

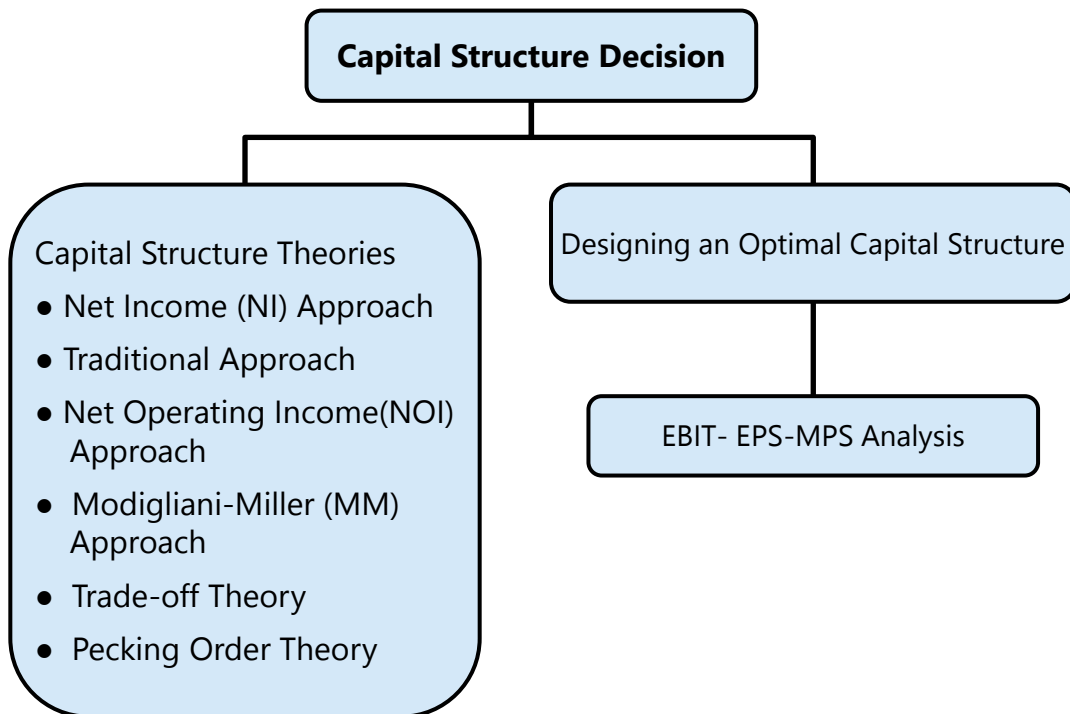
# FINANCING DECISIONS- CAPITAL STRUCTURE



## LEARNING OUTCOMES

After studying this chapter, you would be able to -

- ◆ State the meaning and significance of Capital Structure.
- ◆ Discuss the various capital structure theories i.e., Net Income (NI) Approach, Traditional Approach, Net Operating Income (NOI) Approach, Modigliani and Miller (MM) Approach, Trade- off Theory and Pecking Order Theory.
- ◆ Describe concepts and factors for designing an optimal capital structure.
- ◆ Discuss essential features of capital structure of an entity.
- ◆ Discuss optimal capital structure.
- ◆ Analyse the relationship between the performance of a company and its impact on the earnings of the shareholders i.e., EBIT-EPS-MPS analysis.
- ◆ Discuss the meaning, causes and consequences of over and under capitalisation to an entity.

**CHAPTER OVERVIEW****1. MEANING OF CAPITAL STRUCTURE**

Capital structure is the combination of capitals from different sources of finance. The capital of a company consists of equity share holders' fund, preference share capital and long term external debts. The source and quantum of capital is decided keeping in mind the following factors:

- i. **Control:** Capital structure should be designed in such a manner that existing shareholders continue to hold majority stake.
- ii. **Risk:** Capital structure should be designed in such a manner that financial risk of a company does not increase beyond tolerable limit.
- iii. **Cost:** Overall cost of capital remains minimum.

Practically, it is difficult to achieve all of the above three goals together, hence, a finance manager has to make a balance among these three objectives.

However, the objective of a company is to maximise the value of the company and it is prime objective while deciding the optimal capital structure. 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.

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

$$K_o = (\text{Cost of debt} \times \text{weight of debt}) + (\text{Cost of equity} \times \text{weight of equity})$$

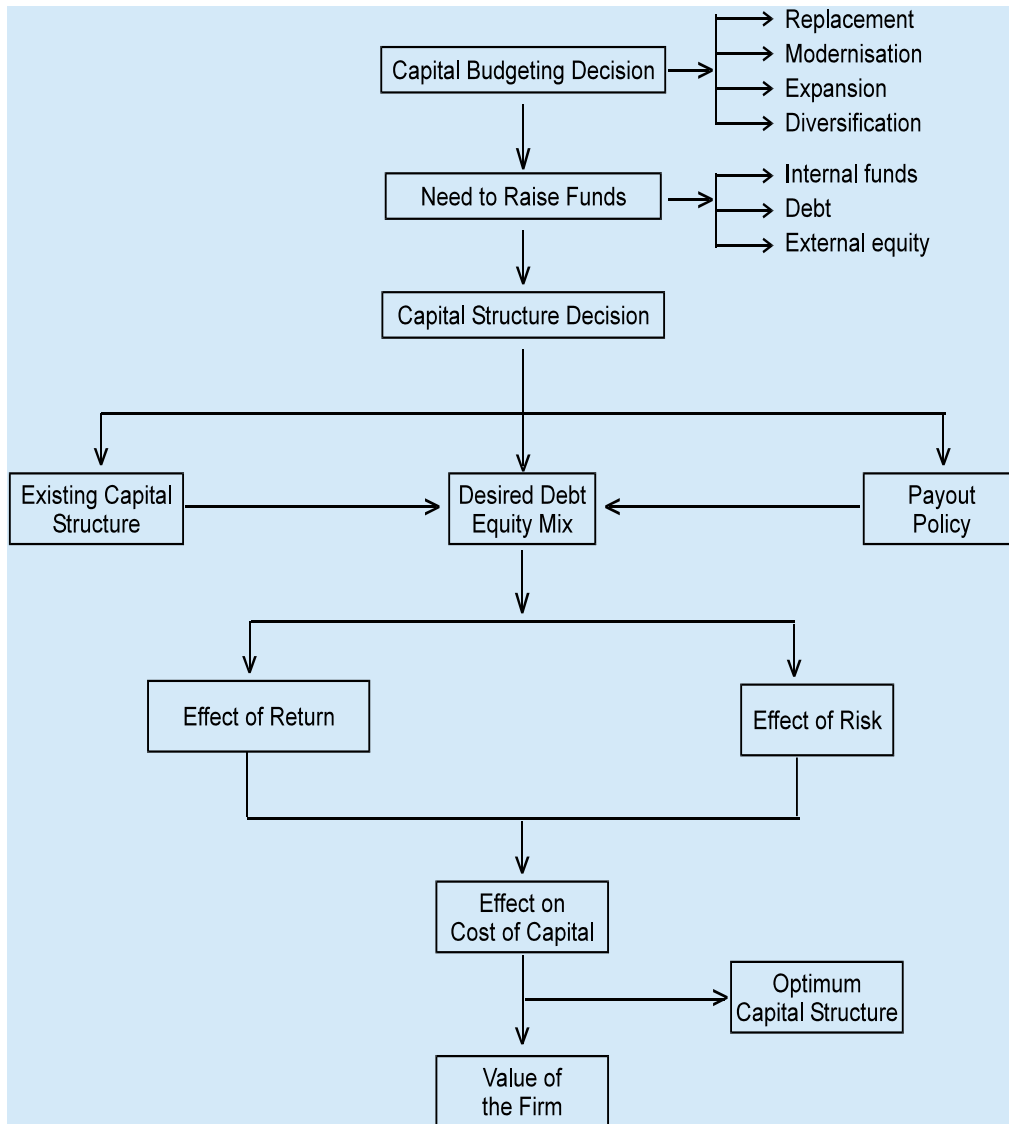
$$K_o = \{[K_d \times D / (D+S)] + [K_e \times S / (D+S)]\}$$

Where:

- ◆  $K_o$  is the weighted average cost of capital (WACC)
- ◆  $K_d$  is the cost of debt
- ◆  $D$  is the market value of debt
- ◆  $S$  is the market value of equity
- ◆  $K_e$  is the cost of equity

Capital structure decision will decide weight of debt and equity and ultimately overall cost of capital as well as Value of the firm. So capital structure is relevant in maximizing value of the firm and minimizing overall cost of capital.

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.

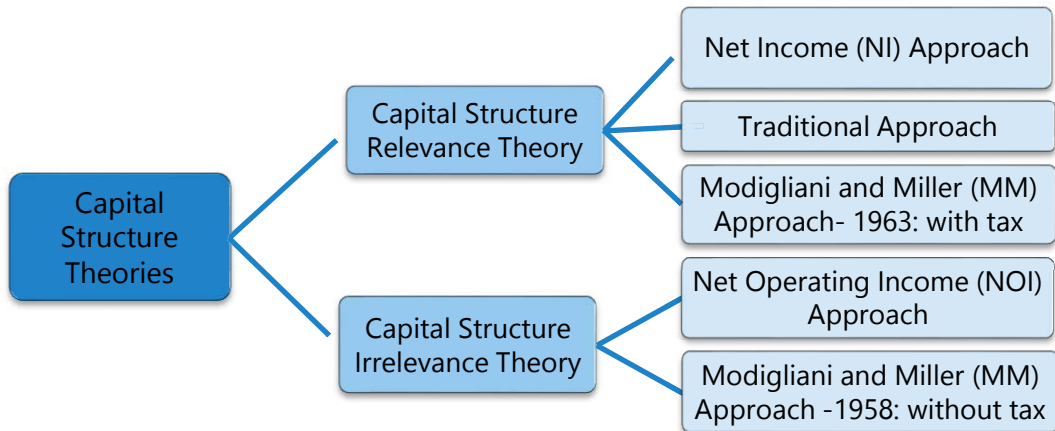


Financing Decision Process



## 2. CAPITAL STRUCTURE THEORIES

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



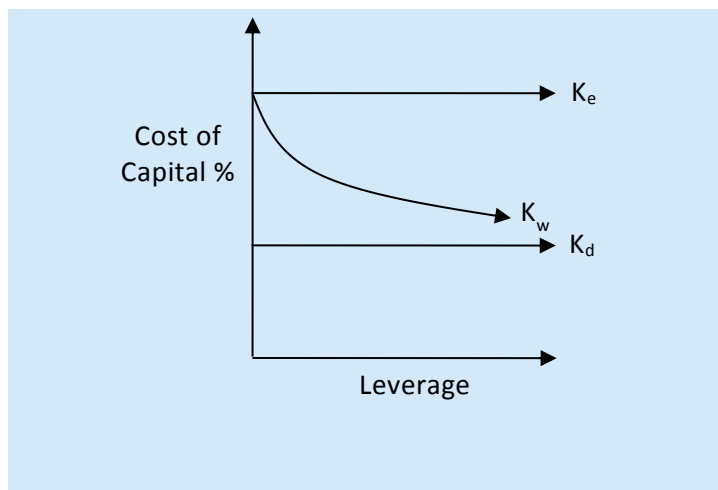
- (a) Net Income (NI) approach
- (b) Traditional approach.
- (c) Net Operating Income (NOI) approach
- (d) Modigliani-Miller (MM) approach

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.
- ◆ The total assets of the firm are given. The degree of leverage can be changed by selling debt to purchase shares or selling shares to retire debt.
- ◆ Taxes are not considered.
- ◆ The dividend payout ratio is 100%.
- ◆ The firm's total financing remains constant.
- ◆ Business risk is constant over time.
- ◆ The firm has perpetual life.

## 2.1 Net Income (NI) Approach

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 (WACC), 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.



Where,  $K_e$  is Cost of Equity,  $K_w$  is Weighted Average Cost of Capital and  $K_d$  is Cost of Debt.

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 (WACC) to decrease.

