# SANKAT MOCHAN SERIES

# BY CA ARUN SETIA

## CAFM PRACTICE QUESTION

# 100+ Questions

## 9 Chapters

PART 1

CHAPTER 1

# LEVERAGE ANALYSIS

## ILLUSTRATION 1

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

*(a) CALCULATE operating leverage.*

*(b) If sales are up by 10%, then COMPUTE the impact on EBIT?*

## SOLUTION

**(a)** Statement of Profitability

| | ₹ |
|---|---|
| Sales Revenue (10,000 × 500) | 50,00,000 |
| *Less:* Variable Cost (10,000 × 200) | 20,00,000 |
| Contribution | 30,00,000 |
| *Less:* Fixed Cost | 25,00,000 |
| EBIT | 5,00,000 |

$$\text{Operating Leverage} = \frac{\text{Contribution}}{\text{EBIT}} = \frac{₹\,30\text{ lakhs}}{₹\,5\text{ lakhs}} = 6\text{ times}$$

**(b)** $$\text{Operating Leverage (OL)} = \frac{\%\text{Change in EBIT}}{\%\text{Change in Sales}}$$

$$6 = \frac{X / 5,00,000}{5,00,000/50,00,000}$$

$$X = ₹\,3,00,000$$

$$\therefore \Delta\text{EBIT} = ₹\,3,00,000/₹\,5,00,000 = 60\%$$

## ILLUSTRATION 2

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

| | Firms | | | |
|---|---|---|---|---|
| | A (₹) | B(₹) | C(₹) | D(₹) |
| *Sale price per unit* | *20* | *32* | *50* | *70* |
| *Variable cost per unit* | *6* | *16* | *20* | *50* |
| *Fixed operating cost* | *60,000* | *40,000* | *1,00,000* | *Nil* |

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

**SOLUTION**

| | Firms | | | |
|---|---|---|---|---|
| | A (₹) | B (₹) | C (₹) | D (₹) |
| Sales (units) | 5,000 | 5,000 | 5,000 | 5,000 |
| Sales revenue (Units × sale price per unit) | 1,00,000 | 1,60,000 | 2,50,000 | 3,50,000 |
| *Less:* Variable cost (Units × variable cost per unit) | (30,000) | (80,000) | (1,00,000) | (2,50,000) |
| *Less:* Fixed operating costs | (60,000) | (40,000) | (1,00,000) | Nil |
| EBIT | 10,000 | 40,000 | 50,000 | 1,00,000 |

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

$$DOL_{(A)} = \frac{₹\ 1,00,000 - ₹\ 30,000}{₹\ 10,000} = 7$$

$$DOL_{(B)} = \frac{₹1,60,000 - ₹\ 80,000}{₹\ 40,000} = 2$$

$$DOL_{(C)} = \frac{₹2,50,000 - ₹\ 1,00,000}{₹\ 50,000} = 3$$

$$DOL_{(D)} = \frac{₹3,50,000 - ₹\ 2,50,000}{₹\ 1,00,000} = 1$$

## ILLUSTRATION 3

*A firm's details are as under:*

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

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

*Consider tax @ 50 %.*

*CALCULATE:*

*(a) Operating Leverage*

*(b) Financial Leverage*

*(c) Combined Leverage*

*(d) Return on Investment*

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

## SOLUTION

| | (₹) |
|---|---|
| Sales | 24,00,000 |
| *Less:* Variable cost | 12,00,000 |
| Contribution | 12,00,000 |
| *Less:* Fixed cost | 10,00,000 |
| EBIT | 2,00,000 |
| *Less:* Interest | 1,00,000 |
| EBT | 1,00,000 |
| *Less:* Tax (50%) | 50,000 |
| EAT | 50,000 |
| No. of equity shares | 10,000 |
| EPS | 5 |

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

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

(c) Combined Leverage = OL × FL = 6 × 2 = 12 times.

(d) ROI $= \frac{₹50,000}{₹10,00,000} \times 100 = 5\%$

Here ROI is calculated as ROE i.e. $\frac{\text{EAT - Pref. Dividend}}{\text{Equity shareholders' fund}}$

(e) Operating Leverage = 6

$$6 = \frac{\Delta \text{EBIT}}{0.25}$$

$$\Delta \text{EBIT} = \frac{6 \times 1}{4} = 1.5$$

Increase in EBIT = ₹ 2,00,000 × 1.5

= ₹ 3,00,000

New EBIT = ₹ 5,00,000

**ILLUSTRATION 4**

The following information is related to Yizi Company Ltd. for the current Financial Year:

| | |
|---|---|
| Equity share capital (of ₹ 10 each) | ₹ 50 lakhs |
| 12% Bonds of ₹ 1,000 each | ₹ 37 lakhs |
| Sales | ₹ 84 lakhs |
| Fixed cost (excluding interest) | ₹ 6.96 lakhs |
| Financial leverage | 1.49 |
| Profit-volume Ratio | 27.55% |
| Income Tax Applicable | 40% |

You are required to CALCULATE:

(i) Operating Leverage;

(ii) Combined leverage; and

(iii) Earnings per share.

Show calculations up-to two decimal points.

**SOLUTION**

**Computation of Profits after Tax (PAT)**

| Particulars | (₹) |
|---|---|
| Sales | 84,00,000 |
| Contribution (Sales × P/V ratio) | 23,14,200 |
| Less: Fixed cost (excluding Interest) | (6,96,000) |
| EBIT (Earnings before interest and tax) | 16,18,200 |
| Less: Interest on debentures (12% × ₹37 lakhs) | (4,44,000) |
| Less: Other fixed Interest (balancing figure) | (88,160)* |
| EBT (Earnings before tax) | 10,86,040 |
| Less: Tax @ 40% | 4,34,416 |
| PAT (Profit after tax) | 6,51,624 |

**(i) Operating Leverage:**

$$= \frac{\text{Contribution}}{\text{EBIT}} = \frac{₹23,14,200}{₹16,18,200} = 1.43$$

**(ii) Combined Leverage:**

= Operating Leverage × Financial Leverage

= 1.43 × 1.49 = 2.13

Or,

$$\text{Combined Leverage} = \frac{\text{Contribution}}{\text{EBIT}} \times \frac{\text{EBIT}}{\text{EBT}}$$

$$\text{Combined Leverage} = \frac{\text{Contribution}}{\text{EBT}} = \frac{₹23,14,200}{₹10,86,040} = 2.13$$

$$^{*}\text{Financial Leverage} = \frac{\text{EBIT}}{\text{EBT}} = \frac{₹16,18,200}{\text{EBT}} = 1.49$$

$$\text{So, EBT} = \frac{₹16,18,200}{1.49} = ₹10,86,040$$

Accordingly, other fixed interest = ₹ 16,18,200 - ₹ 10,86,040 - ₹ 4,44,000

= ₹ 88,160

**(iii) Earnings per share (EPS):**

$$= \frac{\text{PAT}}{\text{No. of shares outstanding}} = \frac{₹\ 6,51,624}{5,00,000 \text{ equity shares}} = ₹\ 1.30$$

## ILLUSTRATION 5

Following are the selected financial information of A Ltd. and B Ltd. for the current Financial Year:

| | A Ltd. | B Ltd. |
|---|---|---|
| Variable Cost Ratio | 60% | 50% |
| Interest | ₹ 20,000 | ₹ 1,00,000 |
| Operating Leverage | 5 | 2 |
| Financial Leverage | 3 | 2 |
| Tax Rate | 30% | 30% |

You are required to FIND out:

(i) EBIT

(ii) Sales

(iii) Fixed Cost

(iv) Identify the company which is better placed with reasons based on leverages.

## SOLUTION

**Company A**

(i) Financial Leverage $= \frac{\text{EBIT}}{\text{EBT i.e EBIT} - \text{Interest}}$

So, 3 $= \frac{\text{EBIT}}{\text{EBIT} - ₹\,20,000}$

Or, 3 (EBIT – 20,000) = EBIT

Or, 2 EBIT = 60,000

Or, EBIT = 30,000

(ii) Operating Leverage $= \frac{\text{Contribution}}{\text{EBIT}}$ Or, $5 = \frac{\text{Contribution}}{₹\,30,000}$

Or, Contribution = ₹ 1, 50,000

$\text{Sales} = \frac{\text{contribution}}{\text{P/V Ratio}(1 - \text{variable cost ratio})} = \frac{₹\,1,50,000}{40\%} = ₹\,3,75,000$

(iii) Fixed Cost = Contribution – EBIT

= ₹ 1, 50,000 – 30,000

Or, Fixed cost = ₹ 1,20,000

**Company B**

(i) Financial Leverage $= \frac{\text{EBIT}}{\text{EBT i.e EBIT} - \text{Interest}}$

So, 2 $= \frac{\text{EBIT}}{\text{EBIT} - 1,00,000}$

Or, 2 (EBIT – ₹1,00,000) = EBIT

Or, 2 EBIT – ₹ 2,00,000 = EBIT

Or, EBIT = ₹ 2,00,000

(ii) Operating Leverage $= \frac{\text{Contribution}}{\text{EBIT}}$

Or, 2 $= \frac{\text{Contribution}}{₹\ 2,00,000}$

Or, Contribution = ₹ 4,00,000

$$\text{Sales} = \frac{\text{Contribution}}{\text{P/V Ratio (1 - variable cost ratio)}} = \frac{₹\ 4,00,000}{50\%} = ₹\ 8,00,000$$

(iii) Fixed Cost = Contribution – EBIT

= ₹ 4, 00,000 – ₹ 2,00,000

Or, Fixed cost = ₹ 2,00,000

**Income Statements of Company A and Company B**

| | **Company A (₹)** | **Company B (₹)** |
|---|---|---|
| Sales | 3,75,000 | 8,00,000 |
| Less: Variable cost | 2,25,000 | 4,00,000 |
| Contribution | 1,50,000 | 4,00,000 |
| Less: Fixed Cost | 1,20,000 | 2,00,000 |
| Earnings before interest and tax (EBIT) | 30,000 | 2,00,000 |
| Less: Interest | 20,000 | 1,00,000 |
| Earnings before tax (EBT) | 10,000 | 1,00,000 |
| Less: Tax @ 30% | 3,000 | 30,000 |
| Earnings after tax (EAT) | 7,000 | 70,000 |

**Comment based on Leverage**

Comment based on leverage – Company B is better than company A of the following reasons:

- Capacity of Company B to meet interest liability is better than that of companies A (from EBIT/Interest ratio)

$$[A = \frac{₹30,000}{₹20,000} = 1.5,\ B = \frac{₹2,00,000}{₹1,00,000} = 2]$$

- Company B has the least financial risk as the total risk (business and financial) of company B is lower (combined leverage of Company A – 15 and Company B- 4)

## SUMMARY

| DOL | DFL | DCL |
|---|---|---|
| Shows level of business risk. | Shows level of financial risk. | Shows level of total or combined risk. |
| It is dependent upon fixed cost. | It is dependent upon interest and preference dividend | It is dependent upon fixed cost, interest & preference dividend. |
| Measures % change in EBIT which results from a 1% change in Sales. | Measures % change in EPS which results from a 1% change in EBIT. | Measures % change in EPS which results from a 1% change in Sales. |
| For example, if DOL is 3 and there is 8% increase in output then EBIT will increase by 24% & if there is a 8% decrease in output then EBIT will decrease by 24%. | For example, if DFL is 2 and there is 5% increase in EBIT then EPS will increase by 10% and if there is a 5% decrease in EBIT then EPS will decrease by 10%. | For example, if DCL is 6 and there is a 8% increase in sales then EPS will increase by 48% and if there is a 8% decrease in sales then EPS will decrease by 48%. |
| There is a unique DOL for each level of output. | There is a unique DFL for each level of EBIT. | There is a unique DCL for each level of sales. |
| It is undefined at Operating B.E.P. | It is undefined at Financial B.E.P. | It is undefined at Financial B.E.P. |

## Practical Problems

1. *From the following information extracted from the books of accounts of Imax Ltd., CALCULATE percentage change in earnings per share, if sales increase by 10% and Fixed Operating cost is ₹ 1,57,500.*

| **Particulars** | **(₹)** |
|---|---|
| *EBIT (Earnings before Interest and Tax)* | *31,50,000* |
| *Earnings before Tax (EBT)* | *14,00,000* |

2. *Consider the following information for Mega Ltd.:*

| | |
|---|---|
| *Production level* | *2,500 units* |
| *Contribution per unit* | *₹ 150* |
| *Operating leverage* | *6* |
| *Combined leverage* | *24* |
| *Tax rate* | *30%* |

*Required:*

*COMPUTE its earnings after tax.*

3. *From the following information, prepare Income Statement of Company A & B:*

| **Particulars** | **Company A** | **Company B** |
|---|---|---|
| *Margin of safety* | *0.20* | *0.25* |
| *Interest* | *₹ 3,000* | *₹ 2,000* |
| *Profit volume ratio* | *25%* | *33.33%* |
| *Financial Leverage* | *4* | *3* |
| *Tax rate* | *45%* | *45%* |

4. *The capital structure of PS Ltd. at the end of the current Financial Year consisted as follows:*

| ***Particulars*** | ***(₹)*** |
|---|---|
| *Equity share capital (face value ₹ 100 each)* | *10,00,000* |
| *10% debentures (₹ 100 each)* | *10,00,000* |

*During the year, sales decreased to 1,00,000 units as compared to 1,20,000 units in the previous year. However, the selling price stood at ₹ 12 per unit and variable cost at ₹ 8 per unit for both the years. The fixed expenses were at ₹ 2,00,000 p.a. and the income tax rate is 30%.*

*You are required to CALCULATE the following:*

*(i) The degree of financial leverage at 1,20,000 units and 1,00,000 units.*

*(ii) The degree of operating leverage at 1,20,000 units and 1,00,000 units.*

*(iii) The percentage change in EPS.*

5. *The Sale revenue of TM excellence Ltd. @ ₹ 20 Per unit of output is ₹ 20 lakhs and Contribution is ₹ 10 lakhs. At the present level of output, the DOL of the company is 2.5. The company does not have any Preference Shares. The number of Equity Shares are 1 lakh. Applicable corporate Income Tax rate is 50% and the rate of interest on Debt Capital is 16% p.a. CALCULATE the EPS (at sales revenue of ₹ 20 lakhs) and amount of Debt Capital of the company if a 25% decline in Sales will wipe out EPS.*

6. *Betatronics Ltd. has the following balance sheet and income statement information:*

***Balance Sheet***

| ***Liabilities*** | ***(₹)*** | ***Assets*** | ***(₹)*** |
|---|---|---|---|
| *Equity capital (₹ 10 per share)* | *8,00,000* | *Net fixed assets* | *10,00,000* |
| *10% Debt* | *6,00,000* | *Current assets* | *9,00,000* |
| *Retained earnings* | *3,50,000* | | |
| *Current liabilities* | *1,50,000* | | |
| | *19,00,000* | | *19,00,000* |

***Income Statement for the year***

| ***Particulars*** | ***(₹)*** |
|---|---|
| *Sales* | *3,40,000* |
| *Operating expenses (including ₹ 60,000 depreciation)* | *1,20,000* |
| *EBIT* | *2,20,000* |
| *Less: Interest* | *60,000* |
| *Earnings before tax* | *1,60,000* |
| *Less: Taxes* | *56,000* |
| *Net Earnings (EAT)* | *1,04,000* |

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

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

7. *A company had the following Balance Sheet at the end of the current Financial Year:*

| ***Liabilities*** | ***(₹) in crores*** | ***Assets*** | ***(₹) in crores*** |
|---|---|---|---|
| *Equity Share Capital (50 lakhs shares of ₹ 10 each)* | *5* | *Fixed Assets (Net)* | *12.5* |
| *Reserves and Surplus* | *1* | *Current Assets* | *7.5* |
| *15% Debentures* | *10* | | |
| *Current Liabilities* | *4* | | |
| | *20* | | *20* |

*The additional information given is as under:*

| | |
|---|---|
| *Fixed cost per annum (excluding interest)* | *₹ 4 crores* |
| *Variable operating cost ratio* | *65%* |
| *Total assets turnover ratio* | *2.5* |
| *Income Tax rate* | *30%* |

*Required :*

*CALCULATE the following and comment:*

*(i) Earnings Per Share*

*(ii) Operating Leverage*

*(iii) Financial Leverage*

*(iv) Combined Leverage*

8. *CALCULATE the operating leverage, financial leverage and combined leverage from the following data under Situation I and II and Financial Plan A and B :*

| | |
|---|---|
| *Installed Capacity* | *4,000 units* |
| *Actual Production and Sales* | *75% of the Capacity* |
| *Selling Price* | *₹ 30 Per Unit* |
| *Variable Cost* | *₹ 15 Per Unit* |

*Fixed Cost:*

| | |
|---|---|
| *Under Situation-I* | *₹ 15,000* |
| *Under Situation-II* | *₹ 20,000* |

*Capital Structure:*

| | ***Financial Plan*** | |
|---|---|---|
| | ***A (₹)*** | ***B (₹)*** |
| *Equity* | *10,000* | *15,000* |
| *Debt (Rate of Interest at 20%)* | *10,000* | *5,000* |
| | *20,000* | *20,000* |

**1. Operating Leverage (OL)**

$$= \frac{\text{Contribution}}{\text{EBIT}} = \frac{\text{EBIT} + \text{Fixed Cost}}{\text{EBIT}} = \frac{₹\ 31,50,000 + ₹\ 1,57,500}{₹\ 31,50,000} = 1.05$$

**Financial Leverage (FL)**

$$= \frac{\text{EBIT}}{\text{EBT}} = \frac{₹\ 31,50,000}{₹\ 14,00,000} = 2.25$$

**Combined Leverage (CL)**

$= 1.05 \times 2.25 = 2.3625$

**Percentage Change in Earnings per share**

$$\text{DCL} = \frac{\%\ \text{change in EPS}}{\%\ \text{change in Sales}} = 2.3625 = \frac{\%\ \text{change in EPS}}{10\%}$$

$\therefore$ % change in EPS = 23.625%

Hence, if sales increases by 10%, EPS will be increased by 23.625%.

