financial variables may be costs, output, sales revenue, Earnings Before Interest and Tax (EBIT), Earning per share (EPS) etc.

There are three commonly used measures of leverage in financial analysis. These are:

(i) Operating Leverage
(ii) Financial Leverage
(iii) Combined Leverage

#### 3.3.1 Operating Leverage

Operating leverage (OL) maybe defined as the employment of an asset with a fixed cost in the hope that sufficient revenue will be generated to cover all the fixed and variable costs.

The use of assets for which a company pays a fixed cost is called operating leverage.

With fixed costs the percentage change in profits accompanying a change in volume is greater than the percentage change in volume. The higher the turnover of operating assets, the greater will be the revenue in relation to the fixed charge on those assets.

Operating leverage is a function of three factors:

(i) Rupee amount of fixed cost,
(ii) Variable contribution margin, and
(iii) Volume of sales.
Operating leverage is the ratio of net operating income before fixed charges to net operating income after fixed charges. Degree of operating leverage is equal to the percentage increase in the net operating income to the percentage increase in the output.

\[
OL = \frac{N(P - V)}{N(P - V) - F}
\]

Where,
- \( OL \) = Operating leverage
- \( N \) = Number of units sold
- \( P \) = Selling price per unit
- \( V \) = Variable cost per unit
- \( F \) = Fixed cost

Degree of operating leverage = \( \frac{\text{Percentage increase in net operating income}}{\text{Percentage increase in output}} \)

Operating leverage is directly proportional to business risk. More operating leverage leads to more business risk, for then a small sales decline causes a big profit. This can be illustrated graphically as:

**Illustration 1:** A Company produces and sells 10,000 shirts. The selling price per shirt is ₹500. Variable cost is ₹200 per shirt and fixed operating cost is ₹25,00,000.

(a) Calculate operating leverage.
(b) If sales are up by 10%, then what is the impact on EBIT?
Solution

(a) Statement of Profitability

<table>
<thead>
<tr>
<th></th>
<th>₹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales Revenue ((10,000 \times 500))</td>
<td>5,00,000</td>
</tr>
<tr>
<td>Less: Variable Cost ((10,000 \times 200))</td>
<td>2,00,000</td>
</tr>
<tr>
<td>Contribution</td>
<td>3,00,000</td>
</tr>
<tr>
<td>Less: Fixed Cost</td>
<td>2,50,000</td>
</tr>
<tr>
<td>EBIT</td>
<td>5,00,000</td>
</tr>
</tbody>
</table>

\[
\text{Operating Leverage} = \frac{\text{Contribution}}{\text{EBIT}} = \frac{30 \text{lakhs}}{5 \text{lakhs}} = 6 \text{ times}
\]

\[
\text{OL} = \frac{\% \Delta \text{ in EBIT}}{\% \Delta \text{ in sales}} \times \frac{x}{5,000,000}
\]

\[
x = 3,00,000
\]

\[
\therefore \Delta \text{EBIT} = \frac{3,00,000}{5,00,000} = 60\%
\]

Illustration 2: Calculate the operating leverage for each of the four firms A, B, C and D from the following price and cost data:

<table>
<thead>
<tr>
<th>Firms</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sale price per unit</td>
<td>₹ 20</td>
<td>₹ 32</td>
<td>₹ 50</td>
<td>₹ 70</td>
</tr>
<tr>
<td>Variable cost per unit</td>
<td>₹ 6</td>
<td>₹ 16</td>
<td>₹ 20</td>
<td>₹ 50</td>
</tr>
<tr>
<td>Fixed operating cost</td>
<td>₹ 80,000</td>
<td>₹ 40,000</td>
<td>₹ 2,00,000</td>
<td>₹ Nil</td>
</tr>
</tbody>
</table>

What calculations can you draw with respect to levels of fixed cost and the degree of operating leverage result? Explain. Assume number of units sold is 5,000.