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

$$\text{Value of Firm (V)} = S + D$$

Where,

$V$  = Value of the firm

$S$  = Market value of equity

$D$  = Market value of debt

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

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 (WACC) 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 1

*Rupa Ltd.'s EBIT is ₹ 5,00,000. The company has 10%, ₹ 20 lakh debentures. The equity capitalization rate ( $K_e$ ) 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 Market value of equity and value of firm**

	₹
EBIT	5,00,000
Less: Interest on debentures (10% of ₹ 20,00,000)	(2,00,000)
Earnings available for equity holders i.e. Net Income (NI)	3,00,000

Equity capitalization rate ( $K_e$ )	16%
Market value of equity ( $S$ ) = $\frac{NI}{K_e} = \left( \frac{3,00,000}{16} \times 100 \right)$	18,75,000
Market value of debt ( $D$ )	20,00,000
Total value of firm $V = S + D$	38,75,000

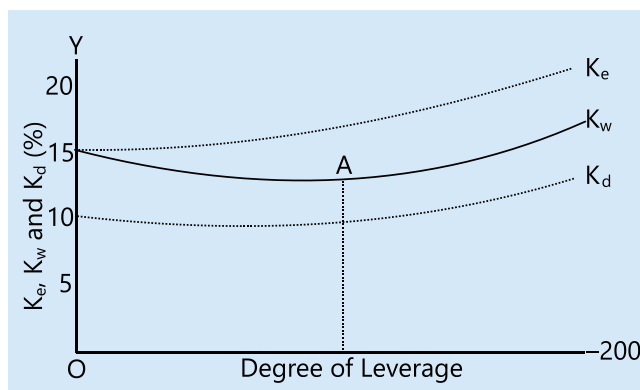
(ii) Overall cost of capital =  $\frac{\text{EBIT}}{\text{Value of firm}} = \frac{\text{₹ } 5,00,000}{\text{₹ } 38,75,000} = 12.90\%$

## 2.2 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 emerges. 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.

Under this approach:

- The rate of interest on debt remains constant for a certain period and thereafter with an increase in leverage, it increases.
- The expected rate by equity shareholders remains constant or increase gradually. After that, the equity shareholders starts perceiving a financial risk and then from the optimal point, the expected rate increases speedily.
- As a result of the activity of rate of interest and expected rate of return, the WACC first decreases and then increases. The lowest point on the curve is optimal capital structure.





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 Highlight of Traditional Approach

The firm should strive to reach the optimal capital structure and its total valuation through a judicious use of both the 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.

### ILLUSTRATION 2

*Indra Ltd. has an EBIT of ₹ 1,00,000. The company makes use of both the 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) Total value of the firm
- (ii) Overall cost of capital.

### SOLUTION

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

	₹
EBIT	1,00,000
Less: Interest (@10% on ₹ 5,00,000)	50,000
Earnings available for equity holders	50,000
Equity capitalization rate i.e. $K_e$	15%

$$\begin{aligned}
 \text{Value of equity (S)} &= \frac{\text{Earnings available for equity holders}}{K_e} \\
 &= \frac{₹50,000}{0.15} = ₹ 3,33,333
 \end{aligned}$$

Value of Debt (D) (given) ₹ 5,00,000

Total value of the firm (V) = D + S (5,00,000 + 3,33,333) ₹ 8,33,333

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

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

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

$$\text{Or, } K_o = \frac{\text{EBIT}}{V} = \frac{₹1,00,000}{₹8,33,333} = 12.00\%$$

### ILLUSTRATION 3

DETERMINE the optimal capital structure of a company from the following information:

Options	Cost of Debt ( $K_d$ ) in %	Cost of Equity ( $K_e$ ) in %	Percentage of Debt on total value (Debt + Equity)
1	11.0	13.0	0.0
2	11.0	13.0	0.1
3	11.6	14.0	0.2
4	12.0	15.0	0.3
5	13.0	16.0	0.4
6	15.0	18.0	0.5
7	18.0	20.0	0.6

### SOLUTION

Note that the ratio given in this question is not debt to equity ratio. Rather it is the debt to total value ratio. Therefore, if the ratio is 0.6, it means that capital employed comprises 60% debt and 40% equity.

$$K_o = \frac{K_d \times D + K_e \times S}{D + S}$$

In this question total of weight is equal to 1 in all cases, hence we need not to divide by it.

$$1) \quad K_0 = 11\% \times 0 + 13\% \times 1 = 13.00\%$$

$$2) \quad K_0 = 11\% \times 0.1 + 13\% \times 0.9 = 12.80\%$$

$$3) \quad K_0 = 11.6\% \times 0.2 + 14\% \times 0.8 = 13.52\%$$

$$4) \quad K_0 = 12\% \times 0.3 + 15\% \times 0.7 = 14.10\%$$

$$5) \quad K_0 = 13\% \times 0.4 + 16\% \times 0.6 = 14.80\%$$

$$6) \quad K_0 = 15\% \times 0.5 + 18\% \times 0.5 = 16.50\%$$

$$7) \quad K_0 = 18\% \times 0.6 + 20\% \times 0.4 = 18.80\%$$

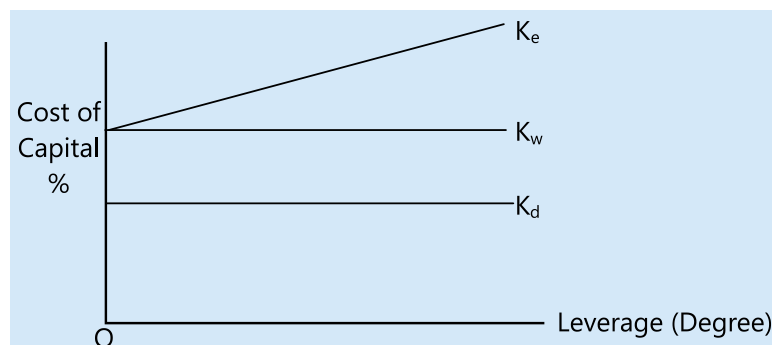
Decision: 2<sup>nd</sup> option is the best because it has lowest WACC.

### 2.3 Net Operating Income (NOI) Approach

NOI means Earnings before interest and tax (EBIT). 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  $K_w$  (Weighted Average Cost of Capital) and  $K_d$  (debt capitalisation rate) are constant and  $K_e$  (Cost of equity) increases with leverage.

#### ILLUSTRATION 4

*Amita Ltd.'s operating income (EBIT) 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 CALCULATE:*

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

#### SOLUTION

##### (i) Statement showing total value of the firm

	₹
Net operating income (EBIT)	5,00,000
Less: Interest on debentures (10% of ₹ 15,00,000)	(1,50,000)
Earnings available for equity holders	3,50,000
Total cost of capital ( $K_0$ ) (given)	15%
Value of the firm ( $V$ ) = $\frac{EBIT}{k_0} = \frac{₹ 5,00,000}{0.15}$	33,33,333

##### (ii) Calculation of cost of equity

	₹
Market value of debt (D)	15,00,000
Market value of equity (S) = $V - D = ₹ 33,33,333 - ₹ 15,00,000$	18,33,333

$$K_e = \frac{\text{Earnings available for equity holders}}{\text{Value of equity (S)}}$$

$$\text{Or, } = \frac{EBIT - \text{Interest paid on debt}}{\text{Market value of equity}} = \frac{₹ 3,50,000}{₹ 18,33,333} = 19.09\%$$

OR

$$K_o = K_e \left( \frac{S}{V} \right) + K_d \left( \frac{D}{V} \right)$$

$$K_e = K_o \left( \frac{V}{S} \right) - K_d \left( \frac{D}{S} \right)$$

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

$$= \frac{1}{₹ 18,33,333} (0.15 \times ₹ 33,33,333) - (0.10 \times ₹ 15,00,000)$$

$$= \frac{1}{₹ 18,33,333} 5,00,000 - 1,50,000$$

$$= 19.09\%$$

**ILLUSTRATION 5**

*Alpha Ltd. and Beta Ltd. are identical except for capital structure. Alpha Ltd. has 50 per cent debt and 50 per cent equity, whereas Beta Ltd. has 20 per cent debt and 80 per cent equity (All percentages are in market-value terms). The borrowing rate for both the 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 Ltd., DETERMINE your return if the company has net operating income of ₹ 3,60,000 and the overall capitalisation rate of the company ( $K_o$ ) is 18 per cent.*
- (ii) *CALCULATE the implied required rate of return on equity of Alpha Ltd.*
- (b) *Beta Ltd. has the same net operating income as Alpha Ltd.*
- (i) *CALCULATE the implied required rate of return on equity of Beta Ltd.*
- (ii) *ANALYSE why does it differ from that of Alpha Ltd.*

**SOLUTION**

(a) Value of the Alpha Ltd. =  $\frac{\text{NOI}}{K_0} = \frac{\text{₹ } 3,60,000}{18\%} = \text{₹ } 20,00,000$

**(i) Return on Equity shares of Alpha Ltd.**

	₹
Value of the company	20,00,000
Market value of debt (50% × ₹ 20,00,000)	10,00,000
Market value of equity (50% × ₹ 20,00,000)	10,00,000
	₹
Net operating income	3,60,000
Less: Interest on debt (8% × ₹ 10,00,000)	80,000
Earnings available to equity shareholders	2,80,000
Return on 2% equity shares (2% × ₹ 2,80,000)	5,600

**(ii) Implied required rate of return on equity of Alpha Ltd.**

$$= \frac{\text{Earnings available for equity shareholders}}{\text{Market value of Equity}} = \frac{\text{₹ } 2,80,000}{\text{₹ } 10,00,000} = 28\%$$

**(b) (i) Calculation of Implied rate of return on equity of Beta Ltd.**

	₹
Total value of company	20,00,000
Market value of debt (20% × ₹ 20,00,000)	4,00,000
Market value of equity (80% × ₹ 20,00,000)	16,00,000
	₹
Net operating income	3,60,000
Less: Interest on debt (8% × ₹ 4,00,000)	32,000
Earnings available to shareholders	3,28,000

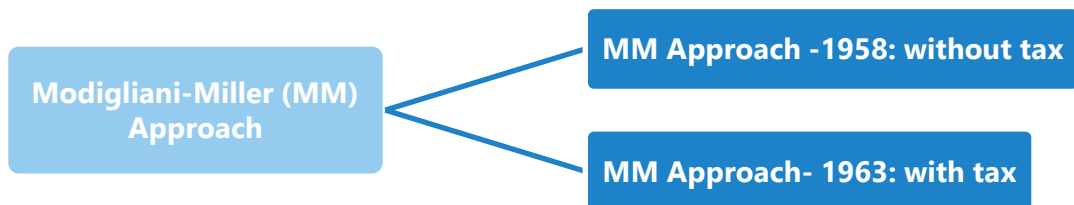
Implied required rate of return on equity

$$= \frac{\text{Earnings available for equity shareholders}}{\text{Market value of Equity}} = \frac{\text{₹ 3,28,000}}{\text{₹ 16,00,000}} = 20.5\%$$

- (ii) Implied required rate of return on equity of Beta Ltd. is lower than that of Alpha Ltd. because Beta Ltd. 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.

## 2.4 Modigliani-Miller (MM) Approach

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 (MM) approach provides behavioural justification for constant overall cost of capital and therefore, total value of the firm.



### MM Approach – 1958: without tax:

This approach describes, in a perfect capital market where there is no transaction cost and no taxes, the value and cost of capital of a company remain unchanged irrespective of change in the capital structure. This approach is based on further following additional assumptions:

- ◆ 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 approach derived the following three propositions:

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

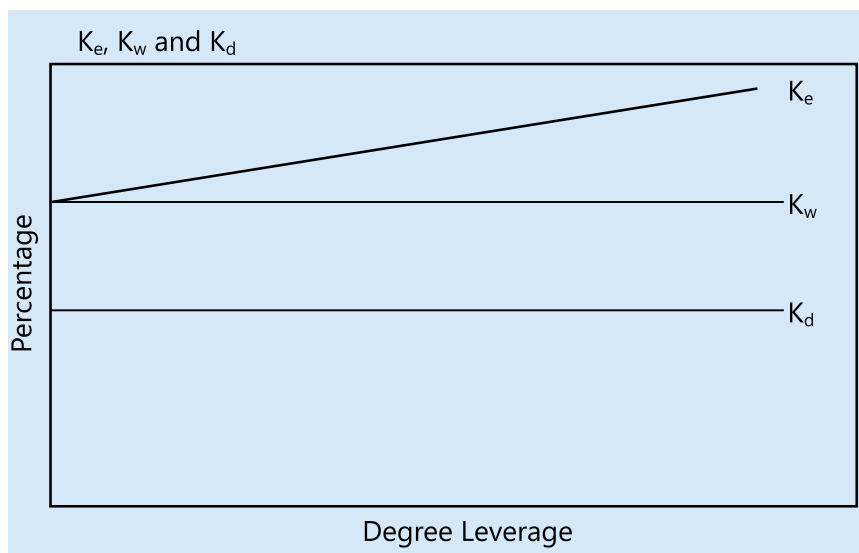
$$\text{Value of levered firm (V}_g\text{)} = \text{Value of unlevered firm (V}_u\text{)}$$

$$\text{Value of a firm} = \frac{\text{Net Operating Income (NOI)}}{K_0}$$

- (ii) A firm having debt in its capital structure has higher cost of equity than an unlevered firm. The cost of equity will include risk premium for the financial risk. The cost of equity in a levered firm is determined as under:

$$K_e = K_o + (K_o - K_d) \frac{\text{Debt}}{\text{Equity}}$$

- (iii) The structure of the capital (financial leverage) does not affect the overall cost of capital. The cost of capital is only affected by the business risk.