**2. Workings:**

1. Operating Leverage $= \frac{\text{Contribution}}{\text{EBIT}}$

$$= \frac{₹\ 150 \times 2,500}{\text{EBIT}} = \frac{₹\ 3,75,000}{\text{EBIT}} = 6$$

$$\therefore \text{EBIT} = \frac{₹\ 3,75,000}{6} = ₹\ 62,500$$

2. Operating Leverage (OL) $\times$ Financial Leverage (FL)= Combined Leverage (CL)

$6 \times$ Financial Leverage = 24

$\therefore$ Financial Leverage = 4

Also, Financial Leverage $= \frac{\text{EBIT}}{\text{EBT}} = 4$

$$\therefore \text{EBT} = \frac{\text{EBIT}}{4} = \frac{₹62,500}{4} = ₹\ 15,625$$

**Computation of Earnings after tax**

Earnings after Tax (EAT) = EBT (1 − t)

$$= ₹\ 15,625\ (1 - 0.30) = ₹\ 15,625 \times 0.70$$

$\therefore$ Earnings after Tax (EAT) = ₹ 10,938

**3.** **Income Statement**

| Particulars | Company A (₹) | Company B (₹) |
|---|---|---|
| Sales | 80,000 | 36,000 |
| *Less:* Variable Cost | 60,000 | 24,000 |
| Contribution | 20,000 | 12,000 |
| *Less:* Fixed Cost | 16,000 | 9,000 |
| EBIT | 4,000 | 3,000 |
| *Less:* Interest | 3,000 | 2,000 |
| EBT | 1,000 | 1,000 |
| Tax (45%) | 450 | 450 |
| EAT | 550 | 550 |

**Workings:**

**(i) Company A**

| | |
|---|---|
| Financial Leverage | = EBIT/(EBIT- Interest) |
| 4 | = EBIT/(EBIT- ₹ 3,000) |
| 4EBIT – ₹ 12,000 | = EBIT |
| 3EBIT | = ₹ 12,000 |
| EBIT | = ₹ 4,000 |

**Company B**

| | |
|---|---|
| Financial Leverage | = EBIT/(EBIT - Interest) |
| 3 | = EBIT/(EBIT – ₹ 2,000) |
| 3EBIT – ₹ 6000 | = EBIT |
| 2EBIT | = ₹ 6,000 |
| EBIT | = ₹ 3,000 |

**(ii) Company A**

| | |
|---|---|
| Operating Leverage | = 1/Margin of Safety |
| = 1/0.20 | = 5 |

| | | |
|---|---|---|
| | Operating Leverage | = Contribution/EBIT |
| | 5 | = Contribution/₹ 4,000 |
| | Contribution | = ₹ 20,000 |
| | **Company B** | |
| | Operating Leverage | = 1/Margin of Safety |
| | = 1/0.25 | = 4 |
| | Operating Leverage | = Contribution/EBIT |
| | 4 | = Contribution/₹ 3,000 |
| | Contribution | = ₹ 12,000 |
| **(iii)** | **Company A** | |
| | Profit Volume Ratio | = 25%(Given) |
| | Profit Volume Ratio | = Contribution/Sales × 100 |
| | 25% | = ₹ 20,000/Sales |
| | Sales | = ₹ 20,000/25% |
| | Sales | = ₹ 80,000 |
| | **Company B** | |
| | Profit Volume Ratio | = 33.33% |
| | Therefore, Sales | = ₹ 12,000/33.33% |
| | Sales | = ₹ 36,000 |

**4. Income Statement with required calculations**

| **Particulars** | **(₹)** | **(₹)** |
|---|---|---|
| Sales in units | 1,20,000 | 1,00,000 |
| Sales Value | 14,40,000 | 12,00,000 |
| Variable Cost | (9,60,000) | (8,00,000) |
| Contribution | 4,80,000 | 4,00,000 |
| Fixed expenses | (2,00,000) | (2,00,000) |
| EBIT | 2,80,000 | 2,00,000 |

| | | |
|---|---|---|
| Debenture Interest | (1,00,000) | (1,00,000) |
| EBT | 1,80,000 | 1,00,000 |
| Tax @ 30% | (54,000) | (30,000) |
| Profit after tax (PAT) | 1,26,000 | 70,000 |
| No. of shares | 10,000 | 10,000 |
| (i) Financial Leverage $= \frac{EBIT}{EBT}$ | $= \frac{₹\,2,80,000}{₹\,1,80,000}$ $= 1.56$ | $= \frac{₹\,2,00,000}{₹\,1,00,000}$ $= 2$ |
| (ii) Operating leverage $= \frac{Contribution}{EBIT}$ | $= \frac{₹\,4,80,000}{₹\,2,80,000}$ $= 1.71$ | $= \frac{₹\,4,00,000}{₹\,2,00,000}$ $= 2$ |
| (iii) Earnings per share (EPS) $= \frac{PAT}{No.\ of\ shares}$ | $= \frac{₹\,1,26,000}{10,000}$ $= ₹\ 12.6$ | $= \frac{₹\ 70,000}{10,000}$ $= ₹\ 7$ |
| Decrease in EPS | = ₹ 12.6 – ₹ 7 = ₹ 5.6 | |
| | % decrease in EPS $= \frac{5.6}{12.6} \times 100$ $= 44.44\%$ | |

**5. (i) Calculation of Fixed Cost**

$$DOL = \frac{Contribution}{Contribution\text{-}Fixed\ Cost} \text{ or } 2.5 = \frac{₹\ 10,00,000}{EBIT} \text{ or } EBIT = ₹\ 4,00,000$$

EBIT = Contribution – Fixed Cost

₹ 4,00,000 = ₹ 10,00,000 – Fixed Cost

Fixed Cost = ₹ 10,00,000 - ₹ 4,00,000 = ₹ 6,00,000

**(ii) Calculation of Degree of Combined Leverage (DCL)**

Question says that 25% change in sales will wipe out EPS. Here, wipe out means it will reduce EPS by 100%.

$$DCL = \frac{Percentage\ Change\ in\ EPS}{Percentage\ Change\ in\ Sales} = \frac{100\%}{25\%} = 4$$

**(iii) Calculation of Degree of Financial Leverage (DFL)**

DCL = DOL × DFL

4 = 2.5 × DFL

So, DFL = 1.6

**(iv) Calculation of Interest and amount of Debt**

$$DFL = \frac{EBIT}{EBIT\text{-}Int} \text{ Or, } 1.6 = \frac{₹\ 4,00,000}{₹\ 4,00,000 - Int} \text{ Or, Int} = ₹\ 1,50,000$$

Debt × Interest rate = Amount of Interest

Debt × 16% = ₹ 1,50,000

Debt = ₹ 9,37,500

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

$$EPS = \frac{(EBIT\text{-}Int)(1\text{-}t)}{N} = \frac{(₹\ 4,00,000 - ₹\ 1,50,000)0.5}{1,00,000} = ₹\ 1.25$$

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

$$DOL = \frac{₹\ 3,40,000 - ₹\ 60,000}{₹\ 2,20,000} = 1.27$$

$$DFL = \frac{₹\ 2,20,000}{₹\ 1,60,000} = 1.38$$

DCL = DOL × DFL = 1.27 × 1.38 = 1.75

**(b) Earnings per share at the new sales level**

| | **(i) Increase by 20%** | **(ii) Decrease by 20%** |
|---|---|---|
| | **(₹)** | **(₹)** |
| Sales level | 4,08,000 | 2,72,000 |
| *Less:* Variable expenses | 72,000 | 48,000 |
| *Less:* Fixed cost | 60,000 | 60,000 |
| Earnings before interest and taxes | 2,76,000 | 1,64,000 |

| | | |
|---|---|---|
| *Less:* Interest | 60,000 | 60,000 |
| Earnings before taxes | 2,16,000 | 1,04,000 |
| *Less:* Taxes | 75,600 | 36,400 |
| Earnings after taxes (EAT) | 1,40,400 | 67,600 |
| Number of equity shares | 80,000 | 80,000 |
| EPS | 1.76 | 0.85 |

**Working Notes:**

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

(ii) Variable Costs at:

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

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

**7. Workings:**

Total Assets = ₹ 20 crores

Total Asset Turnover Ratio = 2.5

Hence, Total Sales = 20 × 2.5 = ₹ 50 crores

**Computation of Profit after Tax (PAT)**

| | **(₹) in crores** |
|---|---|
| Sales | 50.00 |
| *Less*: Variable Operating Cost @ 65% | 32.50 |
| Contribution | 17.50 |
| *Less*: Fixed Cost (other than Interest) | 4.00 |
| EBIT | 13.50 |
| *Less*: Interest on Debentures (15% × ₹ 10 crores) | 1.50 |
| PBT | 12.00 |
| *Less*: Tax @ 30% | 3.60 |
| PAT | 8.40 |

**(i) Earnings per Share**

$$EPS = \frac{PAT}{\text{Number of Equity Shares}} = \frac{₹\ 8.40\ \text{crores}}{50,00,000} = ₹\ 16.80$$

It indicates the amount, the company earns per share. Investors use this as a guide while valuing the share and making investment decisions. It is also an indicator used in comparing firms within an industry or industry segment.

**(ii) Operating Leverage**

$$\text{Operating Leverage} = \frac{\text{Contribution}}{EBIT} = \frac{₹\ 17.50\ \text{crores}}{₹\ 13.50\ \text{crores}} = 1.296$$

It indicates the choice of technology and fixed cost in cost structure. It is level specific. When firm operates beyond operating break-even level, then operating leverage is low. It indicates sensitivity of earnings before interest and tax (EBIT) to change in sales at a particular level.

**(iii) Financial Leverage**

$$\text{Financial Leverage} = \frac{EBIT}{PBT} = \frac{₹\ 13.50\ \text{crores}}{₹\ 12.00\ \text{crores}} = 1.125$$

The financial leverage is very comfortable since the debt service obligation is small vis-à-vis EBIT.

**(iv) Combined Leverage**

$$\text{Combined Leverage} = \frac{\text{Contribution}}{EBIT} \times \frac{EBIT}{PBT}$$

Or,

$$= \text{Operating Leverage} \times \text{Financial Leverage}$$

$$= 1.296 \times 1.125 = 1.458$$

The combined leverage studies the choice of fixed cost in cost structure and choice of debt in capital structure. It studies how sensitive the change in EPS is vis-à-vis change in sales. The leverages, operating, financial and combined are used as measurement of risk.

**8. (i) Operating Leverage (OL)**

| | Situation-I | Situation-II |
|---|---|---|
| | (₹) | (₹) |
| Sales (3000 units @ ₹ 30 per unit) | 90,000 | 90,000 |
| *Less:* Variable Cost (@ ₹ 15 per unit) | 45,000 | 45,000 |
| Contribution (C) | 45,000 | 45,000 |
| *Less:* Fixed Cost | 15,000 | 20,000 |
| EBIT | 30,000 | 25,000 |
| Operating Leverage (OL) = $\frac{C}{EBIT}$ | $= \frac{₹\ 45,000}{₹\ 30,000}$ = 1.5 | $= \frac{₹\ 45,000}{₹\ 25,000}$ = 1.8 |

**(ii) Financial Leverage (FL)**

| | A (₹) | B (₹) |
|---|---|---|
| **Situation I** | | |
| EBIT | 30,000 | 30,000 |
| *Less:* Interest on debt | 2,000 | 1,000 |
| EBT | 28,000 | 29,000 |
| Financial Leverage (FL) = $\frac{EBIT}{EBT}$ | $= \frac{₹\ 30,000}{₹\ 28,000}$ = 1.07 | $= \frac{₹\ 30,000}{₹\ 29,000}$ = 1.034 |

| | A (₹) | B (₹) |
|---|---|---|
| **Situation-II** | | |
| EBIT | 25,000 | 25,000 |
| *Less:* Interest on debt | 2,000 | 1,000 |
| EBT | 23,000 | 24,000 |
| Financial Leverage (FL) = $\frac{EBIT}{EBT}$ | $= \frac{₹\ 25,000}{₹\ 23,000}$ = 1.09 | $= \frac{₹\ 25,000}{₹\ 24,000}$ = 1.04 |

**(iii) Combined Leverage (CL)**

| | A | B |
|---|---|---|
| **Situation-I** | | |
| CL = FL x OL | 1.5×1.07 = 1.61 | 1.5 × 1.034 = 1.55 |
| **Situation-II** | | |
| CL = FL x OL | 1.8 × 1.09 = 1.96 | 1.8 × 1.04 = 1.872 |

**ICSI PAST QUESTIONS**

Question 1

*Explain Hamada Equation and also calculate Hamada coefficient using following information. A company has a debt to equity ratio of 0.65 : 1.00, a tax rate of 35% and an unlevered beta of 0.80.*

Solution

The Hamada equation is the method of analyzing a firm's cost of capital as it uses additional financial leverage. It draws upon the Modigliani-Miller theorem on capital structure. The higher the beta equation, the higher the risk associated with the firm.

$ß_L = ß_U [1+ (1 -t) (D/E)]$

= 0.80 [1 + (1-.35) (.65)]

1.138, Hence, the leveraged beta is 1.138.

It means that the financial leverage of the company increases the overall risk by the beta amount of 0.338= (1.138-.80). Therefore, as the beta of the coefficient rises, the associated risk of having higher debt also rises.

CHAPTER 2

# TIME VALUE OF MONEY

Question 1

Compute the compound interest on ` 4,000 for 11⁄2 years at 10% per annum compounded half- yearly.

**Solution:** Here principal P = ₹ 4,000. Since the interest is compounded half-yearly the number of conversion periods in 1½ years are 3. Also the rate of interest per conversion period (6 months) is 10% x 1/2 = 5% (0.05 in decimal).

Thus the amount $A_n$ (in ₹) is given by

$$A_n = P\,(1 + i)^n$$

$$A_3 = 4{,}000(1 + 0.05)^3$$

$$= 4{,}630.50$$

The compound interest is therefore ₹ (4,630.50 - 4,000)

= ₹ 630.50

Question 2

What annual rate of interest compounded annually doubles an investment in 7 years? Given that (2 )1/7 =1.104090

**Solution:** If the principal be P then $A_n = 2P$.

Since $A_n = P(1+ i)^n$

- $2P = P\,(1 + i)^7$
- $2^{1/7} = (1 + i)$
- $1.104090 = 1 + i$
- $i = 0.10409$

$\therefore$ Required rate of interest = 10.41% per annum

Question 3

A certain sum invested at 4% per annum compounded semi-annually amounts to `78,030 at the end of one year. Find the sum.

**Solution:** Here $A_n = 78{,}030$

$n = 2 \times 1 = 2$

$i = 4 \times 1/2\,\% = 2\% = 0.02$

$P(\text{in } ₹) = ?$

We have

$A_n = P(1 + i)^n$

- $A_2 = P(1 + 0.02)^2$
- $78{,}030 = P\,(1.02)^2$
- $P = \dfrac{78{,}030}{(1.02)^2}$

$= 75{,}000$

Thus the sum invested is ₹ 75,000 at the begining of 1 year.

**Example 21:** A person opened an account on April, 2011 with a deposit of ₹ 800. The account paid 6% interest compounded quarterly. On October 1 2011 he closed the account and added enough additional money to invest in a 6 month time-deposit for ₹ 1,000, earning 6% compounded monthly.

(a) How much additional amount did the person invest on October 1?

(b) What was the maturity value of his time deposit on April 1 2012?

(c) How much total interest was earned?

Given that $(1 + i)^n$ is 1.03022500 for i=1½ % n = 2 and $(1+ i)^n$ is 1.03037751 for i = ½ % and n = 6.

**Solution:** (a) The initial investment earned interest for April-June and July- September quarter i.e. for two quarters. In this case i = 6/4 = 1½ % = 0.015, n $\left[n = \dfrac{6}{12} \times 4\right] = 2$

and the compounded amount $= 800(1 + 0.015)^2$

$= 800 \times 1.03022500$

$= ₹\ 824.18$

The additional amount invested $= ₹\ (1{,}000 - 824.18)$

$= ₹\ 175.82$

(b) In this case the time-deposit earned interest compounded monthly for six months.

Here $i = \dfrac{6}{12} = 1/2\,\% = (0.005)$ $\quad n = 6 \quad$ and $\quad P = ₹\ 1{,}000$

$= \dfrac{6}{12} \times 12$

Maturity value $= 1{,}000(1+0.005)^6$

$= 1{,}000 \times 1.03037751$

$= ₹\ 1{,}030.38$

(c) Total interest earned = ₹ (24.18+30.38) = ₹ 54.56

Question 5

5,000 is invested in a Term Deposit Scheme that fetches interest 6% per annum compounded quarterly. What will be the interest after one year? What is effective rate of interest?

**Solution:** We know that

$$I = P\left[(1+i)^n - 1\right]$$

Here P = ₹ 5,000

i = 6% p.a. = 0.06 p.a. or 0.015 per quarter

n = 4

and I = amount of compound interest

putting the values we have

$$I = ₹\ 5{,}000\left[(1+0.015)^4 - 1\right]$$

$$= ₹\ 5{,}000 \times 0.06136355$$

$$= ₹\ 306.82$$

For effective rate of interest using I = PEt we find

$$306.82 = 5{,}000 \times E \times 1.$$

$$\text{➢}\quad E = \frac{306.82}{5000}$$

$$= 0.0613 \text{ or } 6.13\%$$

**Note:** We may arrive at the same result by using

$$E = (1+i)^n - 1$$

$$\text{➢}\quad E = (1 + 0.015)^4 - 1$$

$$= 1.0613 - 1$$

$$= .0613 \text{ or } 6.13\%$$

We may also note that effective rate of interest is not related to the amount of principal. It is related to the interest rate and frequency of compounding the interest.

Question 6

You invest ` 3000 in a two year investment that pays you 12% per annum. Calculate the future value of the investment.

**Solution:** We know

$$F = C.F.\ (1 + i)^n$$

where $F$ = Future value

$C.F.$ = Cash flow = ₹ 3,000

$i$ = rate of interest = 0.12

$n$ = time period = 2

$F = ₹\ 3{,}000(1+0.12)^2$

$= ₹\ 3{,}000 \times 1.2544$

$= ₹\ 3{,}763.20$

Question 7

Find the future value of an annuity of ` 500 made annually for 7 years at interest rate of 14% compounded annually. Given that (1.14)7 = 2.5023.

**Solution:** Here annual payment $A = ₹\ 500$

$n = 7$

$i = 14\% = 0.14$

Future value of the annuity

$$A(7, 0.14) = 500\left[\frac{(1+0.14)^7 - 1}{(0.14)}\right]$$

$$= \frac{500 \times (2.5023 - 1)}{0.14}$$

$= ₹\ 5{,}365.35$

Question 8

200 is invested at the end of each month in an account paying interest 6% per year compounded monthly. What is the future value of this annuity after 10th payment? Given that (1.005)10 = 1.0511

**Solution:** Here $A = ₹\ 200$

$n = 10$

$i = 6\%$ per annum $= 6/12\%$ per month $= 0.005$

Future value of annuity after 10 months is given by

$$A(n, i) = A\left[\frac{(1+i)^n - 1}{i}\right]$$

$$A(10, 0.005) = 200\left[\frac{(1+0.005)^{10} - 1}{0.005}\right]$$

$$= 200\left[\frac{1.0511 - 1}{0.005}\right]$$

Question 9

S borrows ` 5,00,000 to buy a house. If he pays equal instalments for 20 years and 10% interest on outstanding balance what will be the equal annual instalment?

**Solution:** We know

$$A = \frac{V}{P(n, i)}$$

Here $V = ₹\ 5{,}00{,}000$

$n = 20$

$i = 10\%$ p.a. $= 0.10$

$$\therefore \quad A = \frac{V}{P(n, i)} = ₹\ \frac{5{,}00{,}000}{P(20,\ 0.10)}$$

$$= ₹\ \frac{5{,}00{,}000}{8.51356} \quad [P(20, 0.10) = 8.51356 \text{ from table 2(a)}]$$

$$= ₹\ 58{,}729.84$$

Question 10

Suppose your mom decides to gift you ` 10,000 every year starting from today for the next five years. You deposit this amount in a bank as and when you receive and get 10% per annum interest rate compounded annually. What is the present value of this annuity?

