

## **Interest Rate**

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## **Chapter-3**

### **Interest Rates**

#### \* **The Cost of Money:**

The cost of money refers to the price paid for using the money whether borrowed or owned.

The interest paid on debt capital and the dividends paid on ownership capital are examples of the cost of money. It is affected by the following factors:

- a. Production opportunities
- b. Time preference for consumption
- c. Risk
- d. Inflation

#### \* **Interest:**

Interest is defined as the price paid for borrowed capital. Interest is the cost incurred by users of funds when they use debt capital. Therefore, interest is a cost for users of funds and revenue for the suppliers of funds.

### \* Interest Rates:

The interaction between demand for and supply of funds is the basic determinants of interest rate levels. Higher demand for funds leads to higher interest rates while higher supply of funds leads to lower interest rates.

The market interest rate is denoted as 'K' and can be expressed as:

$$OK_n = K^* + IP + DRP + LP + MRP$$

Where,

$OK_n$  = The market rate of interest on a 'n' year security, which differs from one security to another depending upon the nature of risk associated.

$K^*$  = The real risk-free rate of interest that exists on a risk-free asset in the world with zero inflation.

IP = Average expected inflation rate over the life of given securities.

$$IP_1 = I_1$$

$$IP_2 = \frac{I_1 + I_2}{2}$$

$$IP_3 = \frac{I_1 + I_2 + I_3}{3}$$

$$IP_4 = \frac{I_1 + I_2 + I_3 + I_4}{4} \text{ and so on...}$$

DRP = The default risk premium that results because of the possibility that a borrower will not pay interest and principal within the stated time period.

LP = Liquidity Premium

MRP = The maturity Risk Premium reflected by price risk on longer-term maturity bond.

**TIPS:**

- The quoted rate of interest on Treasury bills is the nominal risk-free rate.
- Treasury securities are free from default risk as they are backed by government's treasury funds.
- The securities issued by larger, well established and financially sound firms have lower default risk.
- Treasury securities are more liquid than corporate securities because of no default risk.

### Problem 3.1

SOLN

Given:

$$\text{Real Risk Free Rate } (k^*) = 3\%$$

$$\text{Inflation rate this year } (I_1) = 2\%$$

$$\text{Inflation in second year } (I_2) = 4\%$$

$$\text{Inflation in third year } (I_3) = 6\%$$

$$\text{Maturity Risk premium (MRP)} = 0$$

a. Yield on 2 Year Securities ( $ok_2$ ) = ?

We know that,

$$\begin{aligned} ok_2 &= k^* + IP_2 + MRP_2 \\ &= 3\% + 3\% + 0 \\ &= 6\% \end{aligned}$$

where,

$$IP_2 = \frac{I_1 + I_2}{2} = \frac{2\% + 4\%}{2} = 3\%$$

b. Yield on 3 Year Treasury securities ( $ok_3$ ) = ?

We know that,

$$\begin{aligned} ok_3 &= k^* + IP_3 + MRP_3 \\ &= 3\% + 4\% + 0 \\ &= 7\% \end{aligned}$$

Where,

$$IP_3 = \frac{I_1 + I_2 + I_3}{3} = \frac{2\% + 4\% + 6\%}{3} = 4\%$$

- c. The yield on 3-year securities is larger than that of 2-year securities because of higher inflation premium.

### Problem 3.2

Soln

Given:

$$\text{Real Risk free Rate } (K^*) = 3\%$$

$$\text{Inflation this year } (I_1) = 2\%$$

$$\text{Inflation in Year 2 } (I_2) = 4\%$$

$$\text{Inflation in Year 3 } (I_3) = 4\%$$

$$\text{Maturity Risk premium (MRP)} = 0$$

Calculation of Yield on 2-Year securities ( $OK_2$ )

$$\begin{aligned} OK_2 &= K^* + IP_2 + MRP_2 \\ &= 3\% + 3\% + 0 \\ &= 6\% \end{aligned}$$

Where,

$$IP_2 = \frac{I_1 + I_2}{2} = \frac{2\% + 4\%}{2} = 3\%$$

Calculation of Yield on 3-Year securities:

$$\begin{aligned}OK_3 &= K^* + IP_3 + MRP_3 \\&= 3\% + 3.33\% + 0 \\&= 6.33\%\end{aligned}$$

Where,

$$IP_3 = \frac{I_1 + I_2 + I_3}{3} = \frac{2\% + 4\% + 4\%}{3} = 3.33\%$$

### Problem 3.3

Sol<sup>n</sup>

Given:

Real Risk Free Rate ( $K^*$ ) = 4%

Inflation in Year 1 ( $I_1$ ) = 7%

Inflation in Year 2 ( $I_2$ ) = 6%

Inflation thereafter ( $I_3, I_4, I_5, I_6, \dots$ ) = 5%

Yield on 2-Year securities ( $OK_2$ ) = 12%

Yield on 5-Year securities ( $OK_5$ ) = 12%

Here,

$$OK_2 = K^* + IP_2 + MRP_2$$

$$12\% = 4\% + 6.5\% + MRP_2$$

$$\therefore MRP_2 = 1.5\%$$

Where,  $IP_2 = \frac{I_1 + I_2}{2} = \frac{7\% + 6\%}{2} = 6.5\%$

$$OK_5 = K^* + IP_5 + MRP_5$$

$$12\% = 4\% + 5.6\% + MRP_5$$

$$\therefore MRP_5 = 2.4\%$$

$$\text{Where, } IP_5 = \frac{I_1 + I_2 + I_3 + I_4 + I_5}{5} = \frac{7\% + 6\% + 5\% + 5\% + 5\%}{5} = 5.6\%$$

Again,

$$\begin{aligned}\text{Difference in } MRP_s &= MRP_5 - MRP_2 \\ &= 2.4\% - 1.5\% \\ &= 0.9\%\end{aligned}$$

The maturity Risk premium on longer term bond is higher because longer term bonds are more exposed to interest rate risk.

### Problem 3.4

Soln

Given:

$$\text{Real Risk Free Rate } (K^*) = 3\%$$

$$\text{Inflation rate in Year 1 } (I_1) = 3\%$$

$$\text{Inflation rate in Year 2 } (I_2) = 3\%$$

$$\text{Yield on 2-year Treasury security } (OK_2) = 6.2\%$$

$$\text{Maturity Risk premium for Year 2 } (MRP_2) = ?$$

We know that,

$$OK_2 = k^* + IP_2 + MRP_2$$

$$6.2\% = 3\% + \frac{3\% + 3\%}{2} + MRP_2$$

$$6.2\% = 3\% + 3\% + MRP_2$$

$$\therefore MRP_2 = 6.2\% - 6\% \\ = 0.2\%$$

### Problem 3.5

Sol:

Given:

$$\text{Real Risk Free Rate } (k^*) = 3\%$$

$$\text{Inflation This Year } (I_1) = 3\%$$

$$\text{Inflation rate next year } (I_2) = 4\%$$

$$\text{Inflation rate thereafter } (I_3, I_4, I_5, I_6, \dots) = 3.5\%$$

$$\text{Maturity Risk premium } (MRP) = 0.0005 \times (t-1)$$

Nominal Interest Rate on 7-Year Treasury Bond

$$OK_7 = k^* + IP_7 + MRP_7 \\ = 3\% + 3.5\% + 0.3\% \\ = 6.8\%$$

$$\text{where, } IP_7 = \frac{I_1 + I_2 + I_3 + I_4 + I_5 + I_6 + I_7}{7}$$

$$= \frac{3\% + 4\% + 3.5\% + 3.5\% + 3.5\% + 3.5\% + 3.5\%}{7} \\ = 3.5\%$$

$$MRP_t = 0.0005(t-1)$$

$$MRP_7 = 0.0005(7-1) = 0.003 = 0.3\%$$

### Problem 3.6

Sol:

Given:

Inflation rate in year 1 ( $I_1$ ) = 2.5%

Real Risk free Rate ( $k^*$ ) = 4%

3-Year Treasury Yield ( $ok_3$ ) =  $ok_1 + 1.5\%$

Here,

$$ok_1 = k^* + I_1 = 4\% + 2.5\% = 6.5\%$$

$$ok_3 = ok_1 + 1.5\% = 6.5\% + 1.5\% = 8\%$$

Now,

$$ok_3 = k^* + IP_3 + MRP_3$$

$$8\% = 4\% + \frac{I_1 + I_2 + I_3}{3} + 0$$

$$8\% - 4\% = \frac{2.5\% + I_2 + I_3}{3}$$

$$4\% = \frac{2.5\% + 2I_2}{3}$$

$$12\% = 2.5\% + 2I_2$$

$$\therefore I_2 = \frac{12\% - 2.5\%}{2} = 4.75\%$$

Hence, the rate of inflation in year 2 and thereafter is expected to remain constant at 4.75%.

### Problem 3.7

Soln

Given:

Yield on 15 years Treasury bond ( $OK_{15-T}$ ) = 9 %.

Yield on 15 years Corporate bond ( $OK_{15-c}$ ) = 12 %

Liquidity premium on Corporate Bond (LP) = 1 %

Default Risk premium on Corporate Bond (DRP) = ?

We know that,

$$OK_{15-c} = K^* + IP_{15} + MRP_{15} + LP + DRP$$

$$OK_{15-c} = OK_{15-T} + LP + DRP$$

$$12\% = 9\% + 1\% + DRP$$

$$\therefore DRP = 2\%$$

Corporate bonds are exposed to default risk but Treasury bonds are not because a corporation is likely to bankrupt.

### Problem 3.8

Soln

Given:

Yield on 10-year Treasury bond ( $OK_{10-T}$ ) = 15 %

Yield on 10-year Corporate bond ( $OK_{10-c}$ ) = 20 %

Liquidity Risk premium (LP) = 3 %

Default Risk premium (DRP) = ?

We know that.

$$OK_{10-c} = k^* + IP_{10} + MRP_{10} + LP + DRP$$

$$OK_{10-c} = OK_{10-T} + LP + DRP$$

$$20\% = 15\% + 3\% + DRP$$

$$\therefore DRP = 2\%$$

Default Risk is the risk of loss that the issuer will not pay contractual interest payment and repayment of principal at maturity.

Corporate bonds are exposed to default risk because a corporation is likely to bankrupt.

### Problem 3.9

Sojñ

Given:

Real Risk free Rate ( $k^*$ ) = 2%

Inflation rate for 4 years ( $I_1, I_2, I_3, I_4$ ) = 3%

Inflation rate in year 5 and thereafter ( $I_5, \dots$ ) = 4%

Yield on 8-Year corporate Bond ( $OK_{8-c}$ ) = 9%

Liquidity Risk premium (LRP) = 1%

Default Risk premium (DRP) = ?

We know that

$$OK_{8-c} = k^* + IP_8 + LRP + DRP$$

$$9\% = 2\% + 3\% \times 4 + 4\% \times 4 + 1\% + DRP$$

8

$$9\% = 2\% + 3.5\% + 1\% + DRP$$

$$\therefore DRP = 2.5\%$$

### Problem 3.10

Soln

Given:

$$\text{Real Risk Free Rate } (k^*) = 5\%$$

$$\text{Inflation rate in Year 1 } (I_1) = 5\%$$

$$\text{Inflation rate in Year 2 } (I_2) = 6\%$$

$$\text{Inflation rate in Year 3 } (I_3) = 7\%$$

$$\text{Inflation rate in Year 4 } (I_4) = 8\%$$

a. Yield on 3-year securities ( $OK_3$ ) = ?

$$\begin{aligned} OK_3 &= k^* + IP_3 + MRP_3 \\ &= 5\% + \frac{5\% + 6\% + 7\%}{3} + 0 \\ &= 5\% + 6\% \\ &= 11\% \end{aligned}$$

b. Yield on 4-year securities ( $OK_4$ ) = 12%.

Maturity Risk premium ( $MRP_4$ ) = ?

$$\begin{aligned} OK_4 &= k^* + IP_4 + MRP_4 \\ 12\% &= 5\% + \frac{5\% + 6\% + 7\% + 8\%}{4} + MRP_4 \\ 12\% - 5\% &= 6.5\% + MRP_4 \\ \therefore MRP_4 &= 0.5\% \end{aligned}$$

- c. The longer term bonds are more exposed to maturity risk because the change in market interest rate causes the value of longer term bonds to fluctuate more.

### Problem 3.11

Soln

Given:

$$\text{Real Risk Free Rate } (k^*) = 2\%$$

$$\text{Inflation rate for 2 years } (I_1, I_2) = 5\%$$

$$\text{Inflation rate thereafter } (I_3, I_4, \dots) = 8\%$$

$$\text{Maturity Risk Premium } (MRP_{0-3}) = 0\%$$

$$\text{Maturity Risk Premium } (MRP_4) = 1\%$$

$$MRP_5 = 2\% \text{ and so on.}$$

a. Yield on 3-Year securities ( $ok_3$ ) = ?

$$\begin{aligned} ok_3 &= k^* + IP_3 + MRP_3 \\ &= 2\% + \frac{5\% + 5\% + 8\%}{3} + 0 \\ &= 2\% + 6\% \\ &= 8\% \end{aligned}$$

b. Yield on 5-year Treasury Securities ( $ok_5$ ) = ?

$$\begin{aligned} ok_5 &= k^* + IP_5 + MRP_5 \\ &= 2\% + \frac{5\% + 5\% + 8\% + 8\% + 8\%}{5} + 2\% \\ &= 10.8\% \end{aligned}$$

c. Expected Inflation rate in 2019 ( $I_5$ ) = ?

$$OK_5 = k^* + IP_5$$

$$8\% = 2\% + \frac{I_1 + I_2 + I_3 + I_4 + I_5}{5}$$

$$8\% - 2\% = \frac{4\% + 5\% + 6\% + 7\% + I_5}{5}$$

$$30\% = 22\% + I_5$$

$$\therefore I_5 = 8\%$$

∴ The implied expected inflation rate in 2019 is 8%.

Problem 3.13

Sol:

Given:

$$\text{Real Risk Free Rate } (k^*) = 3\%$$

$$\text{Inflation rate for 3 years } (I_1, I_2, I_3) = 2\%$$

$$\text{Inflation rate for next 5 years } (I_4, I_5, I_6, I_7, I_8) = 4\%$$

$$\text{Maturity Risk Premium } (MRP) = 0.1\% \text{ (t-1)}$$

$$\text{Default Risk Premium } (DRP) = 3\%.$$

a. Average expected inflation rate over the next 4-years ( $IP_4$ )

$$IP_4 = \frac{I_1 + I_2 + I_3 + I_4}{4} = \frac{2\% + 2\% + 2\% + 4\%}{4} = 2.5\%$$

b. Yield on 4-Year Treasury Bond ( $OK_{4-T}$ )

$$\begin{aligned}OK_{4-T} &= K^* + IP_4 + MRP_4 \\&= 3\% + 2.5\% + 0.3\% \\&= 5.8\%\end{aligned}$$

where,

$$\begin{aligned}MRP_4 &= 0.1\% \cdot (t-1) \\&= 0.1\% \cdot (4-1) \\&= 0.3\%\end{aligned}$$

c. Liquidity Premium (LRP) = 0.5%

Yield on 4-year B-Grade Corporate Bond ( $OK_{4-c}$ )

$$\begin{aligned}OK_{4-c} &= K^* + IP_4 + MRP_4 + LRP + DRP \\&= 3\% + 2.5\% + 0.3\% + 0.5\% + 3\% \\&= 9.3\%\end{aligned}$$

d. Yield on 8-Year Treasury Bond ( $OK_{8-T}$ )

$$\begin{aligned}OK_{8-T} &= K^* + IP_8 + MRP_8 \\&= 3\% + 3.25\% + 0.7\% \\&= 6.95\%\end{aligned}$$

where,

$$IP_8 = \frac{2\% \times 3 + 4\% \times 5}{8} = 3.25\%$$

$$MRP_8 = 0.1\% \cdot (t-1) = 0.1\% \cdot (8-1) = 0.7\%$$

e. Yield on 8-year B-Grade corporate bond ( $OK_{8-c}$ )  
liquidity premium (LRP) = 0.5%.

$$OK_{8-c} = K^* + IP_8 + MRP_8 + LRP + DRP$$
$$= 3\% + 3.25\% + 0.7\% + 0.5\% + 3\%$$
$$= 10.45\%$$

f. Yield on g-year Treasury Bond ( $OK_{g-T}$ ) = 7.3%.  
Inflation rate in g Years ( $I_g$ ) = ?

$$OK_{g-T} = K^* + IP_g + MRP_g$$
$$7.3\% = 3\% + \frac{2\% \times 3 + 4\% \times 5 + I_g}{9} + 0.8\%$$
$$7.3\% - 3\% - 0.8\% = \frac{26\% + I_g}{9}$$
$$\therefore I_g = 5.5\%$$

$\therefore$  The implied inflation rate in year g is 5.5%.

Where,

$$MRP_g = 0.1\% (t-1)$$
$$= 0.1\% (g-1)$$
$$= 0.8\%$$

Problem 3.12

Soln

Given:

$$\text{Inflation rate in 2015 } (I_1) = 4\%$$

$$\text{Inflation rate in 2016 } (I_2) = 5\%$$

$$\text{Inflation rate in 2017 } (I_3) = 6\%$$

$$\text{Inflation rate in 2018 } (I_4) = 7\%$$

$$\text{Real Risk free Rate } (K^*) = 2\%$$

$$\text{Yield on 5-Year T-bond } (OK_5) = 8\%$$

a. Average expected inflation rate over the next 4-year

$$\begin{aligned} IP_4 &= \frac{I_1 + I_2 + I_3 + I_4}{4} \\ &= \frac{4\% + 5\% + 6\% + 7\%}{4} \\ &= 5.5\% \end{aligned}$$

b. Interest Rate (yield) on 4-Year T-bonds ( $OK_4$ ) = ?

$$\begin{aligned} OK_4 &= K^* + IP_4 \\ &= 2\% + 5.5\% \\ &= 7.5\% \end{aligned}$$

### Problem 3.14

So<sup>n</sup>

Given:

Inflation rate in 2015 ( $I_1$ ) = 5%.

2016 ( $I_2$ ) = 6%.

2017 ( $I_3$ ) = 7%.

2018 ( $I_4$ ) = 8%.

2019 ( $I_5$ ) = 9%.

2020-2026 ( $I_6, I_7, I_8, I_9, I_{10}, I_{11}, I_{12}$ ) = 10%.

( $K^*$ ) = 4%.

Calculation of Interest Rate (Yield)

Securities	<u><math>K^*</math></u>	<u>IP</u>	<u>MRP</u>	$OK_n = K^* + IP + MRP$
1-Year	4%	5%	-	9%
3-Year	4%	$\frac{5\% + 6\% + 7\%}{3} = 6\%$	-	10%
5-Year	4%	$\frac{5\% + 6\% + 7\% + 8\% + 9\%}{5} = 7\%$	0.2%	11.2%
8-Year	4%	$\frac{5+6+7+8+9+10 \times 3}{8} = 8.125\%$	0.8%	12.925%
10-Year	4%	$\frac{5+6+7+8+9+10 \times 5}{10} = 8.5\%$	1.2%	13.7%

$$MRP = MRP_5 = 0.2\%$$

$$MRP_6 = 0.2 + 0.2 = 0.4\%$$

$$MRP_7 = 0.4 + 0.2 = 0.6\%$$

$$MRP_8 = 0.6 + 0.2 = 0.8\% \text{ and so on...}$$

Problem 3.15

SOP

Given:

$$\text{Real Risk Free Rate } (K^*) = 3.45\%$$

$$\text{Inflation Rate in Year 1 } (I_1) = 4.2\%$$

$$\text{Inflation Rate in Year 2 } (I_2) = 4.6\%$$

$$\text{Inflation Rate in Year 3 } (I_3) = 4.9\%$$

$$\text{Inflation Rate in Year 4 } (I_4) = 5.1\%$$

$$\text{Maturity Risk Premium on 4-year securities } (MRP_4) = 1.15\%$$

$$\text{Maturity Risk Premium on 5-year securities } (MRP_5) = 1.30\%$$

a. Yield on 4-year Treasury securities ( $OK_{4-T}$ )

$$\begin{aligned} OK_{4-T} &= K^* + IP_4 + MRP_4 \\ &= 3.45\% + \frac{4.2\% + 4.6\% + 4.9\% + 5.1\%}{4} + 1.15\% \\ &= 3.45\% + 4.7\% + 1.15\% \\ &= 9.3\% \end{aligned}$$

b. Yield on 4-Year Corporate Bond ( $OK_{4-C}$ ) = 11.5%

$$\text{Liquidity Risk Premium } (LRP) = 0.75\%$$

$$\text{Default Risk Premium } (DRP) = ?$$

We know that,

$$OK_{4-C} = K^* + IP_4 + MRP_4 + LRP + DRP$$

$$11.5\% = OK_{4-T} + LRP + DRP$$

$$11.5\% = 9.3\% + 0.75\% + DRP$$

$$\therefore DRP = 1.45\%$$

$1k_2$  = Yield on 1-year securities next year

$2k_3$  = Yield on 1-year securities two years from now

The estimation of future interest rate on securities that start 't' period from now and end 'n' period from now is given by :

$$tk_n = \left[ \frac{(1+ok_n)^n}{(1+ok_t)^t} \right]^{\frac{1}{n-t}} - 1$$

Example:

0  $ok_1$  |  $1 k_2$  |  $2 k_3$  |  $3 k_4$  |  $4$

|  $ok_1$  |

|  $ok_2$  |

|  $ok_3$  |

|  $ok_4$  |

$ok_1$  = Given:

$$ok_2 = \left[ (1+ok_1)(1+k_2) \right]^{\frac{1}{2}} - 1$$

$$0k_3 = \left[ (1+0k_1)(1+1k_2)(1+2k_3) \right]^{1/3} - 1$$

$$0k_4 = \left[ (1+0k_1)(1+1k_2)(1+2k_3)(1+3k_4) \right]^{1/4} - 1 \text{ and so on...}$$

Now,

$0k_1$  Given

$$1k_2 = \left[ \frac{(1+0k_2)^2}{(1+0k_1)^1} \right]^{\frac{1}{2-1}} - 1$$

$$2k_3 = \left[ \frac{(1+0k_3)^3}{(1+0k_2)^2} \right]^{\frac{1}{3-2}} - 1$$

$$3k_4 = \left[ \frac{(1+0k_4)^4}{(1+0k_3)^3} \right]^{\frac{1}{4-3}} - 1$$

$$2k_5 = \left[ \frac{(1+0k_5)^5}{(1+0k_4)^4} \right]^{\frac{1}{5-4}} - 1$$

$$3k_6 = \left[ \frac{(1+0k_6)^6}{(1+0k_5)^5} \right]^{\frac{1}{6-5}} - 1$$

and so on...

c. Yield on 5-Year Treasury bond ( $ok_{5-T}$ ) = 9.8%.

Maturity Risk Premium in Year 5 ( $MRP_5$ ) = 1.30%.

Inflation rate in year 5 ( $I_5$ ) = ?

We know that,

$$ok_{5-T} = k^* + IP_5 + MRP_5$$

$$9.8\% = 3.45\% + 4.2\% + 4.6\% + 4.9\% + 5.1\% + I_5 + 1.30\%$$

5

$$9.8\% - 3.45\% - 1.30\% = \frac{18.8\% + I_5}{5}$$

$$5.05\% \times 5 = 18.8\% + I_5$$

$$\therefore I_5 = 6.45\%$$

∴ The Implied rate of inflation in Year 5 is 6.45%.

### Problem 3.16

Soln

Given:

Yield on 5-Year Treasury Bond ( $ok_{5-T}$ ) = 5.2%.

Yield on 10-Year Treasury Bond ( $ok_{10-T}$ ) = 6.4%.

Yield on 10-Year Corporate Bond ( $ok_{10-C}$ ) = 8.4%.

Average Inflation Rate over 10 years ( $IP_{10}$ ) = 2.5%.

We know that,

$$ok_{10-C} = ok_{10-T} + DRP + LRP$$

$$8.4\% = 6.4\% + DRP + LRP$$

$$\therefore DRP + LRP = 2\%$$

### Yield on 5-year Corporate Bond ( $OK_{5-c}$ )

$$\begin{aligned}OK_{5-c} &= OK_{5-T} + DRP + LRP \\&= 5.2\% + 2\% \\&= 7.2\%\end{aligned}$$

#### \* Price Expectation Theory:

According to price expectation theory, in the absence of maturity risk premium, long term interest rates are simply the weighted average of current and future short-term debts. According to this theory, the estimation of future interest rates by using yield curve is based on the following two assumptions:

1. First, determination of future interest rates focuses only on the treasury securities.
2. Second, all Treasury securities are assumed to fall in similar risk class as such they have no maturity risk.

The relationship between long term interest rate and future short-term debt is given by:

$$OK_n = [(1+OK_1)(1+OK_2)(1+OK_3) \dots (1+OK_n)]^{1/n} - 1$$

Where,

$OK_n$  = Current Yield on  $n$ -year securities

$OK_1$  = Current Yield on 1-Year securities

### Problem 3.17

Soln

Given:

Yield on 1-year Treasury securities ( $ok_1$ ) = 5.6%

Yield on 2-year Treasury securities ( $ok_2$ ) = 6%

1-Year securities yield 1-year from now ( $1k_2$ ) = ?

Using Pure Expectation Theory

$$1k_2 = \left[ \frac{(1+ok_2)^2}{(1+ok_1)} \right]^{1/2} - 1$$

$$= \left[ \frac{(1+0.06)^2}{(1+0.056)} \right]^{1/2} - 1$$

$$= 6.4\%$$

Therefore, the yield on 1-year securities 1 year from now is expected to be 6.4%.

### Problem 3.18

Soln

Given:

Yield on 2-year Treasury bond ( $ok_2$ ) = 4.5%

Yield on 1-year Treasury bond ( $ok_1$ ) = 3%

Real Risk free Rate ( $R^*$ ) = 1%

Maturity Risk premium (MRP) = 0

a. Yield on 1-year bond during second year ( $1k_2$ ) = ?

Using Pure Expectation Theory

$$1k_2 = \left[ \frac{(1+0k_2)^2}{(1+0k_1)^1} \right]^{\frac{1}{2-1}} - 1$$

$$= \left[ \frac{(1+0.045)^2}{(1+0.03)^1} \right]^{\frac{1}{1}} - 1$$

$$= 6.02\%$$

b. Inflation Rate in Year-1 ( $I_1$ ) = ?

$$0k_1 = k^* + I_1$$

$$3\% = 1\% + I_1$$

$$\therefore I_1 = 2\%$$

Inflation Rate in Year-2 ( $I_2$ ) = ?

$$1k_2 = k^* + I_2$$

$$6.02\% = 1\% + I_2$$

$$\therefore I_2 = 5.02\%$$

Problem 3.19

Sol:

Given:

Real Risk free rate ( $k^*$ ) = 4%

Maturity Risk premium (MRP) = 0

Yield on 1-year bond ( $ok_1$ ) = 11%.

Yield on 2-year bond ( $ok_2$ ) = 13%.

1-Year interest rate expected for year 2 ( $1k_2$ ) = ?

Using Pure Expectation Theory:

$$1k_2 = \left[ \frac{(1+ok_2)^2}{(1+ok_1)^1} \right]^{\frac{1}{2-1}} - 1$$

$$= \left[ \frac{(1+0.13)^2}{(1+0.11)^1} \right]^{\frac{1}{1}} - 1$$

$$= 15.04\%$$

Inflation rate in year 2 ( $I_2$ ) = ?

$$1k_2 = k^* + I_2$$

$$15.04\% = 4\% + I_2$$

$$\therefore I_2 = 11.04\%$$

The interest rate expected for year 2 is greater than the average interest rate during the 2-year period because of increasing inflationary expectation.

### Problem 8.20

Soln

Given:

$$\text{Real Risk Free Rate } (k^*) = 4\%$$

$$\text{Maturity Risk Premium (MRP)} = 0$$

$$\text{Nominal Rate on 1-year bond } (ok_1) = 6\%$$

$$\text{Nominal Rate on 2-year bond } (ok_2) = 7\%$$

$$\text{Nominal Rate on 3-year bond } (ok_3) = 8\%$$

Yield on 1-year bond during second year ( $1k_2$ )

$$1k_2 = \left[ \frac{(1+0k_2)^2}{(1+0k_1)^1} \right]^{\frac{1}{2-1}} - 1$$

$$= \left[ \frac{(1+0.07)^2}{(1+0.06)^1} \right]^{\frac{1}{1}} - 1$$

$$= 8\%$$

Yield on 1-year bond during third year ( $2k_3$ )

$$2k_3 = \left[ \frac{(1+0k_3)^3}{(1+0k_2)^2} \right]^{\frac{1}{3-2}} - 1$$

$$= \left[ \frac{(1+0.08)^3}{(1+0.07)^2} \right]^{\frac{1}{1}} - 1$$

$$= 10.03\%$$

### Problem 3.21

Soln

Given:

Interest rate on 4-Year Treasury securities ( $ok_4$ ) = 7%.