Solution

<table>
<thead>
<tr>
<th>Firms</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales (units)</td>
<td>5,000</td>
<td>5,000</td>
<td>5,000</td>
<td>5,000</td>
</tr>
<tr>
<td>Sales revenue (Units x price) (₹)</td>
<td>1,00,000</td>
<td>1,60,000</td>
<td>2,50,000</td>
<td>3,50,000</td>
</tr>
<tr>
<td>Less: Variable cost</td>
<td>30,000</td>
<td>80,000</td>
<td>1,00,000</td>
<td>2,50,000</td>
</tr>
</tbody>
</table>
Financing Decisions

(Units × variable cost per unit) (₹)

<table>
<thead>
<tr>
<th>EBIT</th>
<th>80,000</th>
<th>40,000</th>
<th>2,00,000</th>
<th>1,00,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less: Fixed operating costs (₹)</td>
<td>(10,000)</td>
<td>40,000</td>
<td>(50,000)</td>
<td>Nil</td>
</tr>
</tbody>
</table>

EBIT (10,000) 40,000 (50,000) 1,00,000

DOL = \frac{Current\ sales (S) - Variable\ costs\ (VC)}{Current\ EBIT}

DOL\_{(A)} = \frac{र 1,00,000 - र 30,000}{र 10,000} = 7

DOL\_{(B)} = \frac{र 1,60,000 - र 80,000}{र 40,000} = 2

DOL\_{(C)} = \frac{र 2,50,000 - र 1,00,000}{र 50,000} = 3

DOL\_{(D)} = \frac{र 3,50,000 - र 2,50,000}{र 1,00,000} = 1

The operating leverage exists only when there are fixed costs. In the case of firm D, there is no magnified effect on the EBIT due to change in sales. A 20 per cent increase in sales has resulted in a 20 per cent increase in EBIT. In the case of other firms, operating leverage exists. It is maximum in firm A, followed by firm C and minimum in firm B. The interception of DOL of 7 is that 1 per cent change in sales results in 7 per cent change in EBIT level in the direction of the change of sales level of firm A.

3.3.2 Financial Leverage: Financial leverage (FL) maybe defined as ‘the use of funds with a fixed cost in order to increase earnings per share.’ In other words, it is the use of company funds on which it pays a limited return. Financial leverage involves the use of funds obtained at a fixed cost in the hope of increasing the return to common stockholders.

Degree of financial leverage is the ratio of the percentage increase in earning per share (EPS) to the percentage increase in earnings before interest and taxes (EBIT).

\[ FL = \frac{\frac{\text{Percentage increase in earnings before interest and tax (EBIT)}}{\text{Percentage increase in earning per share (EPS)}}}{Y} = \frac{Y}{Y - I} \]

Or, \[ FL = \frac{\frac{\text{EBIT}}{\text{EBIT} - \text{Interest}}}{\text{EBIT}} = \frac{Y}{Y - I} \]

Where,

Y = EBIT at a point for which the degree of financial leverage is being calculated

I = Amount of interest charges
Illustration 3: Suppose there are two firms with the same operating leverage, business risk, and probability distribution of EBIT and only differ with respect to their use of debt (capital structure).

<table>
<thead>
<tr>
<th>Firm U</th>
<th>Firm L</th>
</tr>
</thead>
<tbody>
<tr>
<td>No debt</td>
<td>₹ 10,000 of 12% debt</td>
</tr>
<tr>
<td>₹ 20,000 in assets</td>
<td>₹ 20,000 in assets</td>
</tr>
<tr>
<td>40% tax rate</td>
<td>40% tax rate</td>
</tr>
</tbody>
</table>