***Step 1:*** Present value of the annuity as if it were a regular annuity for one year less i.e. for four years

$= ₹\ 10{,}000 \times P\ (4, 0.10)$

$= ₹\ 10{,}000 \times 3.16987$

$= ₹\ 31{,}698.70$

***Step 2:*** Add initial cash deposit to the step 1 value

₹ (31,698.70+10,000) = ₹ 41,698.70

Question 11

How much amount is required to be invested every year so as to accumulate ` 300000 at the end of 10 years if interest is compounded annually at 10%?

Solution

$$A(n\ i) = A\left[\frac{(1+i)^n - 1}{i}\right]$$

$$300000 = A\left[\frac{(1+0.1)^{10} - 1}{0.1}\right]$$

$$300000 = A \times 15.9374248$$

$$A = \frac{3{,}00{,}000}{15.9374248}$$

$$= ₹\ 18{,}823.62$$

Question 12

An investor intends purchasing a three year ` 1,000 par value bond having nominal interest rate of 10%. At what price the bond may be purchased now if it matures at par and the investor requires a rate of return of 14%?

**Solution:** Present value of the bond

$$= \frac{100}{(1+0.14)^1} + \frac{100}{(1+0.14)^2} + \frac{100}{(1+0.14)^3} + \frac{1{,}000}{(1+0.14)^3}$$

$= 100 \times 0.87719 + 100 \times 0.769467 + 100 \times 0.674\ 972 + 1{,}000 \times 0.674972$

$= 87.719 + 76.947 + 67.497 + 674.972$

$= 907.125$

Thus the purchase value of the bond is ₹ 907.125

Question 13

Assuming that the discount rate is 7% per annum, how much would you pay to receive ` 50, growing at 5%, annually, forever?

**Solution:**

$$PVA = \frac{R}{i-g} = \frac{50}{0.07 - 0.05} = 2{,}500$$

Where

R = Cash flow stream, i = interest rate or discount rate, g = growth rate in interest

Question 14

Compute the net present value for a project with a net investment of ` 1,00,000 and net cash flows for year one is ` 55,000; for year two is ` 80,000 and for year three is ` 15,000. Further, the company's cost of capital is 10%?

**Solution:**

| *Year* | *Net Cash Flows* | *PVIF @ 10%* | *Discounted Cash Flows* |
|---|---|---|---|
| 0 | (1,00,000) | 1.000 | (1,00,000) |
| 1 | 55,000 | 0.909 | 49,995 |
| 2 | 80,000 | 0.826 | 66,080 |
| 3 | 15,000 | 0.751 | 11,265 |
| Net Present Value | | | 27,340 |

*Recommendation:* Since the net present value of the project is positive, the company should accept the project.

CHAPTER 3

# COST OF CAPITAL

## ILLUSTRATION 1

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

**SOLUTION**

Cost of irredeemable debenture:

$$K_d = \frac{I}{NP}(1-t)$$

$$K_d = \frac{₹\ 12}{₹\ 94}(1-0.35) = 0.08297 \text{ or } 8.30\%$$

## ILLUSTRATION 2

*A company issued 10,000, 10% debentures of ₹ 100 each at a premium of 10% on 1.4.2023 to be matured on 1.4.2028. The debentures will be redeemed on maturity. COMPUTE the cost of debentures assuming 35% as tax rate.*

**SOLUTION**

The cost of debenture ($K_d$) will be calculated as below:

$$\text{Cost of debenture } (K_d) = \frac{I(1-t)+\frac{(RV-NP)}{n}}{\frac{(RV+NP)}{2}}$$

I = Interest on debenture = 10% of ₹100 = ₹10

NP = Net Proceeds = 110% of ₹100 = ₹110

RV = Redemption value = ₹100

n = Period of debenture = 5 years

t = Tax rate = 35% or 0.35

$$K_d = \frac{₹10(1-0.35)+\frac{(₹100-₹110)}{5\text{years}}}{\frac{(₹100+₹110)}{2}}$$

$$\text{Or, } K_d = \frac{(₹10 \times 0.65)-₹2}{₹105} = \frac{₹4.5}{₹105} = 0.0428 \text{ or } 4.28\%$$

ILLUSTRATION 3

*A company issued 10,000, 10% debentures of ₹ 100 each at par on 1.4.2018to be matured on 1.4.2028. The company wants to know the cost of its existing debt on 1.4.2023when the market price of the debentures is ₹ 80. COMPUTE the cost of existing debentures assuming 35% tax rate.*

**SOLUTION**

$$\text{Cost of debenture } (K_d) = \frac{I(1-t)+\frac{(RV-NP)}{n}}{\frac{(RV+NP)}{2}}$$

I = Interest on debenture = 10% of ₹100 = ₹10

NP = Current market price = ₹80

RV = Redemption value = ₹100

n = Period of debenture = 5 years

t = Tax rate = 35% or 0.35

$$K_d = \frac{₹10(1-0.35)+\frac{(₹100-₹80)}{5\text{years}}}{\frac{(₹100+₹80)}{2}}$$

$$\text{Or, } K_d = \frac{(₹10\times0.65)+₹4}{₹90} = \frac{₹10.5}{₹90} = 0.1166 \text{ or } 11.67\%$$

ILLUSTRATION 4

*Institutional Development Bank (IDB) issued Zero interest deep discount bonds of face value of ₹1,00,000 each issued at ₹2,500 & repayable after 25 years. COMPUTE the cost of debt if there is no corporate tax.*

**SOLUTION**

Here,

Redemption Value (RV)= ₹1,00,000

Net Proceeds (NP) = ₹ 2,500

Interest = 0

Life of bond = 25 years

There is huge difference between RV and NP, therefore, in place of approximation method, we should use trial & error method.

$FV = PV \times (1+r)^n$

$₹\,1,00,000 = ₹\,2,500 \times (1+r)^{25}$

$₹\,40 = (1+r)^{25}$

Trial 1: r = 15%, $(1.15)^{25} = 32.919$

Trial 2: r = 16%, $(1.16)^{25} = 40.874$

Here:

L = 15%, H = 16%

$NPV_L = ₹\,32.919 - ₹\,40 = ₹\,-7.081$

$NPV_H = ₹\,40.874 - 40 = +₹\,0.874$

$$IRR = L + \frac{NPV_L}{NPV_L - NPV_H}(H-L)$$

$$= 15\% + \frac{₹ - 7.081}{₹ - 7.081 - (₹\,0.874)} \times (16\% - 15\%)$$

$$= 15.89\%$$

## ILLUSTRATION 5

*XYZ & Co. issues 2,000 10% preference shares of ₹ 100 each at ₹ 95 each. CALCULATE the cost of preference shares.*

**SOLUTION**

$$K_P = \frac{PD}{P_0}$$

$$K_P = \frac{(10 \times 2,000)}{(95 \times 2,000)} = \frac{10}{95} = 0.1053 \text{ or } 10.53\%$$

## ILLUSTRATION 6

*If R Energy is issuing preferred stock at ₹100 per share, with a stated dividend of ₹12, and a floatation cost of 3% then, CALCULATE the cost of preference share?*

**SOLUTION**

Here, Net Proceeds ($P_o$) will be issue price less floatation cost.

$P_o$ = ₹ 100 - 3% of ₹ 100 = ₹97

$$K_p = \frac{PD}{P_o}$$

$$= \frac{₹\ 12}{₹\ 97} = 0.1237 \text{ or } 12.37\%$$

## ILLUSTRATION 7

*A company has paid dividend of ₹ 1 per share (of face value of ₹ 10 each) last year and it is expected to grow @ 10% every year. CALCULATE the cost of equity if the market price of share is ₹ 55.*

**SOLUTION**

$$K_e = \frac{D_1}{P_0} + g = \frac{₹\,1(1+0.1)}{₹\,55} + 0.1 = 0.12 \text{ or } 12\%$$

## ILLUSTRATION 8

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

**SOLUTION**

$K_e = R_f + ß\ (R_m - R_f)$

$K_e = 0.10 + 1.75\ (0.15 - 0.10)$

$= 0.10 + 1.75\ (0.05) = 0.1875$ or 18.75%

## ILLUSTRATION 9

Cost of equity of a company is 20%. Rate of floatation cost is 5%. Rate of personal income tax is 30%. Calculate cost of retained earnings.
Solution:

**Solution:**

$K_r = K_e (1-t_p)(1-f) = 20\% \times (1-0.30) \times (1-0.05) = 13.3\%$

## ILLUSTRATION 10

*ABC Company provides the following details:*

$D_0$ = ₹ 4.19 $P_0$ = ₹ 50 $g$ = 5%

*CALCULATE the cost of retained earnings.*

**SOLUTION**

$$K_r = \frac{D_1}{P_0} + g = \frac{D_0(1+g)}{P_0} + g$$

$$= \frac{₹4.19(1+0.05)}{₹50} + 0.05$$

$$= 0.088 + 0.05 = 13.8\%$$

## ILLUSTRATION 11

*ABC Company provides the following details:*

$R_f$ = 7% ß = 1.20 $R_m - R_f$ = 6%

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

**SOLUTION**

$K_r = R_f + ß (R_m - R_f)$

$= 7\% + 1.20 (6\%) = 7\% + 7.20$

$K_r = 14.2\%$

## ILLUSTRATION 12

*Cost of equity of a company is 10.41% while cost of retained earnings is 10%. There are 50,000 equity shares of ₹10 each and retained earnings of ₹15,00,000. Market price per equity share is ₹50. Calculate WACC using market value weights if there are no other sources of finance.*

### SOLUTION

Book value of paid up equity capital = ₹ 5,00,000

Book value of retained earnings = ₹ 15,00,000

Ratio of Paid up equity capital & retained earnings = 5,00,000:15,00,000 = 1:3

Market value of paid up equity capital & retained earnings = ₹ 50,000 x ₹ 50

= ₹ 25,00,000

Market value of paid up equity capital = ₹ 25,00,000 x ¼ = ₹ 6,25,000

Market value of retained earnings = ₹ 25,00,000 x ¾ = ₹18,75,000

**Calculation of WACC using market value weights**

| Source of capital | Market Value | Weights | Cost of capital | WACC ($K_o$) |
|---|---|---|---|---|
| | (₹) | (a) | (b) | (c) = (a)×(b) |
| Equity shares | 6,25,000 | 0.25 | 0.1041 | 0.0260 |
| Retained earnings | 18,75,000 | 0.75 | 0.1000 | 0.0750 |
| | 25,00,000 | 1.000 | | 0.1010 |

WACC ($K_o$) = 0.1010 or 10.10%

## ILLUSTRATION 13

*CALCULATE the WACC using the following data by using:*

*(a) Book value weights*

*(b) Market value weights*

*The capital structure of the company is as under:*

| | (₹) |
|---|---|
| *Debentures (₹ 100 per debenture)* | *5,00,000* |
| *Preference shares (₹ 100 per share)* | *5,00,000* |
| *Equity shares (₹ 10 per share)* | *10,00,000* |
| | *20,00,000* |

*The market prices of these securities are:*

*Debentures* *₹ 105 per debenture*

*Preference shares* *₹ 110 per preference share*

*Equity shares* *₹ 24 per equity share*

*Additional information:*

*(1)* *₹ 100 per debenture redeemable at par, 10% coupon rate, 4% floatation costs, 10-year maturity.*

*(2)* *₹ 100 per preference share redeemable at par, 5% coupon rate, 2% floatation cost and 10-year maturity.*

*(3)* *Equity shares has ₹ 4 floatation cost and market price of ₹ 24 per share.*

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

*Corporate tax rate is 30%.Use YTM method to calculate cost of debentures and preference shares.*

**SOLUTION**

**(i) Cost of Equity ($K_e$)**

$$= \frac{D_1}{P_0 - F} + g = \frac{₹1}{₹24 - ₹4} + 0.05 = 0.1 \text{ or } 10\%$$

**(ii) Cost of Debt ($K_d$)**

$$K_d = \left[ \frac{I_N + (1-t) + \frac{R_v - B_o}{N}}{\left(\frac{R_v + B_o}{2}\right)} \times 100 \right]$$

$$= \frac{10(1 - .30) + \left(\frac{100 - 100.8}{10}\right)}{\left(\frac{100 + 100.8}{2}\right)} \times 100$$

$$\Rightarrow \left( \frac{7 + (-.08)}{100.4} \times 100 \right)$$

$$\Rightarrow 6.89\%$$

$$K_p = \frac{K_p + \frac{R_v - P_o}{N}}{\left(\frac{R_v + P_o}{2}\right)} \times 100$$

$$\Rightarrow \frac{5 + \left(\frac{100 - 107.8}{10}\right)}{\left(\frac{107.8 + 100}{2}\right)} \times 100$$

$$\Rightarrow \left(\frac{4.22}{103.9}\right) \times 100 = 4.07\%$$

**(a) Calculation of WACC using book value weights**

| Source of capital | Book Value | Weights | After tax cost of capital | WACC ($K_o$) |
|---|---|---|---|---|
| | (₹) | (a) | (b) | (c) = (a)×(b) |
| 10% Debentures | 5,00,000 | 0.25 | 0.0689 | 0.01723 |
| 5% Preference shares | 5,00,000 | 0.25 | 0.0408 | 0.0102 |
| Equity shares | 10,00,000 | 0.50 | 0.10 | 0.05000 |
| | 20,00,000 | 1.00 | | 0.07743 |

WACC ($K_o$) = 0.07743 or 7.74%

**(b) Calculation of WACC using market value weights**

| Source of capital | Market Value | Weights | After tax cost of capital | WACC ($K_o$) |
|---|---|---|---|---|
| | (₹) | (a) | (b) | (c) = (a)×(b) |
| 10% Debentures (₹105× 5,000) | 5,25,000 | 0.151 | 0.0689 | 0.0104 |
| 5% Preference shares (₹110× 5,000) | 5,50,000 | 0.158 | 0.0408 | 0.0064 |
| Equity shares (₹24× 1,00,000) | 24,00,000 | 0.691 | 0.10 | 0.0691 |
| | 34,75,000 | 1.000 | | 0.0859 |

WACC ($K_o$) = 0.0859 or 8.59%

## ILLUSTRATION 14

*ABC Ltd. has the following capital structure, which is considered to be optimum as on 31st March, 2023.*

| | (₹) |
|---|---|
| *14% Debentures* | *30,000* |
| *11% Preference shares* | *10,000* |
| *Equity Shares (10,000 shares)* | *1,60,000* |
| | *2,00,000* |

*The company share has a market price of ₹ 23.60. Next year dividend per share is 50% of year 2022 EPS. Following is the uniform trend of EPS for the preceding 10 years which is expected to continue in future:*

| Year | EPS (₹) | Year | EPS (₹) |
|---|---|---|---|
| 2013 | 1.00 | 2018 | 1.61 |
| 2014 | 1.10 | 2019 | 1.77 |
| 2015 | 1.21 | 2020 | 1.95 |
| 2016 | 1.33 | 2021 | 2.15 |
| 2017 | 1.46 | 2022 | 2.36 |

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

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

*(A) CALCULATE after tax:*

*(i) Cost of new debt*

*(ii) Cost of new preference shares*

*(iii) Cost of new equity share (assuming new equity from retained earnings)*

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

*(C) DETERMINE the amount that can be spent for capital investment before new ordinary shares must be sold. Assuming that the retained earnings for next year's investment is 50 percent of 2022.*

*(D) COMPUTE marginal cost of capital when the fund exceeds the amount calculated in (C), assuming new equity is issued at ₹ 20 per share.*

## SOLUTION

**(A)** (i) Cost of new debt

$$K_d = \frac{I(1-t)}{P_0}$$

$$= \frac{₹16\,(1-0.5)}{₹96} = 0.0833$$

(ii) Cost of new preference shares

$$K_p = \frac{PD}{P_0} = \frac{₹1.1}{₹9.2} = 0.12$$

(iii) Cost of new equity shares

$$K_e = \frac{D_1}{P_0} + g$$

$$= \frac{₹1.18}{₹23.60} + 0.10 = 0.05 + 0.10 = 0.15$$

Calculation of g when there is a uniform trend (on the basis of EPS)

$$= \frac{EPS\ (2014) - EPS\ (2013)}{EPS\ (2013)}$$

$$= \frac{₹\ 1.10 - ₹\ 1.00}{₹\ 1.00} = 0.10 \text{ or } 10\%$$

Calculation of $D_1$

$D_1$ = 50% of 2022EPS = 50% of 2.36 = ₹ 1.18

**(B)** Calculation of marginal cost of capital

| Type of Capital | Proportion | Specific Cost | Product |
|---|---|---|---|
| (1) | (2) | (3) | (2) × (3) = (4) |
| Debenture | 0.15 | 0.0833 | 0.0125 |
| Preference Share | 0.05 | 0.1200 | 0.0060 |
| Equity Share | 0.80 | 0.1500 | 0.1200 |
| Marginal cost of capital | | | **0.1385** |

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

Retained earnings = 50% of EPS of 2022 × outstanding equity shares

= 0.50×₹2.36 × 10,000 shares = ₹ 11,800

The ordinary equity (Retained earnings in this case) is 80% of total capital

So, ₹11,800 = 80% of Total Capital

∴ Capital investment before issuing equity shares = $\frac{₹\ 11,800}{0.80}$ = ₹ 14,750

**(D)** If the company spends in excess of ₹ 14,750, it will have to issue new equity shares at ₹20 per share.

$\therefore$ The cost of new issue of equity shares will be $= \frac{D_1}{P_0} + g = \frac{₹1.18}{₹20} + 0.10 = 0.159$

The marginal cost of capital will be:

| Type of Capital | Proportion | Specific Cost | Product |
|---|---|---|---|
| (1) | (2) | (3) | (2) × (3) = (4) |
| Debentures | 0.15 | 0.0833 | 0.0125 |
| Preference Shares | 0.05 | 0.1200 | 0.0060 |
| Equity Shares (New) | 0.80 | 0.1590 | 0.1272 |
| | | | **0.1457** |

ICSI PAST PAPERS

Question 1

*(5 marks)*

*The following is an extract from the financial statement of XYZ Ltd :*

| | *(₹ in lakh)* | *(₹ in lakh)* |
|---|---|---|
| *Operating Profit* | *105* | |
| *Less : Interest on debentures* | *33* | *72* |
| *Less : Income Tax (30%)* | | *21.6* |
| *Net profit* | | *50.4* |
| *Equity share capital (shares of 10 each)* | *200* | |
| *Reserves and surplus* | *100* | |
| *15% non-convertible debentures (of ₹ 100 each)* | *220* | *520* |

*The market price per equity share is ₹ 12 and per debenture ₹ 93.75. Calculate :*

*(i) EPS*

*(ii) Percentage cost of capital to the company for the debenture funds and the equity.*

*(5 marks)*

## Solution

i) Calculation of earnings per share:

Earnings per share (EPS) = $\frac{\text{Profit after tax}}{\text{No.of equity shares}}$

5040000/2000000= Rs. 2.52

ii) Computation of Percentage Cost of Capital:

(a) Cost of Equity Capital = Cost of Equity (Ke) = D / MP

Ke (%) = 2.52/12 x 100 = 21%

(b) Cost of Debenture Funds:

| | At Book Value (Rs in lakh) | At Market Price (Rs in lakh) |
|---|---|---|
| Value of 15% Debentures | 220.00 | 206.25 |
| Interest Cost for the year | 33.00 | 33.00 |
| Less: Tax at 30% | 9.90 | 9.90 |
| Interest cost after tax | 23.10 | 23.10 |
| Cost of Debenture Fund (%) | 23.10/220×100 =10.50% | 23.10/206.25×100 =11.20% |

## Question 2

Magma Ltd. is a manufacturing industry which has a mix of equity and debt to finance its business. The company is growing at a considerable rate prompting the management to go for expansion. The company is considering various alternatives to raise funds for the same.