Interest rate on 6-Year Treasury securities ( $ok_6$ ) = 7.5%.

Yield on 2-year securities yielding 4 years from now ( $4k_6$ ) = ?

Using Pure Expectation Theory

$$4k_6 = \left[ \frac{(1+ok_6)^6}{(1+ok_4)^4} \right]^{\frac{1}{6-4}} - 1$$

$$= \left[ \frac{(1+0.075)^6}{(1+0.07)^4} \right]^{\frac{1}{2}} - 1$$

$$= 8.5\%$$

### Problem 3.22

Soln

Given:

Yield on 1-Year security ( $ok_1$ ) = 8%.

Yield on 2-Year security ( $ok_2$ ) = 12%.

Yield on 3-Year security ( $ok_3$ ) = 13%.

Real Risk Free Rate ( $K^*$ ) = 3%.

q. One year implied interest rate in year two ( $1k_2$ ) = ?

Inflation rate in Year 2 ( $I_2$ ) = ?

$$k_2 = k^* + r_2$$

$$16.15\% = 3\% + I_2$$

$$\therefore I_2 = 13.15\%$$

Inflation rate in Year 3 ( $I_3$ ) = ?

$$k_3 = k^* + r_3$$

$$15.03\% = 3\% + I_3$$

$$\therefore I_3 = 12.03\%$$

- c. The one year interest rate expected in year three is larger than three years interest rate because of increasing inflationary trend in the economy.

### Problem 3.23

Soln

Given:

$$\text{Real Risk Free Rate } (k^*) = 3.5\%$$

$$\text{Yield on 1-Year bond } (ok_1) = 5\%$$

$$\text{Yield on 2-Year bond } (ok_2) = 6\%$$

$$\begin{aligned} \text{Yield on 3-Year bond } (ok_3) &= 9\% - MRP_3 \\ &= 9\% - 1.5\% \\ &= 7.5\% \end{aligned}$$

a. Interest rate on 1-year bond during second year ( $1k_2$ )

$$1k_2 = \left[ \frac{(1+0k_2)^2}{(1+0k_1)^2} \right]^{\frac{1}{2-1}} - 1$$

$$= \left[ \frac{(1+0.06)^2}{(1+0.05)^2} \right]^{\frac{1}{1}} - 1$$

$$= 7.01\%$$

b. Interest rate on 1-year bond during third year ( $2k_3$ )

$$2k_3 = \left[ \frac{(1+0k_3)^3}{(1+0k_2)^2} \right]^{\frac{1}{3-2}} - 1$$

$$= \left[ \frac{(1+0.075)^3}{(1+0.06)^2} \right]^{\frac{1}{1}} - 1$$

$$= 10.56\%$$

b. Inflation rate in Year 1 ( $I_1$ )

$$0k_1 = k^* + I_1$$

$$5\% = 3.5\% + I_1$$

$$\therefore I_1 = 1.5\%$$

$$1k_2 = \left[ \frac{(1+0k_2)^2}{(1+0k_1)^1} \right]^{\frac{1}{2-1}} - 1$$

$$= \left[ \frac{(1+0.12)^2}{(1+0.08)^1} \right]^{\frac{1}{1}} - 1$$

$$= 16.15\%$$

One Year Implied Interest rate expected in year 3 ( $2k_3$ )=?

$$2k_3 = \left[ \frac{(1+0k_3)^3}{(1+0k_2)^2} \right]^{\frac{1}{3-2}} - 1$$

$$= \left[ \frac{(1+0.13)^3}{(1+0.12)^2} \right]^{\frac{1}{1}} - 1$$

$$= 15.03\%$$

b. Inflation Rate in Year 1 ( $I_1$ )=?

$$0k_1 = k^* + I_1$$

$$8\% = 3\% + I_1$$

$$\therefore I_1 = 5\%$$

Inflation rate in Year 2 ( $I_2$ )

$$1k_2 = k^* + I_2$$

$$7.01\% = 3.5\% + I_2$$

$$\therefore I_2 = 3.51\%$$

Inflation rate in Year 3 ( $I_3$ )

$$1k_3 = k^* + I_3$$

$$10.56\% = 3.5\% + I_3$$

$$\therefore I_3 = 7.06\%$$

- c. The average interest rate is different from interest rate in year two and three due to the increase in inflation rate in year 2 and year 3.

### Problem 3.24

Soln

Given:

Yield on 4-Year bond ( $ok_4$ ) = 7%

Yield on 1-Year bond ( $ok_1$ ) = 6%

One year yield one year from today ( $1k_2$ ) = 9%.

One year forward yield two years from today ( $2k_3$ ) = 8%.

- a. Expected yield on 1-year bond 3-Years from today ( $3k_4$ )

$$3k_4 = \left[ \frac{(1+0k_4)^4}{(1+0k_2)^3} \right]^{\frac{1}{4-3}} - 1$$

$$= \left[ \frac{(1+0.07)^4}{(1+0.0766)^3} \right]^{\frac{1}{1}} - 1$$

$$= 5.048\%$$

where,

$$0k_3 = \left[ (1+0k_1)(1+1k_2)(1+2k_3) \right]^{\frac{1}{3}} - 1$$

$$= \left[ (1+0.06)(1+0.09)(1+0.08) \right]^{\frac{1}{3}} - 1$$

$$= 7.66\%$$

b. Annual expected yield on a two-year bond issued two years from today ( $2k_4$ )

$$2k_4 = \left[ \frac{(1+0k_4)^4}{(1+0k_2)^2} \right]^{\frac{1}{4-2}} - 1$$

$$= \left[ \frac{(1+0.07)^4}{(1+0.0749)^2} \right]^{\frac{1}{2}} - 1$$

$$= 6.51\%$$

where,

$$0k_2 = [(1+0k_1)(1+1k_2)]^{1/2} - 1$$

$$= [(1+0.06)(1+0.09)]^{1/2} - 1$$

$$= 7.49\%$$

### Problem 3.25

Sol:

Given:

Yield on 1-Year bond ( $0k_1$ ) = 8%

Yield on 2-Year bond ( $0k_2$ ) = 9%

Yield on 3-Year bond ( $0k_3$ ) = 10%

One year yield from next year ( $1k_2$ )

$$1k_2 = \left[ \frac{(1+0k_2)^2}{(1+0k_1)^1} \right]^{\frac{1}{2-1}} - 1$$

$$= \left[ \frac{(1+0.09)^2}{(1+0.08)^1} \right]^{\frac{1}{1}} - 1$$

$$= 10.01\%$$

2-Year Yield from next year ( $1k_3$ )

$$1k_3 = \left[ \frac{(1+0k_2)^3}{(1+0k_1)^2} \right]^{\frac{1}{3-1}} - 1$$

$$= \left[ \frac{(1+0.10)^3}{(1+0.08)^2} \right]^{\frac{1}{2}} - 1$$

$$= 11.01\%$$

Problem 3.26

Soln

Given:

Yield on 3-Year Treasury securities ( $0k_3$ ) = 6%

Yield on 4-Year Treasury securities ( $0k_4$ ) = 6.35%

Yield on 5-Year Treasury securities ( $0k_5$ ) = 6.65%

1-Year Yield for year 4 ( $3k_4$ )

$$3k_4 = \left[ \frac{(1+0k_4)^4}{(1+0k_3)^3} \right]^{\frac{1}{4-3}} - 1$$

$$= \left[ \frac{(1+0.0635)^4}{(1+0.06)^3} \right]^{\frac{1}{1}} - 1$$

$$= 7.40\%$$

### Problem 3.28

Soln

Given:

Inflation Rate in Year 2015 ( $I_1$ ) = 5%.

Inflation Rate in Year 2016 ( $I_2$ ) = 6%.

Inflation Rate in Year 2017 ( $I_3$ ) = 8%.

Inflation Rate in Year 2018, 2019, 2020, ... ( $I_4, I_5, I_6, \dots$ ) = 4%

- a. Average Expected Inflation Rate over the 5-Year period  
2015 - 2019 ( $IP_5$ ) = ?

$$IP_5 = \frac{I_1 + I_2 + I_3 + I_4 + I_5}{5}$$

$$= \frac{5\% + 6\% + 8\% + 4\% + 4\%}{5}$$

$$= 5.4\%$$

- b. Real Risk free Rate ( $k^*$ ) = 2%.

yield on 5-year Treasury security ( $OK_5$ ) = ?

$$OK_5 = k^* + IP_5$$

$$= 2\% + 5.4\%$$

$$= 7.4\%$$

1-year yield for year 5 ( $ok_5$ )

$$ok_5 = \left[ \frac{(1+ok_5)^5}{(1+ok_4)^4} \right]^{\frac{1}{5-4}} - 1$$

$$= \left[ \frac{(1+0.0665)^5}{(1+0.0635)^4} \right]^{\frac{1}{1}} - 1$$

$$= 7.85\%$$

Problem 3.27

Soln

Given:

Yield on 1-year bond ( $ok_1$ ) = 3.2%

Yield on 2-year bond ( $ok_2$ ) = 4.3%

Yield on 3-year bond ( $ok_3$ ) = 4.8%

Yield on 4-year bond ( $ok_4$ ) = 5.4%

Two year forward rate starting at year 2 ( $fk_3$ )

$$fk_3 = \left[ \frac{(1+ok_3)^3}{(1+ok_1)^2} \right]^{\frac{1}{3-1}} - 1$$

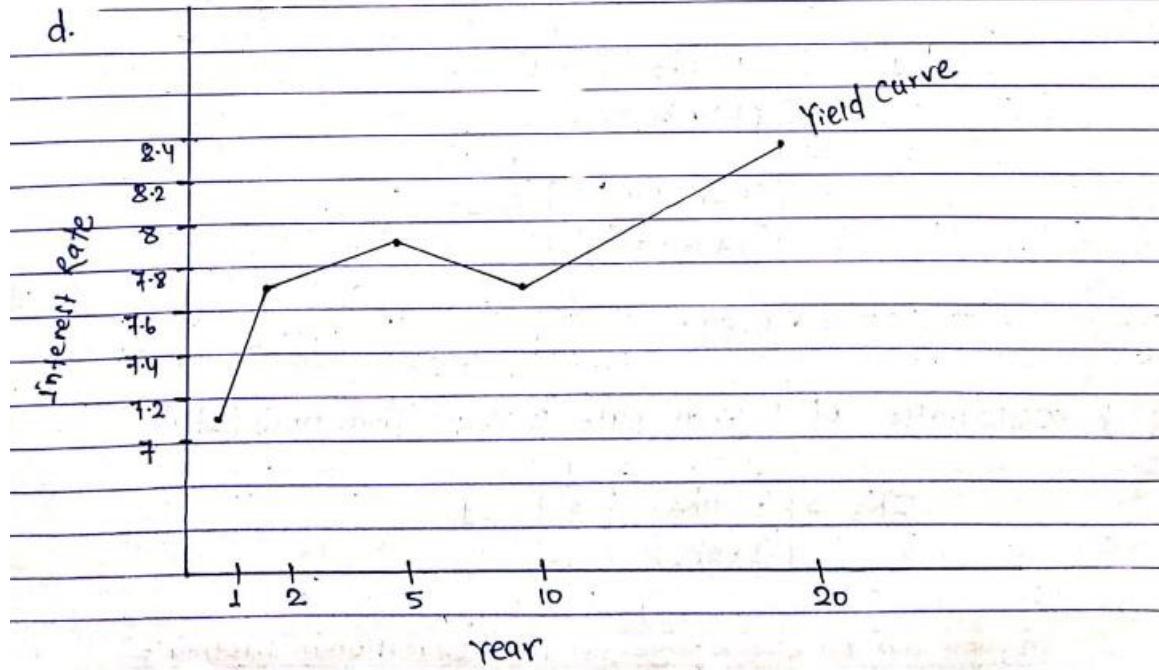
$$= \left[ \frac{(1+0.048)^3}{(1+0.032)^2} \right]^{\frac{1}{2}} - 1$$

$$= 5.6\%$$

d. Calculation of interest Rate

Year	<u>K*</u>	<u>IP</u>	<u>MRP</u>	$OKn = K^* + IP + MRP$
1	2%	5%	0.1%	7.1%
2	2%	$\frac{5\% + 6\%}{2} = 5.5\%$	0.2%	7.7%
5	2%	$5\% + 6\% + 8\% + 4\% + 4\% = 25 \div 5 = 5.4\%$	0.5%	7.9%
10	2%	$5\% + 6\% + 8\% + 4\% \times 7 = 25 \div 10 = 2.5\%$	1%	7.5%
20	2%	$5\% + 6\% + 8\% + 4\% \times 17 = 25 \div 20 = 1.25\%$	2%	8.35%

d.



e. There is an upward sloping yield curve due to increasing maturity, risk premium and inflation rate.

### Problem 3.29

Sol:

Given:

Yield on 1-year bond ( $ok_1$ ) = 5.37%

Yield on 2-year bond ( $ok_2$ ) = 5.47%

Yield on 3-year bond ( $ok_3$ ) = 5.65%

Yield on 4-year bond ( $ok_4$ ) = 5.71%

Yield on 5-year bond ( $ok_5$ ) = 5.64%

a. Calculation of 1-year rate 1 year from now ( $1k_2$ )

$$1k_2 = \left[ \frac{(1+ok_2)^2}{(1+ok_1)^1} \right]^{\frac{1}{2-1}} - 1$$

$$= \left[ \frac{(1+0.0547)^2}{(1+0.0537)^1} \right]^{\frac{1}{1}} - 1$$

$$= 5.57\%$$

b. Calculation of 1-year rate 2 years from now ( $2k_3$ )

$$2k_3 = \left[ \frac{(1+ok_3)^3}{(1+ok_2)^2} \right]^{\frac{1}{3-2}} - 1$$

$$= \left[ \frac{(1+0.0565)^3}{(1+0.0571)^2} \right]^{\frac{1}{3-2}} - 1$$

$$= 6.01\%$$

c. Calculation of 1-year rate 3 years from now ( $3k_4$ )

$$3k_4 = \left[ \frac{(1+0k_4)^4}{(1+0k_3)^3} \right]^{\frac{1}{4-3}} - 1$$

$$= \left[ \frac{(1+0.0571)^4}{(1+0.0565)^3} \right]^{\frac{1}{1}} - 1$$

$$= 5.89\%$$

d. Calculation of 1-year rate 4 years from now ( $4k_5$ )

$$4k_5 = \left[ \frac{(1+0k_5)^5}{(1+0k_4)^4} \right]^{\frac{1}{5-4}} - 1$$

$$= \left[ \frac{(1+0.0564)^5}{(1+0.0571)^4} \right]^{\frac{1}{1}} - 1$$

$$= 5.36\%$$

e. Calculation of 4-year rate 1 year from now ( $1k_5$ )

$$1k_5 = \left[ \frac{(1+0k_5)^5}{(1+0k_1)^1} \right]^{\frac{1}{5-1}} - 1$$

$$= \left[ \frac{(1+0.0564)^5}{(1+0.0537)^1} \right]^{\frac{1}{4}} - 1$$

$$= 5.706 \%$$

f. Calculation of 3-year rate 2 years from now ( $2k_5$ )

$$2k_5 = \left[ \frac{(1+0k_5)^5}{(1+0k_2)^2} \right]^{\frac{1}{5-2}} - 1$$

$$= \left[ \frac{(1+0.0564)^5}{(1+0.0547)^2} \right]^{\frac{1}{3}} - 1$$

$$= 5.75 \%$$

g. Calculation of 2-year rate 3 years from now ( $3k_5$ )

$$3k_5 = \left[ \frac{(1+0k_5)^5}{(1+0k_3)^3} \right]^{\frac{1}{5-3}} - 1$$

$$= \left[ \frac{(1+0.0564)^5}{(1+0.0565)^3} \right]^{\frac{1}{2}} - 1$$

$$= 5.625 \%$$

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# **Introduction to corporate finance**

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## Chapter-1

### Introduction TO Corporate Finance

**Corporate:** A corporation is a legal entity created by a state which is separate and distinct from its owners and managers having unlimited life, easy transferability of ownership and limited liability.

**Finance:** Finance is the art and science of managing money. Money is one of the most useful instruments of transaction. The proper management of money is called finance. Finance refers to funds needed by individual business and government.

**Corporate Finance:** Corporate finance also known as business finance refers to the management of financial resources of a business entity. The scope of corporate finance covers the acquisition, financing and management aspects of assets of corporation. It is also understood as a decision-making process of managerial decisions: investment decision, financial decision and current assets management decision or liquidity management decision.

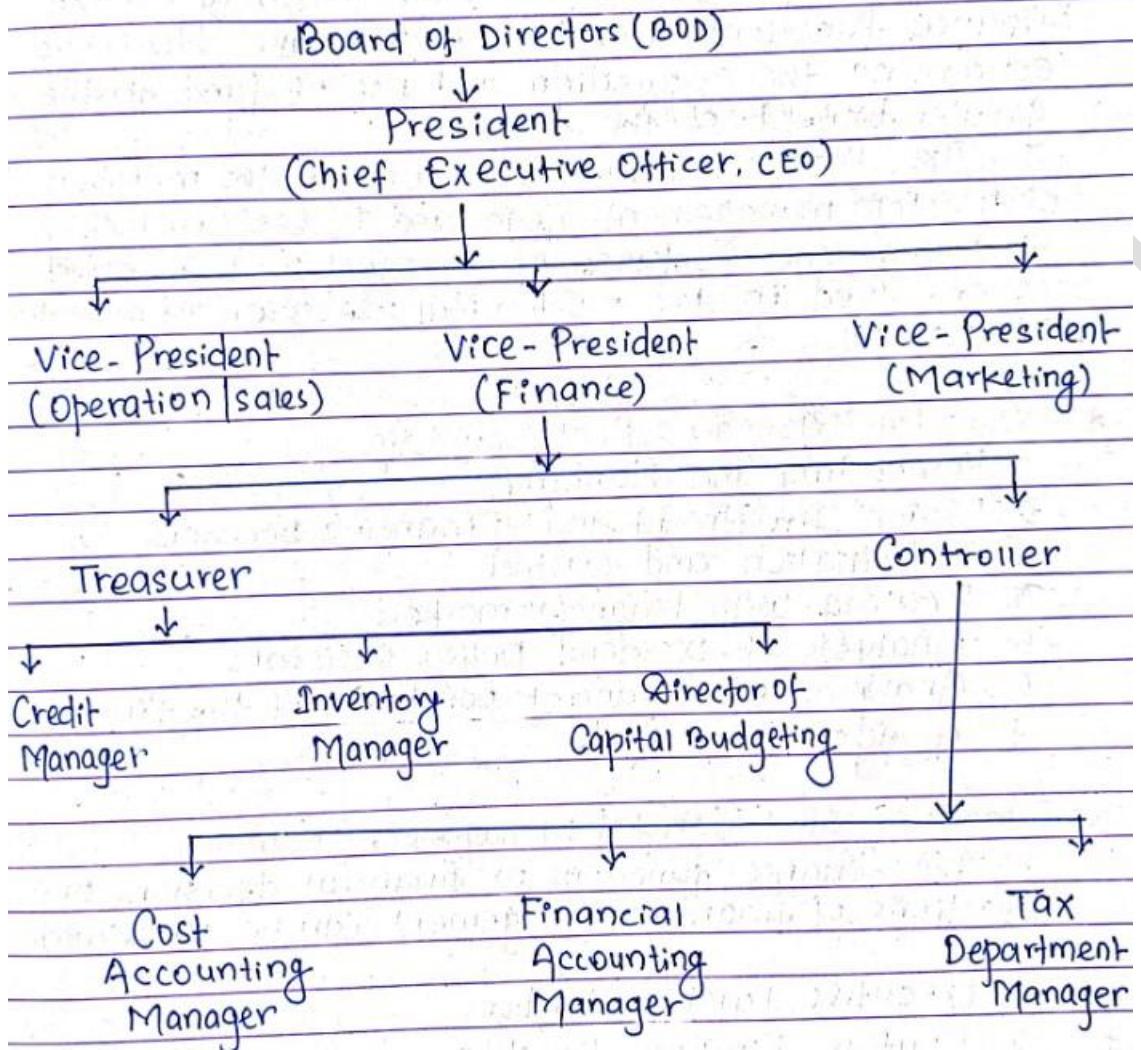
In summary, a primary goal of a corporate finance is to determine:

1. What investment to make.
2. How to finance the investments and
3. How to manage existing resources in a way that will accomplish the given financial objectives.

#### \* Importance of Corporate Finance:

1. To manage personal resources.
2. To deal with business.
3. To pursue interesting and rewarding career opportunities.
4. Important to all parties.
5. To search least costly sources of funds.
6. To distribute the benefits.

## \* Organizational Structure of a Firm:



### \* Financial Manager:

A financial manager is a person who is responsible in a significant way to carry out the finance functions. His task is to make decisions concerning the acquisition and use of funds for the greater benefit of the firm.

The financial manager is one of the members of the top management team and is responsible for shaping the fortunes of the corporation and is involved in the most vital decision of allocation of capital.

### \* Financial Manager's Responsibilities:

1. Forecasting and Planning
2. Major Investment and Financing Decisions
3. Coordination and control
4. Dealing with financial markets
5. Analysis of Dividend policy Decisions
6. Analysis of financial condition of the firm
7. Analysis of Risk

### \* Functions of Financial Management | Manager:

The finance functions or financial decisions or functions of financial management can be classified as:

1. Executive Finance Functions
2. Routine Finance functions

## 1. Executive Finance Functions:

Executive Finance functions are those functions that require high management skills in their planning, execution and control. Since these functions require greater managerial ability, they are also known as managerial functions. The executive finance functions are:

### a. Investment Decision:

Investment decisions relate to selection of assets in which funds are to be invested by the firm.

### b. Financing Decision:

Finance decision is concerned with the mix or composition of the sources of raising the fund required by the firm.

### c. Liquidity Decision:

Liquidity decision is concerned with the management of current assets. Basically, this is working capital management.

### d. Dividend Decision

Dividend decision is concerned with the amount of profits to be distributed and retained in the firm. The term 'dividend' relates to the portion of profit, which is distributed to shareholders of the Company.

## 2. Routine Finance Functions:

Routine Finance functions are those functions which generally do not require manager involvement to carry out. These functions are carried out by the people at lower levels. Routine finance functions includes the following tasks as follows:

- Supervision of cash receipts and cash payment.
- Supervision of fixed assets and current assets.
- Custody and safe guarding cash balances and valuable papers such as securities, insurance policies, certificates of property, contract papers, etc.
- Taking care of mechanical details regarding all new outside financing employed by the firm.
- Maintaining records of firm's activities which have financial implications.
- Timely reporting to facilitate financial manager.

## \* Corporate Governance:

Corporate governance broadly refers to the mechanisms, relations and process by which a corporation is controlled and is directed, involve balancing the many interests of the stakeholder of a corporation. Good corporate governance seeks to make sure that all shareholders get a voice at general meetings and are allowed to participate.

The concept of corporate governance is not something that is essential in banks and financial institutions. It is equally important in all types of business and this awareness is growing. There are three generally accepted fundamental values of good governance.

- a. Accountability
- b. Openness
- c. Probity (honesty and decency)

#### \* Principles of Corporate Governance:

- Stockholder Recognition
- Stockholder interests
- Board responsibilities must be clearly outlined
- Ethical behaviour
- Business transparency.

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# **Common Stock and Investment banking process**

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## Chapter - 5

### COMMON STOCK AND INVESTMENT BANKING PROCESS

#### Common Stock:

- It is a security issued by a firm to obtain equity or ownership capital.
- It is also issued to raise equity capital.
- It is one of the major sources of long term capital.
- It has no maturity date i.e life of common stock is not fixed.
- Shareholders can liquidate their investment by selling their stocks in the secondary markets.
- The major features of common stock are:
  - Par value
  - Maturity (not fixed)
  - Claims on income and assets
  - Voting rights
  - Preemptive rights
  - Limited liability

### \* Common Stock Values:

Common stock has different values, which are used in different perspective. They are:

#### 1. Par value

Par value of a common stock is the stated price in the common stock certificate.

#### 2. Book value

Book value is an accounting concept. The firm's book value of equity includes common stock, share premium and retained earnings.

#### 3. Liquidation value:

Liquidation value is the amount that a company could realize if it sells its assets after having terminated its business and paying to all claimants.

#### 4. Intrinsic value:

Intrinsic value is the present value of the cash flows stream provided to the investor, discounted at an appropriate required rate of return.

#### 5. Market Value:

Market value of a security is the actual price at which the stock is being traded in the market.

### \* Rights and privileges of common stockholders:

1. Right to amend the charter
2. Right to adopt the changes by laws.
3. Right to elect the directors.
4. Right to authorize the sale of fixed assets
5. Right to enter into mergers.
6. Right to change the amount of authorized common stock.
7. Right to issue preferred stock, debentures, bonds and other securities.
8. Right to vote
9. Right to sell their stock certificates
10. Right to share residual income and assets.

### \* Advantages and disadvantages of common stock.

#### Advantages:

1. No fixed Dividend
2. No Fixed Maturity
3. Increase in creditworthiness
4. Easy to issue
5. Tax saving

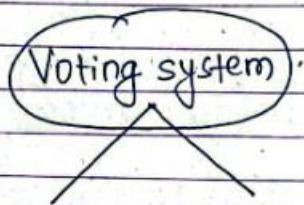
#### Disadvantages:

1. High cost of financing
2. High flotation cost
3. High cost of capital
4. No tax deductibility
5. Uncertain income to investors.

### \* Voting Right :

Common Stockholders can attend annual general meeting to cast vote or use a proxy. A proxy is a legal document given one person the authority to cast vote and represent on behalf of others.

Generally, each share of stock has one vote for each director at annual general meeting. Thus, the owner of 1000 shares has 1000 votes for each director to be elected.



Non-Cumulative  
Voting system

Cumulative voting  
System

#### Non-Cumulative Voting system:

A Voting system in which each common share carries one vote for each directors to be elected, is non-Cumulative Voting system.

∴ Number of Shares required to elect desired number of directors (Req.) =  $\frac{N}{2} + 1$

where,

N = Total number of shares

### Cumulative Voting system:

Cumulative Voting system is a Voting system in which stockholders can accumulate the votes and cast all of them for one director or divide them among more than one director. Cumulative Voting permits multiple votes for a single director.

A commonly used formula for determining the number of shares necessary to elect a certain or desired number of directors under cumulative voting system is given by:

$$\text{req.} = \frac{\text{des.} \times N}{\# + 1} + 1$$

Where,

req. = Number of shares required to elect a desired number of directors.

des. = Number of directors the stockholder desire to elect

N = Total number of shares of common stock outstanding

# = Total number of directors to be elected.

## \* Shareholder's Equity Account:

Shareholder's Equity Account		
Common stock (..... shares @ Rs....)		XXX
Additional paid in Capital		XXX
Retained Earnings		XXX
	Total	XXX
Less: Treasury Stock (if any)		XXX
Shareholder's Equity or Net worth		XXX

Formula:

a. Number of shares issued =  $\frac{\text{Total common stock's value}}{\text{Par value per share}}$

b. Number of outstanding shares = Total issued shares -  
Treasury stocks

c. Book Value per share (Bvps) =  $\frac{\text{Shareholders equity}}{\text{No. of shares outstanding}}$   
OR,

$$= \frac{\text{Net Worth}}{\text{No. of shares outstanding}}$$

**Problem 5.1**

Soln

a. Number of shares outstanding = Number of shares issued - treasury stock  
 $= 600,000 - 80,000$   
 $= 520,000 \text{ shares}$

b. Amount Raised under existing authorization

$$\begin{aligned} &= (\text{Authorized shares} - \text{Outstanding shares}) \times 125 \\ &= (10,00,000 - 520,000) \times 125 \\ &= \text{Rs. } 60,000,000 \end{aligned}$$

c. Shareholder's equity Account

Common stock (10,00,000 shares @ 10)	100,000,000
Additional paid in Capital [4000,000 + 480,000 X 25]	16,000,000

Retained Earnings	5000,000
Total SHE	121,000,000

**Problem 5.2**

Soln

Shareholder's equity Account

Common stock (400,000 shares @ 10)	Rs. 4000,000
Additional paid in Capital	Rs. 1500,000
Retained Earnings	Rs. 1600,000
Total Equity	Rs. 7100,000

Less: Treasury stock (10,000 shares @ Rs.10)	Rs.100,000
Net Common equity	Rs.70,00,000

Problem 5.3

Soln.

a. Number of shares issued =  $\frac{30,00,000}{10} = 300,000 \text{ shares}$

b. Number of shares outstanding = No. of shares issued - Treasury stock  
 $= 300,000 - 40,000$   
 $= 260,000 \text{ shares}$

c. Number of shares that can be issued without approval of shareholders = Number of authorized shares - no. of outstanding shares  
 $= 500,000 - 260,000$   
 $= 240,000 \text{ shares}$

d.