**Firm U: Unleveraged**

<table>
<thead>
<tr>
<th>Economy</th>
<th>Bad</th>
<th>Avg.</th>
<th>Good</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probability</td>
<td>0.25</td>
<td>0.50</td>
<td>0.25</td>
</tr>
<tr>
<td>EBIT</td>
<td>₹ 2,000</td>
<td>₹ 3,000</td>
<td>₹ 4,000</td>
</tr>
<tr>
<td>Interest</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>EBIT</td>
<td>₹ 2,000</td>
<td>₹ 3,000</td>
<td>₹ 4,000</td>
</tr>
<tr>
<td>Taxes (40%)</td>
<td>800</td>
<td>1,200</td>
<td>1,600</td>
</tr>
<tr>
<td>NI</td>
<td>₹ 1,200</td>
<td>₹ 1,800</td>
<td>₹ 2,400</td>
</tr>
</tbody>
</table>

**Firm L: Leveraged**

<table>
<thead>
<tr>
<th>Economy</th>
<th>Bad</th>
<th>Avg.</th>
<th>Good</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probability</td>
<td>0.25</td>
<td>0.50</td>
<td>0.25</td>
</tr>
<tr>
<td>EBIT</td>
<td>₹ 2,000</td>
<td>₹ 3,000</td>
<td>₹ 4,000</td>
</tr>
<tr>
<td>Interest</td>
<td>1,200</td>
<td>1,200</td>
<td>1,200</td>
</tr>
<tr>
<td>EBIT</td>
<td>₹ 800</td>
<td>₹ 1,800</td>
<td>₹ 2,800</td>
</tr>
<tr>
<td>Taxes (40%)</td>
<td>320</td>
<td>720</td>
<td>1,120</td>
</tr>
<tr>
<td>NI</td>
<td>₹ 480</td>
<td>₹ 1,080</td>
<td>₹ 1,680</td>
</tr>
</tbody>
</table>

*Same as for Firm U.

**Ratio comparison between leveraged and unleveraged firms**

<table>
<thead>
<tr>
<th>FIRM U</th>
<th>BAD</th>
<th>AVG.</th>
<th>GOOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>BEP(=EBIT/TOTAL ASSETS)</td>
<td>10.0%</td>
<td>15.0%</td>
<td>20.0%</td>
</tr>
<tr>
<td>ROE(=PAT/NETWORTH)</td>
<td>6.0%</td>
<td>9.0%</td>
<td>12.0%</td>
</tr>
<tr>
<td>TIE(INTEREST COVERAGE RATIO (=EBIT/INTEREST)</td>
<td>∞</td>
<td>∞</td>
<td>∞</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>FIRM L</th>
<th>Bad</th>
<th>Avg.</th>
<th>Good</th>
</tr>
</thead>
<tbody>
<tr>
<td>BEP</td>
<td>10.0%</td>
<td>15.0%</td>
<td>20.0%</td>
</tr>
<tr>
<td>ROE</td>
<td>4.8%</td>
<td>10.8%</td>
<td>16.8%</td>
</tr>
<tr>
<td>TIE</td>
<td>1.67%</td>
<td>2.50%</td>
<td>3.30%</td>
</tr>
</tbody>
</table>

Risk and return for leveraged and unleveraged firms

Expected Values:

<table>
<thead>
<tr>
<th></th>
<th>Firm U</th>
<th>Firm L</th>
</tr>
</thead>
<tbody>
<tr>
<td>E(BEP)</td>
<td>15.0%</td>
<td>15.0%</td>
</tr>
<tr>
<td>E(ROE)</td>
<td>9.0%</td>
<td>10.8%</td>
</tr>
<tr>
<td>E(TIE)</td>
<td>∞</td>
<td>2.5x</td>
</tr>
</tbody>
</table>

Risk Measures:

<table>
<thead>
<tr>
<th></th>
<th>Firm U</th>
<th>Firm L</th>
</tr>
</thead>
<tbody>
<tr>
<td>σ₉ ROE</td>
<td>2.12%</td>
<td>4.24%</td>
</tr>
<tr>
<td>CV ROE</td>
<td>0.24</td>
<td>0.39</td>
</tr>
</tbody>
</table>

Thus, the effect of leverage on profitability and debt coverage can be seen from the above example. For leverage to raise expected ROE, BEP must be greater than kd i.e. BEP > kd because if kd > BEP, then the interest expense will be higher than the operating income produced by debt-financed assets, so leverage will depress income. As debt increases, TIE decreases because EBIT is unaffected by debt, and interest expense increases (Int Exp = kdD).