The capital structure of Magma Ltd. is as follows :

| **Particulars** | **Amount (₹)** |
|---|---|
| 12% Debentures (first issue) | 3,00,000 |
| 13% Debentures (second issue) | 2,00,000 |
| 10% Cumulative Preference Shares | 2,50,000 |
| Equity Shares (Face Value of ₹ 10 per share) | 6,00,000 |
| Retained Earnings | 1,50,000 |

*Additional Information* :

(1) Equity shares are sold in the market at ₹ 25 per share. The company is contemplating the declaration of dividend of ₹ 3 per share at the end of the current financial year. The company has a practice of paying all earnings in the form of dividend.

(2) ₹ 100 per debenture (first issue) redeemable at par has 2% floatation cost and 8 years of maturity. The market price per debenture is ₹ 120.

(3) The second issue of debentures (₹ 100 each) is redeemable after 5 years and are currently selling at ₹ 90 per debenture.

(4) ₹ 100 per preference share redeemable at par has 3% floatation cost and 10 years of maturity. The market price per preference share is ₹ 108.

(5) The tax rate applicable to the company is 30%.

(6) The shareholder's tax liability may be assumed as 25% whereas the capital gain tax is 20%.

The CFO of the company is keen at understanding the cost of capital. Accordingly, you are appointed to complete the following tasks :

(1) Find out the weighted average cost of capital using :

(a) Book value weights.

(b) Market value weights.

(2) Further the company also intends to know the market price of the equity shares at the end of the current year using MM approach along with citing the assumptions of the theory.

(3) Assuming the company has sales of ₹ 20 lakh, variable cost of ₹ 12 lakh and fixed cost of ₹ 5 lakh (excluding of interest), calculate operating leverage, financial leverage and combined leverage.

*(10+5+5=20 marks)*

## Solution

**1. Weighted Average Cost of Capital (WACC)**

**Cost of Debentures=** $C_d = \dfrac{i(1-t)+(MV-NP)/n)}{(MV+NP)/2}$

i = annual interest payment

MV = maturity value

NP= net proceeds

t = corporate tax rate

n = number of years to maturity

| | | | |
|---|---|---|---|
| (i) $Cd_(First\ issue) = \dfrac{i(1-t)+(MV-NP)/n}{(MV+NP)/2}$ | $\dfrac{12(1-0.3)+(100-98)/8}{(100+98)/2}$ = | $\dfrac{8.4+0.25}{99} = \dfrac{8.65}{99}$ | = 0.087 |
| | | | |
| (ii $Cd_(Second\ issue) = \dfrac{i(1-t)+(MV-NP)/n}{(MV+NP)/2}$ | $\dfrac{13(1-0.3)+(100-100)/5}{(100+100)/2}$ | $= \dfrac{9.1+0}{100} = \dfrac{9.1}{100}$ | = 0.091 |
| | | | |

**Cost of Preference Shares(Cp)** $= \dfrac{PD + (MV-NP)/n}{(MV + NP)/2}$

PD= amount of annual preference dividend

(iii) **Cp** = $\frac{PD+(MV-NP)/n}{(MV+NP)/2} = \frac{10+(100-97)/10}{(100+97)/2} = \frac{10+0.3}{98.5} = \frac{10.3}{98.5}$ = 0.1046

**Cost of Equity Shares Capital (Ce) =** $\frac{\textbf{DPS}}{\textbf{MP (or NP)}}$

DPS= Expected Dividend per share

MP= Current Market Price per share

NP= Net proceeds per share

(iv) $C_e$ = = 3/25 = 0.12

**Cost of Retained Earnings ($C_r$)** = $\frac{DPS(1-t1_1)(1-b)}{MP(1-T_2)}$

$T_1$ = marginal tax rate applicable to individual shareholder

$T_2$ =capital gains tax

(iv) $C_r$ = 3(1-0.25)/25(1-0.2) = 2.25/20 = 0.1125

**Weighted Average Cost (Book Value Weights)**

| Source | Amount in ₹ | Weights | Cost | Weighted Average |
|---|---|---|---|---|
| Equity Shares | 600000 | 0.4 | 0.12 | 0.048 |
| 10% Cumulative Preference Shares | 250000 | 0.167 | 0.1046 | 0.0175 |
| 12% Debentures (first issue) | 300000 | 0.2 | 0.087 | 0.0174 |
| 13% Debentures (second issue) | 200000 | 0.133 | 0.091 | 0.0121 |
| Retained Earnings | 150000 | 0.1 | 0.1125 | 0.0113 |
| **Total** | **1500000** | **1.000** | | **0.1063 or 10.63%** |

**Weighted Average Cost (Market Value Weights)**

| Source | Amount in ₹ | Weights | Cost | Weighted Average |
|---|---|---|---|---|
| Equity Shares | 15,00,000 | 0.61 | 0.12 | 0.0732 |
| 10% Cumulative Preference Shares | 2,70,000 | 0.11 | 0.1046 | 0.0115 |

| | | | | |
|---|---|---|---|---|
| 12% Debentures (first issue) | 3,60,000 | 0.146 | 0.087 | 0.0127 |
| 13% Debentures (second issue) | 1,80,000 | 0.073 | 0.091 | 0.0066 |
| Retained Earnings | 1,50,000 | 0.061 | 0.1125 | 0.0069 |
| Total | 24,60,000 | 1.000 | | 0.1109 or 11.09% |

**2. Market Price of equity shares at the end of the current year**

$$Po = \frac{D_1+P_1}{1+K_e}$$

Where,

$K_e$= Cost of Equity

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

$P_1$= Market Price of equity shares at the end of the current year

$P_I = P_o(I+k_e) - D_I = 25(1 + 0.12) - 3 = 28 - 3 =$ ₹ 25

**Assumptions of M-M Hypothesis**

1. The capital markets are perfect. Perfect capital markets imply that
   a) Information is freely available to all,
   b) Transaction and floatation costs do not exist and
   c) No Investor is large enough to affect the market price of a share.
2. Investors behave rationally.
3. There are either no taxes or there are no differences in the tax rates applicable to dividends and capital gains. This means that investors value a rupee of dividend as much as a rupee of capital gains.
4. The firm has a fixed Investment policy.
5. Risk or uncertainty does not exist, (e., Investors are able to forecast future prices and dividends with certainty and one discount rate is appropriate for all securities at time periods.

**3. Calculation of Leverage**

| | **Amount in ₹** |
|---|---|
| Sales | 20,00,000 |
| Less: Variable Cost | 12,00,000 |
| Contribution | 8,00,000 |
| Less: Fixed Cost | 5,00,000 |
| Earnings before Interest and Tax (EBIT) | 3,00,000 |
| Interest: (36,000 + 26,000) | 62,000 |

| | |
|---|---|
| Profit before Tax (PBT) | 2,38,000 |
| Tax | 71,400 |
| Profit after tax (PAT) | 1,66,600 |

Operating Leverage (OL) = Contribution/EBIT

= ₹8,00,000/₹3,00,000

= 2.67

Financial Leverage (FL) = EBIT/EBT

= ₹3,00,000/(₹3,00,000 - ₹62,000)

= ₹3,00,000/₹2,38,000

= 1.26

Combined Leverage = OL x FL

= 2.67 x 1.26 =3.36

## Question 3

An investor wants to invest in the equity shares of XYZ Ltd for one year. The company is expected to declare a dividend of ₹ 3 per share. Further, a leading security analyst has projected the year-end target price of this company's share at ₹ 160. Assume that the required rate of return is 10%. The fair price of the share is :

(A) 111

(B) 145.45

(C) 145

(D) 148.45

CHAPTER 4

# CAPITAL STRUCTURE THEORIES

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

## 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% |

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

$$= \frac{₹50,000}{0.15} = ₹\,3,33,333$$

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

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

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

$$\text{Or, } K_0 = \frac{EBIT}{V} = \frac{₹1,00,000}{₹8,33,333} = 12.00\%$$

## 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) $K_0$ = 11% x 0 + 13% x 1 = 13.00%

2) $K_0$ = 11% x 0.1 + 13% x 0.9 = 12.80%

3) $K_0$ = 11.6% x 0.2 + 14% x 0.8 = 13.52%

4) $K_0$ = 12% x 0.3 + 15% x 0.7 = 14.10%

5) $K_0$ = 13% x 0.4 + 16% x 0.6 = 14.80%

6) $K_0$ = 15% x 0.5 + 18% x 0.5 = 16.50%

7) $K_0$ = 18% x 0.6 + 20% x 0.4 = 18.80%

Decision: 2nd option is the best because it has lowest WACC.

## 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 |

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

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

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 ($K_0$) 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. $= \frac{NOI}{K_0} = \frac{₹\,3,60,000}{18\%} = ₹\,20,00,000$

**(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.**

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

**(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

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

**(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.

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% | -- |

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

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

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

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.

## 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% × ₹ 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 x 15%) | 24,000 |
| Borrow money (₹ 1,00,000 x 15%) | 15,000 |
| Buy shares in Unlevered company | 39,000 |

**3. Change in Return**

| | ₹ |
|---|---|
| Income from shares in Unlevered company (₹ 39,000 x 12.5%) | 4,875 |
| *Less:* Interest on loan (₹ 15,000 x 10%) | 1,500 |
| Net Income from unlevered firm | 3,375 |
| *Less:* Income from Levered firm (₹ 24000 x 12.5%) | 3,000 |
| Incremental Income due to arbitrage | 375 |

## 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) $\left(\frac{EBIT - Interest}{K_e}\right)$ | ₹ 2,00,000 $\left(\frac{20,000}{0.10}\right)$ | ₹ 72,222 $\left(\frac{20,000 - 7,000}{0.18}\right)$ |
| 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% × ₹ 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 | ₹ 10,000 |
| Total investment in levered firm | ₹ 17,222 |

Your resources are ₹ 20,000

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

Your return on investment is:

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

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.

*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.

| 2. | **Investment & Borrowings** | ₹ |
|---|---|---|
| | Sell shares in Unlevered company (₹ 2,40,000 x 15%) | 36,000 |
| | Lend money (₹ 36,000 x 50%) | 18,000 |
| | Buy shares in Levered company (₹ 36,000 x 50%) | 18,000 |
| | Total | 36,000 |

| 3. | **Change in Return** | ₹ |
|---|---|---|
| | Income from shares in Levered company (₹ 18,000 x 20%) | 3,600 |
| | Interest on money lent (₹ 18,000 x 10%) | 1,800 |
| | Total Income after switch over | 5,400 |
| | *Less:* Income from Unlevered firm (₹ 36,000 x 12.5%) | 4,500 |
| | Incremental Income due to arbitrage | 900 |

Question for practice

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

Question 2

| | |
|---|---|
| Net Profit before Tax | ₹ 2,00,000 |
| Taxation | @ 50% of Net Profit |
| 20% Preference Capital | ₹ 75,000 |
| 10,000 Equity shares of ₹ 10 each | ₹ 1,00,000 |

Earnings per share from the data is :

(A) ₹ 10 per share

(B) ₹ 18.5 per share

(C) ₹ 8.5 per share

(D) ₹ 20 per share

CHAPTER 5

# Marginal Costing

## ILLUSTRATION 1

*If P/V ratio is 60% and the Marginal cost of the product is ₹ 20. CALCULATE the selling price?*

## Solution 1

Variable Cost = 100 – P/V Ratio

= 100 – 60 = 40

If Variable cost is 40, then selling price = 100

If Variable cost is 20, then selling price = (100/40) × 20 = ₹ 50

## ILLUSTRATION 2

*The ratio of variable cost to sales is 70%. The break-even point occurs at 60% of the capacity sales. Find the capacity sales when fixed costs are ₹ 90,000. Also COMPUTE profit at 75% of the capacity sales.*

## Solution 2

Variable cost to sales = 70%, Contribution to sales = 30%,

Or P/V Ratio 30%

We know that: BES × P/V Ratio = Fixed Cost

BES × 0.30 = ₹ 90,000

Or BES = ₹ 3,00,000

It is given that break-even occurs at 60% capacity.

Capacity sales = ₹ 3,00,000 ÷ 0.60 = ₹ 5,00,000

Computation of profit of 75% Capacity

| | |
|---|---|
| 75% of capacity sales (i.e. ₹ 5,00,000 × 0.75) | = ₹ 3,75,000 |
| Less: Variable cost (i.e. ₹ 3,75,000 × 0.70) | = ₹ 2,62,500 |
| | = ₹ 1,12,500 |
| Less: Fixed Cost | = ₹ 90,000 |
| Profit | = ₹ 22,500 |

## ILLUSTRATION 3

*You are required to-*

| | | | (₹) |
|---|---|---|---|
| *(i)* | *DETERMINE profit, when sales* | = | *2,00,000* |
| | *Fixed Cost* | = | *40,000* |
| | *BEP* | = | *1,60,000* |
| *(ii)* | *DETERMINE sales, when fixed cost* | = | *20,000* |
| | *Profit* | = | *10,000* |
| | *BEP* | = | *40,000* |

## Solution 3

**3.** (i) We know that: B.E. Sales × P/V Ratio = Fixed Cost

or ₹ 1,60,000 × P/V ratio = ₹ 40,000

P/V ratio = 25%

We also know that Sales × P/V Ratio = Fixed Cost + Profit

or ₹ 2,00,000 × 0.25 = ₹ 40,000 + Profit

or Profit = ₹ 10,000

(ii) Again B.E. Sales × P/V ratio = Fixed Cost

or ₹ 40,000 × P/V Ratio = ₹ 20,000

or P/V ratio = 50%

We also know that: Sales × P/V ratio = Fixed Cost + Profit

or Sales × 0.50 = ₹ 20,000 + ₹ 10,000

or Sales = ₹ 60,000.

## ILLUSTRATION 4

*A company has made a profit of ₹ 50,000 during the year. If the selling price and marginal cost of the product are ₹ 15 and ₹ 12 per unit respectively, FIND OUT the amount of margin of safety.*

## Solution 4

**4.** P/V Ratio $= \frac{\text{Contribution}}{\text{Sales}} \times 100$

$= [(15 - 12)/15] \times 100$

$= (3/15) \times 100 = 20\%$

Marginal of Safety = Profit ÷ P/V Ratio

= 50,000 ÷ 20% = ₹ 2,50,000

## ILLUSTRATION 5

(a) *If margin of safety is ₹ 2,40,000 (40% of sales) and P/V ratio is 30% of AB Ltd, CALCULATE its (1) Break even sales, and (2) Amount of profit on sales of ₹ 9,00,000.*

(b) *X Ltd. has earned a contribution of ₹ 2,00,000 and net profit of ₹1,50,000 of sales of ₹ 8,00,000. What is its margin of safety?*

## Solution 5

**(a)** Total Sales $= 2{,}40{,}000 \times \frac{100}{40} = ₹\ 6{,}00{,}000$

Contribution $= 6{,}00{,}000 \times 30\% = ₹\ 1{,}80{,}000$

Profit $= M/S \times P/V \text{ ratio} = 2{,}40{,}000 \times 30\% = ₹\ 72{,}000$

Fixed cost $=$ Contribution $-$ Profit

$= 1{,}80{,}000 - 72{,}000 = ₹\ 1{,}08{,}000$

(1) Break-even Sales $= \frac{\text{Fixed Cost}}{\text{P/V ratio}} = \frac{1{,}08{,}000}{30\%} = ₹\ 3{,}60{,}000$

(2) Profit $=$ (Sales $\times$ P/V ratio) $-$ Fixed cost

$= (9{,}00{,}000 \times 30\%) - 1{,}08{,}000 = ₹\ 1{,}62{,}000$

**(b)** P/V ratio $= \frac{\text{Contribution}}{\text{Sales}} = \frac{2{,}00{,}000}{8{,}00{,}000} = 25\%$

Margin of safety $= \frac{\text{Profit}}{\text{P/V ratio}} = \frac{1{,}50{,}000}{25\%} = ₹\ 6{,}00{,}000$

*Alternatively:*

Fixed cost $=$ Contribution $-$ Profit

$= ₹\ 2{,}00{,}000 - ₹1{,}50{,}000 = ₹\ 50{,}000$

B.E. Point $= ₹\ 50{,}000 \div 25\% = ₹\ 2{,}00{,}000$

Margin of Safety $=$ Actual sales $-$ B.E. sales

$= 8{,}00{,}000 - 2{,}00{,}000 = 6{,}00{,}000$

## ILLUSTRATION 6

*A company sells its product at ₹ 15 per unit. In a period, if it produces and sells 8,000 units, it incurs a loss of ₹ 5 per unit. If the volume is raised to 20,000 units, it earns a profit of ₹ 4 per unit. CALCULATE break-even point both in terms of Value as well as in units.*

## Solution 6

In first situation:

$15 \times 8{,}000 - 8{,}000\,x = y - 40{,}000$ (1)

In second situation:

$15 \times 20{,}000 - 20{,}000\,x = y + 80{,}000$ (2)

or, $1{,}20{,}000 - 8{,}000\,x = y - 40{,}000$ (3)

$3{,}00{,}000 - 20{,}000\,x = y + 80{,}000$ (4)

From (3) & (4) we get $x$ = ₹ 5, Variable cost per unit = ₹ 5

Putting this value in 3rd equation:

$1{,}20{,}000 - (8{,}000 \times 5) = y - 40{,}000$

or, $y$ = ₹ 1,20,000

Fixed Cost = ₹ 1,20,000

$$\text{P/V ratio} = \frac{S-V}{S} = \frac{15-5}{15} \times 100 = \frac{200}{3} = 66\frac{2}{3}\%.$$

Suppose break-even sales = $x$

$15x - 5x = 1{,}20{,}000$ (at BEP, contribution will be equal to fixed cost)

$x$ = 12,000 units.

or, Break-even sales in units = 12,000, Break-even sales in Value

= 12,000 × 15 = ₹1,80,000.

## ILLUSTRATION 7

*You are given the following data:*

| | **Sales** | **Profit** |
|---|---|---|
| *Year 2021-22* | *₹ 1,20,000* | *8,000* |
| *Year 2022-23* | *₹ 1,40,000* | *13,000* |

*FIND OUT –*

*(i) P/V ratio,*

*(ii) B.E. Point,*

*(iii) Profit when sales are ₹ 1,80,000,*

*(iv) Sales required earn a profit of ₹ 12,000,*

*(v) Margin of safety in year 2022-23.*

## Solution 7

**7.**

| | Sales | Profit |
|---|---|---|
| Year 2021-22 | ₹ 1,20,000 | 8,000 |
| Year 2022-23 | ₹ 1,40,000 | 13,000 |
| Difference | ₹ 20,000 | 5,000 |

**(i)** $\text{P/V Ratio} = \frac{\text{Difference in profit}}{\text{Difference in Sales}} \times 100 = \frac{5,000}{20,000} \times 100 = 25\%$

| | (₹) |
|---|---|
| Contribution in 2021-22 (1,20,000 × 25%) | 30,000 |
| Less: Profit | 8,000 |
| Fixed Cost* | 22,000 |

*Contribution = Fixed cost + Profit

∴ Fixed cost = Contribution - Profit

**(ii)** Break-even point $= \frac{\text{Fixed cost}}{\text{P/V ratio}} = \frac{22,000}{25\%} = ₹\ 88,000$

**(iii)** Profit when sales are ₹1,80,000

| | (₹) |
|---|---|
| Contribution (₹1,80,000 × 25%) | 45,000 |
| Less: Fixed cost | 22,000 |
| Profit | 23,000 |

**(iv)** Sales to earn a profit of ₹12,000

$$\frac{\text{Fixed cost} + \text{Desired profit}}{\text{P/V ratio}} = \frac{22,000 + 12,000}{25\%} = ₹1,36,000$$

**(v)** Margin of safety in 2022-23 –

Margin of safety = Actual sales – Break-even sales

= 1,40,000 – 88,000 = ₹ 52,000.