Par: 100,000 shares @ 10  
 100,000 shares @ 25

premium (Additional paid in Capital)

: 100,000 shares @ 15

Shareholder's equity Account	
Common stock (300,000 + 100,000) shares @ Rs.10	40,00,000
Additional paid in capital (30,00,000 + 1500000)	4500,000
Retained earnings	1600,000
Total equity	10100,000
less: Treasury stock (40,000 shares @ 10)	400,000
Net common Equity	9700,000

e. Shareholder's equity Account

Common stock (300,000 shares @ Rs.10)	30,00,000
Additional paid in Capital	30,00,000
Retained earnings	1600,000
Total equity	7600,000
Less: Treasury stock (40,000 + 60,000) shares @ 10	10,00,000
Net common equity	66,00,000

Problem 5.4

Soln

q. Book value per share =  $\frac{\text{Net worth (C+A+R)}}{\text{Number of shares outstanding}}$

$$\begin{aligned}
 &= \frac{10,00,000 + 200,000 + 500,000}{20,000} \\
 &= \frac{1700,000}{20,000} \\
 &= \text{Rs. 85 per share}
 \end{aligned}$$

b.

$$\begin{aligned}\text{Remaining Authorized shares} &= 50,000 - 20,000 \\ &= 30,000 \text{ shares}\end{aligned}$$

$$\begin{aligned}30,000 \text{ shares} @ \text{Rs. } 60 \\ = \text{Rs. } 1800,000\end{aligned}$$

Par (30,000 shares @ 50)

Premium (30,000 shares @ 10)

Acer Company

Balance sheet, December 31, 2005

Current Assets	28,00,000	Account payable	250,000
(10,00,000 + 1800,000)		Notes payable	150,000
Fixed Assets	15,00,000	Long-term debt	400,000
		Common stock	2500,000
		(50,000 shares @ 50)	
		Paid in capital	500,000
		(200,000 + 300,000)	
		Retained earnings	500,000
	43,00,000		3500,000

$$\text{New Book Value per share} = \frac{\text{New Net worth}}{\text{Number of shares Outstanding}}$$

$$= \frac{3500,000}{50,000}$$

$$= \frac{3500,000}{50,000}$$

$$= \text{Rs. } 70 \text{ per share}$$

Problem 5.5

Soln

Given:

$$\text{a. Book value per share} = \frac{\text{Net Worth}}{\text{No. of shares outstanding}}$$
$$= \frac{364,000 + 336,000}{20,000}$$
$$= \frac{700,000}{20,000}$$
$$= \text{Rs. } 35 \text{ per share}$$

$$\text{b. Book value per share} = \frac{\text{Net Worth}}{\text{No. of shares outstanding}}$$
$$= \frac{364,000 + 336,000 + 10000 \times 32.55}{30,000}$$
$$= \frac{10,25,500}{30,000}$$
$$= \text{Rs. } 34.18 \text{ per share}$$

c. The market value per share is determined by demand and supply of shares and future earning capacity of the firm whereas book value per share is determined on the basis of total book value of equity and number of shares outstanding.

### Problem 5.6

Soln

Given:

a. Total number of directors (#) = 9 directors

Total number of shares (N) = 500,000 shares

Number of shares held by Mr. Karki (Req.) = 240,000 shares

Number of directors that can be elected by  
Mr. Karki (des.) = ?

We know that,

Cumulative Voting Rule

$$\text{req.} = \frac{\text{des.} \times N}{\# + 1} + 1$$

$$240,000 = \frac{\text{des.} \times 500,000}{9+1} + 1$$

$$240,000 - 1 = \frac{\text{des.} \times 500,000}{10}$$

$$239,999 \times 10 = \text{des.} \times 500,000$$

$$\text{des.} = \frac{239,999}{500,000} = 4.8 \approx 4 \text{ directors}$$

Mr. Karki can elect 4 directors with certainty.

b. Total number of directors to be elected (#) = 3 directors

$$\text{req.} = \frac{\text{des.} \times N}{\# + 1} + 1$$

$$240,000 = \frac{\text{des.} \times 500,000}{3+1} + 1$$

$$240,000 - 1 = \text{des.} \times 500,000$$

4

$$239,999 \times 4 = \text{des.} \times 500,000$$

$$\text{des.} = \frac{239,999 \times 4}{500,000}$$

$$= 1.92 \approx 1 \text{ director}$$

Mr. Karki can select 1 director with certainty.

### Problem 5.8

Soln

Given:

Total number of directors (#) = 10 directors

Total number of shares (N) = 800,000 shares

a. Under Majority-rule (Non-cumulative) voting system:

$$\text{Req.} = \frac{N}{2} + 1$$

$$= \frac{800,000}{2} + 1$$

$$= 400,001 \text{ shares}$$

Mrs. Aryal have to control 400,001 shares to be assured of 1 directorship under non-cumulative voting system.

b. Under cumulative Voting system:

$$\begin{aligned}\text{Req.} &= \text{des.} \times N + 1 \\ &\quad \# + 1 \\ &= 1 \times 800,000 + 1 \\ &\quad 10 + 1 \\ &= 72,728 \text{ shares}\end{aligned}$$

Mrs. Aryal have to control 72,728 shares to be assured of 1 directorship under a cumulative Voting system.

Problem 5.8

Soln

Given:

Total number of shares (N) = 500,000 shares

Shares held by current management = 70% of 500,000  
= 350,000 shares

Shares held by me/myself = 10% of 500,000  
= 50,000 shares

Shares held by other minority shareholders  
= 20% of 500,000  
= 100,000 shares

Total number of directors (#) = 10 directors

a. Under Non-cumulative Voting system:

$$\begin{aligned}\text{Req.} &= \frac{N}{2} + 1 \\ &= \frac{500,000}{2} + 1 = 250,001 \text{ shares}\end{aligned}$$

No, I cannot elect myself as a director since the required shares is 250,001 shares and I do have only 50,000 shares under non-cumulative voting system.

b. Total number of shares with minority shareholders  
 $= 50,000 + 100,000 = 150,000$  shares

No, they cannot elect me as a director under non-cumulative voting system since the required shares is 250,001 shares and the total number of shares with minority shareholder is 150,000 shares which is not sufficient.

c. Under Cumulative Voting system:

$$\begin{aligned} \text{Req.} &= \text{des.} \times N + 1 \\ &\quad \# + 1 \\ &= 1 \times 500,000 + 1 \\ &\quad 10 + 1 \\ &= 45,456 \text{ shares} \end{aligned}$$

Under cumulative voting system, 45,456 shares are required to elect one director with certainty. I do have 50,000 shares so I can elect myself as a director.

d. No additional shares are required.

e.  $\text{Req.} = \text{des.} \times N + 1$   
 $\# + 1$

$150,000 = \text{des.} \times 500,000 + 1$   
 $10 + 1$

des. = 3.29 directors  $\approx$  3 directors

Therefore, the minority shareholders can elect only 3 directors with certainty.

### Problem 8.9

SQn

Given:

Current stock price ( $P_0$ ) = Rs. 180

Subscription price ( $P_s$ ) = Rs. 140

Number of rights required to purchase a new share (#) = 3

a. If the stock is selling right on:

$$V_r = \frac{P_0 - P_s}{\# + 1} = \frac{180 - 140}{3 + 1} = \text{Rs. 10}$$

b. Ex-right price ( $P_e$ ) =  $P_0 - V_r = 180 - 10 = \text{Rs. 170}$

c. Actual Market price ( $P_e$ ) = Rs. 172

$$V_r = \frac{P_e - P_s}{\#} = \frac{172 - 140}{3} = \text{Rs. 10.67}$$

### Problem 5.10

Soln

Given:

Funds to be raised = Rs. 10,00,000

Current Market price = Rs. 150 (P<sub>o</sub>)

Subscription price (P<sub>s</sub>) = Rs. 100

Old shares Outstanding = 40,000 shares

a. Number of new shares to be issued = Funds to be raised

$$\begin{aligned} &\quad \text{Subscription price} \\ &= \frac{\text{Rs. } 10,00,000}{\text{Rs. } 100} \\ &= 10,000 \text{ shares} \end{aligned}$$

b. Number of rights required to purchase one new share

$$\# = \frac{\text{old shares}}{\text{new shares}} = \frac{40,000}{10,000} = 4 \text{ rights}$$

c. Theoretical value of each right (V<sub>r</sub>) =  $\frac{P_o - P_s}{\# + 1} = \frac{150 - 100}{4 + 1}$

$$= \text{Rs. } 10$$

d. Ex-right price (P<sub>e</sub>) = P<sub>o</sub> - V<sub>r</sub> = 150 - 10 = Rs. 140

e. Actual Market price (P<sub>e</sub>) = Rs. 145

$$V_r = \frac{P_e - P_s}{\#} = \frac{145 - 100}{4} = \text{Rs. } 11.25$$

### Problem 5.19

Soln

Given:

Funds to be raised = Rs. 5000,000

Current market price ( $P_0$ ) = Rs. 300

Old shares outstanding = 100,000 shares

New share price / subscription price ( $P_s$ ) = Rs. 200

a. New shares to be issued = Funds to be raised

Subscription price

$$= \frac{5000,000}{200}$$

$$= 25000 \text{ shares}$$

b. Number of rights required to purchase a new share

$$\# = \frac{\text{Old shares}}{\text{new shares}} = \frac{100,000}{25000}$$

$$= 4 \text{ rights}$$

c. Theoretical value of right ( $V_r$ ) =  $P_0 - P_s = \frac{300 - 200}{4 + 1} = \text{Rs. } 20$

d. Ex-right price ( $P_e$ ) =  $P_0 - V_r = 300 - 20 = \text{Rs. } 280$

e. Statement of wealth position

Before Rights offering

Value of stock (100 shares @ Rs. 300) Rs. 30,000

Total wealth Rs. 30,000

f.

i. He sells all his rights (100 shares = 100 rights)

Statement of wealth position:

After Rights offering

Value of stock (100 shares @ Rs. 280)	Rs. 28,000
Add: cash from sell of rights (100 rights @ Rs. 20)	Rs. 2,000
Total Wealth	Rs. 30,000

ii. He exercises all his rights

$$\text{New shares} = \frac{100 \text{ rights}}{4 \text{ rights}} = 25 \text{ shares}$$

Statement of wealth position:

After Rights offering

Value of stock (125 shares @ Rs. 280)	Rs. 35,000
Less: Cash payment for new shares (25 shares @ 200) (Rs. 5,000)	
Total Wealth	Rs. 30,000

iii. He sells 60 rights and exercise 40 rights

$$\text{New shares} = \frac{40 \text{ rights}}{4 \text{ rights}} = 10 \text{ shares}$$

Statement of wealth position:

After rights offering

Value of stock (110 shares @ Rs. 280)	Rs. 30,800
Less: Cash payment for new shares (10 shares @ Rs. 200) (Rs. 2000)	

Add: Cash from sell of rights (60 rights @ Rs. 20)	1200
Total Wealth	30,000

iv. He neither exercise nor sell the rights

#### Statement of wealth position

After Right offering

Value of stock (100 shares @ Rs. 280)	Rs. 28,000
Total Wealth	Rs. 28,000

2017 Q.No.19

Q11

Given:

Old shares outstanding = 350,000 shares

Current stock price ( $P_0$ ) = Rs. 760

New shares = 70,000 shares

New share price / subscription price ( $P_s$ ) = Rs. 700

a. The advantages of rights offering are:

- i. The right issue is a fast source of raising funds.
- ii. The right issue incurs low cost.
- iii. The right issue provides an option for the shareholders to maintain the same ownership.
- iv. Raise funds without a form of debt
- v. The board of directors can not misuse share issuing option.

### Problem 5.10

Soln

Given:

Funds to be raised = Rs. 10,00,000

Current Market price = Rs. 150 (P<sub>o</sub>)

Subscription price (P<sub>s</sub>) = Rs. 100

Old shares Outstanding = 40,000 shares

a. Number of new shares to be issued = Funds to be raised

$$\begin{aligned} & \text{Subscription price} \\ &= \frac{\text{Rs. } 10,00,000}{\text{Rs. } 100} \\ &= 10,000 \text{ shares} \end{aligned}$$

b. Number of rights required to purchase one new share

$$\# = \frac{\text{old shares}}{\text{new shares}} = \frac{40,000}{10,000} = 4 \text{ rights}$$

c. Theoretical value of each right (V<sub>r</sub>) =  $\frac{P_o - P_s}{\# + 1} = \frac{150 - 100}{4 + 1} = \text{Rs. } 10$

d. Ex-right price (P<sub>e</sub>) = P<sub>o</sub> - V<sub>r</sub> = 150 - 10 = Rs. 140

e. Actual Market price (P<sub>e</sub>) = Rs. 145

$$V_r = \frac{P_e - P_s}{\#} = \frac{145 - 100}{4} = \text{Rs. } 11.25$$

**Problem 5.19**

Soln

Given:

$$\text{Funds to be raised} = \text{Rs. } 5,000,000$$

$$\text{Current market price (P}_0\text{)} = \text{Rs. } 300$$

$$\text{Old shares outstanding} = 100,000 \text{ shares}$$

$$\text{New share price / subscription price (P}_s\text{)} = \text{Rs. } 200$$

a. New shares to be issued = Funds to be raised

$$\frac{\text{Subscription price}}{= 5,000,000}$$

$$200 = 25,000 \text{ shares}$$

b. Number of rights required to purchase a new share

$$\# = \frac{\text{Old shares}}{\text{new shares}} = \frac{100,000}{25,000} = 4 \text{ rights}$$

c. Theoretical value of right ( $V_r$ ) =  $\frac{P_0 - P_s}{\# + 1} = \frac{300 - 200}{4 + 1} = \text{Rs. } 20$

d. EX-right price ( $P_e$ ) =  $P_0 - V_r = 300 - 20 = \text{Rs. } 280$

e. Statement of wealth position

Before Rights offering

Value of stock (100 shares @ Rs. 300)	Rs. 30,000
Total Wealth	Rs. 30,000

f.

i. He sells all his rights (100 shares = 100 rights)

Statement of wealth position

After Rights offering

Value of stock (100 shares @ Rs. 280)	Rs. 28,000
Add: cash from sell of rights (100 rights @ Rs. 20)	Rs. 2,000
Total Wealth	Rs. 30,000

ii. He exercise all his rights

New shares =  $\frac{100 \text{ rights}}{4 \text{ rights}} = 25 \text{ shares}$

Statement of wealth position

After Rights offering

Value of stock (125 shares @ Rs. 280)	Rs. 35,000
Less: Cash payment for new shares (25 shares @ 200) (Rs. 5,000)	
Total Wealth	Rs. 30,000

iii. He sells 60 rights and exercise 40 rights

New shares =  $\frac{40 \text{ rights}}{4 \text{ rights}} = 10 \text{ shares}$

Statement of wealth position

After rights offering

Value of stock (110 shares @ Rs. 280)	Rs. 30,800
Less: Cash payment for new shares (10 shares @ Rs. 200) (Rs. 2000)	

Add: Cash from sell of rights (60 rights @ Rs. 20)	1200
Total Wealth	30,000

iv. He neither exercise nor sell the rights

#### Statement of Wealth position

After Right offering

Value of stock (100 shares @ Rs. 280)	Rs. 28,000
Total Wealth	Rs. 28,000

2077 Q.No.19

Soln

Given:

Old shares outstanding = 350,000 shares

Current stock price ( $P_0$ ) = Rs. 760

New shares = 70,000 shares

New share price / subscription price ( $P_s$ ) = Rs. 700

a. The advantages of Rights offering are:

- i. The right issue is a fast source of raising funds.
- ii. The right issue incurs low cost.
- iii. The right issue provides an option for the shareholders to maintain the same ownership.
- iv. Raise funds without a form of debt
- v. The board of directors can not misuse share issuing option.

f.i. If he sells all his rights ( $1000 \text{ shares} = 1000 \text{ rights}$ )

#### Wealth Statement

##### After right Offering

Value of stock (1000 shares @ Rs. 240)	Rs. 240,000
Cash Balance	Rs. 150,000
Add: Cash from sell of Rights (1000 Rights @ Rs. 10)	Rs. 10,000
Total Wealth	Rs. 400,000

ii. He exercises all his rights

$$\begin{aligned}\text{New shares} &= 1000 \text{ Rights} \\ &\quad 4 \text{ Rights} = 250 \text{ shares}\end{aligned}$$

#### Wealth Statement

##### After right offering

Value of stock (1250 shares @ Rs. 240)	Rs. 300,000
Cash Balance	Rs. 150,000
less: Cash payment for new shares (250 shares @ 200) (Rs. 50,000)	
Total Wealth	Rs. 400,000

2015 Q.N.19

Soln

Given:

$$\text{Funds to be raised} = \text{Rs. } 1,000,000$$

$$\text{Current Market price (P}_o\text{)} = \text{Rs. } 350$$

$$\text{Subscription price (P}_s\text{)} = \text{Rs. } 200$$

$$\text{Old shares Outstanding} = 10,000 \text{ shares}$$

a. New shares to be issued =  $\frac{\text{Fund to be raised}}{\text{Subscription price}}$

$$= \frac{\text{Rs. } 1000,000}{\text{Rs. } 200}$$
$$= 5000 \text{ shares}$$

b. Number of rights required to purchase a new share

$$\# = \frac{\text{Old shares}}{\text{new shares}} = \frac{10,000}{5000} = 2 \text{ rights}$$

c. Theoretical Value of right ( $V_r$ ) =  $\frac{P_o - P_s}{\# + 1} = \frac{350 - 200}{2 + 1} = \text{Rs. } 50$

d. Ex-right price ( $P_e$ ) =  $P_o - V_r = 350 - 50 = \text{Rs. } 300$

e. Actual Market price ( $P_e$ ) =  $\text{Rs. } 330$

$$\text{Value of Right } (V_r) = \frac{P_e - P_s}{\#} = \frac{330 - 200}{2} = \text{Rs. } 65$$

f. Advantages of Right offerings

(see 20 77 Q.N.19)

b. Number of rights required to purchase a new share

$$\# = \frac{\text{old shares}}{\text{new shares}} = \frac{350,000}{70,000} = 5 \text{ rights}$$

c. Theoretical Value of a right ( $V_r$ ) =  $\frac{P_o - P_s}{\# + 1} = \frac{760 - 700}{5+1} = \text{Rs. } 10$

d. EX-right price ( $P_e$ ) =  $P_o - V_r = 760 - 10 = \text{Rs. } 750$

e.

Wealth Position

before right offering

Value of stock (500 shares @ Rs. 760)	Rs. 380,000
Cash Balance	Rs. 50,000
Total Wealth	Rs. 430,000

You sell 200 rights and exercise 300 rights.

New shares = 300 rights

5 rights = 60 shares

Wealth Position

After Right offerings

Value of stock (560 shares @ Rs. 750)	Rs. 420,000
Cash Balance	Rs. 50,000
Add: Cash from sell of rights (200 rights @ Rs. 10)	Rs. 2,000
Less: Cash payment for new shares (60 shares @ Rs. 700) (Rs. 42000)	
Total Wealth	Rs. 430,000

2076 Q. NO. 19

90/1

Given:

$$\text{Fund to be raised} = \text{Rs. } 10,000,000$$

$$\text{Current Market price (P}_0) = \text{Rs. } 250$$

$$\text{Old shares outstanding} = 200,000 \text{ shares}$$

$$\text{New share price / subscription price (P}_s) = \text{Rs. } 200$$

a. New shares to be issued =  $\frac{\text{Fund to be raised}}{\text{Subscription price}} = \frac{10,000,000}{200} = 50,000 \text{ shares}$

b. Number of rights required to purchase a new share

$$\# = \frac{\text{old shares}}{\text{new shares}} = \frac{200,000}{50,000} = 4 \text{ rights}$$

c. Theoretical value of right ( $V_r$ ) =  $\frac{P_0 - P_s}{\# + 1} = \frac{250 - 200}{4 + 1} = \text{Rs. } 10$

d. EX-right price ( $P_e$ ) =  $P_0 - V_r = 250 - 10 = \text{Rs. } 240$

e. Wealth statement

Before Rights Offering

Value of stock (1000 shares @ Rs. 250) Rs. 250,000

Cash Balance Rs. 150,000

Total Wealth Rs. 400,000

2074 Q.N.19

Soln

Given:

Funds to be raised = Rs. 4000,000

Old shares outstanding = 80,000 shares

Current selling price ( $P_0$ ) = Rs. 160

Subscription price ( $P_s$ ) = Rs. 100

a. Number of new shares to be raised =  $\frac{\text{Funds to be raised}}{\text{Subscription price}}$

$$= \frac{4000,000}{100}$$
$$= 40,000 \text{ shares}$$

b. Number of rights required to purchase one new share

$$\# = \frac{\text{Old shares}}{\text{new shares}} = \frac{80,000}{40,000} = 2 \text{ rights}$$

$$10,000 \text{ shares} = 10,000 \text{ rights}$$

$$\text{Additional shares} = \frac{10,000 \text{ rights}}{2 \text{ rights}} = 5000 \text{ shares}$$

c. Theoretical value of right ( $V_r$ ) =  $\frac{P_0 - P_s}{\# + 1} = \frac{160 - 100}{2 + 1}$

$$= \text{Rs. } 20$$

d.

## Wealth Statement

## Before Right offering

Value of shares / stock (1000 shares @ Rs. 160)	Rs. 160,000
Cash Balance	Rs. 40,000
Total Wealth	Rs. 200,000

If she sells 500 rights and exercise 500 rights

$$\text{Additional shares} = \frac{500 \text{ rights}}{2 \text{ rights}} = 250 \text{ shares}$$

## Wealth Statement

## After Right Offerings

Value of stock (1250 shares @ 140)	Rs. 175,000
Cash Balance	Rs. 40,000
Add: Cash from sell of rights (500 rights @ 20)	Rs. 10,000
Less: Cash paid for new shares (250 shares @ 100)	(Rs. 25,000)
Total Wealth	Rs. 200,000

where,

$$P_e = P_o - V_r = 160 - 20 = \text{Rs. } 140$$

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## Chapter-10

# MULTINATIONAL CORPORATE FINANCE

### \* Multinational Corporation:

It is a company that operates at least in two or more than two countries. A multinational corporation (MNC) or worldwide enterprise is a corporate organization which owns or controls production of goods or services in at least one country other than its home country.

A multinational corporation can also be referred to as a multinational enterprise (MNE), a transactional enterprise (TNE), a transactional corporation (TNC), an international corporation or a stateless corporation.

The two main characteristics of MNCs are their large size and the fact that their world wide activities are centrally controlled by the parent companies.

Some of the examples of multinational corporations operating in Nepal are:

- Nepal Lever Limited
- Bottlers Nepal Coca-Cola
- Pepsi Cola Nepal
- Nepal Arab Bank Ltd.

- Hotel Radisson
- Standard Chartered Bank

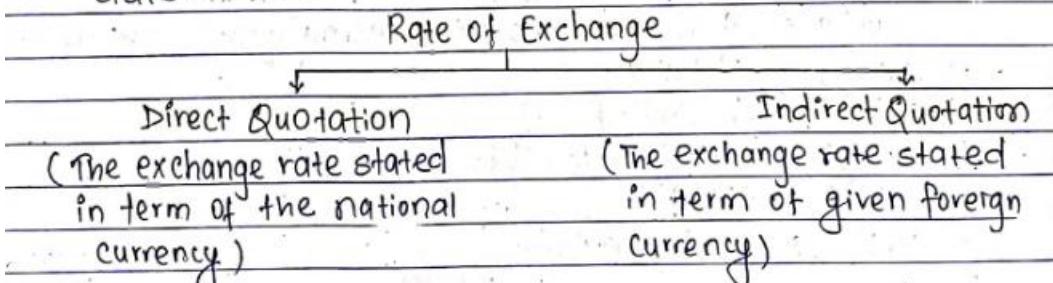
### \* Reasons for companies Going Global:

1. To broaden their market
2. To seek Raw material's
3. To seek New Technology
4. To seek production Efficiency
5. To Avoid political and Regulatory hurdle
6. To Diversify Risk.

### \* Exchange Rates:

Exchange Rate is the rate at which one currency will be exchanged for another. It is also regarded as the value of one country's currency in relation to another currency.

The spot exchange rate refers to the current exchange rate whereas forward exchange rate refers to an exchange rate that is quoted and traded today but for delivery and payment on a specific future date:



Some of the countries with their currencies are:

Countries	Currencies
Nepal	Rs. NC
India	Rs. IC
America	\$ dollar US
Australia	\$ Australian dollar
Singapore	\$ Singapore dollar
German	DM (Mark)
Japan	¥ Yen
Russia	Roubles
England	£ pound
Bangkok (Thailand)	baht
France	French France
European Union	€ Euro

Note:

$$\$ 1 = 100 \text{ cents}$$

$$\text{£ } 1 = 100 \text{ pence}$$

### Problem 10.1

Soln

$$1 \text{ USD} = \text{NR } 86.28$$

$$\text{USD } 5000 = ? \text{ NR}$$

We know that,

$$\begin{aligned}\text{USD } 5000 &= \text{NR } 86.28 \times 5000 \\ &= \text{NR } 431400\end{aligned}$$

### Problem 10.2

Soln

$$\text{SGD } 1 = \text{NR } 69.57$$

$$\text{SGD } 10,000 = \text{NR } ?$$

We know that,

$$\begin{aligned}\text{SGD } 10,000 &= \text{NR } 69.57 \times 10,000 \\ &= \text{NR } 695,700\end{aligned}$$

### Problem 10.3

Soln

$$\text{USD } 1 = \text{NR } 86.40$$

$$\text{NR } 5000,000 = \text{USD } ?$$

We know that,

$$\text{NR } 86.40 = \text{USD } 1$$

$$\text{NR } 1 = \text{USD } \frac{1}{86.40}$$

$$\begin{aligned}\text{NR } 5000,000 &= \text{USD } \frac{1}{86.40} \times 5000,000 \\ &= \text{USD } 57,870.37\end{aligned}$$

### Problem 10.4

Soln

$$AUD 1 = NR 90.24$$

$$NR 1 = AUD ?$$

We know that,

$$NR 90.24 = AUD 1$$

$$NR 1 = \frac{AUD 1}{90.24}$$

$$= AUD 0.01108$$

∴ The exchange rate is AUD 0.01108 per nepalese rupee.

### Problem 10.5

Soln

Given:

$$1 \text{ US Dollar} = 1498.2 \text{ Italian Lira}$$

$$1 \text{ US Dollar} = 111.23 \text{ Japanese Yen}$$

We have,

$$\text{Let } X \text{ Lira} = 1 \text{ JPY}$$

$$111.23 \text{ JPY} = 1 \text{ USD}$$

$$1 \text{ USD} = 1498.2 \text{ Lira}$$

$$X \times 111.23 \times 1 = 1 \times 1 \times 1498.2$$

$$X = 1498.2$$

$$111.23 = 13.468 \text{ Lira}$$

The exchange rate between yen and the lira is 13.468 lira per yen.

### Problem 10.6

Soln

Given:

$$FF\ 5.9 = \$\ 1$$

$$BP\ 1 = \$\ 1.50$$

Here,

$$\text{Let } FF\ x = BP\ 1$$

$$BP\ 1 = \$\ 1.50$$

$$\$\ 1 = FF\ 5.9$$

Now,

$$x \times 1 \times 1 = 1 \times 1.50 \times 5.9$$

$$x = FF\ 8.85 \text{ per pound}$$

The exchange rate between francs and pounds is FF 8.85 per pound.

### Problem 10.7

Soln

Given:

$$USD\ 1 = NR\ 86.40$$

$$SGD\ 1 = NR\ 69.09$$

$$SGD\ 1 = INR\ 25.35$$

Here,

$$\text{Let } INR\ x = USD\ 1$$

$$USD\ 1 = NR\ 86.40$$

$$NR\ 69.09 = SGD\ 1$$

$$SGD\ 1 = INR\ 25.35$$

Now,

$$xx 1 \times 69.09 \times 1 = 1 \times 86.40 \times 1 \times 25.35$$

$$x = \frac{86.40 \times 25.35}{69.09}$$

$$= \text{INR } 31.70 \text{ per USD.}$$

The exchange rate between US Dollar and Indian Rupee  
is INR 31.70 per US Dollar.