Thus, it can be concluded that the basic earning power (BEP) is unaffected by financial leverage. Firm L has higher expected ROE because BEP > kd and it has much wider ROE (and EPS) swings because of fixed interest charges. Its higher expected return is accompanied by higher risk.

3.3.3 Degree of Combined Leverage: Combined leverage maybe defined as the potential use of fixed costs, both operating and financial, which magnifies the effect of sales volume change on the earning per share of the firm.

Degree of combined leverage (DCL) is the ratio of percentage change in earning per share to the percentage change in sales. It indicates the effect the sales changes will have on EPS.

Degree of combined leverage = Degree of operating leverage × Degree of financial leverage

DCL = DOL × DFL

Where,

DCL = Degree of combined leverage
DOL = Degree of operating leverage
DFL = Degree of financial leverage
Illustration 4: A firm’s details are as under:

Sales (@100 per unit) ₹ 24,00,000
Variable Cost 50%
Fixed Cost ₹ 10,00,000

It has borrowed ₹ 10,00,000 @ 10% p.a. and its equity share capital is ₹ 10,00,000 (₹ 100 each)

Calculate:

(a) Operating Leverage

(b) Financial Leverage

(c) Combined Leverage

(d) Return on Investment

(e) If the sales increases by ₹ 6,00,000; what will the new EBIT?

Solution

<table>
<thead>
<tr>
<th>Description</th>
<th>₹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales</td>
<td>24,00,000</td>
</tr>
<tr>
<td>Less: Variable cost</td>
<td>12,00,000</td>
</tr>
<tr>
<td>Contribution</td>
<td>12,00,000</td>
</tr>
<tr>
<td>Less: Fixed cost</td>
<td>10,00,000</td>
</tr>
<tr>
<td>EBIT</td>
<td>2,00,000</td>
</tr>
<tr>
<td>Less: Interest</td>
<td>1,00,000</td>
</tr>
<tr>
<td>EBT</td>
<td>1,00,000</td>
</tr>
<tr>
<td>Less: Tax (50%)</td>
<td>50,000</td>
</tr>
<tr>
<td>EAT</td>
<td>50,000</td>
</tr>
<tr>
<td>No. of equity shares</td>
<td>10,000</td>
</tr>
<tr>
<td>EPS</td>
<td>5</td>
</tr>
</tbody>
</table>

(a) Operating Leverage = \( \frac{12,00,000}{2,00,000} = 6 \) times

(b) Financial Leverage = \( \frac{2,00,000}{1,00,000} = 2 \) times

(c) Combined Leverage = \( \text{OL} \times \text{FL} = 6 \times 2 = 12 \) times.
(d) R.O.I = \frac{50,000}{10,00,000} \times 100 = 5% \\
(e) Operating Leverage = 6 \\
\[ 6 = \frac{\Delta \text{EBIT}}{0.25} \]
\[ \Delta \text{EBIT} = \frac{6 \times 1}{4} = 1.5 \]
Increase in EBIT = ₹ 2,00,000 \times 1.5 = ₹ 3,00,000  
New EBIT = 5,00,000 

Illustration 5: Betatronics Ltd. has the following balance sheet and income statement information:

**Balance Sheet as on March 31st**

<table>
<thead>
<tr>
<th>Liabilities</th>
<th>(₹)</th>
<th>Assets</th>
<th>(₹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equity capital (₹ 10 per share)</td>
<td>8,00,000</td>
<td>Net fixed assets</td>
<td>10,00,000</td>
</tr>
<tr>
<td>10% Debt</td>
<td>6,00,000</td>
<td>Current assets</td>
<td>9,00,000</td>
</tr>
<tr>
<td>Retained earnings</td>
<td>3,50,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current liabilities</td>
<td>1,50,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>19,00,000</td>
<td></td>
<td>19,00,000</td>
</tr>
</tbody>
</table>

**Income Statement for the year ending March 31**

<table>
<thead>
<tr>
<th></th>
<th>(₹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales</td>
<td>3,40,000</td>
</tr>
<tr>
<td>Operating expenses (including ₹ 60,000 depreciation)</td>
<td>1,20,000</td>
</tr>
<tr>
<td>EBIT</td>
<td>2,20,000</td>
</tr>
<tr>
<td>Less: Interest</td>
<td>60,000</td>
</tr>
<tr>
<td>Earnings before tax</td>
<td>1,60,000</td>
</tr>
<tr>
<td>Less: Taxes</td>
<td>56,000</td>
</tr>
<tr>
<td>Net Earnings (EAT)</td>
<td>1,04,000</td>
</tr>
</tbody>
</table>

(a) Determine the degree of operating, financial and combined leverages at the current sales level, if all operating expenses, other than depreciation, are variable costs.

(b) If total assets remain at the same level, but sales (i) increase by 20 percent and (ii) decrease by 20 percent, what will be the earnings per share at the new sales level?
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Solution

(a) Calculation of Degree of Operating (DOL), Financial (DFL) and Combined leverages (DCL).

\[
\text{DOL} = \frac{3,40,000 - 60,000}{2,20,000} = 1.27
\]

\[
\text{DFL} = \frac{2,20,000}{1,60,000} = 1.38
\]

\[
\text{DCL} = \text{DOL} \times \text{DFL} = 1.27 \times 1.38 = 1.75
\]

(b) Earnings per share at the new sales level

<table>
<thead>
<tr>
<th></th>
<th>Increase by 20%</th>
<th>Decrease by 20%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales level</td>
<td>4,08,000</td>
<td>2,72,000</td>
</tr>
<tr>
<td>Less: Variable expenses</td>
<td>72,000</td>
<td>48,000</td>
</tr>
<tr>
<td>Less: Fixed cost</td>
<td>60,000</td>
<td>60,000</td>
</tr>
<tr>
<td>Earnings before interest and taxes</td>
<td>2,76,000</td>
<td>1,64,000</td>
</tr>
<tr>
<td>Less: Interest</td>
<td>60,000</td>
<td>60,000</td>
</tr>
<tr>
<td>Earnings before taxes</td>
<td>2,16,000</td>
<td>1,04,000</td>
</tr>
<tr>
<td>Less: Taxes</td>
<td>75,600</td>
<td>36,400</td>
</tr>
<tr>
<td>Earnings after taxes (EAT)</td>
<td>1,40,400</td>
<td>67,600</td>
</tr>
<tr>
<td>Number of equity shares</td>
<td>80,000</td>
<td>80,000</td>
</tr>
<tr>
<td>EPS</td>
<td>1.76</td>
<td>0.85</td>
</tr>
</tbody>
</table>

Working Notes:

(i) Variable Costs = ₹ 60,000 (total cost – depreciation)

(ii) Variable Costs at:

(a) Sales level, ₹ 4,08,000 = ₹ 72,000 (increase by 20%)

(b) Sales level, ₹ 2,72,000 = ₹ 48,000 (decrease by 20%)

Illustration 6: Calculate the operating leverage, financial leverage and combined leverage from the following data under Situation I and II and Financial Plan A and B:

<table>
<thead>
<tr>
<th>Installed Capacity</th>
<th>4,000 units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual Production and Sales</td>
<td>75% of the Capacity</td>
</tr>
<tr>
<td>Selling Price</td>
<td>₹ 30 Per Unit</td>
</tr>
<tr>
<td>Variable Cost</td>
<td>₹ 15 Per Unit</td>
</tr>
</tbody>
</table>
Financing Decisions

Fixed Cost:

<table>
<thead>
<tr>
<th>Situation</th>
<th>₹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under Situation I</td>
<td>15,000</td>
</tr>
<tr>
<td>Under Situation II</td>
<td>20,000</td>
</tr>
</tbody>
</table>

Capital Structure:

<table>
<thead>
<tr>
<th>Financial Plan</th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equity</td>
<td>10,000</td>
<td>15,000</td>
</tr>
<tr>
<td>Debt (Rate of Interest at 20%)</td>
<td>10,000</td>
<td>5,000</td>
</tr>
</tbody>
</table>

Solution

<table>
<thead>
<tr>
<th>Operating Leverage:</th>
<th>Situation—I</th>
<th>Situation—II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales (s)</td>
<td>₹ 90,000</td>
<td>₹ 90,000</td>
</tr>
<tr>
<td>3000 units @ ₹ 30/- per unit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less: Variable Cost (VC) @ ₹ 15 per unit</td>
<td>₹ 45,000</td>
<td>₹ 45,000</td>
</tr>
<tr>
<td>Contribution (C)</td>
<td>₹ 45,000</td>
<td>₹ 45,000</td>
</tr>
<tr>
<td>Less: Fixed Cost (FC)</td>
<td>₹ 15,000</td>
<td>₹ 20,000</td>
</tr>
<tr>
<td>Operating Profit (OP)</td>
<td>₹ 30,000</td>
<td>₹ 25,000</td>
</tr>
<tr>
<td>(EBIT)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(i) Operating Leverage

\[
\frac{C}{OP} = \frac{₹ 45,000}{₹ 30,000} = 1.5
\]

(ii) Financial Leverages

<table>
<thead>
<tr>
<th>Situation 1</th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Profit (EBIT)</td>
<td>₹ 30,000</td>
<td>₹ 30,000</td>
</tr>
<tr>
<td>Less: Interest on debt</td>
<td>₹ 2,000</td>
<td>₹ 1,000</td>
</tr>
<tr>
<td>PBT</td>
<td>₹ 28,000</td>
<td>₹ 29,000</td>
</tr>
</tbody>
</table>

Financial Leverage = \[
\frac{OP}{PBT} = \frac{₹ 30,000}{₹ 28,000} = 1.07 \quad \frac{₹ 30,000}{₹ 24,000} = 1.04
\]
### 4.70 Financial Management

<table>
<thead>
<tr>
<th></th>
<th>A (₹)</th>
<th>B (₹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Situation-II</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating Profit (OP) (EBIT)</td>
<td>25,000</td>
<td>25,000</td>
</tr>
<tr>
<td>Less: Interest on debt</td>
<td>2,000</td>
<td>1,000</td>
</tr>
<tr>
<td>PBT</td>
<td>23,000</td>
<td>24,000</td>
</tr>
</tbody>
</table>

Financial Leverage = \( \frac{\text{OP}}{\text{PBT}} = \frac{25,000}{23,000} = 1.09 \) \( \frac{25,000}{24,000} = 1.04 \)

(iii) Combined Leverages

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Situation I</td>
<td>1.5 x 1.07 = 1.61</td>
<td>1.5 x 1.04 = 1.56</td>
</tr>
<tr>
<td>(b) Situation II</td>
<td>1.8 x 1.09 = 1.96</td>
<td>1.8 x 1.04 = 1.87</td>
</tr>
</tbody>
</table>

### SUMMARY

1. **Cost of Capital**: In simple terms, Cost of capital refers to the **discount rate** that is used in determining the present value of the estimated future cash proceeds of the business/new project and eventually deciding whether the business/new project is worth undertaking or not. It is also the **minimum rate of return** that a firm must earn on its investment which will maintain the market value of share at its current level. It can also be stated as the **opportunity cost** of an investment, i.e. the rate of return that a company would otherwise be able to earn at the same risk level as the investment that has been selected.