It is evident from the above diagram that the average cost of the capital ( $K_w$ ) is constant and is 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 to this approach. The two must be equal. There is neither advantage nor disadvantage in using debt in the firm's capital structure.

This 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 hypothesis, since the sum of the parts must be equal to the whole, therefore, regardless of the financing mix, the total value of the firm stays the same.

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

### **MM Approach-1963: with tax**

In 1963, MM model was amended by incorporating tax, 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.

MM has developed the following formulae for computation of cost of capital ( $K_o$ ), cost of equity ( $K_e$ ) for the levered firm.

- (i) Value of a levered company = Value of an unlevered company + Tax benefit  
 Or,  $V_g = V_u + TB$
- (ii) Cost of equity in a levered company ( $K_{eg}$ ) =  $K_{eu} + (K_{eu} - K_d) \frac{\text{Debt}}{\text{Debt} + \text{Equity}}$

Where,

$K_{eg}$  = Cost of equity in a levered company

$K_{eu}$  = Cost of equity in an unlevered company

$K_d$  = Cost of debt

TB = Present Value of Tax Shields

- (iii) WACC in a levered company ( $K_{og}$ ) =  $K_{eu} (1 - tL)$

Where,

$K_{og}$  = WACC of a levered company

$K_{eu}$  = Cost of equity in an unlevered company

t = Tax rate

$L = \frac{\text{Debt}}{\text{Debt} + \text{Equity}}$

### ILLUSTRATION 6

**(When value of levered firm is more than the value of unlevered firm)**

*There are two companies N Ltd. and M Ltd., having same earnings before interest and taxes (EBIT) of ₹ 20,000. M Ltd. is a levered company having a debt of ₹1,00,000 @ 7% rate of interest. The cost of equity of N Ltd. is 10% and of M Ltd. is 11.50%.*

*COMPUTE how arbitrage process will be carried on?*

**SOLUTION**

	Company	
	M Ltd.	N Ltd.
EBIT (NOI)	₹ 20,000	₹ 20,000
Debt (D)	₹ 1,00,000	--
$K_e$	11.50%	10%
$K_d$	7%	--

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

$$S_M = \frac{₹20,000 - ₹7,000}{11.50\%} = ₹ 1,13,043$$

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

$$\text{Value of Firm (V)} = S + D$$

$$V_M = ₹ 1,13,043 + ₹ 1,00,000 = ₹ 2,13,043$$

$$V_N = ₹ 2,00,000$$

**Arbitrage Process:**

If you have 10% shares of M Ltd., your value of investment in equity shares is 10% of ₹ 1,13,043 i.e. ₹ 11,304.30 and return will be 10% of (₹20,000 – ₹ 7,000) = ₹ 1,300.

**Alternate Strategy will be:**

Sell your 10% shares of levered firm for ₹ 11,304.30 and borrow 10% of levered firm's debt i.e. ₹ 10,000 (10% of ₹ 1,00,000) and invest the money i.e. 10% in unlevered firm's stock:

Total resources /Money we have = ₹ 11,304.30 + ₹ 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

Now your return remains the same i.e. ₹ 1,300 which you are getting from N Ltd. before investing in M Ltd. but still you have ₹ 1,304.3 excess money available with you. Hence, you are better off by doing arbitrage.

**In the above example** you have not invested entire amount received from “sale of shares of levered company plus amount borrowed”. You maintained same level of earning and reduced investment. Alternatively, you could have invested entire amount in unlevered company. In that case your annual earnings would have increased. An example for the same is as follows:

### ILLUSTRATION 7

Following data is available in respect of two companies having same business risk:

Capital employed = ₹ 2,00,000, EBIT = ₹ 30,000 and  $K_e = 12.5\%$

Sources	Levered Company (₹)	Unlevered Company (₹)
Debt (@10%)	1,00,000	Nil
Equity	1,00,000	2,00,000

An investor is holding 15% shares in levered company. CALCULATE the increase in annual earnings of investor if he switches his holding from Levered to Unlevered company.

### SOLUTION

#### 1. Valuation of firms

Particulars	Levered Firm (₹)	Unlevered Firm (₹)
EBIT	30,000	30,000
Less: Interest on debt ( $10\% \times ₹ 1,00,000$ )	10,000	Nil
Earnings available to Equity shareholders	20,000	30,000
$K_e$	12.5%	12.5%
Value of Equity (S) (Earnings available to Equity shareholders/ $K_e$ )	1,60,000	2,40,000
Debt (D)	1,00,000	Nil
Value of Firm (V) = S + D	2,60,000	2,40,000

Value of Levered company is more than that of unlevered company. Therefore, investor will sell his shares in levered company and buy shares in unlevered company. To maintain the level of risk he will borrow proportionate amount and invest that amount also in shares of unlevered company.

## 2. Investment & Borrowings

	₹
Sell shares in Levered company ( $₹ 1,60,000 \times 15\%$ )	24,000
Borrow money ( $₹ 1,00,000 \times 15\%$ )	<u>15,000</u>
Buy shares in Unlevered company	<u>39,000</u>

## 3. Change in Return

	₹
Income from shares in Unlevered company ( $₹ 39,000 \times 12.5\%$ )	4,875
Less: Interest on loan ( $₹ 15,000 \times 10\%$ )	<u>1,500</u>
Net Income from unlevered firm	3,375
Less: Income from Levered firm ( $₹ 24,000 \times 12.5\%$ )	<u>3,000</u>
Incremental Income due to arbitrage	<u>375</u>

### ILLUSTRATION 8

**(When value of unlevered firm is more than the value of levered firm.)**

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

*COMPUTE how arbitrage process will work.*

**SOLUTION**

Particulars	Company	
	U Ltd.	L Ltd.
NOI (EBIT)	₹ 20,000	₹ 20,000
Debt (D)	–	₹ 1,00,000
$K_d$	–	7%
$K_e$	10%	18%
Value of equity capital (S)	₹ 2,00,000	₹ 72,222
$\left( \frac{\text{EBIT} - \text{Interest}}{K_e} \right)$	$\left( \frac{20,000}{0.10} \right)$	$\left( \frac{20,000 - 7,000}{0.18} \right)$
Total value of the firm (V) = S + D	₹ 2,00,000	₹ 1,72,222 (₹ 72,222 + ₹ 1,00,000)

**Arbitrage Process:**

If 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.  $10\% \times ₹ 20,000 = ₹ 2,000$ .

**Alternative strategy will be:**

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

10% equity of levered firm	₹ 7,222
10% debt of levered firm	<u>₹ 10,000</u>
Total investment in levered firm	<u>₹ 17,222</u>

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 ( $10\% \times ₹ 13,000$ )	<u>₹ 1,300</u>
Total return	<u>₹ 2,000</u>

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

Hence, you are better off by doing arbitrage 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.

**In the above example** we have not invested entire amount received from "sale of shares of Unlevered company". We also have the same level of earning along with reduced investment. Alternatively, we could have invested entire amount in Levered company. In that case annual earnings would have increased. An example for the same is as follows:

#### ILLUSTRATION 9

*Following data is available in respect of two companies having same business risk:*

*Capital employed = ₹2,00,000, EBIT = ₹30,000*

Sources	Levered Company (₹)	Unlevered Company (₹)
Debt (@10%)	1,00,000	Nil
Equity	1,00,000	2,00,000
$K_e$	20%	12.5%

*An investor is holding 15% shares in Unlevered company. CALCULATE the increase in annual earnings of investor if he switches his holding from Unlevered to Levered Company.*

#### SOLUTION

##### 1. Valuation of firms

Particulars	Levered Firm (₹)	Unlevered Firm (₹)
EBIT	30,000	30,000
Less: Interest on debt (10% × ₹ 1,00,000)	10,000	Nil
Earnings available to Equity shareholders	20,000	30,000

$K_e$	20%	12.5%
Value of Equity (S) (Earnings available to Equity shareholders/ $K_e$ )	1,00,000	2,40,000
Debt (D)	1,00,000	Nil
Value of Firm (V) = S + D	2,00,000	2,40,000

Value of Unlevered company is more than that of Levered company therefore investor will sell his shares in Unlevered company and buy shares in Levered company. Market value of Debt and Equity of Levered company are in the ratio of ₹ 1,00,000 : ₹ 1,00,000 i.e. 1:1. To maintain the level of risk he will lend proportionate amount (50%) and invest balance amount (50%) in shares of Levered company.

<b>2. Investment &amp; Borrowings</b>	₹
Sell shares in Unlevered company (₹ 2,40,000 x 15%)	<u>36,000</u>
Lend money (₹ 36,000 x 50%)	18,000
Buy shares in Levered company (₹ 36,000 x 50%)	<u>18,000</u>
Total	<u>36,000</u>
<b>3. Change in Return</b>	₹
Income from shares in Levered company (₹ 18,000 x 20%)	3,600
Interest on money lent (₹ 18,000 x 10%)	<u>1,800</u>
Total Income after switch over	5,400
Less: Income from Unlevered firm (₹ 36,000 x 12.5%)	<u>4,500</u>
Incremental Income due to arbitrage	<u>900</u>

### ILLUSTRATION 10

Blue Ltd., an all equity financed company is considering the repurchase of ₹ 275 lakhs equity shares and to replace it with 15% debentures of the same amount. Current market value of the company is ₹ 1,750 lakhs with its cost of capital of 20%. The company's Earnings before Interest and Taxes (EBIT) are expected to remain constant in future years. The company also has a policy of distributing its entire earnings as dividend.



Assuming the corporate tax rate as 30%, you are required to CALCULATE the impact on the following on account of the change in the capital structure as per Modigliani and Miller (MM) Approach:

- (i) Market value of the company
- (ii) Overall Cost of capital
- (iii) Cost of equity

### SOLUTION

#### Workings:

$$\begin{aligned} \text{Market Value of Equity} &= \frac{\text{Net income (NI) for equity holders}}{K_e} \\ ₹ 1,750 \text{ lakhs} &= \frac{\text{Net income (NI) for equity holders}}{0.20} \\ \text{Net Income to equity holders/EAT} &= ₹ 350 \text{ lakhs} \\ \text{Therefore, EBIT} &= \frac{\text{EAT}}{(1-t)} = \frac{₹ 350 \text{ lakhs}}{(1-0.3)} = ₹ 500 \text{ lakhs} \end{aligned}$$

#### Income Statement

	All Equity (₹ In lakhs)	Equity & Debt (₹ In lakhs)
EBIT (as calculated above)	500	500.00
Interest on ₹ 275 lakhs @ 15%	-	41.25
EBT	500	458.75
Tax @ 30%	150	137.63
Income available to equity holders	350	321.12

#### (i) Market value of the company

$$\begin{aligned} \text{Market value of levered firm} &= \text{Value of unlevered firm} + \text{Tax Advantage} \\ &= ₹ 1,750 \text{ lakhs} + (₹ 275 \text{ lakhs} \times 0.3) \\ &= ₹ 1,832.5 \text{ lakhs} \end{aligned}$$

$$\begin{aligned} \text{Change in market value of the company} &= ₹ 1,832.5 \text{ lakhs} - ₹ 1,750 \text{ lakhs} \\ &= ₹ 82.50 \text{ lakhs} \end{aligned}$$

The impact is that the market value of the company has increased by ₹ 82.50 lakhs due to replacement of equity with debt.

### (ii) Overall Cost of Capital

Market Value of Equity = Market value of levered firm - Equity repurchased

$$= ₹ 1,832.50 \text{ lakhs} - ₹ 275 \text{ lakhs} = ₹ 1,557.50 \text{ lakhs}$$

$$\text{Cost of Equity (K}_e\text{)} = \frac{\text{Net Income to equity holders}}{\text{Market value of equity}} \times 100$$

$$= \frac{₹ 321.12 \text{ lakhs}}{₹ 1,557.50 \text{ lakhs}} \times 100 = 20.62\%$$

$$\text{Cost of debt (K}_d\text{)} = I (1 - t) = 15 (1 - 0.3) = 10.50\%$$

Components	Amount (₹ In lakhs)	Cost of Capital %	Weight	WACC (K <sub>o</sub> ) %
Equity	1,557.50	20.62	0.85	17.53
Debt	275.00	10.50	0.15	1.58
	1,832.50		1	19.11

The impact is that the Overall Cost of Capital or K<sub>o</sub> has fallen by 0.89% (20% - 19.11%) due to the benefit of tax relief on debt interest payment.

### (iii) Cost of Equity

The impact is that cost of equity has risen by 0.62% (20.62% - 20%) due to the presence of financial risk i.e. introduction of debt in capital structure.