### Problem 10.8

Soln

Given:

$$\text{USD } 1 = \text{NR } 86.40$$

$$\text{GBP } 1 = \text{NR } 130.76$$

Here,

$$\text{Let } \text{USD } x = \text{GBP } 1$$

$$\text{GBP } 1 = \text{NR } 130.76$$

$$\text{NR } 86.40 = \text{USD } 1$$

Again,

$$xx 1 \times 86.40 = 1 \times 130.76 \times 1$$

$$x = \frac{130.76}{86.40}$$

$$= \text{USD } 1.5134 \text{ per GBP}$$

The cross exchange rate between US dollar and Great Britain  
Pound is USD 1.5134 per GBP.

Problem 10.9

Soln

Given:

$$\text{March 17, 2013} \quad 1 \text{ SGD} = \text{NR } 69.13$$

$$\text{April 4, 2013} \quad 1 \text{ SGD} = \text{NR } 69.27$$

a. The Singapore dollar was appreciated on April 4, 2013.

b. The Nepalese Rupee was depreciated on April 4, 2013.

c. Appreciated or Depreciated percentage

$$= \frac{69.27 - 69.13}{69.13}$$

$$= 0.20\%$$

Problem 10.10

Soln

Given: Bid Rate:  $1 \text{ CAD} = \text{NR } 84.53$

Ask Rate:  $1 \text{ CAD} = \text{NR } 85.12$

a. The ask rate is NR 85.12 per CAD

$$\text{NR } 85.12 = 1 \text{ CAD}$$

$$\text{NR } 1 = \frac{1}{85.12} \text{ CAD}$$

$$\text{NR } 500,000 = \frac{1}{85.12} \times 500,000 \text{ CAD} = 5874.06 \text{ CAD}$$

She received CAD 5874.06 after exchanging NR 500,000 on March 19.

b. The bid rate is NR 84.53 per CAD.

$$1 \text{ CAD} = \text{NR } 84.53$$

$$\begin{aligned} 5874.06 \text{ CAD} &= \text{NR } 84.53 \times 5874.06 \\ &= \text{NR } 496534.29 \end{aligned}$$

She received NR 496534.29 after exchanging 5874.06 CAD on March 25.

c. She lost RS.3465.70 ( $\text{NR } 500,000 - \text{NR } 496534.29$ ) in the buying and selling of CAD.

d. Percentage loss =  $\frac{\text{NR } 3465.70}{\text{NR } 500,000} = 0.69\%$

e. She had to lose her money because of bid-ask spread.

f. The bid-ask percentage spread is 0.69%.

### Problem 10.11

Soln

Given:

Cost of Land Cruiser in Japan = 3,367,403.32 JPY

Selling price in Nepal = NR 35,00,000

Exchange rate: NR 9.05 = 10 JPY

$$NR 9.05 = 10 \text{ JPY}$$

$$NR 1 = \frac{10}{9.05} \text{ JPY}$$

$$NR 3500,000 = \frac{10}{9.05} \times 3500,000 \text{ JPY}$$

$$= 3867403.32 \text{ JPY}$$

∴ The selling price is 3867403.32 JPY

$$\begin{aligned}\% \text{ profit} &= \text{Selling price} - \text{Cost price} \\ &= 3867403.32 \text{ JPY} - 3367403.32 \text{ JPY} \\ &= 500,000 \text{ JPY}\end{aligned}$$

After 3 months:

Exchange rate: NR 9.20 = 10 JPY

$$NR 9.20 = 10 \text{ JPY}$$

$$NR 1 = \frac{10}{9.20} \text{ JPY}$$

$$NR 3500,000 = \frac{10}{9.20} \times 3500,000 \text{ JPY}$$

$$= 3804347.82 \text{ JPY}$$

∴ The selling price is 3804347.82 JPY after 3 months.

$$\begin{aligned}\% \text{ profit} &= 3804347.82 \text{ JPY} - 3367403.32 \text{ JPY} \\ &= 436944.50 \text{ JPY}\end{aligned}$$

$$\begin{aligned}\text{Percentage decrease in profit} &= \frac{500,000 \text{ JPY} - 436944.50 \text{ JPY}}{500,000 \text{ JPY}} \\ &= 12.61\%\end{aligned}$$

### \* Interest Rate Parity (IRP):

The relationship between spot and forward rate is determined by the interest rate parity. If we invest in the countries other than in our home country, return on our investment is affected by return on investment itself and fluctuation in the exchange rate.

The international Fisher effect suggests the following relationship between two countries to illustrate the Interest Rate Parity:

$$Fr = 1 + k_h$$

$$Sr = 1 + k_f$$

Where,

$k_h$  = nominal interest rate for given period in the home country

$k_f$  = nominal interest rate for given period in the foreign country

Fr = forward rate

Sr = spot rate

Annualized Discount/Premium percentage:

$$\text{Annualized percentage} = \left( \frac{F_r - S_r}{S_r} \right) \times \left( \frac{360}{F_p} \right) \times 100$$

Where,

$F_r$  = Forward Rate.

$S_r$  = Spot Rate

$F_p$  = Period of forward contract

TIPS

- If spot rate expressed in home currency is higher than the forward rate, the home currency is said to be trading at a premium in a forward market.
- Upon Comparison between spot rate and forward rate of two currencies, if one is trading at premium than it implies other is trading at discount in the forward market.

Example:

USA

Interest rate = 5% ( $k_f$ )

Spot rate: 1 USD = NR 120

Loan: 100,000 USD

Interest =  $100,000 \times 5\%$

= 5000 USD

Total =  $100,000 + 5000$

= 105,000 USD

Nepal

Interest rate = 12% ( $k_h$ )

$100,000 \times 120 = \text{NR } 12,000,000$

Interest =  $12,000,000 \times 12\%$

= 1440000

Total =  $12,000,000 + 1440000$

= NR 13440,000

$$\begin{aligned}\text{Forward Rate (Fr)} &= \frac{\text{NR } 13440,000}{105,000 \text{ USD}} \\ &= \text{NR } 128 \text{ per USD}\end{aligned}$$

$$\begin{array}{c} \text{spot rate: } 1 \text{ USD} = \text{NR } 120 \\ \downarrow \qquad \downarrow \\ \text{Foreign} \qquad \text{Home} \end{array}$$

According to IRP

$$\frac{Fr}{Sr} = \frac{1 + k_h}{1 + k_f}$$

$$\frac{Fr}{\text{NR } 120} = \frac{1 + 0.12}{1 + 0.05}$$

$$\therefore Fr = \text{NR } 128 \text{ per USD}$$

$$\text{spot rate: } 1 \text{ USD} = \text{NR } 120$$

$$\text{forward rate: } 1 \text{ USD} = \text{NR } 128$$

NR is at discount (12%)  
USD is at premium (5%)

### Problem 10.12

Soln

90-day yield in United States = 5%

90-day yield in Britain = 5.3%

Spot rate: 1 pound = 1.65 dollar

- a. Since the 90 day risk free securities yield 5.3% in Britain and 5% in United States, the 90 day forward rate must be trading at a discount relative to spot rate.

b.

Periodic interest rate on 90 day securities in US =  $5\% \times 90$

$$(K_h) \quad \frac{360}{360} = 1.25\%$$

Periodic interest rate on 90-day securities in Britain =  $5.3\% \times 90$

$$(K_f) \quad \frac{360}{360} = 1.325\%$$

If interest rate parity holds:

90-day forward rate is given by:

$$\frac{F_r}{S_r} = \frac{1 + K_h}{1 + K_f}$$

$$F_r = \frac{1 + 0.0125}{1 + 0.01325}$$

$$F_r = \text{USD } 1.6487 \text{ per pound}$$

### Problem 10.13

Soln

Given:

Spot rate: 1 JPY = 0.0086 dollar

Forward rate: 1 JPY = 0.0086 dollar

90-day risk free securities yield in Japan = 4.6%

Since, the spot rate and forward rate both are equal,  
the 90-day risk free securities must yield the same 4.6%  
return in United States as well.

### Problem 10.14

Soln

Given:

Periodic rate on 180-day securities in China ( $K_h$ ) =  $\frac{7 \times 180}{360} = 3.5\%$

Periodic rate on 180-days securities in Britain ( $K_f$ ) =  $\frac{75 \times 180}{360} = 3.75\%$

spot rate: 1 pound = 10.5 CY

q. If interest rate parity holds 180-day forward rate is :

$$F_r = 1 + K_h$$

$$S_r = 1 + K_f$$

$$\frac{F_r}{S_r} = \frac{1 + 0.035}{1 + 0.0375}$$

$$10.5 = \frac{1 + 0.0375}{1 + 0.035}$$

$$F_r = CY 10.475 \text{ per pound}$$

b. The 180-days forward rate is trading at premium, since the spot rate of Chinese Yuan is greater than the forward rate.

$$\begin{aligned}\text{Premium \%} &= \frac{S_r - F_r}{S_r} \times \frac{360}{t} \times 100 \\ &= \frac{10.5 - 10.475}{10.5} \times \frac{360}{180} \times 100 \\ &= 0.476\%\end{aligned}$$

The nominal interest rate on securities in China is less than that in Britain, so the Chinese Yuan is selling at premium in 180-day forward market.

### Problem 10.15

Sold

Given:

Spot rate: 1 FF = Rs. 45.95

Forward rate: 1 FF = Rs. 46.15

a. Periodic Interest Rate on T-securities in Nepal ( $K_h$ ) =  $\frac{5 \times 90}{360}$

$$= 1.25\% = 0.0125$$

If interest rate parity holds

Periodic interest rate on 90-day Treasury security in France is given by:

$$\frac{Fr}{Sr} = \frac{1+k_n}{1+k_f}$$

$$\frac{46.15}{45.95} = \frac{1+0.0125}{1+k_f}$$

$$k_f = 0.00811$$

$$\text{Nominal interest rate} = 0.00811 \times \frac{360}{90} \times 100 \\ = 3.244\%$$

b. Since, the interest rate of Nepalese currency is higher than the French currency, Nepalese Rupee is selling at discount

$$\text{c. Discount percentage} = \frac{Fr - Sr}{Sr} \times \frac{360}{90} \times 100 \\ = \frac{46.15 - 45.95}{45.95} \times \frac{360}{90} \times 100 \\ = 1.74\%$$

### Problem 10.16

Sol:

Given:

Spot rate: 1 CNY = NR 13.98

Forward rate: 1 CNY = Rs. 14.05

Export Amount = CNY \$10,000.

a. Value of spot currency = NR 13.98 × 500,000 = NR 6990,000

b. Value of forward currency = NR 14.05 × 500,000 = NR 7025000

c. The forward currency is not selling at discount.

d. Premium percentage =  $\frac{Fr - Sr}{Sr} \times \frac{12}{3} \times 100$

$$= \frac{14.05 - 13.98}{13.98} \times \frac{12}{3} \times 100 \\ = 2.002\%$$

### Problem 10.17

SOM

Given:

$$\text{Periodic interest rate on Canadian T-Bill (}K_h\text{)} = 7 \times \frac{3}{12}$$

$$= 1.75\% = 0.0175$$

$$\text{Periodic interest rate on Japanese Bond (}K_f\text{)} = 6 \times \frac{3}{12}$$

$$= 1.5\% = 0.015$$

$$\text{Spot rate: } 1 \text{ JPY} = \$0.0085$$

a. If Interest Rate parity holds,

Three months forward exchange rate is given by:

$$\frac{F_r}{S_r} = \frac{1+k_n}{1+k_f}$$

$$\frac{F_r}{S_r} = \frac{1+0.0175}{1+0.015}$$
$$0.0085$$

$$F_r = 0.00852$$

b. Premium on Forward Yen =  $\frac{F_r - S_r}{S_r} \times \frac{12}{3} \times 100$

$$= \frac{0.00852 - 0.0085}{0.0085} \times \frac{12}{3} \times 100$$
$$= 0.9411\%$$

c. Since, the interest rate on Japanese bond is less than the interest rate on Canadian T-bill, the Japanese forward yen is selling at premium.

### Problem 10.18

Soln

Given:

$$\text{Spot Rate: } \text{USD} 0.01358 = \text{NR} 1$$

$$\begin{aligned}\text{Total Investment} &= \text{USD } 0.01358 \times 500,000 \\ &= \text{USD } 6790\end{aligned}$$

$$\begin{aligned}\text{90 days Interest Amount} &= \text{USD } 6790 \times 0.04 \times \frac{90}{360} \\ &= 67.9 \text{ USD}\end{aligned}$$

$$\begin{aligned}\text{Total Amount} &= \text{USD } 6790 + \text{USD } 67.90 \\ &= \text{USD } 6857.90\end{aligned}$$

$$\text{Forward rate: } \text{USD } 0.01354 = \text{NR } 1$$

$$\text{USD } 0.01354 = \text{NR } 1$$

$$\text{USD } 1 = \text{NR } 1$$

$$0.01354$$

$$\text{USD } 6857.90 = \frac{\text{NR } 1}{0.01354} \times 6857.90$$

$$= \text{NR } 506491.87$$

$$\begin{aligned}\therefore \text{Rate of Return} &= \frac{\text{NR } 506,491.87 - \text{NR } 500,000}{\text{NR } 500,000} \\ (\text{90 days}) &= 0.01298 = 1.298\%\end{aligned}$$

$$\begin{aligned}\text{Annual Rate} &= 0.01298 \times \frac{360}{90} \times 100 \\ &= 5.192\%\end{aligned}$$

$$\begin{aligned}(b) \text{Return on depreciation of Nepalese currency} &= 5.192 - 4 \\ &= 1.192\%\end{aligned}$$

### Problem 10.19

sof

Given:

$$\text{Periodic interest rate on T-bill in USD} (k_h) = 7\% \times \frac{6}{12} = 3.5\%$$

$$\text{Periodic Interest rate on Japanese bond} (k_f) = 5\% \times \frac{6}{12} = 2.5\%$$

$$\text{Spot rate: } 1 \text{ JPY} = \text{USD } 0.009$$

a. Six-month forward exchange rate is given by:

$$\frac{F_r}{S_r} = \frac{1 + k_h}{1 + k_f}$$

$$\frac{F_r}{0.009} = \frac{1 + 0.035}{1 + 0.025}$$

$$\therefore F_r = 0.0090878$$

b. Premium on Forward Yen =  $\frac{F_r - S_r}{S_r} \times \frac{12}{6} \times 100$

$$= \frac{0.0090878 - 0.009}{0.009} \times \frac{12}{6} \times 100$$

$$= 1.95\%$$

c. The rate of return on Japanese bond is less than US bond, so the Japanese yen is selling at premium.

### Problem 10.20

Soln

$$\text{JPY } 10 = \text{ NR } 9.05$$

$$\text{JPY } 1 = \text{ NR } 9.05$$

10

$$\text{JPY } 100,000 = \frac{\text{NR } 9.05}{10} \times 100,000$$

$$= \text{ NR } 90,500$$

∴ Cost price of mobile set = NR 90,500

∴ Selling price of mobile set = NR 92,000

∴ Profit = 92,000 - 90,500 = NR 1,500

### \* Purchasing Power Parity:

Purchasing power parity is a theory of exchange rate determination and a way to compare the average costs of goods and services between countries. This theory postulates that the exchange rate adjusts to keep the purchasing power constant among the currencies.

We use the following equation for purchasing power parity:

$$P_h = P_f \times S_r$$

$$\therefore S_r = \frac{P_h}{P_f}$$

Where,

$P_h$  = Price of the goods in the home country

$P_f$  = Price of the goods in the foreign country

$S_F$  = Spot rate and it is always expressed as the number of units of home currency.

Tips:

- Forward rate is at discount if the interest rate in the home country is higher than in the foreign country.
- Purchasing power parity postulates that the exchange rate adjusts to keep purchasing power constant among the countries. According to this principle, a commodity should costs the same regardless of the currency used to purchase and the country where it is purchased.

### Problem 10.21

Soln

Given:

$$\text{Price of Camera in Singapore } (P_f) = \text{SGD } 5000$$

$$\text{Price of Camera in Nepal } (P_h) = \text{Rs. } 75,000$$

$$\text{Actual spot rate: } 1 \text{ SGD} = \text{NR } 14.25$$

a. Implied spot exchange rate (Sir)

$$Sir = \frac{P_h}{P_f} = \frac{\text{Rs. } 75,000}{\text{SGD } 5000} = \text{Rs. } 15 \text{ per SGD}$$

b. Since, the actual spot rate 14.25 is less than the implied spot rate, NR is overvalued.

$$\begin{aligned} \text{c. Overvalued percentage} &= \frac{Sir - Sar}{Sar} \times 100 \\ &= \frac{15 - 14.25}{14.25} \times 100 \\ &= 5.26\% \end{aligned}$$

### Problem 10.22

Soln

Given:

$$\text{Spot exchange rate: } 1 \text{ GM} = 1.28 \text{ SK}$$

$$\text{Price of Video Camera in Germany } (P_f) = \text{GM } 1245$$

$$\text{Price of Video Camera in Sweden } (P_h) = ?$$

If purchasing power parity holds,

$$\begin{aligned}P_h &= P_f \times S_r \\&= GM 1245 \times 1.28 SK \\&= SK 1593.6\end{aligned}$$

∴ The price of video camera in Sweden is SK 1593.6

### Problem 10.23

Soln

Given:

Price of rice per quintal in India ( $P_f$ ) = INR 2550

Price of rice per quintal in Nepal ( $P_h$ ) = NR 4,125

Actual spot rate: INR 1.60 = 1 INR

$$S_{IR} = \frac{P_h}{P_f} = \frac{4125}{2550} = NR 1.6176 \text{ per INR}$$

Since, the actual spot rate and implied spot rate is not same, it does not represent purchasing power parity.

The Nepalese rupee seems to be overvalued because the implied rate is higher than the actual spot rate.

$$\begin{aligned}\text{Overvalued percentage} &= \frac{S_{IR} - S_{AR}}{S_{AR}} \times 100 \\&= \frac{1.6176 - 1.60}{1.60} \times 100 \\&= 1.1\%\end{aligned}$$

### Problem 10.24

Soln)

Given:

$$\text{Price of Laptop in home country } (P_h) = \text{NR} 125,000$$

$$\text{Price of Laptop in foreign country } (P_f) = \text{HKD} 15,000$$

$$\text{Actual spot rate: HKD 1 = NR 11.12}$$

a. Implied spot rate ( $S_{ir}$ ) =  $\frac{P_h}{P_f} = \frac{\text{NR } 125,000}{\text{HKD } 15,000}$   
 $\hat{=} \text{ NR } 8.3333 \text{ per HKD}$

b. Since the actual spot rate is higher than the implied spot rate, the NR is undervalued.

c. Undervalued percentage =  $\frac{S_{ar} - S_{ir}}{S_{ar}} \times 100$   
 $= \frac{11.12 - 8.333}{11.12} \times 100$   
 $= 25.06\%$

### Problem 10.25

Soln)

Given:

$$\text{Price of LCD projector in home country } (P_h) = \text{NR } 125,000$$

$$\text{Price of LCD projector in foreign country } (P_f) = \text{JPY } 205,254.52$$

$$\text{Actual spot rate} = ?$$

$$\text{Spot rate} = \frac{P_h}{P_f} = \frac{\text{NR } 125,000}{\text{JPY } 205,254.52} \\ = \text{NR } 0.6089 \text{ per JPY}$$

Problem 10.26

Soln

Given:

- a. Price of the beer in US dollar if it is purchased today's spot rate:

$$\text{CAD } 1.4430 = \text{USD } 1$$

$$\text{CAD } 1 = \frac{\text{USD } 1}{1.4430}$$

$$\text{CAD } 4000,000 = \frac{\text{USD } 1}{1.4430} \times 4000,000 \\ = \text{USD } 2772003$$

- b. Price of the beer in US dollar if it is purchased in 90 days forward rate:

$$\text{CAD } 1.4401 = \text{USD } 1$$

$$\text{CAD } 1 = \frac{\text{USD } 1}{1.4401}$$

$$\text{CAD } 4000,000 = \frac{\text{USD } 1}{1.4401} \times 4000,000 \\ = \text{USD } 2777585$$

c. Price of beer in US, if CAD 1.20 = \$ 1

$$\text{CAD } 1.20 = \$ 1$$

$$\text{CAD } 1 = \frac{\$ 1}{1.20}$$

$$\text{CAD } 4000,000 = \frac{\$ 1}{1.20} \times 4000,000$$
$$= \text{USD } 3333,333$$



# **Short Term Financing**

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## Chapter-4

### SHORT - TERM FINANCING

#### Concept:

Short - term financing consists of all the liabilities or obligations that are originally scheduled for re-payment in one year or less. Even though short term financing is repaid within one year, some sources provide funds that are continuously rolled over.

Company can raise fund from short - term sources of financing to meet regular daily expenses like wages, salary, repair and maintenance, taxes etc. Similarly, short-term fund can be raised to take advantage of cash discount and off - season purchase. A firm may also need short - term bridge loan to finance the purchase of new equipment or a new project.

#### \* Advantages Of short term financing:

1. Economical or less costly
2. Flexibility → More flexible
3. Collateral → No collateral required
4. Serves as long-term purposes

## \* Disadvantages of short-term financing

1. Fixed Burden
2. Charge on Assets
3. Difficulty on raising Finance
4. Uncertainty
5. High risk

## Sources of short term financing

Spontaneous sources  
of financing

Non-spontaneous sources  
(Negotiated financing)

• **Spontaneous Sources:** Spontaneous sources of financing which arise naturally as a part of the operation of business include trade credit and other payable account payable and accruals are spontaneous sources of short-term financing.

• **Non-spontaneous Sources:** The negotiated sources of short-term financing are arranged on a formal basis. Bank loan, commercial papers are the major source's of negotiated source of short-term financing.

## Short term credit

Unsecured loans

Secured loans

• **Unsecured loans:** Unsecured loans include all those sources that require no collateral. Firms with high credit rating are capable to use such sources.

• **Secured loans:** Secured loans require specific assets as collateral. Inventories and account receivables can be used as collateral for such loan.

\* **Accruals:** Accruals represent short-term liabilities for the services that have been provided to the firm but payment has not been made. The most common accruals are wages payable and tax payable.

Accruals trend to rise or fall with the level of the firm's level of activity. For example, as level of production and sales increases, labour cost usually increases, as a result accrued wages increases. And as profit increase, accrued taxes increases.

\* **Deferred Income:** Deferred income represents fund received by the firm for goods and services which it has agreed to supply in future. These receipts increase the firm's liquidity in the form of cash. Therefore, they constitute a source of short-term funds.

Advance payments made by customers are prime sources of deferred income.

### \* Trade Credit (Account payable)

Trade credit refers to the credit extended by the supplier of goods and services in the normal course of transaction. In other words, it is the credit guaranteed by the suppliers of raw material, finished goods, components, etc. It is a spontaneous source of short term financing.

### \* Credit Terms:

The credit terms state the credit period, size of cash discount offered, the discount period and the beginning date of the discount period and credit period.

e.g.

Credit Term:

Discount Rate  
(DR)

3  
10

net 30

Credit period (CP)

Discount Period (DP)

Most common credit terms and their meaning are as follows:

Net 35      The invoice or bill must be paid within 35 days.

**Net 10, EOM** All goods shipped before the end of month just be paid by the 10th of the following month.

**3/10, net 30** Terms of 3/10 net 30 provide a discount of 3 percent if payment is made within 10 days of invoice date otherwise payment is due in 30 days.

**3/10, net 30 EOM** 3 percent cash discount is available if amount is paid within 10 days of next month otherwise payment is due in 30 days from 1st day of the next month.

**4/10, net 30 MDM** Discount period and credit period begins from middle of the month (if invoice date is between 1<sup>st</sup> to 15<sup>th</sup> to last date of the month) and end of the month (if invoice date is between 15<sup>th</sup> to last date of the month)

**Net 30, Feb 1** Net credit period is 30 days and credit period begins from 1<sup>st</sup> February.

## \* Cost of Trade Credit

Annual Percentage Cost (APC)

$$= \frac{\text{Discount Rate}}{100 - \text{Discount Rate}} \times \frac{\text{Days in a Year}}{\text{Credit Period} - \text{Discount Period}}$$

Effective Annual Interest Rate of not taking Discount

$$\text{EAR} = \left[ 1 + \frac{\text{Discount Rate}}{100 - \text{Discount Rate}} \right]^{\frac{365}{\text{CP}-\text{DP}}} - 1$$

Where,

CP = Credit Period

DP = Discount Period

OR,

$$\text{EAR} = (1 + \text{Periodic Interest Rate})^m - 1$$

Where,

m = Number of Compounding in a year

### \*Commercial Paper:

Commercial Paper is a short-term, unsecured negotiable promissory note issued by a company to raise funds from money market.

Only well established and large companies are able to borrow funds through sale of commercial paper.

Maturity of commercial paper generally varies from a few days to a maximum of 270 days.

### Advantages:

1. It is cheaper source of short-term financing.
2. Generally use of commercial paper does not require for compensating balance.
3. It meets the firm's large amount of credit needs.
4. It can be sold by the issuing company directly to the investors.

### Disadvantages:

1. It is high risky.
2. It is least flexible source of short-term financing.
3. It is not suitable for medium or small size firm.

The annual percentage cost on commercial paper can be computed as follows:

### Annual Percentage Cost (APC)

$$= \frac{\text{Interest Cost} + \text{Placement cost}}{\text{Net Amount used}} + \frac{\text{Days in a Year}}{\text{Maturity (days)}}$$

OR

$$= \frac{\text{Face Value} - \text{Sales price}}{\text{Sales price}} \times \frac{\text{Days in a Year}}{\text{Days of maturity}}$$

### \* Short-Term Bank Loans:

Bank loan is non-spontaneous and unsecured short-term credit. The amount approved by the bank for firms short-term borrowing is called credit limit. Credit limit is the maximum funds which a firm can obtain from the banking system. Generally, Banks provides unsecured short-term loans to the firm as:

- i. Transaction cost
- ii. Line of credit agreement
- iii. Revolving credit agreement

### \* Transaction Loan:

Transaction loan is made for a specific purpose and period of time. Commercial banks grant transaction loan to credit-worthy customers. Principal and interest of commercial loan are generally paid in a single payment at maturity. So, it is called single payment notes.

Cost of transaction loan generally is calculated in one of three ways:

1. Regular or Simple Interest
2. Discount Interest
3. Add-on Interest

- **Regular or Simple Interest Loan:**

The borrower receives the face value of the loan at the beginning of contract and repays both the principal and interest at the maturity. This type of loan is also called collect basis loan.

Interest on this loan is compounded annually.

Effective annual interest rate for annual compounded is calculated as follows:

$$\text{Effective annual Interest Rate} = \frac{\text{Annual Interest}}{\text{Net Usable Fund}}$$

If compounding period is less than one year.

$$\text{Effective annual interest Rate} = \left[ 1 + \frac{\text{Annual Interest}/m}{\text{Net Usable Fund}} \right]^m - 1$$

Where,

$m$  = number of compounding period in a year

### \* Discount Interest Loan:

It is a loan in which the interest is calculated on the amount borrowed and is paid in advance. In this system, the borrower pays interest on face amount of loan but does not receive full amount of loan. As a result, effective interest rate increases.

Effective interest rate on discounted loan is calculated as:

$$\text{Effective Annual Interest rate} = \frac{\text{Interest}}{\text{Loan Amount - Interest}}$$

If the discount loan matures in less than one year.

$$\text{Effective Annual Interest rate} = \left[ 1 + \frac{\text{Annual Interest}/m}{\text{Loan Amt} - \text{Interest}/m} \right]^m - 1$$

If compensating balance is given:

Effective Annual Interest Rate

$$= \frac{\text{Interest}}{\text{Loan Amount} - \text{Compensating balance} - \text{Interest} \text{ (discount)}}$$

### \* Installment Loans | Add-on interest:

In this loan, interest is charged on initial loan and then added to the loan amount and loan including interest is payable in equal installment.

Example Question:

Your company plans to borrow Rs. 5 million for 12 months, and your banker gives you a stated rate of 14% interest. You would like to know the effective rate of interest for an installment loan (12 payments).