## ILLUSTRATION 8

*The following information is given by Star Ltd.:*

| | |
|---|---|
| *Margin of Safety* | *₹ 1,87,500* |
| *Total Cost* | *₹ 1,93,750* |
| *Margin of Safety* | *3,750 units* |
| *Break-even Sales* | *1,250 units* |

*Required:*

*CALCULATE Profit, P/V Ratio, BEP Sales (in ₹) and Fixed Cost.*

## Solution 8

$$\text{Margin of Safety (\%)} = \frac{3{,}750\text{units}}{3{,}750\text{units}+1{,}250\text{units}}$$

$$= 75\%$$

$$\text{Total Sales} = \frac{₹1{,}87{,}500}{0.75} = ₹\ 2{,}50{,}000$$

$$\text{Profit} = \text{Total Sales} - \text{Total Cost}$$

$$= ₹\ 2{,}50{,}000 - ₹\ 1{,}93{,}750 = ₹\ 56{,}250$$

$$\text{P/V Ratio} = \frac{\text{Profit}}{\text{Margin of Safety}\,(₹)} \times 100$$

$$= \frac{₹56{,}250}{₹1{,}87{,}500} \times 100 = 30\%$$

$$\text{Break-even Sales} = \text{Total Sales} \times [100 - \text{Margin of Safety \%}]$$

$$= ₹\ 2{,}50{,}000 \times 0.25 = ₹\ 62{,}500$$

$$\text{Fixed Cost} = \text{Sales} \times \text{P/V Ratio} - \text{Profit}$$

$$= ₹\ 2{,}50{,}000 \times 0.30 - ₹\ 56{,}250 = ₹\ 18{,}750$$

## ILLUSTRATION 9

*A company has a P/V ratio of 40%. COMPUTE by what percentage must sales be increased to offset: 20% reduction in selling price?*

## ILLUSTRATION 10

*You are given the following particulars*

*i. Fixed cost ₹ 1,50,000*

*ii. Variable cost ₹ 15 per unit*

*iii. Selling price is ₹ 30 per unit*

*CALCULATE:*

*(a) Break-even point*

*(b) Sales to earn a profit of ₹ 20,000*

**SOLUTION**

**(a)** Break-even point (BEP) $= \frac{\text{Fixed cost}}{\text{Contribution per unit}^*} = \frac{₹1,50,000}{₹15} = 10,000 \text{ Units}$

* (Contribution per unit = Sales per unit – Variable cost per unit = ₹ 30 - ₹15)

**(b)** Sales to earn a Profit of ₹ 20,000:

$$= \frac{\text{Fixed cost} + \text{Desired profit}}{\text{Contribution per unit}} \times \text{Selling price per unit}$$

$$= \frac{₹1,50,000 + ₹20,000}{₹15} \times ₹30 = ₹\ 3,40,000$$

Or

$$\frac{\text{Fixed cost} + \text{Desired profit}}{\text{P/V Ratio}} = \frac{₹1,70,000}{\text{P/V Ratio}} = \frac{₹1,70,000}{50\%} = ₹3,40,000$$

$$\text{PV Ratio} = \frac{\text{Contribution}}{\text{Sales}} \times 100$$

## ILLUSTRATION 11

*A company earned a profit of ₹ 30,000 during the year. If the marginal cost and selling price of the product are ₹ 8 and ₹ 10 per unit respectively, FIND OUT the amount of margin of safety.*

**SOLUTION**

$$\text{P/V ratio} = \frac{\text{Selling price} - \text{Variable cost per unit}}{\text{Selling price}} = \frac{₹10 - ₹8}{₹10} = 20\%$$

$$\text{Margin of safety} = \frac{\text{Profit}}{\text{P/V ratio}} = \frac{30,000}{20\%} = ₹\ 1,50,000$$

## ILLUSTRATION 12

*A Ltd. Maintains margin of safety of 37.5% with an overall contribution to sales ratio of 40%. Its fixed costs amount to ₹5 lakhs.*

*CALCULATE the following:*

*i. Break-even sales*

*ii. Total sales*

*iii. Total variable cost*

*iv. Current profit*

*v. New 'margin of safety' if the sales volume is increased by 7 ½ %.*

**SOLUTION**

**(i)** We know that: Break- even Sales (BES) × P/V Ratio = Fixed Cost

Break-even Sales (BES) × 40% = ₹ 5,00,000

Break- even Sales (BES) = ₹ 12,50,000

**(ii)** Total Sales (S) = Break Even Sales + Margin of Safety

S = ₹ 12,50,000 + 0.375S

Or, S – 0.375S = ₹ 12,50,000

Or, S = ₹ 20,00,000

**(iii)** Contribution to Sales Ratio = 40%

Therefore, Variable cost to Sales Ratio = 60%

Variable cost = 60% of sales = 60% of 20,00,000

Variable cost = 12,00,000

**(iv)** Current Profit = Sales – (Variable Cost + Fixed Cost)

= ₹ 20,00,000 – (12,00,000 + 5,00,000) = ₹ 3,00,000

**(v)** If sales value is increased by 7 ½ %

New Sales value = ₹ 20,00,000 × 1.075 = ₹ 21,50,000

New Margin of Safety = New Sales value – BES

= ₹ 21,50,000 – ₹ 12,50,000 = ₹ 9,00,000

ICSI PAST PAPERS

## Question 1

(a) *ABC Ltd. provides the following information regarding the cost of the product. Direct materials ₹ 20,000 Direct Wages ₹ 16,000 Variable Factory Overhead : 25% of wages Variable Administration Overhead : 10% of the factory cost Variable Selling and Distribution Overhead : ₹ 4 per unit Fixed Overhead : ₹ 8,000 Units sold 1,000 @ ₹ 64 per unit From the above data of ABC Ltd., you are required to calculate :*

*(i) Profit-Volume Ratio*

*(ii) Break-Even Point*

*(iii) Margin of Safety*

*(iv) Profit.*

*(5 marks)*

## Solution

**Statement of Marginal Cost**

| | |
|---|---|
| Direct Material | 20,000 |
| Direct Wages | 1 6,000 |
| Prime Cost | 36,000 |
| Variable Factory Overhead (25% of wages) | 4,000 |
| Marginal Factory Cost | 40,000 |
| Variable Administrative Overhead (10% of 40,000) | 4,000 |
| Marginal Cost of Production | 44,000 |
| Variable Selling & Distribution Overhead (l,000 x 4) | 4,000 |
| Total Marginal Cost | 48,000 |
| Sales (1,000x64) | 64,000 |

**Calculation of Ratio**

(i) P/V Ratio = S-V /S * 100 = 64,000-48,000 /64,000 = 25%

(ii) B.E.P. = Fixed Costs / P/V Ratio = 8,000 / 25% = Rs 32000

(iii) Margin of Safety = Sales - B E.P. = 64,000 - 32,000 = Rs 32,000

(iv) Profit= (S* P/V)-F = (64000*25%)-8000 = Rs 8000

Question 2

The data of a Limited company

| | Year 2022 | Year 2023 |
|---|---|---|
| Sales (lakhs) | 300 | 400 |
| Cost (lakhs) | 240 | 300 |

The P/V Ratio is :

(A) 20%

(B) 25%

(C) 33.3%

(D) 40%

CHAPTER 6

# DIVIDEND DECISION

## ILLUSTRATION 1

*XYZ Ltd. earns ₹ 10/ share. Capitalization rate and return on investment are 10% and 12% respectively.*

*DETERMINE the optimum dividend payout ratio and the price of the share at the payout.*

**SOLUTION**

Since $r > K_e$ , the optimum dividend pay-out ratio would 'Zero' (i.e. D = 0),

Accordingly, value of a share:

$$P = \frac{D + \frac{r}{Ke}(E - D)}{K_e}$$

$$P = \frac{0 + \frac{0.12}{0.10}(10 - 0)}{0.10} = ₹120$$

The optimality of the above payout ratio can be proved by using 25%, 50%, 75% and 100% as pay- out ratio:

**At 25% pay-out ratio**

$$P = \frac{2.5 + \frac{0.12}{0.10}(10 - 2.5)}{0.10} = ₹\ 115$$

**At 50% pay-out ratio**

$$P = \frac{5 + \frac{0.12}{0.10}(10 - 5)}{0.10} = ₹\ 110$$

**At 75% pay-out ratio**

$$P = \frac{7.5 + \frac{0.12}{0.10}(10 - 7.5)}{0.10} = ₹\ 105$$

**At 100% pay-out ratio**

$$P = \frac{10 + \frac{0.12}{0.10}(10 - 10)}{0.10} = ₹\ 100$$

## ILLUSTRATION 2

*The following figures are collected from the annual report of XYZ Ltd.:*

| | |
|---|---|
| *Net Profit* | *₹ 30 lakhs* |
| *Outstanding 12% preference shares* | *₹ 100 lakhs* |
| *No. of equity shares* | *3 lakhs* |
| *Return on Investment* | *20%* |
| *Cost of capital i.e. ($K_e$)* | *16%* |

*COMPUTE the approximate dividend pay-out ratio so as to keep the share price at ₹ 42 by using Walter's model?*

## SOLUTION

| | ₹ in lakhs |
|---|---|
| Net Profit | 30 |
| *Less:* Preference dividend | 12 |
| Earning for equity shareholders | 18 |
| Earning per share | 18/3 = ₹ 6.00 |

Let, the dividend per share be D to get share price of ₹ 42

$$P = \frac{D + \frac{r}{K_e}(E - D)}{K_e}$$

$$₹\ 42 = \frac{D + \frac{0.20}{0.16}(6 - D)}{0.16}$$

$$6.72 = \frac{0.16D + 1.2 - 0.20D}{0.16}$$

$$0.04D = 1.2 - 1.0752$$

$$D = 3.12$$

$$\text{D/P ratio} = \frac{DPS}{EPS} \times 100 = \frac{3.12}{6} \times 100 = 52\%$$

So, the required dividend payout ratio will be = 52%

## ILLUSTRATION 3

*The following figures are collected from the annual report of XYZ Ltd.:*

| | |
|---|---|
| *Net Profit* | *₹ 30 lakhs* |
| *Outstanding 12% preference shares* | *₹ 100 lakhs* |
| *No. of equity shares* | *3 lakhs* |
| *Return on Investment* | *20%* |
| *Cost of capital i.e. ($K_e$)* | *16%* |

*CALCULATE price per share using Gordon's Model when dividend pay-out is (i) 25%; (ii) 50% and (iii) 100%.*

## SOLUTION

| | ₹ in lakhs |
|---|---|
| Net Profit | 30 |
| Less: Preference dividend | 12 |
| Earning for equity shareholders | 18 |
| Earning per share | 18/3 = ₹ 6.00 |

Price per share according to Gordon's Model is calculated as follows:

$$P_0 = \frac{E_1(1-b)}{K_e - br}$$

Here, E1 = 6, Ke = 16%

(i) When dividend pay-out is 25%

$$P_0 = \frac{6 \times 0.25}{0.16 - (0.75 \times 0.2)} = \frac{1.5}{0.16 - 0.15} = 150$$

(ii) When dividend pay-out is 50%

$$P_0 = \frac{6 \times 0.5}{0.16 - (0.5 \times 0.2)} = \frac{3}{0.16 - 0.10} = 50$$

(iii) When dividend pay-out is 100%

$$P_0 = \frac{6 \times 1}{0.16 - (0 \times 0.2)} = \frac{6}{0.16} = 37.50$$

## ILLUSTRATION 4

*X Ltd. is a no growth company, pays a dividend of ₹5 per share. If the cost of capital is 10%, COMPUTE the current market price of the share?*

**SOLUTION**

$$P_0 = \frac{D}{K_e} = \frac{5}{0.10} = ₹50$$

**(b) Constant Growth Rate (Gordon's Growth Model):** The relationship between dividend and share price on the basis of Gordon's formula is:

$$\text{Market price per share (P)} = \frac{D_0(1+g)}{K_e - g}$$

Where

P = Market price per share

$D_0$ = current year dividend

g = growth rate of dividends

$K_e$ = cost of equity capital/ expected rate of return

**Notes:**

g = b × r

b = proportion of retained earnings or (1- dividend payout ratio)

## ILLUSTRATION 5

*XYZ is a company having share capital of ₹10 lakhs of ₹10 each. It distributed current dividend of 20% per annum. Annual growth rate in dividend expected is 2%. The expected rate of return on its equity capital is 15%. CALCULATE price of share applying Gordon's growth Model.*

**SOLUTION**

$$P = \frac{D_0(1+g)}{K_e - g}$$

$$= \frac{2(1+0.02)}{0.15 - 0.02} = ₹\ 15.69$$

## ILLUSTRATION 6

*A firm had paid dividend at ₹ 2 per share last year. The estimated growth of the dividends from the company is estimated to be 5% p.a. DETERMINE the estimated market price of the equity share if the estimated growth rate of dividends (i) rises to 8%, and (ii) falls to 3%. Also FIND OUT the present market price of the share, given that the required rate of return of the equity investors is 15%.*

### SOLUTION

In the present situation, the current MPS is as follows:

$$P = \frac{D_0(1+g)}{K_e - g}$$

$$P = \frac{2(1+0.05)}{0.15-0.05} = ₹\ 21$$

(i) The impact of changes in growth rate to 8% on MPS will be as follows:

$$P = \frac{2(1+0.08)}{0.15-0.08} = ₹\ 30.86$$

(ii) The impact of changes in growth rate to 3% on MPS will be as follows:

$$P = \frac{2(1+0.03)}{0.15-0.03} = ₹\ 17.17$$

So, the market price of the share is expected to vary in response to change in expected growth rate of dividends.

## ILLUSTRATION 7

*RST Ltd. has a capital of ₹ 10,00,000 in equity shares of ₹ 100 each. The shares are currently quoted at par. The company proposes to declare a dividend of ₹ 10 per share at the end of the current financial year. The capitalization rate for the risk class of which the company belongs is 12%. COMPUTE market price of the share at the end of the year, if*

*(i) dividend is not declared*

*(ii) dividend is declared*

*Assuming that the company pays the dividend and has net profits of ₹ 5,00,000 and makes new investments of ₹ 10,00,000 during the period, CALCULATE number of new shares to be issued? Use the MM model.*

## SOLUTION

Given,

| | |
|---|---|
| Cost of Equity ($K_e$) | 12% |
| Number of shares in the beginning (n) | 10,000 |
| Current Market Price ($P_0$) | ₹ 100 |
| Net Profit (E) | ₹ 5,00,000 |
| Expected Dividend ($D_1$) | ₹ 10 per share |
| Investment (I) | ₹ 10,00,000 |

Computation of market price per share, when:

**(i) No dividend is declared:**

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

$$100 = \frac{P_1 + 0}{1 + 0.12}$$

$$P_1 = 112 - 0 = ₹\ 112$$

**(ii) Dividend is declared:**

$$100 = \frac{P_1 + 10}{1 + 0.12}$$

$$P_1 = 112 - 10 = ₹\ 102$$

**Calculation of number of shares required for investment**

| | ₹ |
|---|---|
| Earning | 5,00,000 |
| Dividend distributed | 1,00,000 |
| Fund available for investment | 4,00,000 |
| Total Investment | 10,00,000 |
| Balance Funds required | 10,00,000 - 4,00,000 = 6,00,000 |

$$\text{No. of shares} = \frac{\text{Funds required}}{\text{Price at end}(P_1)}$$

$$\Delta n = \frac{6,00,000}{102} = 5,882.35 \text{ or } 5,883 \text{ Shares}$$

## ILLUSTRATION 8

*The following information pertains to M/s XY Ltd.*

| | |
|---|---|
| *Earnings of the Company* | *₹ 5,00,000* |
| *Dividend Payout ratio* | *60%* |
| *No. of shares outstanding* | *1,00,000* |

| | |
|---|---|
| *Equity capitalization rate* | *12%* |
| *Rate of return on investment* | *15%* |

*CALCULATE:*

*(i) Market value per share as per Walter's model.*

*(ii) Optimum dividend payout ratio according to Walter's model and the market value of Company's share at that payout ratio.*

## SOLUTION

(i) As per Walter's model:

$$P = \frac{D + \frac{r}{K_e}(E - D)}{K_e}$$

Where,

P = Market price per share.

E = Earnings per share = ₹ 5

D = Dividend per share = ₹ 3

R = Return earned on investment = 15%

$K_e$ = Cost of equity capital = 12%

$$P = \frac{3 + \frac{0.15}{0.12}(5 - 3)}{0.12} = ₹\ 45.83$$

(ii) According to Walter's model, when the return on investment is more than the cost of equity capital, the price per share increases as the dividend pay-out ratio decreases. Hence, the optimum dividend pay-out ratio in this case is nil.

So, at a pay-out ratio of zero, the market value of the company's share will be:

$$P = \frac{0 + \frac{0.15}{0.12}(5 - 0)}{0.12} = ₹\ 52.08$$

## ILLUSTRATION 9

*The following information is given below in case of Aditya Ltd.:*

*Earnings per share = ₹ 60*

*Capitalisation rate = 15%*

*Return on investment = 25%*

*Dividend payout ratio = 30%*

*(i) COMPUTE price per share using Walter's Model.*

*(ii) WHAT would be optimum dividend payout ratio per share under Gordon's Model.*

## SOLUTION

**(i) As per Walter's Model, Price per share is computed by using the following formula:**

$$P = \frac{D + \frac{r}{K_e}(E - D)}{K_e}$$

Where,

P = Market Price of the share.

E = Earnings per share.

D = Dividend per share.

$K_e$ = Cost of equity/ rate of capitalization/ discount rate.

r = Internal rate of return/ return on investment

Applying the above formula, price per share

$$P = \frac{18 + \frac{0.25}{0.15}(60 - 18)}{0.15}$$

$$\text{Or, } P = \frac{18 + 70}{0.15} = ₹\ 586.67$$

**(ii) As per Gordon's model, when $r > K_e$, optimum dividend payout ratio is 'Zero'.**

ICSI BOOK QUESTIONS

## PRACTICAL TYPE QUESTIONS

**Question 1.** A Company belongs to a risk class for which the capitalization rate is 20%. Its total number of existing shares is 1,00,000 at a selling price of Rs.100 each. The company is thinking to declare dividend of Rs.5 per share at the end of the current year. Using the Modigliani and Miller Model and assuming no taxes, answer the price of equity share at the end of the year, when (i) dividend is declared and (ii) dividend is not declared. Explain that whether dividend is paid or not, the wealth of shareholders is equal.