**Note:** Cost of Capital and Cost of equity can also be calculated with the help of following formulas, though there will be no change in the final answers.

$$\text{Cost of Capital (K}_o\text{)} = K_{eu} [1 - (t \times L)]$$

Where,

K<sub>eu</sub> = Cost of equity in an unlevered company

t = Tax rate

$$L = \frac{\text{Debt}}{\text{Debt} + \text{Equity}}$$

$$\text{So, } K_o = 0.20 \left[ 1 - \left( 0.3 \times \frac{\text{₹ } 275 \text{ lakhs}}{\text{₹ } 1,832.5 \text{ lakhs}} \right) \right] = 0.191 \text{ or } 19.10\% \text{ (approx.)}$$

$$\text{Cost of Equity } (K_e) = K_{eu} + (K_{eu} - K_d) \frac{\text{Debt } (1-t)}{\text{Equity}}$$

Where,

$K_{eu}$  = Cost of equity in an unlevered company

$K_d$  = Cost of debt

$t$  = Tax rate

$$\text{So, } K_e = 0.20 + \left( (0.20 - 0.15) \times \frac{\text{₹ } 275 \text{ lakhs } (1 - 0.3)}{\text{₹ } 1,557.5 \text{ lakhs}} \right) = 0.2062 \text{ or } 20.62\%$$

## 2.5 The Trade-off Theory

The trade-off theory of capital structure refers to the idea that a company chooses how much debt finance and how much equity finance to use by balancing the costs and benefits. Trade-off theory of capital structure basically entails offsetting the costs of debt against the benefits of debt.

Trade-off theory of capital structure primarily deals with two concepts - cost of financial distress and agency costs. An important purpose of the trade-off theory of capital structure is to explain the fact that corporations usually are financed partly with debt and partly with equity.

It states that there is an **advantage** to financing with debt, the **tax benefits** of debt and there is a **cost** of financing with debt, the costs of **financial distress** including bankruptcy costs of debt and non-bankruptcy costs (e.g. staff leaving, suppliers demanding disadvantageous payment terms, bondholder/ stockholder infighting, etc).

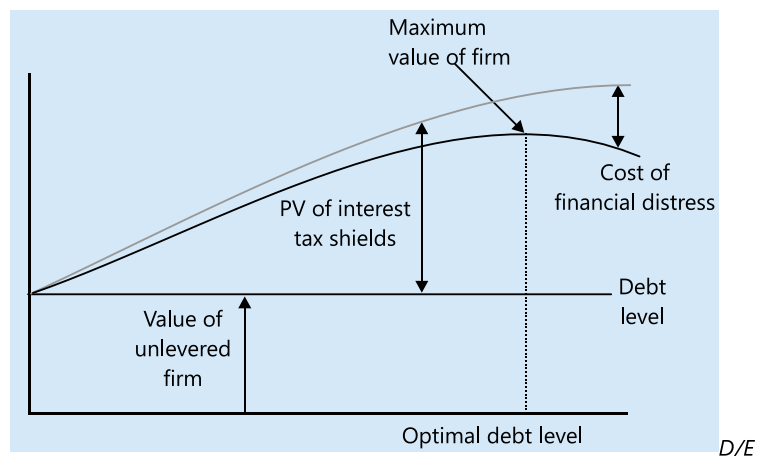
The marginal benefit of further increases in debt declines as debt increases, while the marginal cost increases, so that a firm that is optimizing its overall value will focus on this trade-off when choosing how much debt and equity to use for financing. Modigliani and Miller in 1963 introduced the tax benefit of debt. Later work led to an optimal capital structure which is given by the trade-off theory. According to Modigliani and Miller, the attractiveness of debt decreases with the personal tax on the interest income. A firm experiences financial distress when the

firm is unable to cope with the debt holders' obligations. If the firm continues to fail in making payments to the debt holders, the firm can even be insolvent.

The first element of Trade-off theory of capital structure, considered as the cost of debt is usually the financial distress costs or bankruptcy costs of debt. The **direct cost of financial distress** refers to the cost of insolvency of a company. Once the proceedings of insolvency start, the assets of the firm may be needed to be sold at **distress price**, which is generally much lower than the current values of the assets. A huge amount of administrative and **legal costs** is also associated with the insolvency. Even if the company is not insolvent, the financial distress of the company may include a number of **indirect costs** like - cost of employees, cost of customers, cost of suppliers, cost of investors, cost of managers and cost of shareholders.

The firms may often experience a dispute of interests among the management of the firm, debt holders and shareholders. These disputes generally give birth to agency problems that in turn give rise to the agency costs. The agency costs may affect the capital structure of a firm. There may be two types of conflicts - shareholders-managers conflict and shareholders-debt holders conflict. The introduction of a dynamic Trade-off theory of capital structure makes the predictions of this theory a lot more accurate and reflective of that in practice.

Value of Firm



As the Debt-equity ratio (i.e. leverage) increases, there is a trade-off between the interest tax shield and bankruptcy, causing an optimum capital structure.

## 2.6 Pecking Order Theory

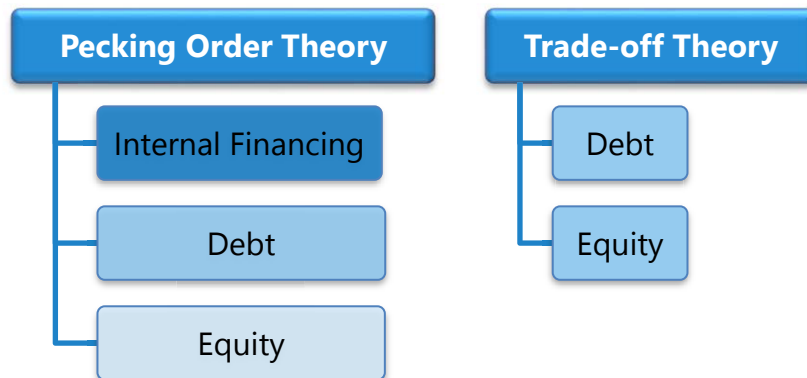
This theory is based on Asymmetric information, which refers to a situation in which different parties have different information. In a firm, managers will have better information than investors. This theory states that firms prefer to issue debt when they are positive about future earnings. Equity is issued when they are doubtful and internal finance is insufficient.

The pecking order theory argues that the capital structure decision is affected by manager's choice of a source of capital that gives higher priority to sources that reveal the least amount of information.

Myers has given the name 'PECKING ORDER' theory as here is no well-defined debt-equity target and there are two kind of equity internal and external. Now Debt is cheaper than both internal and external equity because of interest. Further internal equity is less than external equity particularly because of no transaction/issue cost, no tax etc.

Pecking order theory suggests that managers may use various sources for raising of fund in the following order:

1. Managers first choice is to use **internal finance**.
2. In absence of internal finance, they can use secured **debt**, unsecured debt, hybrid debt etc.
3. Managers may issue new **equity** shares as a last option.



**Financial Hierarchy**



### 3. FACTORS DETERMINING CAPITAL STRUCTURE

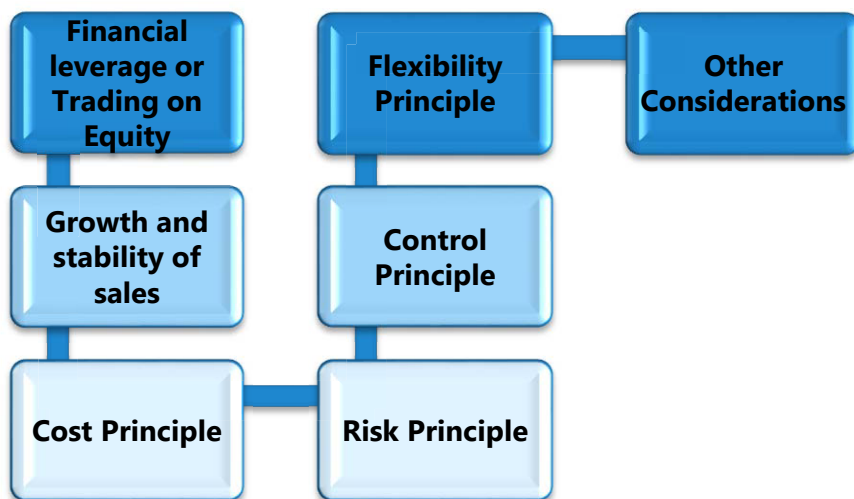
#### 3.1 Choice of source of funds

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 (in case of existing company), or
- (b) Exclusively use equity capital, or
- (c) Exclusively use preference share capital (in case of existing company), 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 proportion (in case of existing company).

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?

#### 3.2 Factors affecting capital structure



While choosing a suitable financing pattern, certain fundamental principles should be kept in mind, to design capital structure, which are discussed below:

- (1) **Financial leverage or Trading on Equity:** The use of long-term fixed interest bearing debt and preference share capital along with equity share capital is called financial leverage or trading on equity. The use of long-term debt increases the earnings per share if the firm yields a return higher than the cost of debt. The earnings per share also increase with the use of preference share capital but due to the fact that interest is allowed to be deducted while computing tax, the leverage impact of debt is much more. However, leverage can operate adversely also if the rate of interest on long-term loan is more than the expected rate of earnings of the firm. Therefore, it needs caution to plan the capital structure of a firm.
- (2) **Growth and stability of sales:** The capital structure of a firm is highly influenced by the growth and stability of its sales. If the sales of a firm are expected to remain fairly stable, it can raise a higher level of debt. Stability of sales ensures that the firm will not face any difficulty in meeting its fixed commitments of interest repayments of debt. Similarly, the rate of the growth in sales also affects the capital structure decision. Usually, greater the rate of growth of sales, greater can be the use of debt in the financing of firm. On the other hand, if the sales of a firm are highly fluctuating or declining, it should not employ, as far as possible, debt financing in its capital structure.
- (3) **Cost Principle:** According to this principle, an ideal pattern or capital structure is one that minimizes cost of capital structure and maximizes earnings per share (EPS). For 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.
- (4) **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 unfavorable business situation. With increase in amount of Debt, financial risk increase and vice versa.

- (5) **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 it also involves higher cost. Issue of more debt causes no dilution in control but causes a higher degree of financial risk.
- (6) **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.
- (7) **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.



## 4. OPTIMAL CAPITAL STRUCTURE

Objective of financial management is to **maximize wealth**. Therefore, one should choose a capital structure which maximizes wealth. For this purpose, following analysis should be done:

- (1) **EBIT-EPS-MPS analysis:** Chose a capital structure which maximizes market price per share. For that, start with same EBIT for all capital structures and calculate EPS. Thereafter, either multiply EPS by price earning ratio or divide it by cost of equity to arrive at MPS.
- (2) **Indifference Point analysis:** In above analysis, we have considered value at a given EBIT only. What will happen if EBIT changes? Will it change your



decision also? To answer this question, you can do indifference point analysis.

- (3) Financial Break-Even Point (BEP) analysis: With change in capital structure, financial risk also changes. Though this risk has already been considered in PE ratio or in cost of equity in point one above, but one may calculate and consider it separately also by calculating Financial BEP.

## 5. EBIT-EPS-MPS ANALYSIS

### 5.1 Relationship between EBIT-EPS-MPS

The basic objective of financial management is to design an appropriate capital structure which can provide the highest wealth, i.e., highest MPS, which in turn depends on EPS.

Given a level of EBIT, EPS will be different under different financing mix depending upon the extent of debt financing. The effect of leverage on the EPS emerges because of the existence of fixed financial charge i.e., interest on debt, financial fixed dividend on preference share capital. The effect of fixed financial charge on the EPS depends upon the relationship between the rate of return on assets and the rate of fixed charge. If the rate of return on assets is higher than the cost of financing, then the increasing use of fixed charge financing (i.e., debt and preference share capital) will result in increase in the EPS. This situation is also known as favourable financial leverage or Trading on Equity. On the other hand, if the rate of return on assets is less than the cost of financing, then the effect may be negative and, therefore, the increasing use of debt and preference share capital may reduce the EPS of the firm.

The fixed financial charge financing may further be analysed with reference to the choice between the debt financing and the issue of preference shares. Theoretically, the choice is tilted in favour of debt financing for two reasons: (i) the explicit cost of debt financing i.e., the rate of interest payable on debt instruments or loans is generally lower than the rate of fixed dividend payable on preference shares, and (ii) interest on debt financing is tax-deductible and therefore the real cost (after-tax) is lower than the cost of preference share capital.

Thus, the analysis of the different types of capital structure and the effect of leverage on the expected EPS and eventually MPS will provide a useful guide to selection of a particular level of debt financing. The EBIT-EPS analysis is of significant importance and if undertaken properly, can be an effective tool in the hands of a financial manager to get an insight into the planning and designing of the capital structure of the firm.