Soln

$$\text{Approximate Annual interest Rate} = \frac{\text{Interest}}{\text{Loan Amount}/2}$$
$$= \frac{5000,000 \times 0.14}{500,000/2}$$
$$= \frac{700,000}{250,000}$$
$$= 28\%$$

### Effective Rate of Interest

The effective rate of this loan will be different than this approximate interest. To find the effective rate of this loan we should follow the following steps:

**Step-1:** Calculate the interest on loan and add it with the principal amount to find the total amount of loan to be repaid.

$$\therefore \text{Total amount to be repaid} = \text{Interest} + \text{principal}$$

$$= 700,000 + 5,000,000$$

$$= \text{Rs. } 57,00,000$$

**Step-2:** Calculate the amount of installment by dividing the total amount to be repaid by number of installments.

$$\therefore \text{Amount of Installment} = \frac{\text{Total amount to be repaid}}{\text{Number of Installment}}$$

$$= \frac{57,00,000}{12}$$

$$= \text{Rs. } 475,000$$

**Step-3:** Determine the effective interest rate:  
We have,

$$\text{Loan Amount (PVA)} = \text{Rs. } 5,000,000$$

$$\text{Monthly payment (PMT)} = \text{Rs. } 475,000$$

$$\text{Number of payments (n)} = 12$$

$$\text{Effective Interest Rate} = ?$$

Here,

$$\text{PVA} = \text{PMT} \times \text{PVIFA}_{k\%, n}$$

$$5,000,000 = 475,000 \times \text{PVIFA}_{k\%, 12}$$

$$\therefore \text{PVIFA}_{k\%, 12} = \frac{5,000,000}{475,000}$$

$$= 10.5263$$

Looking at PVIFA table at 12<sup>th</sup> period, the PVIFA factor lies between 2% and 3%. So,

By interpolation,

$$\text{Low Rate} = 2\%$$

$$\text{High Rate} = 3\%$$

$$\text{Low Rate factor} = 10.5753$$

$$\text{High Rate factor} = 9.9540$$

$$\text{Periodic Interest Rate} = \frac{\text{LR} + \frac{\text{LR factor - Required factor}}{\text{LR factor - HR factor}} \times (HR - LR)}{(HR - LR)}$$

$$= \frac{2\% + \frac{10.5753 - 10.5263}{10.5753 - 9.9540} \times (3-2)}{(3-2)}$$

$$= 2.078\%$$

$$\therefore \text{Annual Interest Rate} = 2.078 \times 12 = 24.9312$$

$$\text{Effective Interest Rate} = (1 + 0.02078)^{12} - 1$$

$$= 28\%$$

### \* Line of credit:

A line of credit is an agreement between a bank and borrower specifying the maximum amount of unsecured credit that the bank will make available to the borrower (firm) over a given period of time.

### \* Revolving Credit Agreement:

Revolving credit agreement is a legal commitment by a bank to extend credit up to a stated amount. Like line of credit, under revolving credit agreement interest is charged on average amount used.

### Annual Percentage Cost (APC)

$$= \frac{\text{Interest Cost} + \text{Commitment fee}}{\text{Net Amount Used}} \times \frac{365}{\text{No. of days fund used}}$$

### \* Pledging Receivables:

Pledging receivable is simply the process of getting short term loan from financial institutions such as a bank or finance company through keeping receivables as collateral.

### Annual Percentage cost (APC)

$$= \frac{\text{Interest} + \text{Fees}}{\text{Net Amount used}} \times \frac{\text{Days in a Year}}{\text{No. of days fund used}}$$

### Problem 4.1

a. Average accruals under present payroll system

$$= \frac{\text{Amount of payroll per pay day}}{2}$$

$$= \frac{300,000}{2}$$

$$= \frac{150,000}{2}$$

b. Total annual payroll expenses under present payroll system

$$= \text{Payroll expenses per pay day} \times \text{Number of pay day in a year}$$

$$= 2000 \times (12 \times 2)$$

$$= \text{Rs. } 48,000$$

c. Calculation of Average accruals under proposed plan

$$= \frac{\text{Amount of payroll per pay day}}{2}$$

$$= \frac{600,000}{2}$$

$$= \text{Rs. } 300,000$$

where,

Amount of payroll per pay day

$$= \frac{\text{Amt. of payroll Under present system} \times \text{No. of days in a year}}{\text{Under present system}}$$

Number of pay days in a year Under proposed plan

$$= \frac{300,000 \times 24}{12} = \text{Rs. } 600,000$$

d. Total amount of annual payroll expenses under proposed plan

$$= 2000 \times 12$$

$$= \text{Rs. } 24000$$

e. Calculation of annual saving:

Interest saving	$(300,000 - 150,000) \times 9\%$	13,500
Annual payroll expenses saving	$(18000 - 24000)$	24,000
Total Annual saving		37,500

### Problem 4.2

Sol:

a. Credit Term: 2/10 net 30

Given:

Discount Rate = 2%

Discount period = 10 days

Credit period = 30 days

Annual Percentage Cost (APC) for not taking discount

$$\begin{aligned} APC &= \frac{\text{Discount Rate}}{100 - \text{Discount Rate}} \times \frac{\text{Days in a Year}}{\text{Credit Period} - \text{Discount Period}} \\ &= \frac{2}{100-2} \times \frac{365}{30-10} \\ &= 0.3723 \text{ or } 37.23\% \end{aligned}$$

### Effective Annualized cost (EAR)

$$\begin{aligned} \text{EAR} &= \left[ \frac{1 + \text{Discount Rate}}{100 - \text{Discount Rate}} \right] \frac{365}{\text{CP} - \text{DP}} - 1 \\ &= \left[ \frac{1 + 2}{100 - 2} \right] \frac{365}{30 - 10} - 1 \\ &= 44.58\% \end{aligned}$$

b.

Given:

Credit term: 3/20, net 60

Discount Rate = 3%

Discount period (DP) = 20 days

Credit period (CP) = 60 days

### Annual Percentage cost (APC) for not taking discount

$$\begin{aligned} \text{APC} &= \frac{\text{Discount Rate}}{100 - \text{Discount Rate}} \times \frac{\text{Days in a year}}{\text{Credit period} - \text{Discount period}} \\ &= \frac{3}{100 - 3} \times \frac{365}{60 - 20} \\ &= 28.22\% \end{aligned}$$

### Effective Annualized cost (EAR)

$$\text{EAR} = \left[ 1 + \frac{\text{Discount Rate}}{100 - \text{Discount Rate}} \right]^{\frac{365}{\text{CP-DP}}} - 1$$

$$= \left[ 1 + \frac{2}{100-2} \right]^{\frac{365}{50-10}} - 1$$

$$= 32.04 \%$$

### Problem 4.3

Soln

Given:

Credit Term = 2/10, net 50

Discount Rate = 2 %

Discount Period (DP) = 10 days

Credit period (CP) = 50 days

Days in a year = 365 days

- a. If company does not take discount and pays on due date.

### Annual Percentage Cost (APC)

$$= \frac{\text{Discount Rate}}{100 - \text{Discount Rate}} \times \frac{\text{Days in a Year}}{\text{Credit period} - \text{Discount period}}$$

$$= \frac{2}{100-2} \times \frac{365}{50-10}$$

$$= 18.62 \%$$

- b. If the company does not take discount and pays on 40<sup>th</sup> day  
Credit period (cp) = 40 days

Annual Percentage Cost (APC)

$$= \frac{\text{Discount Rate}}{100 - \text{Discount Rate}} \times \frac{\text{Days in a Year}}{\text{credit period} - \text{Discount period}}$$
$$= \frac{2}{100 - 2} \times \frac{365}{40 - 10}$$
$$= 24.83\%$$

- c. If the company stretches the credit period by 10 days  
Credit period (P) = 50 + 10 = 60 days

Annual Percentage Cost (APC)

$$= \frac{\text{Discount Rate}}{100 - \text{Discount Rate}} \times \frac{\text{Days in a Year}}{\text{credit period} - \text{Discount period}}$$
$$= \frac{2}{100 - 2} \times \frac{365}{60 - 10}$$
$$= 14.90\%$$

- d. If company actually pays on 15<sup>th</sup> day and still takes discount  
Discount period (DP) = 15 days

Annual Percentage cost (APC) for non-free trade credit

$$\begin{aligned}
 &= \frac{\text{Discount Rate}}{100 - \text{Discount Rate}} \times \frac{\text{Days in a Year}}{\text{credit period} - \text{Discount period}} \\
 &= \frac{2}{100-2} \times \frac{365}{50-15} \\
 &= 21.28\%
 \end{aligned}$$

### Problem 4.4

Soln

- a. Mr. Shapa is comparing between the 2% discount rate with 12% annual cost of bank loan. These costs are not comparable because of difference in time scale.
- b. Calc' of the real cost of not taking discount:

$$\text{Discount Rate} = 2\%$$

$$\text{Discount period} = 10 \text{ days}$$

$$\text{Credit period} = 25 \text{ days}$$

Real cost of not taking discount

$$\begin{aligned}
 &= \frac{\text{Discount Rate}}{100 - \text{Discount Rate}} \times \frac{\text{Days in a year}}{\text{credit period} - \text{Discount period}} \\
 &= \frac{2}{100-2} \times \frac{365}{25-10} \\
 &= 148.98\%
 \end{aligned}$$

c. If the firm pays on 30th Days:

Discount rate = 2 %

Credit period = 30 days

Discount period = 10 days

Annual Percentage Cost (APC) =

$$= \frac{\text{Discount rate}}{100 - \text{Discount rate}} \times \frac{\text{Days in a Year}}{\text{Credit period} - \text{Discount period}}$$
$$= \frac{2}{100-2} \times \frac{365}{30-10}$$
$$= 37.24 \%$$

### Problem 4.5

Soln

Given:

Net purchase = Rs. 3.6 m = Rs. 36,00,000

Credit Term = 2/10, net 30

a. Average amount of account payable net of discounts

$$= \frac{\text{Net purchase}}{\text{Days in a year}} \times \text{payable period}$$
$$= \frac{36,00,000}{360} \times 10$$
$$= \text{Rs. } 100,000$$

b. Since Company is taking cash discount, there is no cost of the trade credit the firm uses. It is cost-free trade credit.

c. If the firm did not take discount

$$\begin{aligned}\text{Average payable} &= \frac{\text{Net purchase}}{\text{Days in a Year}} \times \text{payable period} \\ &= \frac{36,00,000}{360} \times 30 \\ &= \text{Rs. } 300,000\end{aligned}$$

Annual percentage cost for not taking discount

$$\begin{aligned}\text{APC} &= \frac{\text{Discount Rate}}{100 - \text{Discount Rate}} \times \frac{\text{Days in a Year}}{\text{Credit period} - \text{Discount period}} \\ &= \frac{2}{100-2} \times \frac{360}{30-10} \\ &= 36.73\%\end{aligned}$$

Effective Annual cost for not taking discount

$$\begin{aligned}\text{EAR} &= \left[ 1 + \frac{\text{Discount Rate}}{100 - \text{Discount Rate}} \right]^{\frac{360}{\text{CP-DP}}} - 1 \\ &= \left[ 1 + \frac{2}{100-2} \right]^{\frac{360}{30-10}} - 1 \\ &= 43.86\%\end{aligned}$$

d. If it could stretch its payments to 40 days

$$\text{Credit period (CP)} = 40 \text{ days}$$

Approximate Annual Cost for not taking discount

$$\begin{aligned} \text{APC} &= \frac{\text{Discount Rate}}{100 - \text{Discount Rate}} \times \frac{\text{Days in a Year}}{\text{Credit period} - \text{Discount period}} \\ &= \frac{2}{100-2} \times \frac{360}{40-10} \\ &= 24.49\% \end{aligned}$$

Effective Annual cost for not taking discount

$$\begin{aligned} \text{EAR} &= \left[ 1 + \frac{\text{Discount Rate}}{100 - \text{Discount Rate}} \right]^{\frac{360}{\text{CP-DP}}} - 1 \\ &= \left[ 1 + \frac{2}{100-2} \right]^{\frac{360}{40-10}} - 1 \\ &= 27.43\% \end{aligned}$$

### Problem 4.6

Soln

Given:

Loan Amount = Rs. 500,000

Maturity period (n) = 1 year

a. Here, (Simple loan)

$$\text{Interest Amount} = 500,000 \times 0.15 = \text{Rs. } 75,000$$

$$\begin{aligned}\text{Effective Interest Rate} &= \frac{\text{Interest Amount}}{\text{Loan Amount}} \\ &= \frac{75000}{500,000} \\ &= 15\%\end{aligned}$$

b. Here, (Simple loan with CB)

$$\text{Interest Amount} = 500,000 \times 0.13 = \text{Rs. } 65,000$$

$$\text{Compensating Balance} = 500,000 \times 0.20 = \text{Rs. } 100,000$$

$$\begin{aligned}\text{Effective Interest Rate} &= \frac{\text{Interest Amount}}{\text{Loan Amount} - \text{Compensating Balance}} \\ &= \frac{65000}{500,000 - 100,000} \\ &= 16.25\%\end{aligned}$$

c. Here, (Discounted loan with CB)

$$\text{Interest Amount} = 500,000 \times 0.11 = \text{Rs. } 55000$$

$$\text{Compensating Balance (CB)} = 500,000 \times 0.15 = \text{Rs. } 75000$$

$$\text{Effective Interest Rate} = \frac{\text{Interest Amount}}{\text{Loan Amount} - \text{CB} - \text{Interest Amount}}$$

$$\begin{aligned}
 &= \frac{55000}{500,000 - 75000} \\
 &= \frac{55000}{425000} \\
 &= 14.86\%
 \end{aligned}$$

If Star Traders wishes to minimize the effective interest rate, it should choose alternative 'c' i.e. discounted loan with compensating balance.

### Problem 4.7

Soln

Given:

$$\text{Loan Amount} = \text{Rs. } 50,000$$

- a. Simple Interest loan

$$\text{Interest Amount} = \text{Rs. } 50,000 \times 0.12 = \text{Rs. } 6000$$

$$\begin{aligned}
 \text{Effective Interest Rate} &= \frac{\text{Interest Amount}}{\text{Loan Amount}} \\
 &= \frac{6000}{50,000} \\
 &= 12\%
 \end{aligned}$$

- b. Simple Interest loan

$$\text{Interest Amount} = \text{Rs. } 50,000 \times 0.09 = \text{Rs. } 4500$$

$$\text{Compensating Balance} = \text{Rs. } 50,000 \times 0.20 = \text{Rs. } 10,000$$

$$\begin{aligned}
 \text{Effective Interest Rate} &= \frac{\text{Interest Amount}}{\text{Loan Amount} - \text{Interest Amount} - \text{CB}} \\
 &= \frac{4500}{50,000 - 10,000} \\
 &= 11.25\%
 \end{aligned}$$

c. Discounted loan with no compensating balance

$$\begin{aligned}
 \text{Effective Interest Rate} &= \frac{\text{Interest Amount}}{\text{Loan Amount} - \text{Interest Amount}} \\
 &= \frac{4500}{50,000 - 4500} \\
 &= 9.89\%
 \end{aligned}$$

Where,

$$\text{Interest Amount} = 50,000 \times 0.09 = \text{Rs. } 4500$$

d. Discounted loan with compensating Balance

$$\text{Interest Amount} = 50,000 \times 0.0875 = \text{Rs. } 4375$$

$$\text{Compensating Balance} = 50,000 \times 0.15 = \text{Rs. } 7500$$

$$\begin{aligned}
 \text{Effective Interest Rate} &= \frac{\text{Interest Amount}}{\text{Loan Amount} - \text{CB} - \text{Interest Amount}} \\
 &= \frac{4375}{50,000 - 7500 - 4375} \\
 &= 11.48\%
 \end{aligned}$$

Alternative 'c' i.e 9%. Annual interest with no compensating balance has the lowest effective interest rate.

### Problem 4.8

Soln

Given:

Additional investment = Rs. 200,000

q.

Alternative 1: Bank loan (Discount Basis)

$$\text{Interest Amount} = 200,000 \times 0.12 = \text{Rs. } 24000$$

$$\text{Compensating Balance} = 0$$

$$\begin{aligned}\text{Effective Interest Rate} &= \frac{\text{Interest Amount}}{\text{Loan Amount} - \text{CB} - \text{Interest Amount}} \\ &= \frac{24000}{200,000 - 0 - 24000} \\ &= 13.64\%\end{aligned}$$

Alternative 2: Trade credit:

Credit term = 3/10, net 40

Discount Rate = 3%

Discount period = 10 days

Credit period = 40 + 20 = 60 days

$$\text{Effective Annual Rate} = \left[ \frac{1 + \text{Discount Rate}}{100 - \text{Discount Rate}} \right] \cdot \frac{365}{\text{CP-DP}} - 1$$

$$= \left[ \frac{1 + 3}{100 - 3} \right] \frac{365}{60 - 10} - 1$$

$$= 24.90\%$$

Based strictly on effective Annual Interest Rate AFC should finance its expansion by bank loan due to lower effective annual interest rate.

b. Factors to be considered while financing

- i. Cost of financing
- ii. Amount of financing
- iii. Period of financing
- iv. Use of fund
- v. Requirement of collateral

### Problem 4.9

Soln

Given:

Loan Amount = Rs. 100,000

Loan period = 1 year

a. Collect Basis loan (simple interest loan)

$$\text{Interest Amount} = \text{Rs. } 100,000 \times 0.09 = \text{Rs. } 9000$$

$$\begin{aligned}\text{Effective Annual Interest Rate} &= \frac{\text{Interest Amount}}{\text{Loan Amount}} \\ &= \frac{9000}{100,000} \\ &= 9\%\end{aligned}$$

b. Discounted Loan:

$$\text{Interest Amount} = 100,000 \times 0.084 = \text{Rs. } 8400$$

$$\begin{aligned}\text{Effective Annual Interest Rate} &= \frac{\text{Interest Amount}}{\text{Loan Amount} - \text{Interest Amount}} \\ &= \frac{8400}{100,000 - 8400} \\ &= 9.17\%\end{aligned}$$

c. Add-on Basis loan:

$$\text{Interest Amount} = 100,000 \times 0.06 = \text{Rs. } 6000$$

Step-1:

$$\begin{aligned}\text{Total Amount to be repaid} &= \text{Principal} + \text{Interest} \\ &= 100,000 + 6000 \\ &= \text{Rs. } 106,000\end{aligned}$$

Step-2:

$$\begin{array}{lcl}\text{Quarterly Instalment} & = & \text{Rs. } 106,000 \\ (\text{Payment}) & & 4 \\ & & = \text{Rs. } 26,500\end{array}$$

Step-3:

Loan Amount (PVA) = Rs. 100,000

Quarterly payment (PMT) = Rs. 26,500

Number of payments (n) = 4

Effective Interest Rate = ?

We know that,

$$PVA = PMT \times PVIFA_{k\%, n}$$

$$100,000 = 26,500 \times PVIFA_{k\%, 4}$$

$$\therefore PVIFA_{k\%, 4} = \frac{100,000}{26,500} = 3.7736$$

Looking at PVIFA table at 4th period, the required factor lies between 2% and 3% so.

By interpolation:

$$\text{Low Rate (LR)} = 2\%$$

$$\text{High Rate (HR)} = 3\%$$

$$\text{LR factor} = 3.8077$$

$$\text{HR factor} = 3.7171$$

Now,

$$\begin{aligned}\text{Quarterly Rate (Periodic Rate)} &= LR + \frac{\text{LR factor} - \text{Req. factor}}{\text{LR factor} - \text{HR factor}} \times (HR - LR) \\ &= 2\% + \frac{3.8077 - 3.7736}{3.8077 - 3.7171} \times (3\% - 2\%) \\ &= 2.376\%\end{aligned}$$

$$\text{Annual Interest Rate} = 2.376\% \times 4 = 9.504\%$$

$$\begin{aligned}\text{Effective Interest Rate} &= (1 + \text{periodic Rate})^m - 1 \\ &= (1 + 0.02376)^4 - 1 \\ &= 9.84\%\end{aligned}$$

Alternative 'a' has the lowest yield.

### Problem 4.10

SOP

Given:

Additional fund needed = Rs. 500,000

Trade credit:

Credit Term: 3/10, net 90

Discount Rate = 3%

Discount period (DP) = 10 days

Credit period (CP) = 90 days

Effective Annual Cost for not taking discount

$$\begin{aligned}\text{EAR} &= \left[ 1 + \frac{\text{Discount Rate}}{100 - \text{Discount Rate}} \right]^{\frac{365}{\text{CP}-\text{DP}}} - 1 \\ &= \left[ 1 + \frac{3}{100-3} \right]^{\frac{365}{90-10}} - 1 \\ &= 14.91\%\end{aligned}$$

Bank Loan: (Discounted)

Interest Rate = 12 %

$$\text{Interest Amount} = \text{Rs. } 500,000 \times 0.12 = \text{Rs. } 60,000$$

Effective Interest Rate =  $\frac{\text{Interest Amount}}{\text{Loan Amount} - \text{Interest Amount}}$

$$= \frac{60,000}{500,000 - 60,000}$$

$$= 18.64 \%$$

Bank Loan has lower effective interest rate.

### Problem 4-11

Soln

Given:

Additional fund Needed = Rs. 100,000

a. Simple Interest Basis

$$\text{Interest Amount} = \text{Rs. } 100,000 \times 0.12 = \text{Rs. } 12,000$$

Effective Annual cost =  $\frac{\text{Interest Amount}}{\text{Loan Amount} - \text{Interest Amount}}$

$$= \frac{12,000}{100,000 - 12,000}$$

$$= 12 \%$$

b. 3-month Renewable loan

Annual Interest Rate = 11.5%

$$\begin{aligned}\text{Effective Interest Rate} &= \left(1 + \text{periodic rate}\right)^m - 1 \\ &= \left(1 + \frac{0.115}{4}\right)^4 - 1 \\ &= 12\%\end{aligned}$$

c. Installment loan Basis (Add-on Basis)

Step-1:

$$\begin{aligned}\text{Total Amount to be repaid} &= \text{Principal} + \text{Interest} \\ &= 100,000 + (100,000 \times 0.06) \\ &= 100,000 + 6000 \\ &= \text{Rs. } 106,000\end{aligned}$$

Step-2:

$$\begin{aligned}\text{Monthly payment (installment)} &= \frac{\text{Amount to be repaid}}{12} \\ &= \frac{106,000}{12} \\ &= \text{Rs. } 8833.33\end{aligned}$$

Step-3:

Loan Amount (PVA) = Rs. 100,000

Monthly payment (PMT) = Rs. 8833.33

Number of payment (n) = 12

$$PVA = PMT \times PVIFA_{i\%, n}$$

$$100,000 = 8833.33 \times PVIFA_{i\%, 12}$$

$$\therefore PVIFA_{i\%, 12} = \frac{100,000}{8833.33} = 11.3208$$

Looking at PVIFA table at 12<sup>th</sup> period, the required factor lies between 0.5% and 1%.

#### Step-4:

By Interpolation:

$$\text{Low Rate (LR)} = 0.5\%$$

$$\text{High Rate (HR)} = 1\%$$

$$LR \text{ factor} = 11.6189$$

$$HR \text{ factor} = 11.2551$$

$$\begin{aligned}\text{Periodic Interest Rate} &= LR + LR \text{ factor} - \text{Req. factor} \times (HR - LR) \\ &\quad \text{LR factor} - HR \text{ factor} \\ &= 0.5\% + \frac{11.6189 - 11.3208}{11.6189 - 11.2551} \times (1\% - 0.5\%) \\ &= 0.9097\%\end{aligned}$$

$$\begin{aligned}\text{Effective Annual Interest Rate} &= (1 + \text{periodic rate})^m - 1 \\ &= (1 + 0.009097)^{12} - 1 \\ &= 11.48\%\end{aligned}$$

d. Trade Credit:

Credit Term = 1/15, net 60

Discount Rate = 1%

Discount Period (DP) = 15 days

Credit Period (CP) = 60 days

Effective Annual Interest Rate (EAR)

$$\begin{aligned} \text{EAR} &= \left[ 1 + \frac{\text{Discount Rate}}{100 - \text{Discount Rate}} \right]^{\frac{365}{\text{CP} - \text{DP}}} - 1 \\ &= \left[ 1 + \frac{1}{100 - 1} \right]^{\frac{365}{60 - 15}} - 1 \\ &= 8.50\% \end{aligned}$$

Problem 4.12

Sol:

Given:

Loan Amount = Rs. 4.5 million = Rs. 15,00,000

Interest Rate = 9% (3-months)

Compensating Balance = 20%

a. Approximate interest rate = 11.25%.

True Effective Rate = ?

$$\text{True Effective Rate} = (1 + \text{periodic rate})^m - 1$$

$$= \left( 1 + 0.1125 \right)^4 - 1$$

$$= 11.73\%$$

b. Discounted loan

$$\begin{aligned} \text{Effective Annual Rate} &= \left[ 1 + \frac{\text{Interest Amt./y}}{\text{Loan Amount} - \text{CB} - \text{Interest Amt./y}} \right]^{M-1} - 1 \\ &= \left[ 1 + \frac{15,00,000 \times 0.09 / 4}{15,00,000 - 150,000 \times 0.20 - 15,00,000 \times 0.09 / 4} \right]^4 - 1 \\ &= 12.09\% \end{aligned}$$

c.

$$\begin{aligned} \text{Approximate Annual Interest Rate} &= \frac{\text{Interest Amount}}{\text{Loan Amount}/2} \\ &= \frac{1500,000 \times 0.09}{1500,000/2} \\ &= 18\% \end{aligned}$$

Problem 4.13

Soln

Given:

Revolving credit amount = Rs. 5 m = Rs. 5,000,000

Cost of fund = 1%

Commitment fee = 0.5%

a. Interest rate =  $9\% + 1\% = 10\%$

Calculation of Total cost:

Interest ( $5,000,000 \times 0.60 \times 0.10$ )	Rs. 300,000
--	-------------

Commitment fee ( $5,000,000 \times 0.40 \times 0.005$ )	Rs. 10,000
---	------------

Total Cost	Rs. 310,000
------------	-------------

b.

$$\text{Percentage Cost} = \frac{\text{Total Cost}}{\text{Net Fund Used}} = \frac{310,000}{5,000,000 \times 0.60}$$
$$= 10.33\%$$

c.

Calculation of Total Cost:

Interest ( $5,000,000 \times 0.20 \times 0.10$ )	Rs. 100,000
--	-------------

Commitment fee ( $5,000,000 \times 0.80 \times 0.005$ )	Rs. 20,000
---	------------

Total Cost	Rs. 120,000
------------	-------------

$$\text{Percentage Cost} = \frac{\text{Total Cost}}{\text{Total fund used}} = \frac{120,000}{5,000,000 \times 0.20}$$
$$= 12\%$$

**Problem 4.14**

Sol:

Given:

$$\text{Additional fund Needed} = \text{Rs. } 150,000$$

1. One Year line of credit:

$$\text{Interest Rate} = 10\%$$

$$\text{Commitment fee} = 1\%$$

Calculation of Total Cost

$$\text{Interest } (150,000 \times 0.10 \times \frac{1}{12}) \quad \text{Rs. } 1250$$

$$\text{Commitment fee } (150,000 \times 0.01 \times \frac{1}{12}) \quad \text{Rs. } 1375$$

$$\text{Total cost} \quad \text{Rs. } 2625$$

2. Trade Discount:

$$\text{Credit Term} = 2/10, \text{ net } 40$$

$$\text{Account payable} = \text{Rs. } 150,000$$

$$\text{Total cost} = \text{Account payable} \times \text{Discount rate}$$

$$= \text{Rs. } 150,000 \times 0.02$$

$$= \text{Rs. } 3000$$

### 3. Commercial Paper:

Interest rate = 9%

Commitment / Transaction Cost = 0.5%

Return from marketable securities = 8%

Calculation of Total cost:

$$\text{Interest} : \frac{(150,000 \times 0.09 \times 60)}{360} \quad \text{Rs. } 2250$$

$$\text{Commitment fee} : \frac{(150,000 \times 0.005)}{360} \quad \text{Rs. } 750$$

$$\text{Total Cost} \quad \text{Rs. } 3000$$

$$\text{less: Return from marketable securities} \quad \text{Rs. } 1000$$

$$(150000 \times 0.08 \times \frac{30}{360})$$

$$\text{Net Cost} \quad \text{Rs. } 2000$$

### Problem 4.15.

Soln

Given:

Credit Term = 2/10, net 40

Gross Sales = 4.5 m = Rs. 45,00,000

Account Receivable = Rs. 437,500

Discount taking customers = 50%

Discount not taking customers = 50%

DSO = Account Receivable X Days in a Year

$$\begin{aligned} & \quad \text{Annual Sales} \\ &= 437,500 \times 360 \\ & \quad 45,00,000 \\ &= 35 \text{ days} \end{aligned}$$

$$\begin{aligned} \text{DSO} &= \% \text{ of customer not taking discount} \times \text{payment date} + \\ & \quad \% \text{ of customer taking discount} \times \text{discount period} \\ 35 &= 0.50 \times \text{payment date} + 0.50 \times 10 \end{aligned}$$

$$\therefore \text{payment date} = 60 \text{ days (credit period)}$$

APC for not taking Discount

$$\begin{aligned} &= \frac{\text{Discount Rate}}{100 - \text{Discount Rate}} \times \frac{\text{Days in a Year}}{\text{Credit Period} - \text{Discount Period}} \\ &= \frac{2}{100-2} \times \frac{360}{60-10} \\ &= 14.69\% \end{aligned}$$

Effective Annual Rate for not taking discount:

$$\begin{aligned} &= \left[ 1 + \frac{\text{Discount Rate}}{100 - \text{Discount Rate}} \right]^{\frac{360}{CP-DP}} - 1 \\ &= \left[ 1 + \frac{2}{100-2} \right]^{\frac{360}{60-10}} - 1 \\ &= 15.66\% \end{aligned}$$

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# **Financial Planning and Forecasting**

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## Chapter-8

# Financial planning and Forecasting

### \* Strategic Plan:

Strategic planning is the process of developing and analysing the organizational mission, goal, objective and strategies and allocating resources.