2. **Components of Cost of Capital**: In order to calculate the specific cost of each type of capital, recognition should be given to the explicit and the implicit cost. The cost of capital can be either explicit or implicit. The **explicit cost** of any source of capital may be defined as the discount rate that equals that present value of the cash inflows that are incremental to the taking of financing opportunity with the present value of its incremental cash outflows. The **implicit cost** is the rate of return associated with the best investment opportunity for the firm and its shareholders that will be foregone if the project presently under consideration by the firm was accepted.

3. **Measurement of Specific Cost of Capital for each source of Capital**: The first step in the measurement of the cost of the capital of the firm is the calculation of the cost of individual sources of raising funds. From the viewpoint of capital budgeting decisions, the long-term sources of funds are relevant as they constitute the major sources of financing the fixed assets. In calculating the cost of capital, therefore the focus on long-term funds...
and which are:-

- Long term debt (including Debentures)
- Preference Shares
- Equity Capital
- Retained Earnings

4. **Weighted Average Cost of Capital**: WACC (weighted average cost of capital) represents the investors’ opportunity cost of taking on the risk of putting money into a company. Since every company has a capital structure i.e. what percentage of funds comes from retained earnings, equity shares, preference shares, debt and bonds, so by taking a weighted average, it can be seen how much cost/interest the company has to pay for every rupee it borrows/invest. This is the weighted average cost of capital.

5. **Capital Structure and Its Factors**: Capital structure refers to the mix of a firm’s capitalisation (i.e. mix of long term sources of funds such as debentures, preference share capital, equity share capital and retained earnings for meeting total capital requirement). Capital Structure decision refers to deciding the forms of financing (which sources to be tapped), their actual requirements (amount to be funded) and their relative proportions (mix) in total capitalisation. Normally a finance manager tries to choose a pattern of capital structure which minimises cost of capital and maximises the owners’ return. Well, while choosing a suitable financing pattern, certain factors like cost, risk, control, flexibility and other considerations like nature of industry, competition in the industry etc. should be considered. For e.g. Industries facing severe competition also resort to more equity than debt.

6. **Leverage (Operating and Financial)**: Operating leverage exists when a firm has a fixed cost that must be defrayed regardless of volume of business. It can be defined as the firm’s ability to use fixed operating costs to magnify the effects of changes in sales on its earnings before interest and taxes. Financial leverage involves the use fixed cost of financing and refers to mix of debt and equity in the capitalisation of a firm. Financial leverage is a superstructure built on the operating leverage. It results from the presence of fixed financial charges in the firm’s income stream.

7. **Combined Leverage**: Combined leverage maybe defined as the potential use of fixed costs, both operating and financial, which magnifies the effect of sales volume change on the earning per share of the firm. Degree of combined leverage (DCL) is the ratio of percentage change in earning per share to the percentage change in sales. It indicates the effect the sales changes will have on EPS.

8. **Optimal Capital Structure (EBIT-EPS Analysis)**: The basic objective of financial management is to design an appropriate capital structure which can provide the highest earnings per share (EPS) over the firm’s expected range of earnings before interest and taxes (EBIT). PS measures a firm’s performance for the investors. The level of EBIT varies from year to year and represents the success of a firm’s operations. EBIT-EPS
Financial Management

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Analysis is a vital tool for designing the optimal capital structure of a firm. The objective of this analysis is to find the EBIT level that will equate EPS regardless of the financing plan chosen.

9. **Capital Structure Theories**: The following approaches explain the relationship between cost of capital, capital structure and value of the firm:

   a. Net income approach
   b. Net operating income approach
   c. Modigliani-Miller approach
   d. Traditional approach.