### ILLUSTRATION 11

*Suppose that a firm has an all equity capital structure consisting of 1,00,000 ordinary shares of ₹ 10 per share. The firm wants to raise ₹ 2,50,000 to finance its investments and is considering three alternative methods of financing – (i) to issue 25,000 ordinary shares at ₹ 10 each, (ii) to borrow ₹ 2,50,000 at 8 per cent rate of interest, (iii) to issue 2,500 preference shares of ₹ 100 each at an 8 per cent rate of dividend. If the firm's earnings before interest and taxes after additional investment are ₹ 3,12,500 and the tax rate is 50 per cent, FIND the effect on the earnings per share under the three financing alternatives.*

### SOLUTION

#### EPS under alternative financing plans:

Particulars	Equity Financing (₹)	Debt Financing (₹)	Preference Financing (₹)
EBIT	3,12,500	3,12,500	3,12,500
Less: Interest	0	20,000	0
PBT	3,12,500	2,92,500	3,12,500
Less: Taxes	1,56,250	1,46,250	1,56,250
PAT	1,56,250	1,46,250	1,56,250
Less: Preference dividend	0	0	20,000
Earnings available to ordinary shareholders	1,56,250	1,46,250	136,250
Shares outstanding	1,25,000	1,00,000	1,00,000
EPS	1.25	1.46	1.36

The firm is able to maximize the earnings per share when it uses debt financing. Though the rate of preference dividend is equal to the rate of interest, EPS is high in case of debt financing because interest charges are tax deductible while preference dividends are not. With increasing levels of EBIT, EPS will increase at a faster rate with a high degree of leverage.

We know that market price per share is equal to earning per share multiplied by price earning (PE) ratio. If PE ratio is same for all three plans, then the plan which has highest EPS will also have highest MPS and it will be selected. On the other hand, if PE ratio for equity plan is 10 times, for debt plan it is 8 times and for preference plan it is 7 times then:

EPS	1.25	1.46	1.36
PE ratio	x10	x8	x7
MPS	12.50	11.68	9.52

Now despite of lower EPS, equity plan will be selected because it has highest MPS.

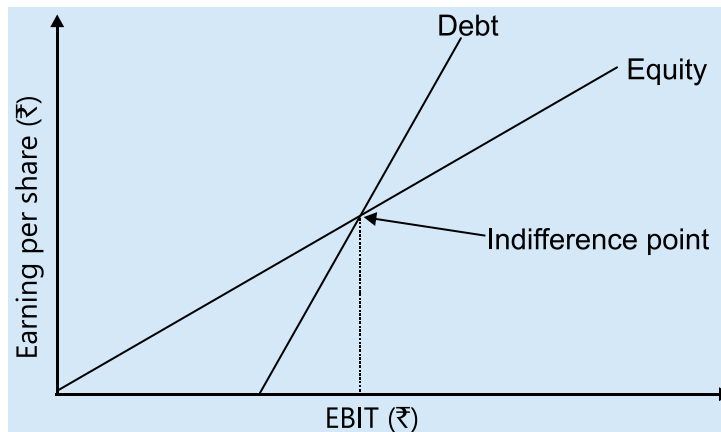
However, if a company is not able to earn a rate of return on its assets higher than the interest rate (or the preference dividend rate), debt (or preference financing) will have an adverse impact on EPS. Suppose the firm in illustration above has an EBIT of ₹75,000, then EPS under different methods will be as follows:

EPS under alternative financing methods: Unfavourable EBIT:

Particulars	Equity Financing (₹)	Debt Financing (₹)	Preference Financing (₹)
EBIT	75,000	75,000	75,000
Less: Interest	0	20,000	0
PBT	75,000	55,000	75,000
Less: Taxes	37,500	27,500	37,500
PAT	37,500	27,500	37,500
Less: Preference dividend	0	0	20,000
Earnings available to ordinary shareholders	37,500	27,500	17,500
Shares outstanding	1,25,000	1,00,000	1,00,000
EPS	0.30	0.275	0.175

It is obvious that under unfavourable conditions i.e.,] when the rate of return on the total assets is less than the cost of debt, the earnings per share will fall with the degree of leverage.

## 5.2 Financial Break-Even Point (BEP) and Indifference Point Analysis



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

Financial breakeven point (BEP) can be calculated as:

$$\text{Financial Break-even point} = \frac{\text{Interest} + \text{Preference dividend}}{(1 - \text{tax rate})}$$

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

EBIT-EPS break-even analysis is used for determining the appropriate amount of debt a company 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:

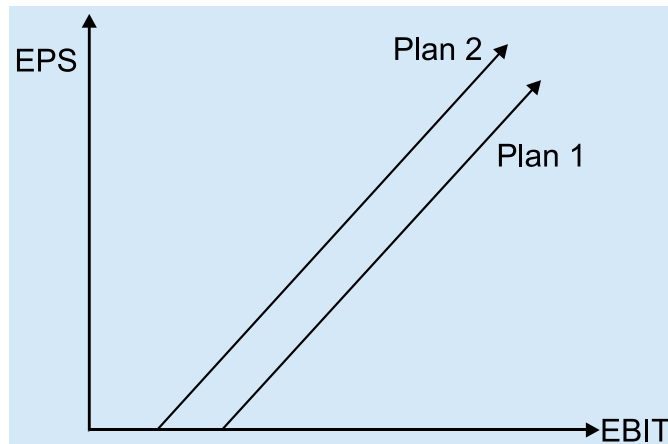
$$\frac{(EBIT - I_1)(1 - t)}{E_1} = \frac{(EBIT - I_2)(1 - t)}{E_2}$$

Where,

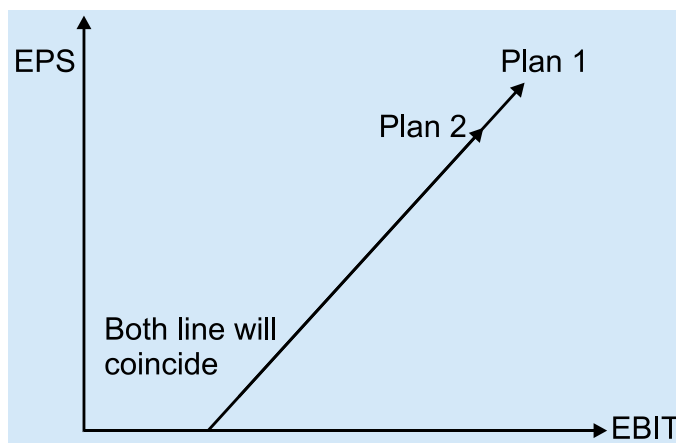
EBIT	=	Indifference point
E <sub>1</sub>	=	Number of equity shares in Alternative 1
E <sub>2</sub>	=	Number of equity shares in Alternative 2
I <sub>1</sub>	=	Interest charges in Alternative 1
I <sub>2</sub>	=	Interest charges in Alternative 2
t	=	Tax-rate

Just keep in mind that if amount of equity share capital is same under two financial plans, then one of the following two situations will arise:

- 1. No indifference point:** If after tax cost of the source other than equity shares is **not same** under both plans then there will be no indifference point between the two. Because one plan will be better than other at all levels of EBIT. For example, if two plans have equity shares of ₹ 1,00,000 each. Plan 1 has 10% debentures of ₹ 50,000 while plan 2 has 8% Term loan of ₹ 50,000. Then plan 2 will be better than plan 1 at any level of EBIT and there will be no indifference point.



2. **Many indifference points:** If after tax cost of the source other than equity shares is **same** under both plans then each EBIT will be an indifference point.



**Debt-Equity Indifference Point**

### ILLUSTRATION 12

*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 share 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.

ADVISE which option is the most suitable to raise the additional capital, keeping in mind that the management wants to maximize 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:**

Particulars	Options		
	Option I: Issue Equity shares only	Option II: Issue 16% Debentures only	Option III: Issue Equity Shares and 16% Debentures of equal amount
Number of Equity Shares			
- Existing	10,00,000	10,00,000	10,00,000
- Newly issued	2,00,000 $\left( \frac{₹50,00,000}{₹(10+15)} \right)$	---	50,000 $\left( \frac{₹25,00,000}{₹(10+40)} \right)$
Total	12,00,000	10,00,000	10,50,000
16% Debentures (₹)	---	50,00,000	25,00,000

	₹	₹	₹
Profit Before Interest and Tax:			
- Existing pre-tax profit	60,00,000	60,00,000	60,00,000
- From new projects	40,00,000	40,00,000	40,00,000
	1,00,00,000	1,00,00,000	1,00,00,000
Less: Interest on 16% Debentures	---	8,00,000 (16% × ₹50,00,000)	4,00,000 (16% × ₹25,00,000)
Profit Before Tax	1,00,00,000	92,00,000	96,00,000
Less: Tax at 50%	50,00,000	46,00,000	48,00,000
Profit After Tax	50,00,000	46,00,000	48,00,000
Earnings Per Share (EPS)	4.17	4.60	4.57
$\left( \frac{\text{PAT}}{\text{No. of Shares}} \right)$	$\left( \frac{₹ 50,00,000}{12,00,000} \right)$	$\left( \frac{₹ 46,00,000}{10,00,000} \right)$	$\left( \frac{₹ 48,00,000}{10,50,000} \right)$

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

### ILLUSTRATION 13

*Shahji Steel 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. ANALYSE which form of financing should the company choose?*



**SOLUTION**

Plan I = Raising Debt of ₹ 2.5 lakh + Equity of ₹ 22.5 lakh

Plan II = Raising Debt of ₹ 10 lakh + Equity of ₹ 15 lakh

Plan III = Raising Debt of ₹ 15 lakh + Equity of ₹ 10 lakh

**Calculation of Earnings per share (EPS):**

Particulars	FINANCIAL PLANS		
	Plan I	Plan II	Plan III
	₹	₹	₹
Expected EBIT	5,00,000	5,00,000	5,00,000
Less: Interest <sup>(a)</sup>	(25,000)	(1,37,500)	(2,37,500)
Earnings before taxes	4,75,000	3,62,500	2,62,500
Less: Taxes @ 50%	(2,37,500)	(1,81,250)	(1,31,250)
Earnings after taxes (EAT)	2,37,500	1,81,250	1,31,250
Number of shares <sup>(b)</sup>	15,000	10,000	8,000
Earnings per share (EPS)	15.83	18.13	16.41

Financing Plan II (i.e. Raising debt of ₹ 10 lakh and issue of equity share capital of ₹ 15 lakh) is the option which maximises the earnings per share.

**Working Notes:****(a) Calculation of interest on Debt**

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

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

$$\text{Plan I} = \frac{\text{₹ } 22,50,000}{\text{₹ } 150 \text{ (Market price of share)}} = 15,000 \text{ shares}$$

$$\text{Plan II} = \frac{\text{₹ } 15,00,000}{\text{₹ } 150} = 10,000 \text{ shares}$$

$$\text{Plan III} = \frac{\text{₹ } 10,00,000}{\text{₹ } 125} = 8,000 \text{ shares}$$

**ILLUSTRATION 14**

The following data are presented in respect of Quality Automation Ltd.:

	(₹)
Profit before interest and tax	52,00,000
Less: Interest on debentures @ 12%	12,00,000
Profit before tax	40,00,000
Less: Income tax @ 50%	20,00,000
Profit After tax	20,00,000
No. of equity shares (of ₹ 10 each)	8,00,000
EPS	2.5
PE Ratio	10
Market price per share	25

The company is planning to start a new project requiring a total capital outlay of ₹ 40,00,000. You are informed that a debt equity ratio ( $D/D+E$ ) higher than 35%, pushes the  $K_e$  up to 12.5%, means reducing the PE ratio to 8 and rises the interest rate on additional amount borrowed to 14%. FIND OUT the probable price of share if:

- the additional funds are raised as a loan.
- the amount is raised by issuing equity shares.

(Note: Retained earnings of the company is ₹ 1.2 crore)

**SOLUTION**

In this question, EBIT after proposed extension is not given. Therefore, we can assume that existing return on capital employed will be maintained.

**Working notes:**

$$1. \quad \text{Return on Capital Employed} = \frac{\text{EBIT}}{\text{Capital Employed}} = \frac{\text{₹ } 52,00,000}{\text{₹ } 3,00,00,000} = 17.33\%$$

$$\begin{aligned} \text{Capital Employed} &= \text{Debt} + \text{Equity} \\ &= \text{₹ } 1,00,00,000 + (\text{₹ } 80,00,000 + \text{₹ } 1,20,00,000) \\ &= \text{₹ } 3,00,00,000 \end{aligned}$$

$$\begin{aligned} 2. \quad \text{Proposed EBIT} &= \text{Proposed Capital Employed} \times \text{Return on capital employed} \\ &= (\text{₹ } 3,00,00,000 + \text{₹ } 40,00,000) \times 17.33\% \\ &= \text{₹ } 58,92,200 \end{aligned}$$

(If you take return on capital employed in full digits then accurate EBIT will be ₹ 58,93,333.)

$$3. \quad \text{Debt Equity Ratio} = \frac{\text{Debt}}{\text{Debt} + \text{Equity}}$$

**Option1: Loan option**

$$\text{Debt} = \text{₹ } 1,00,00,000 + \text{₹ } 40,00,000 = \text{₹ } 1,40,00,000$$

$$\text{Equity} = \text{₹ } 2,00,00,000$$

$$\text{Debt Equity ratio} = \frac{1.4 \text{ cr.}}{1.4 \text{ cr.} + 2 \text{ cr.}} = 41.18\%$$

Debt equity ratio has crossed the limit of 35%, hence, PE ratio in this case will be 8 times and additional borrowing will be at the rate of 14%.