**Answer.** (i) 115, (ii) 120

**Question 2.** A Ltd. has 25,000 equity shares outstanding and its shareholders' expected rate of return is 10%. The current market price of a share is Rs.100. It is expected that the firm would pay dividend of Rs.5 per share in the next year. The firm has project in hand requiring new investment of Rs.5,00,000. The expected net income of the firm is Rs.2,50,000. Calculate the market value of the firm under both the conditions, i.e., when dividends are paid and are not paid. Also calculate the number of equity shares to be issued to meet the financial requirement of the new investment policy.

**Answer.** When dividend are paid MP = 105, No. of additional shares 3571.42

When dividend are not paid MP = 110, No. of additional shares 2272.72

**Question 3.** A Ltd. had 50,000 equity shares of Rs.10 each outstanding on Jan. 1, 1999. The shares are currently quoted at par in the market. The company now intends to pay dividend of Rs.2 per share for the current year. It belongs to a risk class, whose capitalization rate is 15%.

Using MM Model and assuming no taxes, ascertain the price of the company's share at the end of the year (i) When dividend is declared and (ii) when no dividend is declared. Also find out the number of new equity shares that the company must issue to meet its investment needs of Rs.2 lakhs assuming net income of Rs.1.1 lakhs.

Show that the payment or non-payment of dividend does not affect the value of the firm as per MM approach.

**Answer** Value of the firm = 5,00,000

**Question 4.** The earnings per share of a company are Rs.20. The capitalization rate is 15% and retained earnings can be employed to yield a return of 18%. The company is considering a payout of 25%, 50% and 75%. Which of these would maximize the wealth of shareholders?

**Answer** 153.33, 146.67, 140

**Question 5.** The par value of equity shares of PG Ltd. is Rs.100 per share. The company's earning per share is Rs.15. The rate of capitalization in the market is 15%. The following are the alternatives before the management regarding dividends:

a) If payout ratio is zero per cent

b) If payout ratio is 20 per cent

c) If payout ratio is 40 percent and

d) If payout ratio is 60 percent

In the above circumstances which alternative do you consider the best if the productivity of retained earnings is (a) 20%, (b) 15% and (c) 10%.

**Answer.** Retained earning is 20%, (133.33, 126.67, 120, 123.33), By retained earning is 15% (100, 100, 100, 100), If retained earning is 10% (66.67, 73.33, 80, 86.67)

**Question 6.** AR Company earns Rs.5 per share. Its rate of capitalization is 10% and rate of return on investment is 18%. According to Walter's formula, what should be the price per share at 25% dividend payout ratio? Is this the optimum payout ratio according to Walter?

**Question 7.** Calculate the market price of a share of Gupta ltd. under

(i) Walter's formula and (ii) Dividend growth model from the following data:

| | |
|---|---|
| Earning per share | Rs.5 |
| Dividend per share | Rs.3 |
| Cost of Capital | 60% |
| Internal rate of return on investment | 20% |
| Retention ratio | 50% |

**Answer.** 34.37, 41.67

ICSI PAST QUESTIONS

## Question 1

*RST Ltd. has a capital of ₹ 10,00,000 in equity shares of ₹ 100 each. The shares are currently quoted at par. The company proposes to declare a dividend of ₹10 per share at the end of the current financial year. The capitalization rate for the risk class of which the company belongs is 12%.*

*You are requested to calculate market price of the share at the end of the year, if*

*(i) Dividend is not declared.*

*(ii) Dividend is declared.*

*(iii) Assuming that the company pays the dividend and has net profits of ₹5,00,000 and makes new investments of ₹ 10,00,000 during the period, how many new shares must be issued ? Use the MM model.*

## Solution

Cost of Equity (Ke) 12% ; Number of shares in the beginning (n) 10,000 Current Market Price (P0) Rs.100 ; Net Profit (E) Rs. 5, 00,000

Expected Dividend Rs.10 per share Investment (I) Rs.10, 00,000

Computation of market price per share, when:

(i) No dividend is declared:

P0 = Pl +D l/ 1+Ke

100 = Pl +0 /l +0.12

P1 =112 — 0 = Rs 112

(ii) Dividend is declared:

100 = P1 +10 / 1+0. 12

Pl = 112 — 10 = Rs. 102

(iii) Calculation of funds required for investment: Using MM model Earning 5, 00,000

Dividend distributed 1, 00,000

Fund available for investment 4, 00,000

Total Investment 10, 00,000

Balance Funds required 10, 00,000 - 4, 00,000 = Rs. 6, 00,000 No. of shares — Funds required/ Price at end (P l)

Δn = 6, 00,000/ 102 = 5882.35 or 5883 Shares.

## Question 2

ABD Limited has provided the following information :

Earnings per share = ₹ 25

Dividend per share = ₹ 9

Cost of capital = 12%

Internal rate of return (IRR) on investment = 16%.

You are required to compute the market price per share using :

(a) Gorden's formula

(b) Walter's formula.

*(5 marks)*

Solution

**a) Gordon's approach**

$$P_0 = \frac{E(1l\text{-}b))}{ke - g} - \frac{9}{0.12\text{-}0.1024} \quad = 9/0.0176 = ₹\ 511.36$$

Where

$P_0$= Price of equity share

E = Earnings per share

b = Retention Ratio or percentage of earnings retained

1 – b = D/P Ratio, i.e., percentage of earnings distributed as dividends

CR or Ke = Capitalization rate of the firm or Cost of equity capital

br = Growth rate in r = g, i.e., rate of return on investment on an all-equity firm

E (1-b) = D = Dividend per share

where growth (g) = br

b = retention ratio= EPS- DPS /EPS = 25-9 / 25 = 0.64

Growth= b x r = 0.64 * 0.16 = 0.1024

**b) Walter's Approach**

$$P = \frac{D + (R/Ke)\ (E\text{-}D)}{Ke} - \frac{9+0.16/0.12(25\text{-}9)}{\mathbf{0.12}} - \frac{9+0.16/0.12(25\text{-}9)}{\mathbf{0.12}} - \frac{30.33}{\mathbf{0.12}} \quad ₹\ 252.78$$

Where, P = Market price per share

D = Dividend per share

R=Internal rate of return

E= Earnings per share

k = Cost of equity capitalization rate.

CHAPTER 7

# ESTIMATION OF WORKING CAPITAL

## ILLUSTRATION 1

*The following annual figures relate to XYZ Co.:*

| | (₹) |
|---|---|
| *Sales (at two months' credit)* | *36,00,000* |
| *Materials consumed (suppliers extend two months' credit)* | *9,00,000* |
| *Wages paid (1 month lag in payment)* | *7,20,000* |
| *Cash manufacturing expenses (expenses are paid one month in arrear)* | *9,60,000* |
| *Administrative expenses (1 month lag in payment)* | *2,40,000* |
| *Sales promotion expenses (paid quarterly in advance)* | *1,20,000* |

*The company sells its products on gross profit of 25%. Depreciation is considered as a part of the cost of production. It keeps one month's stock each of raw materials and finished goods, and a cash balance of ₹ 1,00,000.*

*Assuming a 20% safety margin, COMPUTE the working capital requirements of the company on cash cost basis. Ignore work-in-process.*

**SOLUTION**

**Statement of Working Capital requirements (cash cost basis)**

| | (₹) | (₹) |
|---|---|---|
| **A. Current Assets** | | |
| Inventory: | | |
| -Raw materials $\left(\frac{₹\,9,00,000}{12\,\text{months}} \times 1\ \text{month}\right)$ | 75,000 | |
| -Finished Goods $\left(\frac{₹25,80,000}{12\,\text{months}} \times 1\ \text{month}\right)$ | 2,15,000 | |
| Receivables (Debtors) $\left(\frac{₹29,40,000}{12\,\text{months}} \times 2\,\text{months}\right)$ | 4,90,000 | |
| Sales Promotion expenses paid in advance $\left(\frac{₹1,20,000}{12\,\text{months}} \times 3\ \text{months}\right)$ | 30,000 | |

## ILLUSTRATION 2

A Performa cost sheet of a company provides the following particulars:

| *Element of Cost* | *Amount per Unit (Rs.)* |
|---|---|
| Raw Material | 80 |
| Direct Labour | 30 |
| Overheads | 60 |
| Total | 170 |
| Profit | 30 |
| Selling Price | 200 |

The following further particulars are available:

Raw materials are in stock on an average one month. Materials are in process, on an average half a month. Finished goods are in stock on average one month.

Credit allowed by suppliers is one month. Credit allowed to debtors is two months. Lag in payment of wages is 1½ weeks. Lag in payment of overhead expenses is one month.

One-fourth of the output is sold against cash. Cash on hand and at bank is expected to be Rs.25,000.

You are required to prepare a statement showing the working capital needed to finance a level of activity of 1,04,000 units of production.

You may assume that production is carried on evenly throughout the year, wages and overheads accrue similarly and a time period of four weeks is equivalent to a month.

***Solution:***

**Statement of Working Capital Requirements Forecast**

| ***Current Assets:*** | | | | ***Rs.*** |
|---|---|---|---|---|
| 1. | Stock of Raw Materials (4 weeks) | (1,60,000 × 4) | | 6,40,000 |
| 2. | Stock of Finished Goods (4 weeks): | | Rs. | |
| | Raw Material | 1,60,000 × 4 | 6,40,000 | |
| | Direct Labour | 60,000 × 4 | 2,40,000 | |
| | Overheads | 1,20,000 × 4 | 4,80,000 | 13,60,000 |

| | | | | |
|---|---|---|---|---|
| 3. | Work-in-Progress (2 weeks): | | | |
| | Raw Material | 1,60,000 × 2 | 3,20,000 | |
| | Direct Labour | 60,000 × 1 | 60,000 | |
| | Overheads | 1,20,000 × 1 | 1,20,000 | 5,00,000 |
| 4. | Debtors (8 weeks): | | | |
| | Raw Material | 1,20,000 × 8 | 9,60,000 | |
| | Direct Labour | 45,000 × 8 | 3,60,000 | |
| | Overheads | 90,000 × 8 | 7,20,000 | 20,40,000 |
| 5. | Cash Balance | | | 25,000 |
| | | | | 45,65,000 |
| **Less Current Liabilities:** | | | | |
| 6. | Creditors for Raw Materials (4 weeks) | (1,60,000 × 4) | 6,40,000 | |
| 7. | Lag in payment of wages (1½ weeks) | (60,000 × 1½) | 90,000 | |
| 8. | Lag in payment of overheads (4 weeks) | (1,20,000 × 4) | 4,80,000 | 12,10,000 |
| **9.** | **Net Working Capital Required** | | | **33,55,000** |

## ILLUSTRATION 3

From the following information, prepare a statement showing the average amount of working capital required by Solvent Ltd., taking 360 days in a year.

Annual sales are estimated at 5,00,000 units at Rs.2 per unit. Production quantities coincide with sales and will be carried on evenly throughout the year and the production cost is:

Materials Re. 1 per unit

Labour Re. 0.40 per unit

Overheads Re. 0.35 per unit

Customers are given 45 days' credit and 60 days' credit is taken from suppliers – 36 days' supply of raw materials and 15 days' supply of finished goods are kept.

Production cycle is 18 days and all material is issued at the commencement of each production cycle.

A cash balance equivalent to one-third of the average of other working capital requirement is kept for contingencies.

***Solution:***

**Statement of Working Capital Requirements Forecast**

| **Current Assets:** | | | ***Rs.*** |
|---|---|---|---|
| 1. Stock of Raw Materials | $\frac{18}{360}$ x 500000 | | 50,000.00 |
| 2. Stock of Finished Goods | $\frac{15}{360}$ x 875000 | | 36,458.33 |
| 3. Work-in-Progress: | | | |
| Material | $\frac{18}{360}$ x 500000 | 25,000 | |
| Labour and Overheads | $\frac{18}{360}$ x 375000 x 50% | 9,375 | 34,375.00 |
| 4. Debtors | $\frac{45}{360}$ x 875000 | | 1,09,375.00 |
| Total Current Assets excluding cash | | | 2,30,208.33 |
| **Less Current Liabilities:** | | | |
| Creditors of Raw Materials | $\frac{60}{360}$ x 500000 | | 83,333.33 |
| Other Working Capital Requirement | | | 1,46,875.00 |
| Add Cash for contingencies (1/3) | | | 48,958.33 |
| **Working Capital Required** | | | **1,95,833.33** |

## ILLUSTRATION 4

On 1st January, 2006, the board of directors of Littlemore & Co. desire to know the amount of working capital that will be required to meet the programme they have planned for the year. From the following information, prepare an estimate of working capital requirements and a forecast of Profit and Loss Account and Balance Sheet.

Issued Shared Capital Rs. 2,00,000

8% Debentures Rs. 50,000

Fixed Assets as on 1st Jan. Rs. 1,25,000

Production during the previous year was 60,000 units and it proposed to maintain the same during 2006.

The expected ratios of cost to selling price are: raw materials 60%, direct wages 10%, and overheads 20%.

Following further information are available:

1) Raw materials are expected to remain in stores for an average of two months before issue to production.
2) Each unit of production is expected to be in process for one month.
3) Finished goods will stay in the warehouse awaiting dispatch to customers for approximately three months.
4) Credit allowed by creditors is two months from date of delivery of raw materials.
5) Credit given to debtors is three months from date of dispatch.
6) Selling price is Rs.5 per unit.
7) Sales and production follow a consistent pattern.

***Solution:***

**Statement of Working Capital Requirement Forecast**

| **Current Assets:** | | | ***Rs.*** |
|---|---|---|---|
| Stock of Raw materials (2 months) | (60,000 × 3 × 2/12) | | 30,000 |
| Stock of Finished Goods (3 months): | | | |
| Material | 60,000 × 3 × 3/12 | 45,000 | |
| Labour | 60,000 × 0.5 × 3/12 | 7,500 | |
| Overhead | 60,000 × 1.0 × 3/12 | 15,000 | 67,500 |
| Work-in-Progress (1 month): | | | |
| Material | 60,000 × 3 × 1/12 | 15,000 | |
| Labour | 60,000 × 0.5 × 50% × 1/12 | 1,250 | |
| Overhead | 60,000 × 1 × 50% × 1/12 | 2,500 | 18,750 |
| Debtors (3 months): | | | |
| Material | 60,000 × 3 × 3/12 | 45,000 | |
| Labour | 60,000 × 0.5 × 3/12 | 7,500 | |
| Overhead | 60,000 × 1.0 × 3/12 | 15,000 | 67,500 |
| | | | 1,87,750 |

| | | | |
|---|---|---|---|
| **Less Current Liabilities:** | | | |
| Creditors of Raw materials (2 months) | (60,000 × 3 × 2/12) | | 30,000 |
| **Net Working Capital Required** | | | **1,53,750** |

## ILLUSTRATION 5

From the following information extracted from the books of a manufacturing company, compute the operational cycle in days:

Period Covered: 365 days

Average period of credit allowed by suppliers: 16 days

| | | |
|---|---|---|
| Average total of debtors outstanding | Rs. 4,80,000 | |
| Raw material consumption | Rs. 44,00,000 | |
| Total production cost | Rs. 1,00,00,000 | |
| Total cost of sales | Rs. 1,05,00,000 | |
| Sales for the year | Rs. 1,60,00,000 | |
| Value of average stock maintained: | | |
| Raw Material | | 3,20,000 |
| Work-in-Progress | | 3,50,000 |
| Finished Goods | | 2,60,000 |

***Solution:***

**Computation of Operational Cycle**

a) Materials Storage Period = $\frac{\text{Average Stock for the year}}{\text{Daily Average Consumption}}$

$= \frac{320}{4,400 \div 365} = \frac{320 \times 365}{4,400} =$ 27 days

Less Average Credit Period granted by suppliers = $\frac{16 \text{ days}}{11 \text{ days}}$

b) Production Process Period = $\frac{\text{Average W.I.P.}}{\text{Average Production Cost}}$

$= \frac{350}{10,000 \div 365} = \frac{350 \times 365}{10,000} =$ 13 days

c) Finished Goods Storage Period = $\frac{\text{Average Stock of Finished Goods}}{\text{Average Cost of Sales}}$

$= \frac{260}{10,500 \div 365} = \frac{260 \times 365}{10,500} =$ 9 days

d) Debtors Collection Period = $\frac{\textit{Average Debtors}}{\textit{Daily Average Sales}}$

$= \frac{480}{16,000 \div 365} = \frac{480 \times 365}{16,000} =$ 11 days

**Operational Cycle Period = 44 days**

## ILLUSTRATION 6

The following information is available for SK Ltd.

| | |
|---|---|
| Average stock of raw materials and stores | 2,00,000 |
| Average work-in-progress inventory | 3,00,000 |
| Average finished goods inventory | 1,80,000 |
| Average accounts receivable | 3,00,000 |
| Average accounts payable | 1,80,000 |
| Average raw materials and stores purchased on credit and consumed per day | 10,000 |
| Average work-in-progress value of raw materials committed per day | 12,500 |
| Average cost of goods sold per day | 18,000 |
| Average sales per day | 20,000 |

Calculate the duration of operating cycle.

**Solution**

**Calculation of operating cycle**

| | | |
|---|---|---|
| Period of raw material stage | $\frac{2,00,000}{10,000}$ | = 20 days |
| Period of work-in-progress stage | $\frac{3,00,000}{12,500}$ | = 24 days |
| Period of finished goods stage | $\frac{1,80,000}{18,000}$ | = 10 days |
| Period of Accounts receivable stage | $\frac{3,00,000}{20,000}$ | = 15 days |
| Period of Accounts payable stage | $\frac{1,80,000}{10,000}$ | = 18 days |

Duration of operating cycle = (20 + 24 + 10 + 15) – 18 =51 days

ICSI practice questions

**PRACTICAL TYPE QUESTIONS**

**Question 1.** From the following information, you are required to estimate the net working capital:

| | **Cost per Unit (Rs.)** |
|---|---|
| Raw Material | 800 |
| Direct Labour | 300 |
| Overheads (excluding Depreciation) | 600 |
| Total Cost | 1700 |
| Output 52,000 units per annum at an even pace | |
| Raw Material in stock | Average 4 weeks |
| Work-in-Progress (whole of material and 50% completion | |
| Stage for labour and overhead) | Average 2 weeks |
| Finished goods in stock | Average 4 weeks |
| Credit allowed to debtors | Average 8 weeks |
| Credit allowed by suppliers | Average 4 weeks |

All sales are on credit basis and materials are introduced at the commencement of the process.

**Ans.**: Rs.2,29,00,000. Note: Investment in debtors has been valued on cost basis.

**Question 2.** The cost sheet of PQR Ltd. provides the following data:

| **Cost per Ton** | **(Rs.)** |
|---|---|
| Raw Material | 50 |
| Direct Labour | 20 |
| Overheads (including depreciation of Rs.10) | 40 |
| Total Cost | 110 |
| Profits | 20 |
| Selling price | 130 |

Average raw material in stock is for one month.

Average material in work-in-progress is for half month. Credit allowed by suppliers: one month; credit allowed to debtors: one month. Average time lag in payment of wages: 10 days; average time lag in payment of overheads 30 days, 25% of the sales are on cash basis. Cash balance expected to be Rs.1,00,000. Finished goods lie in the warehouse for one month.

You are required to prepare a statement of the working capital needed to finance level of the activity of 54,000 units of output. Production is carried on evenly throughout the year and wages and overheads accrue similarly.