It is the way in which strategists determine objectives and make strategic decisions. The procedures of strategic plan are:

- a. Defining the mission
- b. Assessing the situation
- c. Developing goal, objectives and strategies.

### \* Operating Plan:

Operating plan is a detailed guideline for effective implementation of corporate strategies, which helps to achieve corporate objective. Operating plans could be formulated for any time horizon. However, five year planning horizon is the most common in many cases.

### \* Financial plan:

The financial plan refers to the projection of future financial course of action to be carried out for efficient execution of operating plans and effective accomplishment of corporate objectives. It begins with strategic plan that guide the formulation of operating plans and budgets.

Financial planning is the process of planning future financial course of action of a firm and forecasting a concerned with determining firm's future financing needs. A firm needs additional investment in assets to support the growth and expansion of its sales. It must also plan for their financing.

Therefore, financial planning and forecasting have become an important part of financial manager's jobs today.

### Advantages of financial plan:

- a. Establishes priorities
- b. Explore alternatives
- c. Better financial choice
- d. Avoids surprise
- e. Internal consistency

### \* Sales Forecast:

Financial forecasting begins with sales forecast.  
Sales forecast is simply a forecast of firm's future sales both in terms of unit volume and rupee value.

Factors Considering while sales forecasting:

- a. Review of past sales
- b. Estimating Annual Growth Rate

$$\text{Internal growth rate (g)} = \frac{\text{ROA} \times \text{RR}}{1 - \text{ROA} \times \text{RR}}$$

$$\text{Sustainable growth rate (g)} = \frac{\text{ROE} \times \text{RR}}{1 - \text{ROE} \times \text{RR}}$$

$$\text{Return on equity (ROE)} = \frac{\text{Net Income}}{\text{Total equity}}$$

$$\text{Retention Ratio (RR)} = 1 - \text{DPR}$$

$$\text{Dividend payout Ratio (DPR)} = \frac{\text{Dividend}}{\text{Net Income}}$$

c: Adjustment in Growth

## Financial Forecasting : Additional fund Needed (AFN) equation

Financial forecasting is simply a process of projecting future financial requirement of a firm. Financial forecasting, an integral part of finance manager's job, is an act of deciding in advance the quantum of funds requirements of the firm and the time pattern of such requirements.

There are various methods of financial forecasting. In this section, we use additional funds Needed (AFN) equation to provide financial forecast. The application of the AFN equation is based on two basic assumptions:

1. All items of balance sheet except some liabilities are assumed proportionately related to sales volume.
2. Most of the current balance sheet items are justifiable in size for the current sales volume.

We use following steps to determine the additional funds Needed by using AFN equation:

Step-1 : Determine the required increase in assets

$$\text{Required Increase in assets} = \left( \frac{A^*}{S_0} \right) \Delta S$$

where,

A\* = assets that are proportional to sales

S<sub>0</sub> = Current Sales

AS = Change in Sales

Step-2: Determine the spontaneous amount of financing

$$\text{spontaneous financing} = \left( \frac{L^*}{S_0} \right) AS$$

Where,

$L^*$  = total amount of spontaneous liabilities

Step-3: Determine the addition to Retained earnings:

$$\text{Addition to Retained Earnings} = M \times RR \times S_1$$

Where,

$$M = \text{Net profit Margin} = \frac{\text{Net Income}}{\text{Sales}}$$

$$RR = \text{Retention Ratio} = \frac{\text{Net Income} - \text{Dividend}}{\text{Net Income}}$$

$$\text{OR, } RR = 1 - DPR$$

$S_1$  = Forecasted Sales or expected sales

$$= S_0 + \Delta S$$

OR

$$S_1 = S_0(1+g)$$

Step-4: Determine the additional funds Needed (AFN)

$$AFN = \left( \frac{A^*}{S_0} \right) \Delta S - \left( \frac{L^*}{S_0} \right) \Delta S - MXRRX S_1$$

$$= \left( \frac{A^* - L^*}{S_0} \right) \Delta S - MXRRX S_1$$

Note:

Sustainable growth rate is the growth rate in sales at which firm's AFN equals zero.

Percentage of external fund ~~not~~ Required

$$PEFR = \left( \frac{A^* - L^*}{S_0} \right) - MXRRX \left( \frac{1+g}{g} \right)$$

OR.

$$PEFR = \frac{AFN}{\text{Change in sales}}$$

Tips:

- An increase in payout ratio, capital intensity ratio and sales growth rate lead to the increase in AFN.
- An increase in profit margin reduces the AFN.

### \* Forecasted Financial Statement:

The financial statements that project the change in financial position and performance of the firm over a period, is forecasted financial statements.

Financial statement refers to the forecasted Income statement and forecasted Balance sheet.

Format:

#### Forecasted Income Statement

as on .....

Particulars	Amount
Sales ( $S_0 + \Delta S$ )	XXX
Less: Operating cost ( $I+g$ )	XXX
Earning Before Interest and Taxes	XXX
less: Interest	XXX
Earning Before Tax	XXX
less: Taxes (@ ...%)	XXX
Earning After Tax / Net Income	XXX
Dividend (...%)	XXX
Addition to Retained earnings	XXX

Where:

$$g = \text{growth rate}$$

$$S_0 = \text{Current Sales}$$

$$S_1 = \text{Forecasted sales} = S_0(1+g)$$

$$S_1 = S_0 + \Delta S$$

$$\Delta S = \text{Change in sales} = S_1 - S_0$$

### Forecasted Balance sheet

as on .....

Assets	Amt.	Liabilities & Equity	Amt.
Cash ( $I+g$ )	XXX	Account payable ( $I+g$ )	XXX
Account Rec. ( $I+g$ )	XXX	Accruals ( $I+g$ )	XXX
Inventory ( $I+g$ )	XXX	Notes payable	XXX
Net Fixed Assets ( $I+g$ )	XXX	Long term debt	XXX
		Common stock	XXX
		Retained Earnings (+RR)	XXX
		AFN (Balancing Figure)	XXX
	<u>XXXX</u>		<u>XXXX</u>

Note:

\* Spontaneous Assets: Spontaneous Assets are balance sheet items that typically grow in proportion to sales such as account receivable and inventory. Spontaneous assets are the assets that get collected according to the sales of the firm. They are tangible and increase due to rise in the business activity. They grow in proportion with the sales.

\* Spontaneous Liabilities: Spontaneous liabilities are liabilities that a person or firm acquires when buying goods or services on credit. Specifically, spontaneous liabilities are the obligations to pay for the goods or services at some point in the future. Examples of spontaneous liabilities are account payable and accruals.

### Problem 8.1

Soln

Given:

$$\text{Spontaneous Assets } (A^*) = \text{Rs. } 25,000$$

$$\text{Spontaneous Liabilities } (L^*) = \text{Rs. } 5,000$$

$$\text{Sales in 2015 } (S_0) = \text{Rs. } 40,000$$

$$\text{Growth rate } (g) = 20\%$$

$$\begin{aligned}\text{Forecasted Sales } (S_1) &= S_0(1+g) = 40,000(1+0.20) \\ &= \text{Rs. } 48,000\end{aligned}$$

$$\begin{aligned}\text{Change in Sales } (\Delta S) &= S_1 - S_0 = \text{Rs. } 48,000 - \text{Rs. } 40,000 \\ &= \text{Rs. } 8,000\end{aligned}$$

$$\text{Net profit Margin } (M) = 10\%$$

$$\text{Dividend Payout Ratio } (DPR) = 50\%$$

$$\text{Retention Ratio } (RR) = 1 - DPR = 1 - 0.50 = 0.50$$

$$AFN = ?$$

We know that,

$$AFN = \left( \frac{A^* - L^*}{S_0} \right) \Delta S - M \times RR \times S_1$$

$$= \left( \frac{25,000 - 5,000}{40,000} \right) 8,000 - 0.10 \times 0.50 \times 48,000$$

$$= 4,000 - 2,400$$

$$= \text{Rs. } 1,600$$

### Problem 8.2

Soln

Given:

$$\text{Spontaneous Assets } (A^*) = \text{Rs. } 200,000$$

$$\text{Spontaneous Liabilities } (L^*) = 22000 + 9000 = \text{Rs. } 31000$$

$$\text{Sales in 2015 } (S_0) = \text{Rs. } 250,000$$

$$\text{Growth rate } (g) = 20\%$$

$$\begin{aligned}\text{Forecasted Sales in 2016 } (S_1) &= S_0(1+g) = 250,000(1+0.20) \\ &= \text{Rs. } 300,000\end{aligned}$$

$$\begin{aligned}\text{Change in Sales } (\Delta S) &= S_1 - S_0 = 300,000 - 250,000 \\ &= \text{Rs. } 50,000\end{aligned}$$

$$\text{Net profit Margin } (M) = 7\%$$

$$\text{Dividend Payout Ratio } (DPR) = 65\%$$

$$\text{Retention Ratio } (RR) = 1 - DPR = 1 - 0.65 = 0.35$$

a. Capital Intensity Ratio =  $\frac{A^*}{S_0} = \frac{200,000}{250,000} = 0.8$

b. Additional Investment in Assets =  $\left(\frac{A^*}{S_0}\right) \Delta S$   
 $= \left(\frac{200,000}{250,000}\right) \times 50,000$   
 $= \text{Rs. } 40,000$

c. Additional Spontaneous Liabilities =  $\left(\frac{L^*}{S_0}\right) \Delta S$

$$= \left( \frac{31,000}{250,000} \right) \times 50,000$$

$$= \text{Rs. } 6200$$

d. Addition to Retained Earnings =  $M \times R \times S_L$

$$= 0.07 \times 0.35 \times 300,000$$

$$= \text{Rs. } 7350$$

e. Additional fund Needed (AFN) =  $\left( \frac{A^* - L^*}{S_0} \right) \Delta S - M \times R \times S_L$

$$= \left( \frac{200,000 - 31,000}{250,000} \right) 50,000 - 7350$$

$$= \text{Rs. } 26,450$$

f. Percentage external financing requirement

$$\text{PEFR} = \left( \frac{A^* - L^*}{S_0} \right) - M \times R \times \left( \frac{1+g}{g} \right)$$

$$= \left( \frac{200,000 - 31,000}{250,000} \right) - 0.07 \times 0.35 \times \left( \frac{1+0.20}{0.20} \right)$$

$$= \text{Rs. } 52.9\%$$

### Problem 8.3

Soln

Given:

$$\text{Sales in 2015 } (S_0) = \text{Rs. 2 million}$$

$$\text{Sales in 2016 } (S_1) = \text{Rs. 4 million}$$

$$\text{Change in Sales } (\Delta S) = S_1 - S_0 = 4m - 2m = 2 \text{ million}$$

$$\text{growth rate}(g) = \frac{S_1 - S_0}{S_0} = \frac{4m - 2m}{2m} = 100\% = 1$$

$$\text{Spontaneous Liabilities } (L^*) = 250,000 + 150,000 \\ = \text{Rs. } 400,000 = 0.4 \text{ million}$$

$$\text{Spontaneous Assets } (A^*) = \text{Rs. 2 million}$$

$$\text{Net profit Margin } (M) = 6\%$$

$$\text{Retention Ratio } (RR) = 40\%$$

#### a. Additional Fund Needed for 2016

$$\begin{aligned} \text{AFN} &= \left( \frac{A^* - L^*}{S_0} \right) \Delta S - M \times RR \times S_1 \\ &= \left( \frac{2m - 0.4m}{2m} \right) 2m - 0.06 \times 0.40 \times 4m \\ &= \text{Rs. } 1.504 \text{ million} \end{aligned}$$

#### b. Percentage of external financing requirement in 2016

$$\text{PEFR} = \left( \frac{A^* - L^*}{S_0} \right) - M \times RR \times \left( \frac{1+g}{g} \right)$$

$$= \left( \frac{2m - 0.4m}{2m} \right) - 0.06 \times 0.40 \times \left( \frac{1+1}{1} \right)$$

$$= 75.2\%$$

C. Dividend payout Ratio (DPR) = 0  
 Retention Ratio (RR) =  $1 - DPR = 1 - 0 = 1$

$$\text{Additional fund Needed (AFN)} = \left( \frac{A^* - L^*}{S_0} \right) \Delta S - M \times RR \times S_L$$

$$= \left( \frac{2m - 0.4m}{2m} \right) 2m - 0.06 \times 0.40 \times 4m$$

$$= \text{Rs. } 1.36 \text{ million}$$

d. Percentage external financing requirement in 2016

$$\text{PEFR} = \left( \frac{A^* - L^*}{S_0} \right) - M \times RR \times \left( \frac{1+g}{g} \right)$$

$$= \left( \frac{2m - 0.4m}{2m} \right) - 0.06 \times 1 \times \left( \frac{1+1}{1} \right)$$

$$= 68\%$$

Because of increase in Retained earnings.

Problem 8.4

Soln

Given:

$$\text{Ratio of assets to sales} \left( \frac{A^*}{S_0} \right) = 0.60$$

$$\text{Ratio of spontaneous liabilities to sales} \left( \frac{L^*}{S_0} \right) = 0.20$$

Net profit Margin (M) = 5%

Dividend payout Ratio (DPR) = 50%

Retention Ratio (RR) =  $1 - DPR = 1 - 0.50 = 0.50$

Growth rate (g) = 10%

$$\begin{aligned} PEFR &= \left( \frac{A^*}{S_0} \right) - \left( \frac{L^*}{S_0} \right) - M \times RR \times \left( \frac{1+g}{g} \right) \\ &= 0.60 - 0.20 - 0.05 \times 0.50 \times \left( \frac{1+0.10}{0.10} \right) \\ &= 12.5\% \end{aligned}$$

If Dividend payout Ratio (DPR) = 40%

Retention Ratio (RR) =  $1 - DPR = 1 - 0.40 = 0.60$

$$\begin{aligned} PEFR &= \left( \frac{A^*}{S_0} \right) - \left( \frac{L^*}{S_0} \right) - M \times RR \times \left( \frac{1+g}{g} \right) \\ &= 0.60 - 0.20 - 0.05 \times 0.60 \times \left( \frac{1+0.10}{0.10} \right) \\ &= 7\% \end{aligned}$$

### Problem 8.5

Soln

Given:

Ratio of assets to sales  $\left( \frac{A^*}{S_0} \right) = 55\% = 0.55$

Ratio of spontaneous liabilities to sales  $\left( \frac{L^*}{S_0} \right) = 15\% = 0.15$

Net profit Margin (M) = 6%.

Dividend payout Ratio (DPR) = 40%.

Retention Ratio (RR) =  $1 - DPR = 1 - 0.40 = 0.60$

a. Growth rate(g) = 15%

Percentage external financing Requirement.

$$\begin{aligned} PEFR &= \left( \frac{A^*}{S_0} \right) - \left( \frac{L^*}{S_0} \right) - MXRRX \left( \frac{1+g}{g} \right) \\ &= 0.55 - 0.15 - 0.06 \times 0.60 \times \left( \frac{1+0.15}{0.15} \right) \\ &= 12.4\% \end{aligned}$$

b. Growth rate(g) = 25%

$$\begin{aligned} PEFR &= \left( \frac{A^*}{S_0} \right) - \left( \frac{L^*}{S_0} \right) - MXRRX \left( \frac{1+g}{g} \right) \\ &= 0.55 - 0.15 - 0.06 \times 0.60 \times \left( \frac{1+0.25}{0.25} \right) \\ &= 22\% \end{aligned}$$

c. Net profit Margin (M) = 8%

$$\begin{aligned} PEFR &= \left( \frac{A^*}{S_0} \right) - \left( \frac{L^*}{S_0} \right) - MXRRX \left( \frac{1+g}{g} \right) \\ &= 0.55 - 0.15 - 0.08 \times 0.60 \times \left( \frac{1+0.15}{0.15} \right) \\ &= 3.9\% \end{aligned}$$

d. Dividend payout Ratio (DPR) = 10 %

$$\text{Retention Ratio (RR)} = 1 - \text{DPR} = 1 - 0.10 = 0.90$$

$$\text{PEFR} = \left( \frac{A^*}{S_0} \right) - \left( \frac{L^*}{S_0} \right) - M \times \text{RR} \times \left( \frac{1+g}{g} \right)$$

$$= 0.55 - 0.15 - 0.06 \times 0.90 \times \left( \frac{1+0.25}{0.25} \right)$$

$$= 13\%$$

e. Net profit Margin (M) = 8 %

Dividend payout Ratio (DPR) = 20 %

$$\text{Retention Ratio (RR)} = 1 - \text{DPR} = 1 - 0.20 = 0.80$$

$$\text{PEFR} = 0, \text{ growth rate } (g) = ?$$

$$\text{PEFR} = \left( \frac{A^*}{S_0} \right) - \left( \frac{L^*}{S_0} \right) - M \times \text{RR} \times \left( \frac{1+g}{g} \right)$$

$$0 = 0.55 - 0.15 - 0.08 \times 0.80 \times \left( \frac{1+g}{g} \right)$$

$$0 = 0.40 - 0.064 \left( \frac{1+g}{g} \right)$$

$$0.064 \left( \frac{1+g}{g} \right) = 0.40$$

$$\left( \frac{1+g}{g} \right) = \frac{0.40}{0.064}$$

$$1+g = 6.25g$$

$$g = \frac{1}{5.25} = 19.05\%$$

### Problem 8.6

Soln

Given:

$$\text{Sales in 2015 } (S_0) = \text{Rs. 5 million}$$

$$\text{Sales in 2016 } (S_1) = \text{Rs. 6 million}$$

$$\text{Change in Sales } (\Delta S) = S_1 - S_0 = 6 \text{ m} - 5 \text{ m} = \text{Rs. 1 million}$$

$$\text{Growth rate } (g) = 20\%$$

$$\text{Spontaneous Assets } (A^*) = \text{Rs. 3 million}$$

$$\text{Spontaneous Liabilities } (L^*) = 250,000 + 250,000$$

$$= 500,000 = 0.5 \text{ million}$$

$$\text{Net profit Margin } (M) = 5\%$$

$$\text{Retention Ratio } (RR) = 30\%$$

#### a. Additional Fund Needed for 2016

$$AFN = \left( \frac{A^* - L^*}{S_0} \right) \Delta S = M \times RR \times S_L$$

$$= \left( \frac{3 \text{ m} - 0.5 \text{ m}}{5 \text{ m}} \right) 1 \text{ m} - 0.05 \times 0.30 \times 6 \text{ m}$$

$$= \text{Rs. 0.41 million}$$

#### b. Spontaneous Assets $(A^*) = \text{Rs. 4 million}$

$$AFN = \left( \frac{A^* - L^*}{S_0} \right) \Delta S = M \times RR \times S_L$$

$$= \left( \frac{4 \text{ m} - 0.5 \text{ m}}{5 \text{ m}} \right) 1 \text{ m} - 0.05 \times 0.30 \times 6 \text{ m}$$

$$= \text{Rs. 0.61 million}$$

The AFN is different than in part 'a' because of change in sales and assets. The capital intensity is different because of increased financing need on assets.

$$c. \text{ Spontaneous Assets } (A^*) = \text{Rs. 3 million}$$

$$\text{Dividend payout Ratio (DPR)} = 0$$

$$\text{Retention Ratio (RR)} = 1 - \text{DPR} = 1 - 0 = 1$$

$$\text{AFN} = \frac{(A^* - L^*)}{S_0} \Delta S - M \times RR \times \Delta S$$

$$= \frac{(3m - 0.5m)}{5m} 1m - 0.05 \times 1 \times 6m$$

$$= \text{Rs. 0.2 million}$$

The AFN is different than in part 'a' due to increase in retention ratio.

### Problem 8.7

Soln

Given:

$$\text{Sales in 2015 } (S_0) = \text{Rs. 5000 million}$$

$$\text{Sales in 2016 } (S_1) = \text{Rs. 8000 million}$$

$$\begin{aligned} \text{Change in sales } (\Delta S) &= S_1 - S_0 = 8000m - 5000m \\ &= 3000m \end{aligned}$$

$$\text{Spontaneous Assets } (A^*) = \text{Rs. 3000 million}$$

$$\text{Spontaneous Liabilities } (L^*) = 150 + 200 = 350 \text{ million}$$

$$\text{Net profit Margin (M)} = 8\%$$

$$\text{Growth rate (g)} = \frac{S_1 - S_0}{S_0} = \frac{8000 - 5000}{5000} = 60\%$$

Dividend payout Ratio (DPR) = 30%

Retention Ratio (RR) =  $1 - DPR = 1 - 0.30 = 0.70$

Additional fund Needed for year 2016

$$AFN = \frac{(A^* - L^*)}{S_0} \Delta S - MXRR \times SL$$

$$= \frac{(3000m - 350m)}{5000m} 3000m - 0.08 \times 0.70 \times 8000m$$

$$= Rs. 1590 - 448$$

$$= Rs. 1142 \text{ million}$$

### Pro-forma Balance Sheet

as on 31<sup>st</sup> Dec, 2016

Assets		Liabilities	
Cash (400 X 1.60)	640	Account payable (150 X 1.60)	240
Account Rec. (200 X 1.60)	320	Notes payable	150
Inventory (400 X 1.60)	640	Accruals (200 X 1.60)	320
Total CA	1600	Total CL	710
Net fixed Assets (2000 X 1.60)	3200	Long-term debt	1000
		Common stock	1000
		Retained earnings	948
	(500 + 448)		
	AFN		1142
	4800		4800

### Problem 8.8

Soln

Given:

$$\text{Growth Rate}(g) = 20\%$$

$$\begin{aligned}\text{Dividend Payout Ratio (DPR)} &= \frac{\text{Dividend}}{\text{Net income}} \times 100 \\ &= \frac{2426}{6930} \times 100 \\ &= 35\%\end{aligned}$$

### Pro-forma Income Statement

as on 31<sup>st</sup> Dec, 2016

Sales ( $24000 \times 1.20$ )	Rs. 28800
Less: Costs ( $13500 \times 1.20$ )	(Rs. 16,200)
Earning Before Interest and Tax (EBIT)	Rs. 12,600
less: Tax @ 34%	(Rs. 4284)
Net Income	Rs. 8316
Dividends (35%)	Rs. 2910.6
Addition to Retained Earnings	Rs. 5405.4

### Problem 8.9

Soln

Given:

$$\text{Spontaneous Assets } (A^*) = \text{Rs. } 20,000$$

$$\text{Spontaneous Liabilities } (L^*) = \text{Rs. } 500 + 1500 = \text{Rs. } 2000$$

$$\text{Sales in 2015 } (S_0) = \text{Rs. } 25,000$$

$$\text{Growth rate } (g) = 20\%$$

$$\text{Sales in 2016} (S_1) = S_0(1+g) = 25000(1+0.20) = \text{Rs. } 30,000$$

$$\text{Change in Sales} (\Delta S) = S_1 - S_0 = 30,000 - 25000 = \text{Rs. } 5,000$$

### Proforma Income Statement

as on 31st Dec, 2016

Sales (25000X 1.20)	Rs. 30,000
less: Operating cost (15000X 1.20)	(18,000)
Earning before Interest and Tax	12,000
less: Interests (5.00)	
Earning before Tax	11,500
less: Taxes @ 40 % (4,600)	
Net Income	6900
Dividends (50 %) 3450	
Addition to Retained earnings	3450

### Additional Fund Needed for 2016

$$AFN = \left( \frac{A^* - L^*}{S_0} \right) \Delta S - \text{Addition to Retained Earnings}$$

$$= \left( \frac{20,000 - 2000}{25000} \right) 5000 - 3450$$

$$= \text{Rs. } 150 \text{ (in 000)}$$

Proforma Balance Sheet			
as on 31st Dec, 2016			
Cash (2000 X 1.20)	2400	Accounts payable (500 X 1.20)	600
Receivables (1500 X 1.20)	1800	Accruals (1500 X 1.20)	1800
Inventory (3500 X 1.20)	4200	Notes payable (1000 + 150)	1150
Total CA	8400	Total CL	3550
Net fixed assets (13000 X 1.20)	15,600	Mortgage bonds	5000
		Common stock	8,000
		Retained earnings	7450
		(4000 + 3450)	
	24,000		24,000

Problem 8.10

Sol:

Given:

$$\text{Spontaneous Assets (A^*)} = \text{Rs. } 93,000$$

$$\text{Spontaneous Liabilities (L^*)} = 0$$

$$\text{Current Sales (S}_0\text{)} = \text{Rs. } 19,200$$

$$\text{Forecasted Sales (S}_1\text{)} = \text{Rs. } 24,000$$

$$\text{Change in sales (\Delta S)} = S_1 - S_0 = 24000 - 19200 = \text{Rs. } 4800$$

$$\text{Dividend payout Ratio (DPR)} = \frac{\text{Dividend}}{\text{Net Income}} \times 100$$

$$= \frac{1445.40}{2400} \times 100$$

$$= 60\%$$

$$\text{Growth Rate (g)} = \frac{S_1 - S_0}{S_0} = \frac{24000 - 19200}{19200} = 25\%$$

Proforma Income Statement

as on 31st Dec, 2016

Sales ( $19,200 \times 1.25$ )	Rs. 24000
Costs ( $15,550 \times 1.25$ )	(Rs. 19437.5)
Earnings before taxes	Rs. 4562.5
Taxes (34%)	(Rs. 1551.25)
Net Income	Rs. 3011.25
Dividends (60%)	Rs. 1806.75
Addition to Retained Earnings	Rs. 1204.5

Additional fund Needed for 2016

$$\begin{aligned} \text{AFN} &= \left( \frac{A^* - L^*}{S_0} \right) \Delta S - \text{Addition to Retained Earnings} \\ &= \left( \frac{19200 - 17500}{19200} \right) 4800 - 1204.5 \\ &= \text{Rs. } 22045.5 \end{aligned}$$

Problem 8.11

Sol:

Given:

Spontaneous Assets ( $A^*$ ) = 122.5 million

Spontaneous Liabilities ( $L^*$ ) =  $9 + 8.5 = 17.5$  million

Sales for 2015 ( $S_0$ ) = Rs. 350 million

Net Income ( $N_1$ ) = Rs. 10.5 million

Net profit Margin ( $M$ ) =  $\frac{N_1}{Sales} = \frac{10.5}{350} = 0.03$

$$\text{Dividend payout Ratio (DPR)} = \frac{\text{Div.}}{\text{NL}} = \frac{4.2 \text{ m}}{10.5 \text{ m}} = 0.4$$

$$\text{Retention Ratio (RR)} = 1 - \text{DPR} = 1 - 0.4 = 0.6$$

a. Change in sales ( $\Delta S$ ) = Rs. 70 million

Growth rate ( $g$ ) = 20%

$$\text{Forecasted Sales } (S_1) = S_0(1+g) = 350(1+0.20) = 420 \text{ m}$$

### Additional fund Needed for 2016

$$AFN = \left( \frac{A^* - L^*}{S_0} \right) \Delta S - M \times RR \times S_L$$

$$= \left( \frac{122.5 - 17.5}{350} \right) 70 - 0.03 \times 0.6 \times 420$$

$$= \text{Rs. } 21 - 7.56$$

$$= \text{Rs. } 13.44 \text{ million}$$

### b. Pro-forma Balance sheet

as on 31st Dec, 2016

Cash ( $3.5 \times 1.2$ )	4.2	Account payable ( $9 \times 1.2$ )	10.8
Receivables ( $26 \times 1.2$ )	31.2	Notes payable ( $18 + 13.44$ )	31.44
Inventory ( $58 \times 1.2$ )	69.6	Accruals ( $8.5 \times 1.2$ )	10.2
Total CA	105	Total CL	52.44
Net fixed Assets ( $35 \times 1.2$ )	42	Mortgage bonds	6
		Common stock	15
		Retained earnings ( $66 + 7.56$ )	73.56
	147		147

### Problem 8.12

Soln

Given:

$$\text{Sales in 2015} (S_0) = \text{Rs. } 1.875 \text{ m} = \text{Rs. } 18,75,000$$

$$\text{Net profit Margin (M)} = 5\%$$

$$\text{Dividend payout Ratio (DPR)} = 40\%$$

$$\text{Retention Ratio (RR)} = 1 - \text{DPR} = 1 - 0.40 = 0.60$$

$$\text{Growth rate (g)} = 40\%$$

$$\begin{aligned}\text{Sales in 2016} (S_1) &= S_0(1+g) = 18,75,000(1+0.40) \\ &= \text{Rs. } 26,25,000\end{aligned}$$

$$\begin{aligned}\text{Change in Sales} (\Delta S) &= S_1 - S_0 = 26,25,000 - 18,75,000 \\ &= \text{Rs. } 750,000\end{aligned}$$

$$\text{Spontaneous Assets (A*)} = 12,00,000$$

$$\text{Spontaneous Liabilities (L*)} = 40,000 + 25,000 = \text{Rs. } 65,000$$

Additional Fund Needed for 2016

$$\begin{aligned}AFN &= \left( \frac{A^* - L^*}{S_0} \right) \Delta S - MXRRXS_1 \\ &= \left( \frac{1200000 - 65000}{18,75,000} \right) 750000 - 0.05 \times 0.60 \times 26,25,000 \\ &= 454,000 - 78,750 \\ &= \text{Rs. } 375,250\end{aligned}$$

Problem 8.13

Soln

Given:

$$\text{Sales in } 2015 (S_0) = \text{Rs. 2 million}$$

$$\text{Spontaneous Assets (A^*)} = \text{Rs. 1.5 million}$$

$$\begin{aligned}\text{Spontaneous Liabilities (L^*)} &= 200,000 + 100,000 \\ &= \text{Rs. } 300,000 = 0.3 \text{ m}\end{aligned}$$

$$\text{Net profit Margin (M)} = 5\%$$

$$\text{Retention Ratio (RR)} = 40\%$$

$$\text{Additional Fund Needed (AFN)} = 0$$

$$\text{Change in sales (\Delta S)} = ?$$

We know that,

$$AFN = \frac{(A^* - L^*)}{S_0} \Delta S - M \times RR \times (S_0 + \Delta S)$$

$$0 = \frac{(1.5 - 0.3)}{2} \Delta S - 0.05 \times 0.40 \times (2 + \Delta S)$$

$$0 = 0.6 \Delta S - 0.04 + 0.02 \Delta S$$

$$0.04 = 0.58 \Delta S$$

$$\therefore \Delta S = \frac{0.04}{0.58}$$

$$= 0.06896 \text{ million}$$

$$= \text{Rs. } 68965.52$$

The firm should increase Rs. 68965.52 in sales without having to raise funds externally.