**Option2: Equity option**

$$\text{Debt} = \text{₹ } 1,00,00,000$$

$$\text{Equity} = \text{₹ } 2,00,00,000 + \text{₹ } 40,00,000 = \text{₹ } 2,40,00,000$$

$$\text{Debt Equity ratio} = \frac{\text{₹ } 1 \text{ cr.}}{\text{₹ } 1 \text{ cr.} + \text{₹ } 2.4 \text{ cr.}} = 29.41\%$$

Debt equity ratio has not crossed the limit of 35% hence PE ratio in this case will remain at 10 times.

4. Number of equity shares to be issued in case of equity option @ ₹ 25 per share = ₹ 40,00,000 / ₹ 25 = 1,60,000

**Calculation of EPS and MPS under two financial options**

Particulars	Financial Options	
	Option I 14% additional loan of 40,00,000 (₹)	Option II 8,00,000 equity shares @ ₹ 10 i.e 1,60,000 equity shares @ ₹ 25 (₹)
Profit before interest and Tax (PBIT)	58,92,200	58,92,200
Less: Interest on old debentures @ 12%	12,00,000	12,00,000
Less: Interest on additional loan (new) @ 14% on ₹ 40,00,000	5,60,000	Nil
Profit before tax	41,32,200	46,92,000
Less: Taxes @ 50%	20,66,100	23,46,100
Earnings for equity shareholders (EAT/Profit after tax)	20,66,100	23,46,100
Number of Equity Shares	8,00,000	9,60,000
Earnings per Share (EPS)	2.58	2.44
Price/ Earnings ratio	8	10
Market price per share (MPS)	20.66	24.44

**Decision:** Though loan option has higher EPS but equity option has higher MPS therefore company should raise additional fund through equity option.



## 6. OVER-CAPITALISATION AND UNDER-CAPITALISATION

### 6.1 Over-Capitalisation

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.

**Causes of Over-Capitalisation:** 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 capitalisation.

**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.

**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.

## 6.2 Under-Capitalisation

It is just reverse of over-capitalisation. It is a state, when its actual capitalisation is lower than its proper capitalisation 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.

**Consequences of Under-Capitalisation:** 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.

**Effects of Under-Capitalisation:** 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.

**Remedies for Under-Capitalisation:** 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.

### 6.3 Over-Capitalisation vis-à-vis Under-Capitalisation

From the above discussion it can be said that both over-capitalisation and under-capitalisation are not good. However, over-capitalisation is more dangerous to the company, shareholders and the society than under-capitalisation. The situation of under-capitalisation can be handled more easily than the situation of over-capitalisation. Moreover, under-capitalisation is not an economic problem but a problem of adjusting capital structure. Thus, under-capitalisation should be considered less dangerous but both situations are bad and every company should strive to have a proper capitalisation.

## SUMMARY

- ♦ **Capital Structure:** Capital structure refers to the mix of a firm's capitalisation (mix of long term sources of funds such as debentures, preference share capital, equity share capital and retained earnings for meeting total capital requirement). 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.
- ♦ **Capital Structure Theories:** The following approaches explain the relationship between cost of capital, capital structure and value of the firm:  
Net income (NI) approach

Net operating income (NOI) approach

Modigliani-Miller (MM) approach

Traditional approach

Trade-off Theory

Pecking Order Theory

- ◆ **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). 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.
- ◆ **Over-capitalisation:** 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.
- ◆ **Under-capitalisation:** 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.

## TEST YOUR KNOWLEDGE

### Multiple Choice Questions (MCQs)

1. *The assumptions of MM hypothesis of capital structure do not include the following:*
  - (a) *Capital markets are imperfect*
  - (b) *Investors have homogeneous expectations*
  - (c) *All firms can be classified into homogeneous risk classes*
  - (d) *The dividend-payout ratio is cent percent, and there is no corporate tax*



2. *Which of the following is irrelevant for optimal capital structure?*
  - (a) *Flexibility*
  - (b) *Solvency*
  - (c) *Liquidity*
  - (d) *Control*
3. *Financial Structure refers to:*
  - (a) *All financial resources*
  - (b) *Short-term funds*
  - (c) *Long-term funds*
  - (d) *None of these*
4. *An EBIT-EPS indifference analysis chart is used for:*
  - (a) *Evaluating the effects of business risk on EPS*
  - (b) *Examining EPS results for alternative financial plans at varying EBIT levels*
  - (c) *Determining the impact of a change in sales on EBIT*
  - (d) *Showing the changes in EPS quality over time*
5. *The term "capital structure" means:*
  - (a) *Long-term debt, preferred stock, and equity shares*
  - (b) *Current assets and current liabilities*
  - (c) *Net working capital*
  - (d) *Shareholder's equity*
6. *The cost of monitoring management is considered to be a (an):*
  - (a) *Bankruptcy cost*
  - (b) *Transaction cost*
  - (c) *Agency cost*
  - (d) *Institutional cost*

7. *The traditional approach towards the valuation of a firm assumes:*
  - (a) *That the overall capitalization rate changes in financial leverage.*
  - (b) *That there is an optimum capital structure.*
  - (c) *That the total risk is not changed with the changes in the capital structure.*
  - (d) *That the markets are perfect.*
8. *Market values are often used in computing the weighted average cost of capital because:*
  - (a) *This is the simplest way to do the calculation.*
  - (b) *This is consistent with the goal of maximizing shareholder value.*
  - (c) *This is required by SEBI.*
  - (d) *This is a very common mistake.*
9. *A firm's optimal capital structure:*
  - (a) *Is the debt-equity ratio that results in the minimum possible weighted average cost of capital*
  - (b) *40 percent debt and 60 percent equity*
  - (c) *When the debt-equity ratio is 0.50*
  - (d) *When Cost of equity is minimum*
10. *Capital structure of a firm influences the:*
  - (a) *Risk*
  - (b) *Return*
  - (c) *Both Risk and Return*
  - (d) *Return but not Risk*
11. *Consider the below mentioned statements:*
  1. *A company is considered to be over-capitalised when its actual capitalisation is lower than the proper capitalisation as warranted by the earning capacity.*

2. *Both over-capitalisation and under-capitalisation are detrimental to the interests of the society.*

State True or False:

- (a) 1-True, 2-True
  - (b) 1-False, 2-True
  - (c) 1-False, 2-False
  - (d) 1-True, 2-False
12. *A critical assumption of the Net Operating Income (NOI) approach to valuation is:*
- (a) *That debt and equity levels remain unchanged.*
  - (b) *That dividends increase at a constant rate.*
  - (c) *That  $k_0$  remains constant regardless of changes in leverage.*
  - (d) *That interest expense and taxes are included in the calculation.*
13. *Which of the following steps may be adopted to avoid the negative consequences of over-capitalisation?*
- (a) *The shares of the company should be split up. This will reduce dividend per share, though EPS shall remain unchanged.*
  - (b) *Issue of Bonus Shares.*
  - (c) *Revising upward the par value of shares in exchange of the existing shares held by them.*
  - (d) *Reduction in claims of debenture-holders and creditors.*

### Theoretical Questions

1. *DESCRIBE Capital Structure.*
2. *EXPLAIN in brief the assumptions of Modigliani-Miller theory.*
3. *DESCRIBE Net Operating Income (NOI) theory of capital structure? EXPLAIN the assumptions of Net Operating Income approach theory of capital structure.*

4. *EXPLAIN* the principles of "Trading on equity".
5. *DISCUSS* the concept of Debt-Equity or EBIT-EPS indifference point, while determining the capital structure of a company.
6. *DISCUSS* financial break-even and EBIT-EPS indifference analysis.

### Practical Problems

1. Aaina Ltd. is considering a new project which requires a capital investment of ₹ 9 crores. Interest on term loan is 12% and Corporate Tax rate is 30%. *CALCULATE* the point of indifference for the project considering the Debt Equity ratio insisted by the financing agencies being 2 : 1.
2. Xylo Ltd. is considering two alternative financing plans as follows:

Particulars	Plan – A (₹)	Plan – B (₹)
Equity shares of ₹ 10 each	8,00,000	8,00,000
Preference Shares of ₹ 100 each	-	4,00,000
12% Debentures	4,00,000	-
	12,00,000	12,00,000

The indifference point between the plans is ₹ 4,80,000. Corporate tax rate is 30%. *CALCULATE* the rate of dividend on preference shares.

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-I: 100% equity finance by issuing equity shares of ₹ 10 each

Alternative-II: Debt-equity ratio 2:1 (issuing equity shares of ₹ 10 each)

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.

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

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

(b) *Plans of Financing Proportion:*

<b>Plans</b>	<b>Equity</b>	<b>Debt</b>	<b>Preference Shares</b>
A	100%	-	-
B	50%	50%	-
C	50%	-	50%

(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.*

5. *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 issue 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, DETERMINE earnings per share for the three alternatives, assuming no immediate increase in profitability.*

(b) *ANALYSE which alternative do you prefer. COMPUTE how much would EBIT need to increase before the next alternative would be best.*

6. Alpha Limited requires funds amounting to ₹ 80 lakh for its new project. To raise the funds, the company has following two alternatives:
- To issue Equity Shares of ₹ 100 each (at par) amounting to ₹ 60 lakh and borrow the balance amount at the interest of 12% p.a., or
  - To issue Equity Shares of ₹ 100 each (at par) and 12% Debentures in equal proportion.

The Income-tax rate is 30%.

IDENTIFY the point of indifference between the available two modes of financing and state which option will be beneficial in different situations.

7. 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, COMPUTE the cost of equity of Sanghmani Limited?
8. The following data relates to two companies belonging to the same risk class:

<b>Particulars</b>	<b>A Ltd.</b>	<b>B Ltd.</b>
Expected Net Operating Income	₹ 18,00,000	₹ 18,00,000
12% Debt	₹ 54,00,000	-
Equity Capitalization Rate	-	18

REQUIRED:

- Determine the total market value, Equity capitalization rate and weighted average cost of capital for each company assuming no taxes as per M.M. Approach.
  - Determine the total market value, Equity capitalization rate and weighted average cost of capital for each company assuming 40% taxes as per M.M. Approach.
9. Leo Ltd. has a net operating income of ₹ 21,60,000 and the total capitalisation of ₹ 120 lakhs. The company is evaluating the options to introduce debt financing in the capital structure and the following information is available at various levels of debt value.

Debt value (₹)	Interest rate (%)	Equity Capitalisation rate (%)
0	N.A.	12.00
10,00,000	7.00	12.50
20,00,000	7.00	13.00
30,00,000	7.50	13.50
40,00,000	7.50	14.00
50,00,000	8.00	15.00
60,00,000	8.50	16.00
70,00,000	9.00	17.00
80,00,000	10.00	20.00

You are required to COMPUTE the equity capitalization rate if MM approach is followed. Assume that the firm operates in zero tax regime and calculations to be based on book values.

10. Axar Ltd. has a Sales of ₹ 68,00,000 with a Variable cost Ratio of 60%.

The company has fixed cost of ₹16,32,000. The capital of the company comprises of 12% long term debt, ₹ 1,00,000 Preference Shares of ₹ 10 each carrying dividend rate of 10% and 1,50,000 equity shares.

The tax rate applicable for the company is 30%.

At current sales level, DETERMINE the Interest, EPS and amount of debt for the firm if a 25% decline in Sales will wipe out all the EPS.

11. The financial advisor of Sun Ltd. is confronted with following two alternative financing plans for raising ₹ 10 lakhs that is needed for plant expansion and modernization

**Alternative I:** Issue 80% of funds with 14% Debenture [Face value (FV) ₹ 100] at par and redeem at a premium of 10% after 10 years and balance by issuing equity shares at  $33\frac{1}{3}$  % premium.

**Alternative II:** Raise 10% of funds required by issuing 8% Irredeemable Debentures [Face value (FV) ₹ 100] at par and the remaining by issuing equity shares at current market price of ₹125.

Currently, the firm has an Earnings per share (EPS) of ₹ 21

The modernization and expansion programme is expected to increase the firm's Earnings before Interest and Taxation (EBIT) by ₹ 200,000 annually.

The firm's condensed Balance Sheet for the current year is given below:

**Balance Sheet as on 31.3.2022**

<b>Liabilities</b>	<b>(₹)</b>	<b>Assets</b>	<b>(₹)</b>
Current Liabilities	5,00,000	Current Assets	16,00,000
10% Long Term Loan	15,00,000	Plant & Equipment (Net)	34,00,000
Reserves & Surplus	10,00,000		
Equity Share Capital (FV: ₹ 100 each)	20,00,000		
<b>TOTAL</b>	<b>50,00,000</b>	<b>TOTAL</b>	<b>50,00,000</b>

However, the finance advisor is concerned about the effect that issuing of debt might have on the firm. The average debt ratio for firms in industry is 35%. He believes if this ratio is exceeded, the P/E ratio of the company will be 7 because of the potentially greater risk.