**Ans.** 8,91,250

***Assumption:*** (1) Depreciation, being non-cash item, has been excluded. (2) As wages and overheads accrue evenly throughout the year, only 50% of the expenses have been taken in work-in-progress.

**Question 3.** From the following details, prepare an estimate of the requirement of working capital:

| | |
|---|---|
| Production | 60,000 Units |
| Selling Price per Unit | Rs.5 |
| Raw materials | 60% of Selling Price |
| Direct Wages | 10% of Selling Price |
| Overheads | 20% of Selling Price |
| Materials in Hand | 2 months' requirements |
| Production Time | 1 month |
| Finished Goods in Stores | 3 months |
| Credit for Material | 3 months |
| Credit allowed to Customers | 3 months |
| Average Cash Balance | Rs.20,000 |

Wages and overheads are paid at the beginning of the month following. In production all the required materials are charged in the initial stage and wages and overheads accrue evenly.

***Ans.:*** (a) Estimating Debtors at cost Rs.67,500, Working Capital Requirements Rs.1,66,250

ICSI PAST PAPERS

*XYZ Ltd. is a company manufacturing standardized chandeliers. The segment they deal in is more or less an oligopolistic kind of market with mediocre market potential. The demand of their product had been wavering in past, but owing to increasing economic level of middle class in India, the board of directors is confident of brighter days in future. On 1st April, 2023, the board of directors of the company is desirous of knowing the amount of working capital that will be required to meet the planned level of operations during the year 2023-24. Following details have been provided in this regard :*

| | |
|---|---|
| *Issued share capital :* | *₹ 2 Crore* |
| *10% Debentures* | *₹ 50 Lakh* |
| *Fixed Assets (1st April, 2023)* | *₹ 1.25 Crore* |

*Production and sales during the year 2023-24 is expected to average out to 500 units per month. During the previous year, the ratios of cost to selling price, which are also likely to be maintained in current year as well, were as follows :*

| | |
|---|---|
| *Raw Materials :* | *60%* |
| *Direct Wages* | *10%* |
| *Overheads :* | *20%* |

*Following additional information has been provided in this regard :*

*(1) Raw materials and components are expected to remain in store for an average period of two months before being issued to assembly and production.*

*(2) Each unit of product is expected to be in process for 15 days.*

*(3) Finished goods stay in warehouse for an average period of 1 month before being dispatches to customers.*

*(4) Suppliers of raw material components extend an average credit of 1.5 month.*

*(5) 80% sales are credit and though credit extended to customers is two months, average credit collection period is 75 days.*

*(6) On an average, overheads of 2 weeks remain outstanding.*

*(7) Selling price per unit is ₹ 5,000.*

*(8) Work-in-progress, cost involves 100% of material and 50% of labour and overheads.*

*(9) Sundry debtors to be valued at cash cost. Entire overhead cost is assumed to be cash cost. (10) One year is equal to 360 days or 52 weeks.*

*(11) Assuming production and sales follow a constant pattern. You are required to :*

*(a) Prepare an estimate of working capital required by the company for the ensuing year. Add 10% of your calculated figure for contingencies.*

*(10 marks)*

*(b) Prepare a forecast of Profit/Loss account for the ensuing year.*

*(5 marks)*

*(c) Prepare a forecasted Balance Sheet at the end of ensuing year.*

*(5 marks)*

**Statement of Estimated Working Capital by XYZ Ltd.**

| **Particulars** | | | **Amount (Rs.)** |
|---|---|---|---|
| Current Assets: | | | |
| Inventory | | | |
| Raw material | 6000*3000*2/12 | 30,00,000 | |
| Work-in Process | 6000*(3000+250+500)*15/360 | 9,37,500 | |
| Finished Goods | 6000*(3000+500+1000)*1/12 | 22,50,000 | 61,87,500 |
| Sundry Debtor | (6000*80%)*(3000+500+1000)*75/360 | 45,00,000 | 45,00,000 |
| | **Total Current Assets** | | **1,06,87,500** |
| *Less* : Current Liabilities | | | |
| Sundry Creditors | 6000*3000*1.5/12 | 22,50,000 | (22,50,000) |
| Outstanding Overheads | 6000*1000*2/52 | 2,30,769 | (2,30,769) |
| | **Balance** | | **82,06,731** |
| *Add* : 10% for contingencies | | | 8,20,673 |
| **ESTIMATED WORKING CAPITAL REQUIRED** | | | **90,27,404** |

**Working Notes**

(i) **Annual Production**= 500x12=6000 Units

(ii) **Per unit costs**: Raw material= Rs.5000 x 60%= Rs.3000: Direct Wages= 5000x l0%= Rs. 500 and Overhead= 5000x20%= Rs 1000.

**Answer 5(b)**

**Forecasted Profit/ Loss account of XYZ Ltd.**

| *Particulars* | *Amount (Rs.)* | *Particular* | *Amount (Rs.)* |
|---|---|---|---|
| To Material and Components | 1,80,00,000 | By sales | 3,00,00,000 |
| To Direct Labour | 30,00,000 | | |
| To Overheads | 60,00,000 | | |
| To Gross Profit c/d. | 30,00,000 | | |
| **Total** | **3,00,00,000** | **Total** | **3,00,00,000** |
| To Interest on debentures | 5,00,000 | By Gross Profit b/d. | 30,00,000 |
| To Net Profit c/d. | 25,00,000 | | |
| **Total** | **3,00,00,000** | **Total** | **3,00,00,000** |

**Answer 5(c)**

**Forecasted Balance Sheet of XYZ Ltd.**

| *Liabilities* | *Amount (Rs.)* | *Assets* | *Amount (Rs.)* |
|---|---|---|---|
| Share Capital | 2,00,00,000 | Fixed Assets | 1,25,00,000 |
| Profit /Loss a/c.<br>**10% Debenture** | 25,00,000<br>**50,00,000** | **Net Current Assets**<br>Inventory:<br>Raw Material- 30,00,000<br>WIP - 9,37,500<br>Finish Goods - 22,50,000 | 1,50,00,000 |
| | | Total Inventory- 61,87,500<br>Add : Debtors – 50,00,000<br>Add :<br>Cash / Bank – 62,93,269# | |
| | | Total CA: 1,74,80,769<br>Less CL:<br>Creditors – (22,50,000)<br>O/S Overheads-(2,30,769) | |
| **Total** | **2,75,00,000** | **Total** | **2,75,00,000** |

1. **Debtors on selling price = (6000*80 %)*5,000*75/360 = 50, 00,000**
2. **# Balancing figure**

   Cash / Bank Balance = Total Current Assets – Total Inventory – Debtors

   Cash / Bank Balance = 1,74,80,769 - 61,87,500 - 50,00,000 = Rs. 62,93,269
3. In case if student show creditors and O/S overheads in liability side in that case total of balance sheet will be **Rs.2,99,80,769.**
4. Candidates solving the above question by any format, i.e., vertical or horizontal may be awarded marks.
5. **Abbreviations:**

   CA – Current Assets

   CL – Current Liabilities

   O/S Overheads – Outstanding Overheads

CHAPTER 8

# Receivable Management

## ILLUSTRATION 1

*A trader whose current sales are in the region of ₹6 lakhs per annum and an average collection period of 30 days wants to pursue a more liberal policy to improve sales. A study made by a management consultant reveals the following information:-*

| Credit Policy | Increase in collection period | Increase in sales | Present default anticipated |
|---|---|---|---|
| A | 10 days | ₹30,000 | 1.5% |
| B | 20 days | ₹48,000 | 2% |
| C | 30 days | ₹75,000 | 3% |
| D | 45 days | ₹90,000 | 4% |

*The selling price per unit is ₹3. Average cost per unit is ₹2.25 and variable costs per unit are ₹ 2. The current bad debt loss is 1%. Required return on additional investment is 20%. Assume a 360 days year.*

*ANALYSE which of the above policies would you recommend for adoption?*

**SOLUTION**

**A. Statement showing the Evaluation of Debtors Policies (Total Approach)**

| Particulars | | Present Policy 30 days | Proposed Policy A 40 days | Proposed Policy B 50 days | Proposed Policy C 60 days | Proposed Policy D 75 days |
|---|---|---|---|---|---|---|
| | | ₹ | ₹ | ₹ | ₹ | ₹ |
| **A.** | **Expected Profit:** | | | | | |
| | (a) Credit Sales | 6,00,000 | 6,30,000 | 6,48,000 | 6,75,000 | 6,90,000 |
| | (b) Total Cost other than Bad Debts | | | | | |
| | (i) Variable Costs [Sales × 2/ 3] | 4,00,000 | 4,20,000 | 4,32,000 | 4,50,000 | 4,60,000 |
| | (ii)Fixed Costs | 50,000 | 50,000 | 50,000 | 50,000 | 50,000 |
| | | 4,50,000 | 4,70,000 | 4,82,000 | 5,00,000 | 5,10,000 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | (c) Bad Debts | 6,000 | 9,450 | 12,960 | 20,250 | 27,600 |
| | (d) Expected Profit [(a) – (b) – (c)] | 1,44,000 | 1,50,550 | 1,53,040 | 1,54,750 | 1,52,400 |
| **B.** | **Opportunity Cost of Investments in Receivables** | 7,500 | 10,444 | 13,389 | 16,667 | 21,250 |
| **C.** | **Net Benefits (A – B)** | 1,36,500 | 1,40,106 | 1,39,651 | 1,38,083 | 1,31,150 |

**Recommendation:** The Proposed Policy A (i.e. increase in collection period by 10 days or total 40 days) should be adopted since the net benefits under this policy are higher as compared to other policies.

**Working Notes:**

(i) **Calculation of Fixed Cost** = [Average Cost per unit – Variable Cost per unit] × No. of Units sold

= [₹ 2.25 - ₹ 2.00] × (₹ 6,00,000/3)

= ₹ 0.25 × 2,00,000 = ₹ 50,000

(ii) **Calculation of Opportunity Cost of Average Investments**

$$\text{Opportunity Cost} = \text{Total Cost} \times \frac{\text{Collection period}}{360} \times \frac{\text{Rate of Return}}{100}$$

Present Policy $= 4{,}50{,}000 \times \frac{30}{360} \times \frac{20}{100} = 7{,}500$

Policy A $= 4{,}70{,}000 \times \frac{40}{360} \times \frac{20}{100} = 10{,}444$

Policy B $= 4{,}82{,}000 \times \frac{50}{360} \times \frac{20}{100} = 13{,}389$

Policy C $= 5{,}00{,}000 \times \frac{60}{360} \times \frac{20}{100} = 16{,}667$

Policy D $= 5{,}10{,}000 \times \frac{75}{360} \times \frac{20}{100} = 21{,}250$

**B.** Another method of solving the problem is **Incremental Approach**. Here we assume that sales are all credit sales.

| ***Particulars*** | | ***Present Policy 30 days*** | ***Proposed Policy A 40 days*** | ***Proposed Policy B 50 days*** | ***Proposed Policy C 60 days*** | ***Proposed Policy D 75 days*** |
|---|---|---|---|---|---|---|
| | | ₹ | ₹ | ₹ | ₹ | ₹ |
| **A.** | **Incremental Expected Profit:** | | | | | |
| | (a) Incremental Credit Sales | --- | 30,000 | 48,000 | 75,000 | 90,000 |
| | (b) Incremental Costs | | | | | |
| | (i) Variable Costs | --- | 20,000 | 32,000 | 50,000 | 60,000 |
| | (ii)Fixed Costs | --- | - | - | - | - |
| | (c) Incremental Bad Debt Losses | --- | 3,450 | 6,960 | 14,250 | 21,600 |
| | (d) Incremental Expected Profit (a – b –c)] | | **6,550** | **9,040** | **10,750** | **8,400** |
| **B.** | **Required Return on Incremental Investments:** | | | | | |
| | (a) Cost of Credit Sales | 4,50,000 | 4,70,000 | 4,82,000 | 5,00,000 | 5,10,000 |
| | (b) Collection period | 30 | 40 | 50 | 60 | 75 |
| | (c) Investment in Receivable (a × b/360) | 37,500 | 52,222 | 66,944 | 83,333 | 1,06,250 |
| | (d) Incremental Investment in Receivables | --- | 14,722 | 29,444 | 45,833 | 68,750 |
| | (e) Required Rate of Return (in %) | | 20 | 20 | 20 | 20 |
| | (f) Required Return on Incremental Investments (d× e) | --- | **2,944** | **5,889** | **9,167** | **13,750** |
| **C.** | **Net Benefits (A – B)** | --- | 3,606 | 3,151 | 1,583 | - 5,350 |

**Recommendation:** The Proposed Policy A should be adopted since the net benefits under this policy are higher than those under other policies.

**C.** Another method of solving the problem is by computing the **Expected Rate of Return**.

$$\text{Expected Rate of Return} = \frac{\text{Incremental Expected Profit}}{\text{Incremental Investment in Receivables}} \times 100$$

$$\text{For Policy A} = \frac{₹\,6,550}{₹\,14,722} \times 100 = 44.49\%$$

$$\text{For Policy B} = \frac{₹\,9,040}{₹\,29,444} \times 100 = 30.70\%$$

$$\text{For Policy C} = \frac{₹\,10,750}{₹\,45,833} \times 100 = 23.45\%$$

$$\text{For Policy D} = \frac{₹\,8,400}{₹\,68,750} \times 100 = 12.22\%$$

## ILLUSTRATION 2

*XYZ Corporation is considering relaxing its present credit policy and is in the process of evaluating two proposed policies. Currently, the firm has annual credit sales of ₹ 50 lakhs and accounts receivable turnover ratio of 4 times a year. The current level of loss due to bad debts is ₹ 1,50,000. The firm is required to give a return of 25% on the investment in new accounts receivables. The company's variable costs are 70% of the selling price. Given the following information, IDENTIFY which is the better option?*

***(Amount in ₹)***

| | ***Present Policy*** | ***Policy Option I*** | ***Policy Option II*** |
|---|---|---|---|
| *Annual credit sales* | *50,00,000* | *60,00,000* | *67,50,000* |
| *Accounts receivable turnover ratio* | *4 times* | *3 times* | *2.4 times* |
| *Bad debt losses* | *1,50,000* | *3,00,000* | *4,50,000* |

Solution 2

**Statement showing the Evaluation of Debtors Policies**

| | *Particulars* | *Present Policy* | *Proposed Policy I* | *Proposed Policy II* |
|---|---|---|---|---|
| | | ₹ | ₹ | ₹ |
| **A** | **Expected Profit:** | | | |
| | (a) Credit Sales | 50,00,000 | 60,00,000 | 67,50,000 |
| | (b) Total Cost other than Bad Debts: | | | |
| | (i) Variable Costs | 35,00,000 | 42,00,000 | 47,25,000 |
| | (c) Bad Debts | 1,50,000 | 3,00,000 | 4,50,000 |
| | (d) Expected Profit [(a) – (b) – (c)] | 13,50,000 | 15,00,000 | 15,75,000 |
| **B** | **Opportunity Cost of Investments in Receivables** | 2,18,750 | 3,50,000 | 4,92,188 |
| **C** | **Net Benefits (A – B)** | 11,31,250 | 11,50,000 | 10,82,812 |

**Recommendation:** The Proposed Policy I should be adopted since the net benefits under this policy are higher as compared to other policies.

**Working Note:** Calculation of Opportunity Cost of Average Investments

$$\text{Opportunity Cost} = \text{Total Cost} \times \frac{\text{Collection period}}{12} \times \frac{\text{Rate of Return}}{100}$$

Collection Period in months = 12 / Accounts Receivable Turnover Ratio

Present Policy = ₹ 35,00,000 × 3/12 × 25% = ₹ 2,18,750

Proposed Policy I = ₹ 42,00,000 × 4/12 × 25% = ₹ 3,50,000

Proposed Policy II = ₹ 47,25,000 × 5/12 × 25% = ₹ 4,92,188

## ILLUSTRATION 3

*A company is presently having credit sales of ₹ 12 lakh. The existing credit terms are 1/10, net 45 days and average collection period is 30 days. The current bad debts loss is 1.5%. In order to accelerate the collection process further as also to increase sales, the company is contemplating liberalization of its existing credit terms to 2/10, net 45 days. It is expected that sales are likely to increase by 1/3 of existing sales, bad debts increase to 2% of sales and average collection period to decline to 20 days. The contribution to sales ratio of the company is 22% and opportunity cost of investment in receivables is 15 percent (pre-tax). 50 per cent and 80 percent of customers in terms of sales revenue are expected to avail cash discount under existing and liberalization scheme respectively. The tax rate is 30%.*

*ADVISE, should the company change its credit terms? (Assume 360 days in a year).*

**SOLUTION**

**Working Notes:**

**(i) Calculation of Cash Discount**

Cash Discount = Total credit sales × % of customers who take up discount × Rate

$$\text{Present Policy} = \frac{12,00,000 \times 50 \times .01}{100} = ₹\ 6,000$$

Proposed Policy = 16,00,000 × 0.80 × 0.02 = ₹ 25,600

**(ii) Opportunity Cost of Investment in Receivables**

Present Policy = 9,36,000 × (30/360) × (70% of 15)/100 = 78,000 × 10.5/100 = ₹ 8,190

Proposed Policy = 12,48,000 × (20/360) × 10.50/100 = ₹ 7,280

**Statement showing Evaluation of Credit Policies**

| Particulars | Present Policy | Proposed Policy |
|---|---|---|
| Credit Sales | 12,00,000 | 16,00,000 |
| Variable Cost @ 78%* of sales | 9,36,000 | 12,48,000 |
| Bad Debts @ 1.5% and 2% | 18,000 | 32,000 |
| Cash Discount | 6,000 | 25,600 |
| Profit before tax | 2,40,000 | 2,94,400 |
| Tax @ 30% | 72,000 | 88,320 |
| Profit after Tax | 1,68,000 | 2,06,080 |
| Opportunity Cost of Investment in Receivables | 8,190 | 7,280 |
| Net Profit | 1,59,810 | 1,98,800 |

**Advise:** Proposed policy should be adopted since the net benefit is increased by (₹1,98,800 – ₹1,59,810) ₹ 38,990.

## ILLUSTRATION 4

*A Factoring firm has credit sales of ₹ 360 lakhs and its average collection period is 30 days. The financial controller estimates, bad debt losses are around 2% of credit sales. The firm spends ₹ 1,40,000 annually on debtor's administration. This cost comprises of telephonic and fax bills along with salaries of staff members. These are the avoidable costs. A Factoring firm has offered to buy the firm's receivables. The factor will charge 1% commission and will pay an advance against receivables on an interest @15% p.a. after withholding 10% as reserve. ANALYSE what should the firm do?*

*Assume 360 days in a year.*

### SOLUTION

**Working notes:**

Average level of receivables = ₹ 360 lakhs × $\frac{30}{360}$ = 30 lakhs

| | | |
|---|---|---|
| Factoring Commission = 1% of ₹ 30,00,000 | = | ₹ 30,000 |
| Reserve = 10% of ₹ 30,00,000 | = | ₹ 3,00,000 |
| Total (i) | = | ₹ 3,30,000 |

Thus, the amount available for advance is

| | |
|---|---|
| Average level of receivables | ₹ 30,00,000 |
| *Less*: Total (i) from above | ₹ 3,30,000 |
| (ii) | ₹ 26,70,000 |
| *Less*: Interest @ 15% p.a. for 30 days | ₹ 33,375 |
| *Net Amount of Advance available.* | ₹ 26,36,625 |

**Evaluation of Factoring Proposal**

| | ***Particulars*** | ₹ | ₹ |
|---|---|---|---|
| **A.** | **Savings (Benefit) to the firm** | | |
| | Cost of Credit administration | ₹ 1,40,000 | ₹ 1,40,000 |
| | Cost of bad-debt losses | (0.02 × 360 lakhs) | ₹ 7,20,000 |
| | **Total** | | ₹ 8,60,000 |

| | | | |
|---|---|---|---|
| **B.** | **Cost to the Firm:** | | |
| | Factoring Commission [Annual credit Sales × % of Commission (or calculated annually)] | ₹ $30,000 \times \frac{360}{30}$ | ₹ 3,60,000 |
| | Interest Charges | ₹ $33,375 \times \frac{360}{30}$ | ₹ 4,00,500 |
| | **Total** | | ₹ 7,60,500 |
| **C.** | **Net Benefits to the Firm: (A-B)** | | ₹ 99,500 |

**Advice:** Since the savings to the firm exceeds the cost to the firm on account of factoring, therefore, the proposal is acceptable.