### Problem 8.14

Soln

Given:

- a. Growth rate in sales ( $g$ ) = 10%  
DPS in 2016 = Rs. 1.12

#### Pro-forma Income statement

as on 31st Dec, 2016

Sales ( $36,00,000 \times 1.10$ )	Rs. 39,60,000
Operating costs ( $3279,720 \times 1.10$ )	(36,07,692)
Earning Before interest and tax	352,308
Interest	(20,280)
Earning Before Tax	332,028
Taxes (40%)	(132,811.2)
Net Income	199,216.8
Dividend ( $100,000 \times 1.12$ )	112,000
Addition to Retained Earnings	87,216.8

Working Note,

$$EPS = \frac{NI}{\text{No. of shares}}$$

$$1.80 = \frac{180,000}{\text{No. of shares}}$$

$$\therefore \text{No. of shares} = 180,000$$

$$1.80 = 100,000 \text{ shares}$$

Pro-forma Balance sheet			
as on 31st Dec, 2016			
Cash ( $180,000 \times 1.10$ )	198,000	Account payable ( $360,000 \times 1.10$ )	396,000
Receivables ( $360,000 \times 1.10$ )	396,000	Notes payable	156,000
Inventory ( $720,000 \times 1.10$ )	792,000	Accruals ( $180,000 \times 1.10$ )	198,000
Total CA	13,86,000	Total CL	750,000
Net fixed assets	15,84,000	Common stock	18,00,000
( $14,40,000 \times 1.10$ )		Retained Earnings	29,216.8 ( $204,000 + 87,216.8$ )
		AFN (Balancing figure)	128,783.2
	29,70,000		29,70,000

b. Net profit Margin (M) = 5%

Dividend Payout Ratio (DPR) = 60%

Retention Ratio (RR) =  $1 - DPR = 1 - 0.60 = 0.40$

Additional Fund Requirement (AFN) = 0

Growth rate (g) = ?

We know that,

$$AFN = \frac{(A^* - L^*)}{S_0} \Delta S - M \times RR \times S_1$$

$$0 = \frac{(2700,000 - 540,000)}{36,00,000} S_0 \times g - 0.05 \times 0.40 \times S_0 (1+g)$$

$$0 = 0.6 \times 36,00,000 \times g - 0.02 \times 36,00,000 (1+g)$$

$$0 = 21,60,000g - 72000(1+g)$$

$$0 = 21,60,000g - 72000 - 72,000g$$

$$g = \frac{72000}{20,88,000} = 3.45\%$$

Problem 8.15

Sell

Given:

Growth rate on sales ( $g$ ) = 20 %

DPS in 2016 = Rs. 1.10

Pro-forma Income statement

as on 31st Dec, 2016

Sales ( $8000 \times 1.20$ )	Rs. 9,600
Operating costs ( $7450 \times 1.20$ )	(8,940)
Earning before interest and tax	660
Interest	(150)
Earning before taxes	510
Taxes (40%)	204
Net Income	306
Dividend ( $150 \times 1.10$ )	165
Addition to Retained Earnings	141

Working Note:

$$EPS = \frac{\text{Net Income}}{\text{No. of shares}}$$

$$1.60 = \frac{240}{\text{No. of shares}}$$

$$\therefore \text{No. of shares} = 150 \text{ shares}$$

Pro-forma Balance sheet

as on 31st Dec, 2016

Cash (380x1.20)	456	Account payable (160x1.20)	192
Receivables (240x1.20)	288	Accruals (40x1.20)	48
Inventory (420x1.20)	504	Notes payable	252
Total CA	1248	Total CL	492
Net Fixed Assets (3200x1.20)	3840	Longterm debt	1244
		Common stock	1605
		Retained earnings (939 + 141)	1080
		AFN (Balancing figure)	667
	5088		5088

b. Let notes payable be raised by  $x$  to maintain a current ratio of 2.3

$$\text{Current Ratio} = \frac{\text{Current Assets}}{\text{Current Liabilities}}$$

$$2.3 = \frac{1248}{492+x}$$

$$492+x = 1248$$

$$2.3$$

$$x = 542.60 - 492$$

$$= 50.6 \text{ thousands}$$

So, Notes payable should be raised by 50.6 thousand to maintain current ratio of 2.3.

Let the long term debt be raised by  $y$  to maintain the debt ratio of 40 percent.

$$\text{Debt Ratio} = \frac{\text{Total Debt}}{\text{Total Assets}} \rightarrow \frac{(\text{long term debt} + CL)}{\text{Total Assets}}$$

$$0.40 = \frac{(1244+y) + (492+50.6)}{5088}$$

$$2035.2 = 1786.6 + y$$

$$\therefore y = 2035.2 - 1786.6$$

$$= \text{Rs. } 248.6$$

Therefore, the long term debt should be raised by 248.6 to maintain the debt ratio of 40%.

$$\begin{aligned}\text{Additional common stock} &= \text{AFN} - \text{Additional notes payable} \\ &\quad - \text{Additional long term debt} \\ &= 667 - 50.6 - 248.6 \\ &= \text{Rs. } 367.8\end{aligned}$$

### Problem 8.16

Soln

Given:

$$\text{Sales in 2015} (S_0) = \text{Rs. } 1000 \text{ million}$$

$$\text{Sales in 2016} (S_1) = \text{Rs. } 2000 \text{ million}$$

$$\begin{aligned}\text{Change in Sales} (\Delta S) &= S_1 - S_0 = 2000 \text{ m} - 1000 \text{ m} \\ &= 1000 \text{ m}\end{aligned}$$

$$\text{Spontaneous liabilities} (L^*) = 50 + 50 = 100 \text{ m}$$

Net profit Margin (M) = 5 %

Dividend payout Ratio (DPR) = 60 %

Retention Ratio (RR) =  $1 - DPR = 1 - 0.60 = 0.40$

Fixed Assets Utilized = 50 %

$$\begin{aligned} \text{Full Capacity sales} &= \frac{\text{Current Sales}}{\text{Percentage Capacity Used}} \\ &= \frac{1000 \text{ m}}{0.5} \\ &= \text{Rs. } 2000 \text{ m} \end{aligned}$$

Full capacity sales could meet the target sales in 2016. Therefore, the firm is not required to make additional investment in fixed assets. Only current assets are proportional to sales.

∴ Spontaneous Assets ( $A^*$ ) = Rs. 500 m (current assets)

$$AFN \text{ in 2016} = \left( \frac{A^* - L^*}{S_0} \right) \Delta S - M \times RR \times S_L$$

$$= \left( \frac{500 \text{ m} - 100 \text{ m}}{1000 \text{ m}} \right) 1000 \text{ m} - 0.05 \times 0.40 \times 2000 \text{ m}$$

Rs. 360 million

Problem 8.17

$S_0 = ?$

a. Fixed Assets utilized = 75%

$$\text{Full capacity sales} = \text{Sales in 2015}$$

Percentage capacity used

= 36,000

0.75

$$= \text{Rs. } 48,000 \text{ (thousands)}$$

$$\% \text{ Percentage increase in sales} = \frac{\text{Sales in full capacity} - \text{Current sales}}{\text{Current sales}}$$

$$= \frac{48000 - 36000}{36000}$$

36,000

$$= 33.33\%$$

b. Growth rate ( $g$ ) = 25%

$$\text{Spontaneous Assets} = \text{Rs. } 25,200 \text{ (only CA)}$$

$$\text{Spontaneous Liabilities} = 4200 + 2520 = \text{Rs. } 9720$$

$$\text{Current Sales} (S_0) = 36,000$$

$$\text{Sales in 2016} (S_1) = S_0(1+g) = 36,000(1+0.25)$$

= Rs. 45,000

$$\text{Change in Sales (AS)} = S_1 - S_0 = 45000 - 36000 = 9000$$

Pro-forma Income statement

as on 31st Dec., 2016.

Sales ( $36,000 \times 1.25$ )	Rs. 45,000
Operating cost ( $30,783 \times 1.25$ )	(38478.75)
Earning before Interest and Tax Interest	6521.25 (1017)
Earning Before Tax	5504.25
Taxes (40%)	(2201.7)
Net Income	3302.55
Dividend (60%)	1981.53
Addition to Retained Earnings	1321.02

Now:

Additional fund Needed in 2016

$$\begin{aligned} \text{AFN} &= \left( \frac{A^* - L^*}{S_0} \right) \Delta S - \text{Addition to RE} \\ &= \left( \frac{25,200 - 9720}{36,000} \right) 9000 - 1321.02 \\ &= \text{Rs. } 2548.98 \end{aligned}$$

Problem 8.18

Soln

Given:

Spontaneous Assets ( $A^*$ ) = Rs. 3100

Spontaneous Liabilities ( $L^*$ ) = Rs. 500

Sales in 2015 ( $S_0$ ) = Rs. 4250

Growth rate ( $g$ ) = 10%

$$\text{Sales in 2016} (S_1) = S_0(1+g) = 4250(1+0.10) \\ = \text{Rs. } 4675$$

$$\text{Change in sales} (\Delta S) = S_1 - S_0 = 4675 - 4250 = \text{Rs. } 425$$

### Proforma Income Statement.

as on 31st Dec, 2016

Sales ( $4250 \times 1.10$ )	Rs. 4675
Costs ( $3875 \times 1.10$ )	4262.5
Earning before taxes	412.5
Taxes (34%)	140.25
Net Income	272.25
Dividend (33.33%)	90.84
Addition to Retained Earnings	181.41

Working Note:

$$\text{Dividend Payout Ratio (DPR)} = \frac{\text{Dividend}}{\text{Net Income}} \times 100 \\ = \frac{90.84}{272.25} \times 100 \\ = 33.33\%$$

$$AFN = \left( \frac{A^* - L^*}{S_0} \right) \Delta S - \text{Addition to RE}$$

$$= \left( \frac{3100 - 500}{4250} \right) 425 - 181.41 = \text{Rs. } 78.59.$$

a. Capacity used = 60%

Full Capacity sales = Current Sales

$$\begin{aligned} & \text{Percentage capacity used} \\ &= \frac{4250}{0.60} \\ &= \text{Rs. } 7083.33 \end{aligned}$$

full capacity sales could meet the target sales in 2016.  
Therefore, the firm is not required to make additional investment in fixed assets. Only current assets are proportional to sales.

$\therefore$  Spontaneous Assets ( $A^*$ ) = Rs. 900.

$$AFN = \left( \frac{A^* - L^*}{S_0} \right) \Delta S - \text{Addition to RE}$$

$$= \left( \frac{900 - 500}{4250} \right) 425 - 181.41$$

$$= \text{Rs. } -141.41 \quad (\text{No Additional fund is Needed})$$

b. Additional fund Needed (AFN) = 0

Growth rate (g) = ?

$$AFN = \left( \frac{A^* - L^*}{S_0} \right) \Delta S - MXRRX S_L$$

$$0 = \left( \frac{A^* - L^*}{S_0} \right) S_0 g - MXRRX S_0 (1+g)$$

$$0 = \left( \frac{3100 - 500}{4250} \right) 4250g - 247.5 \times \frac{164.9}{4250} \times 4250(1+g)$$

$$0 = 2600g - 164.9(1+g)$$

$$0 = 2600g - 164.9 - 164.9g$$

$$164.9 = 2435.1 g$$

$$g = \frac{164.9}{2435.1} = 6.78\%$$

Problem 8.19

Soln

Given:

Pro-forma income statement

Sales ( $700 \times 1.25$ )	Rs. 875
Operating costs (70% of 875)	612.5
Earning before Interest and taxes	262.5
Interest	40
Earning before taxes	222.5
Taxes (40%)	89
Net Income	133.5
Dividends (33.33%)	44.5
Addition to RE	89

Working Note:

$$DPR = \frac{\text{Dividends}}{\text{Net Income}} \times 100$$

$$= \frac{32}{96} \times 100 = 33.33\%$$

$$\begin{aligned}
 b. \quad \text{Div}_{2016} &= \text{Div}_{2015}(1+g) \\
 44.5 &= 32(1+g) \\
 g &= \frac{44.5}{32} - 1 \\
 &= 39.06\%
 \end{aligned}$$

Problem 8.20

Soln

Given:

Current Sales = 2 billion

Fixed assets = 0.6 billion

Capacity used = 80%

$$\begin{aligned}
 a. \quad \text{Full capacity sales} &= \frac{\text{Current sales}}{\text{Percentage capacity used}} \\
 &= \frac{2 \text{ billion}}{0.80} \\
 &= \text{Rs. } 2.5 \text{ billion}
 \end{aligned}$$

$$\begin{aligned}
 b. \quad \text{Fixed assets-to Sales Ratio} &= \frac{\text{fixed Assets}}{\text{full capacity sales}} \\
 &= \frac{0.6 \text{ billion}}{2.5 \text{ billion}} \\
 &= 24\%
 \end{aligned}$$

$$\begin{aligned}
 c. \quad \text{Target sales} &= S_0(1+g) = 2 \text{ billion } (1+0.30) = \text{Rs. } 2.6 \text{ billion} \\
 \text{Fixed Assets Used} &= 2.6 \text{ billion } \times 0.24 = \text{Rs. } 0.624 \text{ billion}
 \end{aligned}$$

$$\therefore \text{Increase in fixed assets} = 0.624 \text{ billion} - 0.6 \text{ billion} \\ = \text{Rs. } 0.024 \text{ billion.}$$

### Problem 8.21

Soln

Given:

$$\text{Sales in 2015 (S}_0\text{)} = \text{Rs. } 500,000$$

$$\text{Growth rate (g)} = 20\%$$

$$\text{Sales in 2016 (S}_1\text{)} = S_0(1+g) = 500,000(1+0.20) \\ = \text{Rs. } 600,000$$

$$\text{Change in sales (AS)} = S_1 - S_0 = 600,000 - 500,000 \\ = \text{Rs. } 100,000$$

$$\text{Spontaneous Assets (A*}) = \text{Rs. } 500,000 \text{ (except cash)}$$

$$\text{Spontaneous Liabilities (L*)} = 50,000 + 50,000 = \text{Rs. } 100,000$$

$$\text{Net profit Margin (M)} = 8\%$$

$$\text{Dividend payout Ratio (DPR)} = 40\%$$

$$\text{Retention Ratio (RR)} = 1 - \text{DPR} = 1 - 0.40 = 0.60$$

$$\begin{aligned} \text{AFN} &= \left( \frac{A^* - L^*}{S_0} \right) AS - M \times RR \times S_1 \\ &= \left( \frac{500,000 - 100,000}{500,000} \right) 100,000 - 0.08 \times 0.60 \times 600,000 \\ &= 80,000 - 28,800 \\ &= \text{Rs. } 51,200 \end{aligned}$$

Pro-forma Balance Sheet

as on 31<sup>st</sup> Dec, 2016

Cash	100,000	Account payable ( $50,000 \times 1.20$ )	60,000
Receivables ( $100,000 \times 1.20$ )	120,000	Accruals ( $50,000 \times 1.20$ )	60,000
Inventory ( $100,000 \times 1.20$ )	120,000	Notes payable	50,000
Total CA	340,000	Total CL	170,000
Net fixed assets	360,000	Mortgage bonds	150,000
( $300,000 \times 1.20$ )		Common stock	200,000
		Retained earnings	128,800
		( $100,000 + 28,800$ )	
		AFN	51,200
	700,000		700,000

Problem 8.22

Soln

q. Given:

$$\text{Growth rate } (g) = 30\%$$

$$\text{Sales in 2015 } (S_0) = \text{Rs. } 500,000$$

$$\begin{aligned} \text{Sales in 2016 } (S_1) &= S_0(1+g) = 500,000(1+0.30) \\ &= \text{Rs. } 650,000 \end{aligned}$$

$$\begin{aligned} \text{Change in Sales } (\Delta S) &= S_1 - S_0 = 650,000 - 500,000 \\ &= \text{Rs. } 150,000 \end{aligned}$$

$$\text{Spontaneous Assets } (A^*) = \text{Rs. } 500,000$$

$$\begin{aligned} \text{Spontaneous Liabilities } (L^*) &= \text{Rs. } 50,000 + 25,000 \\ &= \text{Rs. } 75,000 \end{aligned}$$

Pro-forma Income statement

as on 31<sup>st</sup> Dec. 2016

Sales (500,000X 1.30)	Rs. 650,000
Operating costs (300,000X 1.30)	390,000
Earning before interest and tax	260,000
Interest	15,000
Earning before taxes	245,000
Taxes (40%)	98,000
Net Income	147,000
Dividend (45%)	66,150
Addition to Retained earnings	80,850

$$AFN = \left( \frac{A^* - L^*}{S_0} \right) \Delta S - \text{Addition to RE}$$

$$= \left( \frac{500,000 - 75,000}{500,000} \right) 150,000 - 80,850 \\ = \text{Rs. } 46,650$$

Pro-forma Balance sheet

as on 31<sup>st</sup> Dec. 2016

Cash (75,000X 1.30)	97,500	Account payable (50,000X 1.30)	65,000
Receivables (125,000X 1.30)	162,500	Accruals (25,000X 1.30)	32,500
Inventory (100,000X 1.30)	130,000	Notes payable (75,000 + 46,650)	121,650
Total CA	390,000	Total CL	219,150
Net Fixed Assets	260,000	Mortgage bonds	150,000
(200,000X 1.30)		Common stock	150,000
		RE (50,000 + 80,850)	130,850
	650,000		650,000

b.

Pro-forma Income statement

For the year ended 31<sup>st</sup> Dec, 2016

Sales ( $500,000 \times 1.30$ )	Rs. 650,000
Operating costs ( $300,000 \times 1.30$ )	390,000
Earning before Interest and Taxes	260,000
Interest ( $15,000 + 46,650 \times 0.10$ )	19,665
Earning before taxes	240,335
Taxes (40%)	96,134
Net Income	144,201
Dividends (45%)	64,890.45
Addition to Retained Earnings	79,310.55

Pro-forma Balance sheet

as on 31<sup>st</sup> Dec, 2016

Cash ( $75,000 \times 1.30$ )	97,500	Account payable ( $50,000 \times 1.30$ )	65,000
Receivables ( $125,000 \times 1.30$ )	162,500	Accruals ( $25,000 \times 1.30$ )	32,500
Inventory ( $100,000 \times 1.30$ )	130,000	Notes payable ( $75,000 + 46,650$ )	121,650
Total CA	390,000	Total CL	219,150
Net fixed assets	260,000	Mortgage bonds	150,000
( $200,000 \times 1.30$ )		Common stock	150,000
		Retained earnings	129,310.55
		( $50,000 + 79,310.55$ )	153,945
		AFN (Balancing Figure)	
	650,000		650,000

If the firm raises Rs. 46,650 in additional notes payable carrying 10 percent interest, it has to raise additional external funds of Rs. 1539.45 to cover the interest expenses.

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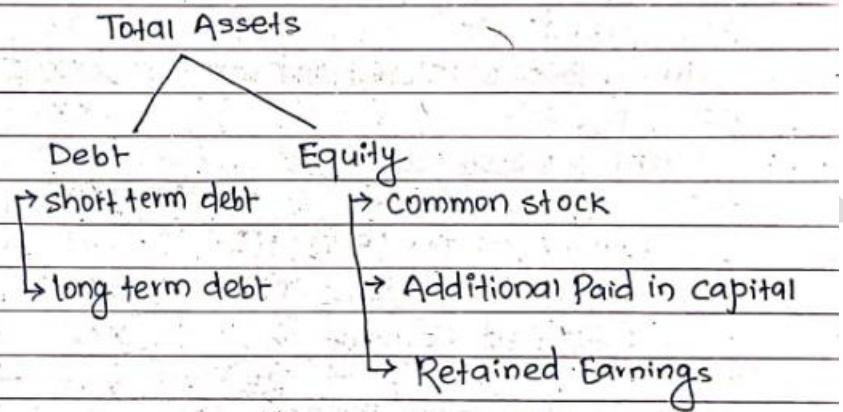
# **Capital Structure and leverage.**

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## Chapter-7

# CAPITAL STRUCTURE AND LEVERAGE



### \* Financial structure:

The composition of short term debt, long term debt and equity is called financial structure. In other words, the financial structure is the mix of short term debt, long term debt, preferred stock and common equity.

### \* Capital structure:

Capital structure is the composition of long term sources of financing. It refers to the mix of long term

source of capital. Long term debt and equity capital are the long term sources of capital.

### Income statement

<u>Particulars</u>	<u>Amount</u>
Sales Revenue	XXX ↗ ↙
Less: Variable cost	XXX
Contribution Margin (cm)	XXX DOL
less: Fixed cost	XXX
Earning Before Interest and Tax (EBIT)	XXX ↗
less: Interest	XXX DCL   DTL
Earning Before Tax (EBT)	XXX
less: Tax	XXX DFL
Earning After Tax (EAT) / NI	XXX
less: Preference Dividend (PD)	XXX
Retained Earnings	XXX
Earning per share (EPS = $\frac{RE}{N}$ )	XXX ↗ ↙

Note:

Ordinary share capital | Common stock | Equity share capital  
 → Number of shares (N)

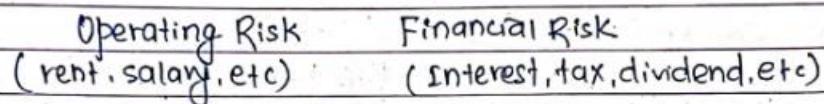
Debenture | Debt | Loan | Borrowed Capital | Bond  
 → Interest

Preferred Stock | Preference share capital → Preference Dividend (PD)

## \* Leverage:

It is a statistical tool which is used to measure the risk created by fixed cost in the business.

Risk



## \* Types of leverage:

1. Operating leverage ( $\text{Sales} \rightarrow \text{EBIT}$ )
2. Financial leverage ( $\text{EBIT} \rightarrow \text{EBT}|\text{NI}|\text{EPS}$ )
3. Combined | Total leverage ( $\text{Sales} \rightarrow \text{EPS}$ )

## \* Operating Leverage:

The leverage which measures the percentage change in EBIT due to 1% change in sales, is operating leverage. It also measures the risk created by fixed cost in the business and the value from operating leverage is also known as degree of operating leverage (DOL).

Calculation of DOL

$$\text{1st Method: } DOL = \frac{CM}{EBIT} \text{ or } \frac{Sales - VC}{Sales - VC - FC} \text{ or, } \frac{EBIT + FC}{EBIT}$$

$$2^{\text{nd}} \text{ Method: } DOL = \frac{\% \text{ change in EBIT}}{\% \text{ change in sales}}$$

Where,

$$\% \text{ change} = \frac{\text{New} - \text{Old}}{\text{Old}}$$

## 2. Financial leverage:

The leverage which measures the percentage change in EBT or EPS due to 1% change in EBIT, is called financial leverage. It also measures the financial risk created by fixed cost in the business and the value from financial leverage is also known as degree of financial leverage (DFL).

Calculation of DFL:

$$1^{\text{st}} \text{ Method: } DFL = \frac{EBIT}{EBIT - I - PD} \quad \text{or} \quad \frac{EBIT}{EBT}$$

$$2^{\text{nd}} \text{ Method: } DFL = \frac{\% \text{ change in EBT/Net EPS}}{\% \text{ change in EBIT}}$$

## 3. Combined leverage:

It is also known as total leverage. The leverage which measures the percentage change in EBT or EPS due to 1% change in sales, is called combined leverage. It also measures

the total risk in the business and the value from the combined leverage is also known as the degree of combined leverage (DCL)

Calculation of DCL:

$$1^{\text{st}} \text{ Method: } DCL = DOL \times DFL$$

$$= \frac{CM}{EBIT} \times \frac{EBIT}{EBIT - I - PD}$$

$$= \frac{CM}{EBIT - I - PD} \quad \text{or,} \quad \frac{CM}{EBT}$$

$$2^{\text{nd}} \text{ method: } DCL = \frac{\% \text{ change in EBT}}{\% \text{ change in Sales}} \times \frac{N}{EPS}$$

\* Earning Per share (EPS):

The return gained from a unit number of share is earning per share.

$$EPS = \frac{(EBIT - I)(1-t) - PD}{N}$$

Where,

N = Number of shares.

~~tips~~

$Q$  = Sales units

$S$  = Selling price per unit

$V$  = Variable cost per unit

$$\text{Sales} = Q \times S$$

$$VC = Q \times V$$

$$CM = \text{Sales} - VC$$

$$= Q \times S - Q \times V$$

$$= Q(S - V)$$

$$EBIT = Q(S - V) - FC$$

$$EBT = Q(S - V) - FC - I$$

$$EAT\text{NI} = [Q(S - V) - FC - I](1 - t)$$

$$EPS = \frac{[Q(S - V) - FC - I](1 - t)}{N}$$

$$\text{Return on Equity (ROE)} = \frac{NI}{\text{Total Equity}}$$

$$\text{Debt-to-assets Ratio / Debt Ratio} = \frac{\text{Total Debt}}{\text{Total Assets}}$$

### Problem 7.1

Sol:

Given:

$$E(\text{EPS}_X) = \text{Rs. } 5.10$$

$$\sigma_X = \text{Rs. } 3.61$$

$$E(\text{EPS}_Y) = \text{Rs. } 4.20$$

$$\sigma_Y = \text{Rs. } 2.96$$

$$\sigma_Z = \text{Rs. } 4.11$$

$$E(\text{EPS}_Z) = ?$$

Expected EPS For Firm Z,  $E(\text{EPS}_Z) = \sum \text{prob.} \times \text{EPS}_Z$

$$= 0.1 \times 2.40 + 0.2 \times 1.35 + 0.4 \times 5.10 + 0.2 \times 8.85 + 0.1 \times 12.60$$

$$= \text{Rs. } 5.1$$

Calculation of Coefficient of Variation (CV)

$$CV_X = \frac{\sigma_X}{E(\text{EPS}_X)} = \frac{3.61}{5.10} = 0.7078$$

$$CV_Y = \frac{\sigma_Y}{E(\text{EPS}_Y)} = \frac{2.96}{4.20} = 0.7048$$

$$CV_Z = \frac{\sigma_Z}{E(\text{EPS}_Z)} = \frac{4.11}{5.1} = 0.8059$$

Firm Z has higher risk due to higher CV.