If the firm increases its equity capital by more than 10 %, he expects the P/E ratio of the company will increase to 8.5 irrespective of the debt ratio.

Assume Tax Rate of 25%. Assume target dividend pay-out under each alternative to be 60% for the next year and growth rate to be 10% for the purpose of calculating Cost of Equity.

SUGGEST with reason which alternative is better on the basis of each of the below given criteria:

- I. Earnings per share (EPS) & Market Price per share (MPS)
- II. Financial Leverage
- III. Weighted Average Cost of Capital & Marginal Cost of Capital (using Book Value weights)



## ANSWERS/SOLUTION

### Answers to the MCQs

1.	(a)	2.	(b)	3.	(a)	4.	(b)	5.	(a)	6.	(c)
7.	(b)	8.	(b)	9.	(a)	10.	(c)	11.	(b)	12.	(c)
13.	(d)										

### Answers to the Theoretical Questions

1. Please refer paragraph 1
2. Please refer paragraph 2.4
3. Please refer paragraph 2.3
4. Please refer paragraph 3.2
5. Please refer paragraph 5
6. Please refer paragraph 5.2

### Answers to the Practical Problems

1. **The capital investment can be financed in two ways i.e.**

- (i) By issuing equity shares only worth ₹ 9 crore or
- (ii) By raising capital through taking a term loan of ₹ 6 crores and ₹ 3 crores through issuing equity shares (as the company has to comply with the 2 : 1 Debt Equity ratio insisted by financing agencies).

In first option interest will be Zero and in second option the interest will be ₹ 72,00,000

Point of Indifference between the above two alternatives =

$$\frac{\text{EBIT} \times (1-t)}{\text{No. of equity shares}(N_1)} = \frac{(\text{EBIT} - \text{Interest}) \times (1-t)}{\text{No. of equity shares}(N_2)}$$

Or,

$$\frac{\text{EBIT} (1-0.30)}{90,00,000 \text{ shares}} = \frac{(\text{EBIT} - ₹ 72,00,000) \times (1-0.30)}{30,00,000 \text{ shares}}$$

$$\begin{aligned}\text{Or, } 0.7 \text{ EBIT} &= 2.1 \text{ EBIT} - ₹ 1,51,20,000 \\ \text{EBIT} &= ₹ 1,08,00,000\end{aligned}$$

EBIT at point of Indifference will be ₹ 1.08 crore.

(The face value of the equity shares is assumed as ₹ 10 per share. However, indifference point will be same irrespective of face value per share).

## 2. Computation of Rate of Preference Dividend

$$\begin{aligned}\frac{(\text{EBIT} - \text{Interest}) (1 - t)}{\text{No. of Equity Shares (N}_1\text{)}} &= \frac{\text{EBIT} (1 - t) - \text{Preference Dividend}}{\text{No. of Equity Shares (N}_2\text{)}} \\ \frac{(\text{₹ } 4,80,000 - \text{₹ } 48,000) \times (1 - 0.30)}{80,00,000 \text{ shares}} &= \frac{\text{₹ } 4,80,000 (1 - 0.30) - \text{Preference Dividend}}{80,00,000 \text{ shares}} \\ \frac{\text{₹ } 3,02,400}{80,00,000 \text{ shares}} &= \frac{\text{₹ } 3,36,000 - \text{Preference Dividend}}{80,00,000 \text{ shares}} \\ \text{₹ } 3,02,400 &= \text{₹ } 3,36,000 - \text{Preference Dividend} \\ \text{Preference Dividend} &= \text{₹ } 3,36,000 - \text{₹ } 3,02,400 = \text{₹ } 33,600 \\ \text{Rate of Dividend} &= \frac{\text{Preference Dividend}}{\text{Preference share capital}} \times 100 \\ &= \frac{\text{₹ } 33,600}{4,00,000} \times 100 = 8.4\%\end{aligned}$$

## 3. Calculation of Indifference point between the two alternatives of financing

**Alternative-I** By issue of 6,00,000 equity shares of ₹ 10 each amounting to ₹ 60 lakhs. No financial charges are involved.

**Alternative-II** 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 =  $40,00,000 \times \frac{18}{100} = ₹ 7,20,000$

The difference point between the two alternatives is calculated by:

$$\frac{(\text{EBIT} - I_1)(1 - T)}{E_1} = \frac{(\text{EBIT} - I_2)(1 - T)}{E_2}$$

Where,

EBIT = Earnings before interest and taxes

$I_1$  = Interest charges in Alternative-I

$I_2$  = Interest charges in Alternative-II

T = Tax rate

$E_1$  = Equity shares in Alternative-I

$E_2$  = Equity shares in Alternative-II

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, at EBIT of ₹ 10,80,000 earnings per share for the two alternatives is equal.

#### 4. (i) Computation of Earnings per share (EPS)

Plans	A (₹)	B (₹)	C (₹)
Earnings before interest and tax (EBIT)	80,000	80,000	80,000
Less: Interest charges	---	(8,000) (8% × ₹1 lakh)	---

Earnings before tax (EBT)	80,000	72,000	80,000
Less: Tax (@ 50%)	(40,000)	(36,000)	(40,000)
Earnings after tax (EAT)	40,000	36,000	40,000
Less: Preference dividend	---	---	(8,000) (8% × ₹1 lakh)
Earnings available for Equity shareholders (A)	40,000	36,000	32,000
No. of Equity shares (B)	10,000 (₹2 lakh ÷ ₹20)	5,000 (₹1 lakh ÷ ₹20)	5,000 (₹1 lakh ÷ ₹20)
EPS [(A) ÷ (B)]	4	7.20	6.40

### (ii) Calculation of Financial Break-even point

Financial break-even point = Interest + Preference Dividend/(1-t)

Plan A: Under this plan there is no interest or preference dividend payment hence, the Financial Break-even point will be zero.

Plan B: Under this plan there is an interest payment of ₹ 8,000 and no preference dividend, hence, the Financial Break-even point will be ₹ 8,000 (Interest charges).

Plan C: Under this plan there is no interest payment but an after tax preference dividend of ₹ 8,000 is paid. Hence, the Financial Break-even point will be before tax earnings of ₹ 16,000 (i.e. ₹ 8,000 ÷ (1 - 0.5) = ₹ 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:

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

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

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

$$0.5 \text{ EBIT} (5,000) = (0.5 \text{ EBIT} - 4,000) (10,000)$$

$$0.5 \text{ EBIT} = \text{EBIT} - 8,000$$

$$0.5 \text{ EBIT} = 8,000$$

$$\text{EBIT} = ₹ 16,000$$

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

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

$$\frac{0.5 \text{ EBIT}}{10,000} = \frac{0.5 \text{ EBIT} - 8,000}{5,000}$$

$$0.25 \text{ EBIT} = 0.5 \text{ EBIT} - 8,000$$

$$0.25 \text{ EBIT} = 8,000$$

$$\text{EBIT} = ₹ 32,000$$

**III. Indifference point where EBIT of Plan B and Plan C are equal.**

$$\frac{(\text{EBIT} - ₹8,000)(1 - 0.5)}{5,000} = \frac{(\text{EBIT} - 0)(1 - 0.5) - ₹8,000}{5,000}$$

$$0.5 \text{ EBIT} - 4,000 = 0.5 \text{ EBIT} - ₹ 8,000$$

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

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. Further EPS of plan B is the highest.

## 5. (a)

Particulars	Alternatives		
	Alternative-I: Take additional Debt	Alternative-II: Issue 11% Preference Shares	Alternative-III: Issue further Equity Shares
	₹	₹	₹
EBIT	15,00,000	15,00,000	15,00,000
Interest on Debts:			
- on existing debt @10%	(3,60,000)	(3,60,000)	(3,60,000)
- on new debt @ 12%	(4,80,000)	---	---
Profit before taxes	6,60,000	11,40,000	11,40,000
Taxes @ 40%	(2,64,000)	(4,56,000)	(4,56,000)
Profit after taxes	3,96,000	6,84,000	6,84,000
Preference shares dividend	---	(4,40,000)	---
Earnings available to equity Shareholders	3,96,000	2,44,000	6,84,000
Number of shares	8,00,000	8,00,000	10,50,000
Earnings per share	0.495	0.305	0.651

- (b) For the present EBIT level, equity shares are 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.

**Working Note:**

Calculation of indifference point between debt and equity shares (in thousands)-

$$\frac{\text{EBIT} - ₹ 840}{800} = \frac{\text{EBIT} - ₹ 360}{1,050}$$

$$\text{EBIT} (1,050) - ₹ 840(1,050) = \text{EBIT} (800) - ₹ 360 (800)$$

$$250\text{EBIT} = ₹ 5,94,000$$

$$\text{EBIT} = ₹ 2,376$$

6. (i) Amount = ₹ 80,00,000

Plan I = Equity of ₹ 60,00,000 + Debt of ₹ 20,00,000

Plan II = Equity of ₹ 40,00,000 + 12% Debentures of ₹ 40,00,000

**Plan I: Interest Payable on Loan**

$$= 12\% \times ₹ 20,00,000 = ₹ 2,40,000$$

**Plan II: Interest Payable on Debentures**

$$= 12\% \times ₹ 40,00,000 = ₹ 4,80,000$$

**Computation of Point of Indifference**

$$\frac{(\text{EBIT} - I_1)(1-t)}{E_1} = \frac{(\text{EBIT} - I_2)(1-t)}{E_2}$$

$$\frac{(\text{EBIT} - ₹ 2,40,000)(1-0.3)}{60,000} = \frac{(\text{EBIT} - ₹ 4,80,000)(1-0.3)}{40,000}$$

$$2 (\text{EBIT} - ₹ 2,40,000) = 3 (\text{EBIT} - ₹ 4,80,000)$$

$$2 \text{ EBIT} - ₹ 4,80,000 = 3 \text{ EBIT} - ₹ 14,40,000$$

$$2 \text{ EBIT} - 3 \text{ EBIT} = - ₹ 14,40,000 + ₹ 4,80,000$$

$$\text{EBIT} = ₹ 9,60,000$$

## (ii) Earnings per share (EPS) under Two Situations for both the Plans

Situation A (EBIT is assumed to be ₹ 9,50,000)		
Particulars	Plan I ₹	Plan II ₹
EBIT	9,50,000	9,50,000
Less: Interest @ 12%	(2,40,000)	(4,80,000)
EBT	7,10,000	4,70,000
Less: Taxes @ 30%	(2,13,000)	(1,41,000)
EAT	4,97,000	3,29,000
No. of Equity Shares	60,000	40,000
EPS	8.28	8.23

**Comment:** In Situation A, when expected EBIT is less than the EBIT at indifference point then, Plan I is more viable as it has higher EPS. The advantage of EPS would be available from the use of equity capital and not debt capital.

Situation B (EBIT is assumed to be ₹ 9,70,000)		
Particulars	Plan I ₹	Plan II ₹
EBIT	9,70,000	9,70,000
Less: Interest @ 12%	(2,40,000)	(4,80,000)
EBT	7,30,000	4,90,000
Less: Taxes @ 30%	(2,19,000)	(1,47,000)
EAT	5,11,000	3,43,000
No. of Equity Shares	60,000	40,000
EPS	8.52	8.58

**Comment:** In Situation B, when expected EBIT is more than the EBIT at indifference point then, Plan II is more viable as it has higher EPS. The use of fixed-cost source of funds would be beneficial from the EPS viewpoint. In this case, financial leverage would be favourable.



**(Note:** The problem can also be worked out assuming any other figure of EBIT which is more than ₹ 9,60,000 and any other figure less than ₹ 9,60,000. Alternatively, the answer may also be based on the factors/governing the capital structure like the cost, risk, control, etc. Principles).

7. Here we are assuming that MM Approach 1958: Without tax, where capital structure has no relevance with the value of company and accordingly overall cost of capital of both levered as well as unlevered company is same. 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, Cost of equity in Sanghmani Ltd. (levered company) will be calculated as follows:

$$K_o = \frac{2}{3} \times K_e + \frac{1}{3} \times K_d = 16\% \text{ (i.e. equal to WACC of Samsui Ltd.)}$$

$$\text{Or, } 16\% = \frac{2}{3} \times K_e + \frac{1}{3} \times 10\% \quad \text{Or, } K_e = 19$$

8. (a) Assuming no tax as per MM Approach.