## ILLUSTRATION 5

*Mosaic Limited has current sales of ₹ 15 lakhs per year. Cost of sales is 75 per cent of sales and bad debts are one per cent of sales. Cost of sales comprises 80 per cent variable costs and 20 per cent fixed costs, while the company's required rate of return is 12 per cent. Mosaic Limited currently allows customers 30 days' credit, but is considering increasing this to 60 days' credit in order to increase sales.*

*It has been estimated that this change in policy will increase sales by 15 per cent, while bad debts will increase from one per cent to four per cent. It is not expected that the policy change will result in an increase in fixed costs and creditors and stock will be unchanged.*

*Should Mosaic Limited introduce the proposed policy? ANALYSE (Assume a 360 days year)*

## SOLUTION

New level of sales will be 15,00,000 × 1.15 = ₹ 17,25,000

Variable costs are 80% × 75% = 60% of sales

Contribution from sales is therefore 40% of sales

Fixed Cost are 20% × 75% = 15% of sales

Fixed Cost are 20% × 75% = 15% of sales

| ***Particulars*** | ₹ | ₹ |
|---|---|---|
| Proposed investment in debtors = Variable Cost + Fixed Cost* = (17,25,000 × 60%) + (15,00,000 × 15%) = (10,35,000 + 2,25,000) × $\frac{60}{360}$ | | 2,10,000 |
| Current investment in debtors = [(15,00,000 × 60%) + (15,00,000 × 15%)] × $\frac{30}{360}$ | | 93,750 |
| Increase in investment in debtors | | 1,16,250 |
| Increase in contribution = 15% × 15,00,000 × 40% | | 90,000 |
| New level of bad debts = (17,25,000 × 4% ) | 69,000 | |
| Current level of bad debts (15,00,000 × 1%) | 15,000 | |
| Increase in bad debts | | (54,000) |
| Additional financing costs = 1,16,250 × 12% = | | (13,950) |
| Savings by introducing change in policy | | 22,050 |

* Fixed Cost is taken at existing level in case of proposed investment as well

*Advise:* Mosaic Limited should introduce the proposed policy.

CHAPTER 9

# Inventory Management

Question 1

Two components A and B are used as follows :

| | |
|---|---|
| Normal usage | 3,000 units |
| Maximum usage | 4,500 units |
| Minimum usage | 1,500 units |

| Units | A | B |
|---|---|---|
| Re-order Quantity (units) | 20,000 | 40,000 |
| Re-order Period | 4 to 6 weeks | 2 to 4 weeks |

Calculate :

(i) Re-order Level

(ii) Maximum Level

(iii) Minimum Leval

(iv) Average Inventory.

*(5 marks)*

**Inventory Level Calculations**

| **Re-order Level** | **Maximum Usage x Maximum Re-order Period** | |
|---|---|---|
| | A | B |
| Units | 4,500 x 6 = 27,000 | 4,500 x 4 = 18,000 |

| **Maximum Level** | **Re-order Level + Re-order Quantity – (Minimum Usage x Minimum Re-order Period)** | |
|---|---|---|
| | **A** | **B** |
| Units | 27,000 + 20,000 - (1,500 x 4) = 41,000 | 18,000 + 40,000 - (1,500 x 2) = 55,000 |

| **Minimum Level** | **Re-order Level – (Normal Usage x Normal Re-order Period)** | |
|---|---|---|
| | **A** | **B** |
| Units | 27,000 - (3,000 x 5) = 12,000 | 18,000 - (3,000 x 3) = 9,000 |

| Average Inventory | Minimum Level + ½ Re-order Quantity | |
|---|---|---|
| | A | B |
| Units | 12,000 + ½ of 20,000 = 22,000 | 9,000 + ½ of 40,000 = 29,000 |

Or

| Average Inventory | (Minimum Level + Maximum Level)/2 | |
|---|---|---|
| | A | B |
| Units | (12,000+41,000)/2 = 26,500 | (9,000+55,000)/2 =32,000 |

Question 2

*CALCULATE the Economic Order Quantity from the following information. Also state the number of orders to be placed in a year.*

*Consumption of materials per annum : 10,000 kg.*

*Order placing cost per order : ₹ 50*

*Cost per kg. of raw materials : ₹ 2*

*Storage costs : 8% on average inventory*

**SOLUTION**

$$EOQ = \sqrt{\frac{2 \times A \times O}{C}}$$

A = Units consumed during year = 10,000

O = Ordering cost per order = 50

C = Inventory carrying cost per unit per annum. = 8% of ₹ 2

$$EOQ = \sqrt{\frac{2 \cdot 10,000 \cdot 50}{\frac{2 \cdot 8}{100}}} = \sqrt{\frac{2 \times 10,000 \times 50 \times 25}{4}} = \mathbf{2,500\ kg}$$

No. of orders to be placed in a year

$$= \frac{\text{Total consumption of materials per annum}}{EOQ}$$

$$= \frac{10,000\ \text{kg.}}{2,500\ \text{kg.}} = \mathbf{4\ Orders\ per\ year}$$

Question 3

*(i) COMPUTE E.O.Q. and the total variable cost for the following:*

| | | |
|---|---|---|
| *Annual Demand* | = | *5,000 units* |
| *Unit price* | = | *₹ 20.00* |
| *Order cost* | = | *₹ 16.00* |
| *Storage rate* | = | *2% per annum* |
| *Interest rate* | = | *12% per annum* |
| *Obsolescence rate* | = | *6% per annum* |

*(ii) DETERMINE the total cost that would result for the items if a new price of ₹ 12.80 is used.*

**SOLUTION**

(i) Carrying cost (C) =

| | | |
|---|---|---|
| Storage rate | = | 2% |
| Interest Rate | = | 12% |
| Obsolescence Rate | = | 6% |
| Total | = | 20% per annum |

C = 20% of ₹ 20 = ₹ 4 per unit per annum.

$$\text{E.O.Q} = \sqrt{\frac{2AO}{C}} = \sqrt{\frac{2\times5000\times16}{4}} = \sqrt{40,000} = 200 \text{ units}$$

**Total cost:**

| | | |
|---|---|---|
| Purchase price of 5,000 units @ ₹ 20.00 per unit | = | ₹ 1,00,000 |
| Ordering cost = $\frac{5000}{200}$ =25 orders @ ₹ 16 | = | ₹ 400 |
| Carrying cost of average Inventory $= \frac{200}{2}$ =100 units @ ₹ 4 | = | ₹ 400 |
| Total cost | | **₹ 1,00,800** |

(ii) If the new price of ₹ 12.80 is used:

C = 20% of 12.80 = ₹ 2.56 per unit per annum.

$$\text{E.O.Q.} = \sqrt{\frac{2\times5,000\times16}{2.56}} = 250 \text{ units}$$

Total cost:

Purchase price of 5,000 units @ ₹ 12.80 per unit = ₹ 64,000

Ordering cost = $\frac{5,000}{250}$ = 20 orders @ ₹ 16 = ₹ 320

Carrying cost (of average inventory) = $\frac{250}{2}$ = 125 units @ ₹ 2.56 = ₹ 320

Total variable cost **₹ 64,640**

Question 4

*Two components, A and B are used as follows:*

| | |
|---|---|
| *Normal usage* | *50 per week each* |
| *Maximum usage* | *75 per week each* |
| *Minimum usage* | *25 per week each* |
| *Re-order quantity* | *A: 300; B: 500* |
| *Re-order period* | *A: 4 to 6 weeks* |
| | *B: 2 to 4 weeks* |

*CALCULATE for each component (a) Re-ordering level, (b) Minimum level, (c) Maximum level, (d) Average stock level.*

**SOLUTION**

**(a) Re-ordering level:**

Maximum usage per week × Maximum delivery period.

Re-ordering level for component A = 75 units × 6 weeks = **450 units**

Re-ordering level for component B = 75 units × 4 weeks = **300 units**

**(b) Minimum level:**

Re-order level – (Normal usage × Average period)

Minimum level for component A = 450 units – (50 units × 5 weeks) = 200 units

Minimum level for component B = 300 units – (50 units × 3 weeks) = 150 units

**(c) Maximum level:**

Re-order level + Re-order quantity – (Min. usage × Minimum period)

Maximum level for component A = (450 units + 300 units) – (25 units × 4 weeks) = 650 units

Maximum level for component B = (300 units + 500 units) – (25 units × 2 weeks) = 750 units

**(d) Average stock level:**

½ (Minimum + Maximum) stock level

Average stock level for component A = ½ (200 units + 650 units) =425 units.

Average stock level for component B = ½ (150 units + 750 units) =450 units.

Question 5

*From the details given below, CALCULATE:*

*(i) Re-ordering level*

*(ii) Maximum level*

*(iii) Minimum level*

*(iv) Danger level.*

*Re-ordering quantity is to be calculated on the basis of following information:*

*Cost of placing a purchase order is ₹ 20*

*Number of units to be purchased during the year is 5,000*

*Purchase price per unit inclusive of transportation cost is ₹ 50*

*Annual cost of storage per units is ₹ 5.*

*Details of lead time : Average- 10 days, Maximum- 15 days, Minimum- 5 days.*
*For emergency purchases- 4 days.*

*Rate of consumption : Average: 15 units per day,*
*Maximum: 20 units per day.*

**SOLUTION**

**Basic Data:**

| | | | |
|---|---|---|---|
| A | (Number of units to be purchased annually) | = | 5,000 units |
| O | (Ordering cost per order) | = | ₹ 20 |
| C | (Annual cost of storage per unit) | = | ₹ 5 |
| Purchase price per unit inclusive of transportation cost | | = | ₹ 50. |

**Computations:**

**(i) Re-ordering level** = Maximum usage per period × Maximum lead time

(ROL) = 20 units per day × 15 days

= **300 units**

**(ii) Maximum level** = ROL + ROQ – [Min. rate of consumption × Min. lead time]

*(Refer to working notes1 and 2)*

= 300 units + 200 units – [10 units per day × 5 days]

= **450 units**

**(iii) Minimum level** = ROL – Average rate of consumption × Average re-order-period

= 300 units – (15 units per day × 10 days)

=**150 units**

**(iv) Danger level** = Average consumption × Lead time for emergency purchases

= 15 units per day × 4 days

= **60 units**

**Working Notes:**

1. Minimum rate of consumption per day

$$\text{Av. rate of consumption} = \frac{\text{Minimum rate of consumption} + \text{Maximum rate of consumption}}{2}$$

$$15 \text{ units per day} = \frac{X \text{ units/day} + 20 \text{ units per day}}{2} \quad \text{or} \quad X = 10 \text{ units per day.}$$

2. Re-order Quantity (ROQ) or Economic Order Quantity (EOQ) =

$$\sqrt{\frac{2 \times 5{,}000 \text{ units} \times ₹\ 20}{5}} = 200 \text{ units}$$

# ABC CATEGORY

**(i)** **'A' Category:** *This category of items consists of only a small percentage i.e., about 10% of the total items handled by the stores but require heavy investment about 70% of inventory value*, because of their **high prices or heavy requirement** or both. Items under this category can be controlled effectively by using a regular system which ensures neither over-stocking nor shortage of materials for production. Such a system plans its total material requirements by making budgets. The stocks of materials are controlled by fixing certain levels like maximum level, minimum level and re-order level.

**(ii)** **'B' Category:** This category of items is relatively less important; *they may be 20% of the total items of material handled by stores. The percentage of investment required is about 20% of the total investment in inventories*. In the case of these items, as the sum involved is **moderate**, the same degree of control as applied in 'A' category of items is not warranted. The orders for the items, belonging to this category may be placed after reviewing their situation periodically.

**(iii)** **'C' Category:** This category of items does not require much investment; it *may be about 10% of total inventory value but they are nearly 70% of the total items handled by store*. For these categories of items, there is no need of exercising constant control. Orders for items in this group may be placed either after six months or once in a year, after ascertaining consumption requirements. In this case the objective is to economies on ordering and handling costs.

Question 6

*From the following details, DRAW a plan of ABC selective control:*

| *Item* | *Units* | *Unit cost (₹)* |
|---|---|---|
| *1* | *7,000* | *5.00* |
| *2* | *24,000* | *3.00* |
| *3* | *1,500* | *10.00* |
| *4* | *600* | *22.00* |
| *5* | *38,000* | *1.50* |
| *6* | *40,000* | *0.50* |
| *7* | *60,000* | *0.20* |
| *8* | *3,000* | *3.50* |
| *9* | *300* | *8.00* |
| *10* | *29,000* | *0.40* |
| *11* | *11,500* | *7.10* |
| *12* | *4,100* | *6.20* |

**SOLUTION**

**Statement of Total Cost and Ranking**

| Item | Units | % of Total units | Unit cost (₹) | Total cost (₹) | % of Total cost | Ranking |
|---|---|---|---|---|---|---|
| 1 | 7,000 | 3.1963 | 5.00 | 35,000 | 9.8378 | **4** |
| 2 | 24,000 | 10.9589 | 3.00 | 72,000 | 20.2378 | **2** |
| 3 | 1,500 | 0.6849 | 10.00 | 15,000 | 4.2162 | **7** |
| 4 | 600 | 0.2740 | 22.00 | 13,200 | 3.7103 | **8** |
| 5 | 38,000 | 17.3516 | 1.50 | 57,000 | 16.0216 | **3** |
| 6 | 40,000 | 18.2648 | 0.50 | 20,000 | 5.6216 | **6** |

| | | | | | | |
|---|---|---|---|---|---|---|
| 7 | 60,000 | 27.3973 | 0.20 | 12,000 | 3.3730 | **9** |
| 8 | 3,000 | 1.3699 | 3.50 | 10,500 | 2.9513 | **11** |
| 9 | 300 | 0.1370 | 8.00 | 2,400 | 0.6746 | **12** |
| 10 | 29,000 | 13.2420 | 0.40 | 11,600 | 3.2605 | **10** |
| 11 | 11,500 | 5.2512 | 7.10 | 81,650 | 22.9502 | **1** |
| 12 | 4,100 | 1.8721 | 6.20 | 25,420 | 7.1451 | **5** |
| | **2,19,000** | **100** | | **3,55,770** | **100** | |

Basis for selective control (Assumed)

₹ 50,000 & above -- 'A' items

₹ 15,000 to 50000 -- 'B' items

Below ₹ 15,000 -- 'C' items

On this basis, a plan of A B C selective control is given below:

| Ranking | Item Nos. | % of Total units | Cost (₹) | % of Total Cost | Category |
|---|---|---|---|---|---|
| 1 | 11 | 5.2512 | 81,650 | 22.9502 | |
| 2 | 2 | 10.9589 | 72,000 | 20.2378 | |
| 3 | 5 | 17.3516 | 57,000 | 16.0216 | |
| **Total** | **3** | **33.5617** | **2,10,650** | **59.2096** | **A** |
| 4 | 1 | 3.1963 | 35,000 | 9.8378 | |
| 5 | 12 | 1.8721 | 25,420 | 7.1451 | |
| 6 | 6 | 18.2648 | 20,000 | 5.6216 | |
| 7 | 3 | 0.6849 | 15,000 | 4.2162 | |
| **Total** | **4** | **24.0181** | **95,420** | **26.8207** | **B** |
| 8 | 4 | 0.2740 | 13,200 | 3.7103 | |
| 9 | 7 | 27.3973 | 12,000 | 3.3730 | |
| 10 | 10 | 13.2420 | 11,600 | 3.2605 | |

| | | | | | |
|---|---|---|---|---|---|
| 11 | 8 | 1.3699 | 10,500 | 2.9513 | |
| 12 | 9 | 0.1370 | 2,400 | 0.6746 | |
| **Total** | **5** | **42.4202** | **49,700** | **13.9697** | **C** |
| **Grand Total** | 12 | 100 | 3,55,770 | 100 | |

Question 7

*The following data are available in respect of material X for the year ended 31st March, 2023.*

| | (₹) |
|---|---|
| *Opening stock* | *90,000* |
| *Purchases during the year* | *2,70,000* |
| *Closing stock* | *1,10,000* |

*CALCULATE:*

*(i) Inventory turnover ratio, and*

*(ii) The number of days for which the average inventory is held.*

**SOLUTION**

**Inventory turnover ratio**

$$\text{(Refer to working note)} = \frac{\text{Cost of stock of raw material consumed}}{\text{Average stock of raw material}}$$

$$= \frac{₹2,50,000}{₹1,00,000} = 2.5$$

Average number of days for which the average inventory is held

$$= \frac{365}{\text{Inventory turnover ratio}} = \frac{365 \text{ days}}{2.5} = \textbf{146 days}$$

**Working Note:**

| | (₹) |
|---|---|
| Opening stock of raw material | 90,000 |
| *Add:* Material purchases during the year | 2,70,000 |
| *Less:* Closing stock of raw material | 1,10,000 |
| Cost of stock of raw material consumed | 2,50,000 |

Question 8

*From the following data for the year ended 31st March, 2023, CALCULATE the inventory turnover ratio of the two items and put forward your comments on them.*

| | ***Material A (₹)*** | ***Material B (₹)*** |
|---|---|---|
| *Opening stock 1.04.2022* | *10,000* | *9,000* |
| *Purchase during the year* | *52,000* | *27,000* |
| *Closing stock 31.03.2023* | *6,000* | *11,000* |

**SOLUTION**

First of all, it is necessary to find out the material consumed:

| **Cost of materials consumed** | **Material A (₹)** | **Material B (₹)** |
|---|---|---|
| Opening stock | 10,000 | 9,000 |
| Add: Purchases | 52,000 | 27,000 |
| | 62,000 | 36,000 |
| *Less*: Closing stock | 6,000 | 11,000 |
| Materials consumed | 56,000 | 25,000 |
| Average inventory: (Opening Stock + Closing Stock) ÷ 2 | 8,000 | 10,000 |
| Inventory Turnover ratio: (Consumption ÷ Average inventory) | **7 times** | **2.5 times** |
| Inventory Turnover (Number of Days in a year/IT ratio) | **52 days** | **146 days** |

*Comments: Material A is moving faster than Material B.*