Calculation of Value of Firms 'A Ltd.' and 'B Ltd' according to MM Hypothesis

Market Value of 'B Ltd' [Unlevered(u)]

Total Value of Unlevered Firm ( $V_u$ ) =  $[NOI/k_e] = 18,00,000/0.18 = ₹ 1,00,00,000$

$K_e$  of Unlevered Firm (given) = 0.18

$K_o$  of Unlevered Firm (Same as above =  $k_e$  as there is no debt) = 0.18

**Market Value of 'A Ltd' [Levered Firm (l)]**

Total Value of Levered Firm ( $V_L$ ) =  $V_u + (\text{Debt} \times \text{Nil})$

$$= ₹ 1,00,00,000 + (54,00,000 \times \text{nil})$$

$$= ₹ 1,00,00,000$$

**Computation of Equity Capitalization Rate and  
Weighted Average Cost of Capital (WACC)**

	Particulars	A Ltd.	B Ltd.
A.	Net Operating Income (NOI)	₹ 18,00,000	₹ 18,00,000
B.	Less: Interest on Debt (I)	₹ 6,48,000	-
C.	Earnings of Equity Shareholders (NI)	₹ 11,52,000	₹ 18,00,000
D.	Overall Capitalization Rate ( $k_o$ )	0.18	0.18
E.	Total Value of Firm ( $V = \text{NOI}/k_o$ )	₹ 1,00,00,000	₹ 1,00,00,000
F.	Less: Market Value of Debt	₹ 54,00,000	-
G.	Market Value of Equity (S)	₹ 46,00,000	₹ 1,00,00,000
H.	Equity Capitalization Rate [ $k_e = \text{NI}/S$ ]	0.2504	0.18
I.	Weighted Average Cost of Capital [WACC ( $k_o$ )] $k_o = (k_e \times S/V) + (k_d \times D/V)$	0.18	0.18

\*Computation of WACC A Ltd

Component of Capital	Amount	Weight	Cost of Capital	WACC
Equity	₹ 46,00,000	0.46	0.2504	0.1152
Debt	₹ 54,00,000	0.54	0.12*	0.0648
Total	₹ 1,00,00,000			0.18

\* $K_d = 12\%$  (since there is no tax)

WACC = 18%

**(b)** Assuming 40% taxes as per MM Approach

Calculation of Value of Firms 'A Ltd.' and 'B Ltd' according to MM Hypothesis

Market Value of 'B Ltd' [Unlevered(u)]

$$\begin{aligned}\text{Total Value of unlevered Firm } (V_u) &= [\text{NOI} (1 - t)/k_e] = 18,00,000 (1 - 0.40) / 0.18 \\ &= ₹60,00,000\end{aligned}$$

$K_e$  of unlevered Firm (given) = 0.18

$K_o$  of unlevered Firm (Same as above =  $k_e$  as there is no debt) = 0.18

### Market Value of 'A Ltd' [Levered Firm (I)]

$$\begin{aligned}\text{Total Value of Levered Firm } (V_L) &= V_u + (\text{Debt} \times \text{Tax}) \\ &= ₹ 60,00,000 + (₹ 54,00,000 \times 0.4) \\ &= ₹ 81,60,000\end{aligned}$$

### Computation of Weighted Average Cost of Capital (WACC) of 'B Ltd.'

$$= 18\% \text{ (i.e. } K_e = K_o)$$

### Computation of Equity Capitalization Rate and Weighted Average Cost of Capital (WACC) of A Ltd

Particulars	A Ltd. (₹)
Net Operating Income (NOI)	18,00,000
Less: Interest on Debt (I)	6,48,000
Earnings Before Tax (EBT)	11,52,000
Less: Tax @ 40%	4,60,800
Earnings for equity shareholders (NI)	6,91,200
Total Value of Firm (V) as calculated above	81,60,000
Less: Market Value of Debt	54,00,000
Market Value of Equity (S)	27,60,000
Equity Capitalization Rate [ $k_e = \text{NI}/S$ ]	0.2504
Weighted Average Cost of Capital ( $k_o$ )* $k_o = (k_e \times S/V) + (k_d \times D/V)$	13.23

\*Computation of WACC A Ltd

Component of Capital	₹	Weight	Cost of Capital	WACC
Equity	27,60,000	0.338	0.2504	0.0846
Debt	54,00,000	0.662	0.072*	0.0477
Total	81,60,000			0.1323

$$*K_d = 12\% (1 - 0.4) = 12\% \times 0.6 = 7.2\%$$

$$WACC = 13.23\%$$

9. As per MM approach, cost of the capital ( $K_0$ ) remains constant, and cost of equity increases linearly with debt.

$$\text{Value of a Firm} = \frac{\text{NOI}}{K_0}$$

$$\therefore 1,20,00,000 = \frac{21,60,000}{K_0}$$

$$\therefore K_0 = \frac{21,60,000}{1,20,00,000} = 18\%$$

$$\text{Under MM approach, } k_e = k_0 + \frac{D}{E}(k_0 - k_d)$$

#### Statement of equity capitalization under MM approach

Debt Value (₹)	Equity Value (₹)	Debt/Equity	$K_d$ (%)	$K_0$ (%)	$K_0 - k_d$ (%)	$K_e = K_0 + (K_0 - K_d)(D/E)$ (%)
-	1,20,00,000	0.0000	NA	18.00	18.00	18.00
10,00,000	1,10,00,000	0.0909	7.00	18.00	11.00	19.00
20,00,000	1,00,00,000	0.2000	7.00	18.00	11.00	20.20
30,00,000	90,00,000	0.3333	7.50	18.00	10.50	21.50
40,00,000	80,00,000	0.5000	7.50	18.00	10.50	23.25
50,00,000	70,00,000	0.7143	8.00	18.00	10.00	25.14
60,00,000	60,00,000	1.0000	8.50	18.00	9.50	27.50
70,00,000	50,00,000	1.4000	9.00	18.00	9.00	30.60
80,00,000	40,00,000	2.0000	10.00	18.00	8.00	34.00

**10. Break Even Sales = ₹ 68,00,000 × 0.75 = ₹ 51,00,000**

**Income Statement**

	Original	Calculation of Interest at BEP (backward calculation)	Now at present level
	₹	₹	₹
Sales	68,00,000	51,00,000	68,00,000
Less: Variable Cost	40,80,000	30,60,000	40,80,000
Contribution	27,20,000	20,40,000	27,20,000
Less: Fixed Cost	16,32,000	16,32,000	16,32,000
EBIT	10,88,000	4,08,000	10,88,000
Less: Interest (EBIT-PBT)	?	<b>3,93,714</b>	<b>3,93,714</b>
PBT	?	14,286(10,000/70%)	6,94,286
Less: Tax @ 30%(or PBT-PAT)	?	4,286	2,08,286
PAT	?	10,000(Nil+10,000)	4,86,000
Less: Preference Dividend	10,000	10,000	10,000
Earnings for Equity share holders	?	<b>Nil (at BEP)</b>	4,76,000
Number of Equity Shares	1,50,000	1,50,000	1,50,000
EPS	?	-	3.1733

So Interest = ₹ 3,93,714, EPS = ₹ 3.1733, Amount of debt = 3,93,714/12% = ₹ 32,80,950

**11. Calculation of Equity Share capital and Reserves and surplus:**

Alternative 1:

$$\text{Equity Share capital} = ₹20,00,000 + \frac{₹2,00,000 \times 100}{133.3333} = ₹21,50,000$$

$$\text{Reserves} = ₹10,00,000 + \frac{₹2,00,000 \times 33.3333}{133.3333} = ₹10,50,000$$

Alternative 2:

$$\text{Equity Share capital} = ₹20,00,000 + \frac{₹9,00,000 \times 100}{125} = ₹27,20,000$$

$$\text{Reserves} = ₹10,00,000 + \frac{₹9,00,000 \times 25}{125} = ₹11,80,000$$

### Capital Structure Plans

(Amount in ₹)

Capital	Alternative 1 ₹	Alternative 2 ₹
Equity Share capital	21,50,000	27,20,000
Reserves and surplus	10,50,000	11,80,000
10% long term debt	15,00,000	15,00,000
14% Debentures	8,00,000	-
8% Irredeemable Debentures	-	1,00,000
Total Capital Employed	55,00,000	55,00,000

### Computation of Present Earnings before interest and tax (EBIT)

EPS (₹)	21
No. of equity shares	20,000
Earnings for equity shareholders (I x II) (₹)	4,20,000
Profit Before Tax (III/75%) (₹)[	5,60,000
Interest on long term loan (1500000 x 10%) (₹)	1,50,000
EBIT (IV + V) (₹)	7,10,000

$$\text{EBIT after expansion} = ₹7,10,000 + ₹2,00,000 = ₹9,10,000$$

**Evaluation of Financial Plans on the basis of EPS, MPS and Financial Leverage**

(Amount in ₹)

Particulars	Alternative I	Alternate II
EBIT	9,10,000	9,10,000
Less: Interest: 10% on long term loan	(1,50,000)	(1,50,000)
14% on Debentures	(1,12,000)	Nil
8% on Irredeemable Debentures	Nil.	(8000)
PBT	6,48,000	7,52,000
Less: Tax @25%	(1,62,000)	(1,88,000)
PAT	4,86,000	5,64,000
No. of equity shares	21,500	27,200
<b>EPS</b>	<b>22.60</b>	<b>20.74</b>
Applicable P/E ratio (Working Note 1)	7	8.5
<b>MPS (EPS X P/E ratio)</b>	<b>158.2</b>	<b>176.29</b>
<b>Financial Leverage EBIT/PBT</b>	<b>1.40</b>	<b>1.21</b>

**Working Note 1**

	Alternative I	Alternative II
Debt:		
₹15,00,000 + ₹8,00,000	23,00,000	-
₹15,00,000 + ₹1,00,000	-	16,00,000
Total capital Employed (₹)	55,00,000	55,00,000
Debt Ratio (Debt/Capital employed)	=0.4182	=0.2909
	<b>=41.82%</b>	<b>=29.09%</b>
Change in Equity: ₹21,50,000-₹20,00,000 ₹27,20,000-₹20,00,000	1,50,000	7,20,000
Percentage change in equity	7.5%	<b>36%</b>
Applicable P/E ratio	<b>7</b>	<b>8.5</b>

### Calculation of Cost of equity and various type of debt

	Alternative I	Alternative II
<b>A) Cost of equity</b>		
EPS ₹	22.60	20.74
DPS (EPS X 60%) ₹	13.56	12.44
Growth (g)	10%	10%
Po (MPS)	158.2	176.29
Ke = $\frac{D_0 (1 + g)}{P_0}$	$\frac{13.56 (1.1)}{158.2}$	$\frac{12.44 (1.1)}{176.29}$
	= 9.43%	= 7.76%
<b>B) Cost of Debt:</b>		
10% long term debt	10% + (1-0.25)	10% + (1-0.25)
	= 7.5%	= 7.5%
14% redeemable debentures	$\frac{14(1-0.25) + (110-100/10)}{110+100/2}$	nil
	= 10.5 + 1 / 10.5	
	= 10.95%	
8% irredeemable debenture	NA	8000 (1-0.25)/1,00,00 = 6%

### Calculation of Weighted Average cost of capital (WACC)

	Alternative 1			Alternative 2		
Capital	Weights	Cost (%)	WACC	Weights	Cost (%)	WACC
Equity Share Capital	0.3909	9.43	3.69%	0.4945	7.76	3.84%
Reserves and Surplus	0.1909	9.43	1.80%	0.2145	7.76	1.66%



10% Long term Debt	0.2727	7.50	2.05%	0.2727	7.50	2.05%
14% Debenture	0.1455	10.95	1.59%			
8% Irredeemable Debentures	-			0.0182	6	0.11%
			<b>9.12%</b>			<b>7.66%</b>

### Calculation Marginal Cost of Capital (MACC)

Capital	Alternative 1			Alternative 2		
	(weight)	Cost (%)	MACC	(weight)	Cost (%)	MACC
Equity Share Capital	₹ 1,50,000 (0.15)	9.43	1.41%	₹7,20,000 (0.72)	7.76	5.59%
Reserves and Surplus	₹ 50,000 (0.05)	9.43	0.47%	₹1,80,000 (0.18)	7.76	1.40%
14% Debenture	₹ 8,00,000 (0.80)	10.95	8.76%	-		0.00%
8% Irredeemable Debentures	-			₹1,00,000 (0.10)	6	0.60%
Total Capital Employed	₹10,00,000		<b>10.65%</b>	₹10,00,000		<b>7.58%</b>

**Summary of solution:**

	<b>Alternate I</b>	<b>Alternate II</b>
Earning per share (EPS) ₹	22.60	20.74
Market price per share (MPS) ₹	158.20	176.29
Financial leverage	1.4043	1.2101
Weighted Average cost of capital (WACC)	9.12%	7.66%
Marginal cost of capital (MACC)	10.65%	7.58%

Alternative 1 of financing will be preferred under the criteria of EPS, whereas Alternative II of financing will be preferred under the criteria of MPS, Financial leverage, WACC and marginal cost of capital.