**Problem #2**

Sojñ

Given:

	Firm A	Firm B
Total Assets	20 million	20 million
EBIT	4 million	4 million
Tax rate (t)	40%	40%
Leverage ratio	50%	30%
Interest rate	12%	10%
Debt	$20 \text{ m} \times 0.50$ = 10 m	$20 \text{ m} \times 0.30$ = Rs. 6 m
Equity	$20 \text{ m} - 10 \text{ m}$ = Rs. 10 m	$20 \text{ m} - 6 \text{ m}$ = Rs. 14 m
Interest (I)	$10 \text{ m} \times 0.12$ = Rs. 1.2 m	$6 \text{ m} \times 0.10$ = Rs. 0.6 m

a. Calculation of Return on Equity (ROE)

	Firm A	Firm B
EBIT	4 m	4 m
- I	1.2 m	0.6 m
EBT	2.8 m	3.4 m
- tax @ 40%	1.12 m	1.36 m
EAT / NI	1.68 m	2.04 m
ROE = $\frac{NI}{\text{Total Equity}}$	$\frac{1.68 \text{ m}}{10 \text{ m}}$ = 16.8%	$\frac{2.04 \text{ m}}{14 \text{ m}}$ = 14.57%

### b. Calculation of Earning Per share (EPS)

#### Low Debt Plan

Earning Before Interest and Tax (EBIT)	90,000	130,000
less: Interest	20,000	20,000
Net Income / EBT	70,000	110,000
less: Tax EPS = NI	70,000	110,000
No. of shares	8,000	8,000
	= Rs. 8.75	= Rs. 13.75

$$\therefore \text{Expected EPS} = 0.5 \times 8.75 + 0.5 \times 13.75 = \text{Rs. } 11.25$$

#### High Debt Plan

EBIT	90,000	130,000
less: Interest	40,000	40,000
Net Income	50,000	90,000
EPS = NI	50,000	90,000
No. of shares	6,000	6,000
	= Rs. 8.33	Rs. 15

$$\therefore \text{Expected EPS} = 0.5 \times 8.33 + 0.5 \times 15 = \text{Rs. } 11.67$$

Although, the expected EPS of high debt plan is higher than low debt plan, the high debt mix is not preferable because it also creates higher risk.

### C. Calculation of EPS

	Low debt plan	High Debt plan
EBIT	Rs. 100,000	Rs. 100,000
less: Interest	20,000	- 40,000
Net Income	Rs. 80,000	Rs. 60,000
EPS = $\frac{NI}{\text{No. of shares}}$	= $\frac{80,000}{8000}$ = Rs. 10	= $\frac{60,000}{6000}$ = Rs. 10

EPS is the same for both plans, because EBIT is 10% of assets which is equal to the rate of interest the firm pays on its debt.

### Problem 7.4

Soln

$$\text{Total Assets} = \text{Rs. 10 m}$$

$$\text{Tax Rate} = 40\%$$

If Leverage ratio = 0%.

$$\text{Debt} = 0$$

$$\text{Equity} = 10m = \text{Rs. 10,000,000}$$

### Calculation of ROE

Probability	0.2	0.5	0.3
EBIT	3,000,000	2,000,000	Rs. 500,000
-Interest	0	0	0
EBT	3,000,000	2,000,000	500,000

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b.	Firm B
Total Assets	20 m
EBIT	4 m
Tax Rate (t)	40%
Leverage ratio	60%
Interest rate	15%
Debt	$20 \text{ m} \times 0.60$
	= 12 m
Equity	$20 \text{ m} - 12 \text{ m}$
	= 8 m
Interest (I)	$12 \text{ m} \times 0.15$
	= 1.8 m

### Calculation of Return on Equity (ROE)

EBIT	4 m
- I	1.8 m
EBT	2.2 m
- Tax @ 40%	0.88 m
NI	1.32 m
ROE = $\frac{NI}{Total\ Equity}$	$\frac{1.32 \text{ m}}{8 \text{ m}}$
	= 16.5%

### Problem 7.3

Soln

Given:

$$\text{Total shares} = 10,000 \text{ shares}$$

$$\text{Total Assets} = 10,000 \text{ shares @ Rs. } 100 = \text{Rs. } 10,00,000$$

#### Low Debt Plan

$$\text{Debt} = \text{Rs. } 200,000$$

$$\begin{aligned}\text{Equity} &= 10,00,000 - 200,000 \\ &= \text{Rs. } 800,000\end{aligned}$$

$$\begin{aligned}\text{Interest} &= 200,000 \times 0.10 \\ &= \text{Rs. } 20,000\end{aligned}$$

$$\begin{aligned}\text{No. of shares} &= \frac{\text{Rs. } 800,000}{\text{Rs. } 100} \\ &= 8000 \text{ shares}\end{aligned}$$

#### High Debt Plan

$$\text{Debt} = \text{Rs. } 400,000$$

$$\begin{aligned}\text{Equity} &= 10,00,000 - 400,000 \\ &= \text{Rs. } 600,000\end{aligned}$$

$$\begin{aligned}\text{Interest} &= 400,000 \times 0.10 \\ &= \text{Rs. } 40,000\end{aligned}$$

$$\begin{aligned}\text{No. of shares} &= \frac{\text{Rs. } 600,000}{\text{Rs. } 100} \\ &= 6000 \text{ shares}\end{aligned}$$

#### a. Calculation of Debt-to-equity ratio:

$$\text{Debt-to-equity Ratio} = \frac{\text{Total Debt}}{\text{Total Equity}}$$

$$\begin{aligned}\text{Low Debt plan} &= \frac{200,000}{800,000} \\ &= 0.25\end{aligned}$$

$$\begin{aligned}\text{High Debt plan} &= \frac{400,000}{600,000} \\ &= 0.667\end{aligned}$$

less: Tax @ 40%	1200,000	800,000	200,000
Net Income	1800,000	1200,000	300,000
ROE = $\frac{NI}{Total\ Equity}$	1800,000	1200,000	300,000
	10900,000	10,000,000	10,000,000
	= 18%	= 12%	= 3%

$$\therefore \text{Expected ROE} = \sum P_j \times \text{Probability} \times \text{ROE}$$

$$E(\text{ROE}) = 0.2 \times 18\% + 0.5 \times 12\% + 0.3 \times 3\%$$

$$= 10.5\%$$

calculation of standard Deviation and CV.

Prob. (P)	ROE	ROE - E(ROE)	$P_j [ROE - E(ROE)]^2$
0.2	18%	7.5	11.25
0.5	12	1.5	1.125
0.3	3	-7.5	16.875
$\sum P_j [ROE - E(ROE)]^2 = 29.25$			

$$\therefore \text{standard Deviation } (\sigma) = \sqrt{\sum P_j [ROE - E(ROE)]^2}$$

$$= \sqrt{29.25} = 5.41\%$$

$$\therefore \text{Coefficient of variation, CV} = \frac{\sigma}{E(\text{ROE})} = \frac{5.41}{10.5} = 0.52$$

Leverage ratio = 10%, Interest rate = 10%

$$\text{Debt} = 10m \times 0.10 = \text{Rs. } 10,00,000 = 1\text{m}$$

$$\text{Equity} = 10m - 1\text{m} = 9\text{ m} = 9,00,000$$

$$\text{Interest} = 10,00,000 \times 0.10 = \text{Rs. } 100,000$$

### Calculation of ROE

Probability	0.2	0.5	0.3
EBIT	3000,000	2000,000	500,000
- I	100,000	100,000	100,000
EBT	29,00,000	19,00,000	400,000
- Tax@ 40%	11,60,000	760,000	160,000
NI	1740,000	11,40,000	240,000
ROE = $\frac{NI}{Total\ Equity}$	= 19.33%	= 12.67%	= 2.67%

$$\therefore \text{Expected ROE} = 0.2 \times 19.33 + 0.5 \times 12.67 + 0.3 \times 2.67 = 11\%$$

### Calculation of standard deviation and CV

Prob. (P)	ROE	ROE - E(ROE)	$P[ROE - E(ROE)]^2$
0.2	19.33%	8.33	13.88
0.5	12.67	1.67	1.39
0.3	2.67	- 8.33	20.82
$\Sigma P[ROE - E(ROE)]^2 = 36.09$			

$$\therefore \text{Standard deviation, } (\sigma) = \sqrt{\sum P [ROE - E(ROE)]^2} \\ = \sqrt{36.09} = 6\%$$

$$\therefore \text{Coefficient of Variation (CV)} = \frac{\sigma}{E(ROE)} = \frac{6}{11} = 0.55$$

Leverage ratio = 50% Interest rate = 12%

Total Assets = 10 m

$$\text{Debt} = 10m \times 0.50 = 5m = 5,000,000$$

$$\text{Equity} = 10m - 5m = 5m = 5,000,000$$

$$\text{Interest} = 5000,000 \times 12\% = \text{Rs. } 600,000$$

### Calculation of ROE

Probability	0.2	0.5	0.3
EBIT	800,000	2000,000	500,000
- I	600,000	600,000	600,000
EBT	2400,000	1400,000	(100,000)
- Tax @ 40%	960,000	560,000	(40,000)
NI	14,40,000	840,000	(60,000)
NI	14,40,000	840,000	(60,000)
ROE = Total equity	5000,000	5000,000	5000,000
	= 28.8%	= 16.8%	= -1.2%

$$\therefore \text{Expected ROE, } E(ROE) = 0.2 \times 28.8\% + 0.5 \times 16.8\% + 0.3 \times (-1.2\%) \\ = 13.8\%$$

Calculation of Standard Deviation:

Prob. ( $P_i$ )	ROE	$ROE - E(ROE)$	$P_i [ROE - E(ROE)]^2$
0.2	28.8%	15	45
0.5	16.8	3	4.5
0.3	-1.2	-15	67.5
$\sum P_i [ROE - E(ROE)]^2 = 117$			

$$\therefore \text{Standard deviation}, \sigma = \sqrt{\sum P_i [ROE - E(ROE)]^2} = \sqrt{117} = 10.82\%$$

$$\therefore \text{Coefficient of Variation, } CV = \frac{\sigma}{E(ROE)} = \frac{10.82}{13.8} = 0.784$$

Leverage ratio = 60%

Interest rate = 15%

### \* Indifference point of EBIT:

That point of EBIT which makes the EPS of plan I equals to the EPS of plan II, is indifference point of EBIT.

For indifference point of EBIT,

$$\frac{EPS_1}{(EBIT - I_1)(1-t) - PD_1} = \frac{EPS_2}{(EBIT - I_2)(1-t) - PD_2}$$
$$\frac{N_1}{}$$
$$\frac{N_2}{}$$

### Problem 7.5

SOL<sup>n</sup>

Given:

	Plan I	Plan II
Number of shares (N)	800,000 100 = 8000 shares	600,000 100 = 6000 shares
Preference Dividend (PD)	12% of 200,000 = Rs. 24,000	12% of 200,000 = Rs. 24,000
Interest (I)	- 8% of 200,000 = Rs. 16,000	
Tax Rate (t)	25%	25%

a. Calculation of Indifference point of EBIT

$$\frac{\text{EPS}_1}{(\text{EBIT} - I_1)(1-t) - PD_1} = \frac{\text{EPS}_2}{(\text{EBIT} - I_2)(1-t) - PD_2}$$

$$\frac{(EBIT - 0)(1-0.25) - 24000}{8000} = \frac{(EBIT - 16000)(1-0.25) - 24000}{3}$$

$$\frac{0.75 \text{ EBIT} - 24000}{4} = \frac{0.75 \text{ EBIT} - 12000 - 24000}{3}$$

$$4(0.75 \text{ EBIT} - 36000) = 3(0.75 \text{ EBIT} - 24000)$$

$$3 \text{ EBIT} - 144,000 = 2.25 \text{ EBIT} - 72,000$$

$$3 \text{ EBIT} - 2.25 \text{ EBIT} = 144000 - 72000$$

$$0.75 \text{ EBIT} = ₹2,000$$

$$0.75 \text{ EBIT} = ₹2,000$$

$$= ₹.96,000$$

b. Variable cost = 60% of sales

Fixed cost = Rs. 150,000

EBIT = Rs. 96,000

Sales = ?

We know that,

$$\text{EBIT} = \text{Sales} - \text{VC} - \text{FC}$$

$$96000 = \text{Sales} - 60\% \text{ of sales} - 150,000$$

$$96000 + 150000 = \text{Sales} - 0.60 \text{ Sales}$$

$$246000 = 0.40 \text{ Sales}$$

$$\therefore \text{Sales} = \frac{246000}{0.40} = \text{Rs. } 615,000$$

c. Calculation of EPS at indifference point:

$$\text{EPS}_1 = \frac{(\text{EBIT} - I_1)(1-t) - PD_1}{N_1} = \frac{(96000 - 0)(1-0.25) - 24000}{8000}$$
$$= \text{Rs. } 6 \text{ per share}$$

OR,

$$\text{EPS}_2 = \frac{(\text{EBIT} - I_2)(1-t) - PD_2}{N_2} = \frac{(96000 - 16000)(1-0.25) - 24000}{6000}$$
$$= \text{Rs. } 6 \text{ per share}$$

Problem 7.6

Soln

Given: Capital Requirement = Rs. 20,00,000

	Plan I	Plan II
Number of shares (N)	1400,000 100 = 14000 shares	700,000 100 = 7000 shares
Interest (I)	10% of 600,000 = Rs. 60,000	10% of 500,000 = Rs. 50,000
Preference Dividend (PD)	— —	15% of 800,000 = Rs. 120,000
Tax Rate (t)	25%	25%

For Indifference point of EBIT.

$$\frac{EPS_1}{(EBIT - I_1) - PD_1} = \frac{EPS_2}{(EBIT - I_2) - PD_2}$$

$$\frac{N_1}{N_2}$$

$$\frac{(EBIT - 60,000)(1-0.25) - 0}{14000} = \frac{(EBIT - 50,000)(1-0.25) - 120,000}{7000}$$

$$0.75 EBIT - 45000 = 2(0.75 EBIT - 37500 - 120,000)$$

$$0.75 EBIT - 45000 = 1.5 EBIT - 315,000$$

$$1.5 EBIT - 0.75 EBIT = 315,000 - 45000$$

$$0.75 EBIT = 270,000$$

$$\therefore EBIT = Rs. 360,000$$

Calculation of EPS under the indifference point of EBIT

$$EPS_1 = \frac{(EBIT - I_1)(1-t) - PD_L}{N_L} = \frac{(360,000 - 60,000)(1-0.25) - 0}{14000}$$

= Rs. 16.07 per share

OR,

$$EPS_2 = \frac{(EBIT - I_2)(1-t) - PD_L}{N_2} = \frac{(360,000 - 50,000)(1-0.25) - 120,000}{7000}$$

= Rs. 16.07 per share

Calculation of EPS if EBIT = Rs. 400,000

$$EPS_1 = \frac{(EBIT - I_1)(1-t) - PD_L}{N_L} = \frac{(400,000 - 60,000)(1-0.25) - 0}{14000}$$

= Rs. 18.21 per share

$$EPS_2 = \frac{(EBIT - I_2)(1-t) - PD_L}{N_2} = \frac{(400,000 - 50,000)(1-0.25) - 120,000}{7000}$$

= Rs. 20.36 per share

We would suggest capital structure II due to higher EPS at EBIT level Rs. 400,000.

Problem 7.7

SOP

Given:

	Plan I	Plan II
Number of shares (N)	1500,000 100 = 15000 shares	15,000 shares
Preference Dividend (PD)	12% of 500,000 = Rs. 60,000	Rs. 60,000
Interest (I)	10% of 500,000 = Rs. 50,000	10% of 500,000 = Rs. 50,000
New shares (N)	10,000,000 100 = 100,000 shares	
New Interest (I)	-	10% of 10,000,000 = Rs. 100,000
Tax Rate (t)	25%	25%

For Indifference point of EBIT

$$\text{EPS}_1 = \text{EPS}_2$$

$$\frac{(EBIT - I_1)(1-t) - PD_1}{N_1} = \frac{(EBIT - I_2)(1-t) - PD_2}{N_2}$$

$$\frac{(EBIT - 50,000)(1-0.25) - 60,000}{25000} = \frac{(EBIT - 150,000)(1-0.25) - 60,000}{37500}$$

$$3(0.75EBIT - 37500 - 60,000) = 5(0.75EBIT - 112500 - 60,000)$$

$$3.75EBIT - 487500 = 2.25EBIT - 517500$$

$$\therefore EBIT = Rs. 380,000$$

Calculation of EPS if EBIT = Rs. 500,000

$$EPS_1 = \frac{(EBIT - I_1)(1-t) - PD_1}{N_1} = \frac{(500,000 - 50,000)(1-0.25) - 60,000}{25000}$$
$$= Rs. 11.1 \text{ per share}$$

$$EPS_2 = \frac{(EBIT - I_2)(1-t) - PD_2}{N_2} = \frac{(500,000 - 150,000)(1-0.25) - 60,000}{15000}$$
$$= Rs. 13.5 \text{ per share}$$

If the firm currently has Rs. 500,000 in EBIT, plan II is appropriate due to higher EPS.

#### \* Levered and Unlevered Beta:

Levered Beta measures the risk of a firm with debt and equity in its capital structure to the volatility of the market.

Unlevered Beta measures the risk of an investment by comparing the market to a company with no debt. Unlevered means no leverage. Leverage means debt.

$$\therefore \text{Levered Beta (B}_L\text{)} = B_U [1 + (1-t) (D/E)]$$

$$\therefore \text{Cost of Equity (k}_e\text{)} = R_f + (R_m - R_f) B_L$$

$$\therefore \text{WACC} = D/A \times k_d + E/A \times k_e$$

where,

$B_L$  = levered Beta

$B_U$  = Unlevered Beta

$t$  = tax rate

$D/E$  = Debt to Equity ratio

$R_f$  = Risk free Rate

$R_m$  = Return on market

$R_m - R_f$  = Market Risk premium

$D/A$  = Debt to Assets Ratio

$k_{dt}$  = cost of debt after tax,  $k_{dt} = k_d(1-t)$

$E/A$  = Equity to Assets ratio

$k_e$  = cost of equity

### Problem 7.8

Soln

Calculation of levered Beta

$D/E$	$B_U$	$t$	levered Beta ( $B_L$ ) = $B_U [1 + (1-t) D/E]$
0.00	1.2	0.4	= $1.2 [1 + (1-0.4) \times 0.00] = 1.2$
0.25	1.2	0.4	= $1.2 [1 + (1-0.4) \times 0.25] = 1.38$
0.67	1.2	0.4	= $1.2 [1 + (1-0.4) \times 0.67] = 1.68$
1.50	1.2	0.4	= $1.2 [1 + (1-0.4) \times 1.50] = 2.28$
4.00	1.2	0.4	= $1.2 [1 + (1-0.4) \times 4.00] = 4.08$

## Calculation of cost of equity ( $K_e$ )

D/E	$R_f$	$R_m - R_f$	$B_L$	$K_e = R_f + (R_m - R_f) B_L$
0.00	5%	6%	1.2	= 5% + 6% $\times$ 1.2 = 12.2%
0.25	5	6	1.38	= 5% + 6% $\times$ 1.38 = 13.28
0.67	5	6	1.68	= 5% + 6% $\times$ 1.68 = 15.08
1.50	5	6	2.28	= 5% + 6% $\times$ 2.28 = 18.68
4.00	5	6	4.08	= 5% + 6% $\times$ 4.08 = 29.48

## Calculation of WACC

D/A	E/A	$K_{dt} = K_d(1-t)$	$K_e$	$WACC = D/A \times K_{dt} + E/A \times K_e$
0.0	1.0	7(1-0.4) = 4.2%	12.2%	= 0.0 $\times$ 4.2 + 1.0 $\times$ 12.2 = 12.2%
0.2	0.8	8(1-0.4) = 4.8%	13.28%	= 0.2 $\times$ 4.8 + 0.8 $\times$ 13.28 = 11.58
0.4	0.6	10(1-0.4) = 6%	15.08%	= 0.4 $\times$ 6 + 0.6 $\times$ 15.08 = 11.45
0.6	0.4	12(1-0.4) = 7.2%	18.68%	= 0.6 $\times$ 7.2 + 0.4 $\times$ 18.68 = 11.79
0.8	0.2	15(1-0.4) = 9%	29.48%	= 0.8 $\times$ 9 + 0.2 $\times$ 29.48 = 13.10

The firm's optimal capital structure is 40% debt and 60% equity because at this capital structure, WACC is the minimum 11.45%.

## Problem 7.9

SQM

Given:

Selling price ( $S$ ) = Rs. 28.80

Sales unit ( $Q$ ) = 450,000 units

Variable cost ( $V_C$ ) = Rs. 10,200,000

$$\text{Fixed Cost (Fc)} = \text{Rs. } 1,560,000$$

$$\text{Interest (I)} = 4,800,000 \times 0.08 = \text{Rs. } 384,000$$

$$\text{Number of shares (N)} = 240,000 \text{ shares}$$

$$\text{Dividend Payout Ratio} = 70\%$$

$$\text{Tax Rate (t)} = 40\% \quad 10,200,000$$

$$\text{Variable Cost per Unit (VCPU)} = \frac{450,000}{450,000} = \text{Rs. } 22.67$$

$$\text{Additional Investment} = \text{Rs. } 72,00,000$$

$$\text{New Variable Cost per Unit (V)} = 22.67 - 20\% \cdot 22.67 \\ = \text{Rs. } 18.14$$

$$\text{New Fixed Cost} = \text{Rs. } 1,800,000$$

Debt

equity

$$\text{New Interest} = 7200,000 \times 0.10 \quad \text{New shares} = 240,000 \text{ shares}$$

$$= \text{Rs. } 720,000$$

$$@ \text{Rs. } 30$$

a.

i. Calculation of Eps under old production process:

Particular	Amount
Sales (450,000 @ 28.80)	12,960,000
- VC	10,200,000
contribution Margin	27,60,000
- FC	15,60,000
EBIT	12,00,000
- Interest	3,84,000
EBT	816,000
- Tax @ 40%	326,400
NI	489,600
EPS = $\frac{NI}{\text{No. of shares}}$	$\frac{489,600}{240,000} \quad \text{Rs. } 2.04$

ii. Calc of EPS if debt financing is used (new process)

Particulars	Amount
EBIT	1200,000
less: Interest (384,000 + 720,000)	<u>1104,000</u>

Particulars	Amount
Sales Revenue (450,000 x 28.80)	1296,000
- VC (450,000 x 18.14)	8160,000 (10,20,000 x 0.80)
Contribution Margin	4800,000
- FC	1800,000
EBIT	30,00,000
- Interest (384,000 + 720,000)	<u>1104,000</u>
EBT	1896,000
- Tax @ 40%	<u>758,400</u>
NI	<u>11,37,600</u>

$$\text{EPS} = \frac{\text{NI}}{\text{No. of shares}} = \frac{11,37,600}{240,000} = \text{Rs. } 4.74$$

iii. Calculation of EPS if common stock financing is used:

Particulars	Amount
EBIT	30,00,000
less: Interest	384,000
EBT	26,16,000
less: Tax @ 40%	1046400
NI	<u>1569,600</u>

$$\text{EPS} = \frac{\text{NI}}{\text{No. of shares}} = \frac{1569,600}{240,000 + 240,000} = \text{Rs. } 3.27$$

## Common stock financing

$$EPS = \frac{[Q(S-V) - FC - I](1-t) - PD}{N}$$

$$0 = \frac{[Q(28.80 - \frac{81,60,000}{450,000}) - 1800,000 - 384,000](1-0.40)}{480,000}$$

$$0 = 10.6667 Q - 21,84,000$$

$$\therefore Q = \frac{21,84,000}{10.6667} = 204,750 \text{ units}$$

## Problem 7.10

Soln

Given:

$$\text{Additional Investment} = 50\% \text{ of } 700,000 = \text{Rs. } 350,000$$

### Debt financing

$$\text{Old Interest} = 8\% \text{ of } 140,000 \\ = \text{Rs. } 11,200$$

$$\text{New Interest} = 11\% \text{ of } 350,000 \\ = \text{Rs. } 38,500$$

PIE Ratio = 8 times

$$\text{Total Interest} = 11,200 + 38,500 \\ = \text{Rs. } 49,700$$

### Equity financing

$$\text{Old shares} = 350,000 \\ 10 = 35000 \text{ shares}$$

$$\text{new shares} = 350,000 \\ 25 = 14000 \text{ shares}$$

PIE Ratio = 10 times

$$\text{Total shares} = 35000 + 14000 \\ = 49000 \text{ shares}$$

#### a. Calculation of EPS (Common stock financing) and MPS

Particulars				
Sales	700,000	1400,000	2100,000	28,00,000
EBIT (10% of sales)	70,000	140,000	210,000	280,000
- I	11,200	11,200	11,200	11,200
EBT	58,800	128,800	198,800	268,800
- Tax @ 50%	29,400	64,400	99,400	134,400
NI	29,400	64,400	99,400	134,400
EPS ( $\frac{NI}{No. \text{ of } shares}$ )	29,400 49,000	64,400 49,000	99,400 49,000	134,400 49,000
	= 0.6	= 1.314	= 2.03	= 2.743
b. P/E Ratio	10 times	10 times	10 times	10 times
MPS = EPS x PE Ratio	Rs. 6	Rs. 13.14	Rs. 20.3	Rs. 27.43

#### Calculation of EPS and MPS (Debt financing)

Sales	700,000	1400,000	2100,000	28,00,000
EBIT (10% of sales)	70,000	140,000	210,000	280,000
- I	49,700	49,700	49,700	49,700
EBT	20,300	90,300	160,300	230,300
- Tax @ 50%	10,150	45,150	80,150	115,150
NI	10,150	45,150	80,150	115,150
EPS = ( $\frac{NI}{35000 \text{ shares}}$ )	0.29	1.29	2.29	3.29
b. MPS (EPS x 8 times)	Rs. 2.32	Rs. 10.32	Rs. 18.32	Rs. 26.32

b. Indifference point of EBIT

$$EPS_{debt} = EPS_{stock}$$

$$\frac{(EBIT - I_1)(1-t) - PD_L}{N_1} = \frac{(EBIT - I_2)(1-t) - PD_2}{N_2}$$

$$\frac{(EBIT - 11,04,000)(1-0.40) - 0}{240,000} = \frac{(EBIT - 384,000)(1-0.40) - 0}{480,000}$$

2

$$2(EBIT - 11,04,000) = EBIT - 384,000$$

$$2EBIT - 22,08,000 = EBIT - 384,000$$

$$2EBIT - EBIT = 22,08,000 - 384,000$$

$$\therefore EBIT = Rs. 18,24,000$$

Sales Unit (Q) = ?

$$EBIT = Q(S-V) - FC$$

$$18,24,000 = Q(28.80 - \frac{816,000}{450,000}) - 1800,000$$

$$18,24,000 = 10.6667Q - 18,00,000$$

$$10.6667Q = 18,24,000 + 18,00,000$$

$$\therefore Q = 339,750 \text{ units}$$

C. EPS=0, Sales Unit ( $Q$ )=?

Old process:

$$EPS_{\text{old}} = \frac{[Q(s-v) - FC - I](1-t) - PD}{N}$$

$$0 = \frac{[Q(28.80 - 10,200,000) - 15,60,000 - 384,000](1-0.40)}{450,000} - 240,000$$

$$0 = 6.133 Q - 19,44,000$$

$$\therefore Q = \frac{19,44,000}{6.133} = 31,6959 \text{ units}$$

Debt Financing

$$EPS = \frac{[Q(s-v) - FC - I](1-t) - PD}{N}$$

$$0 = \frac{[Q(28.80 - 81,60,000) - 1800,000 - 1104,000](1-0.40)}{450,000} - 240,000$$

$$0 = 10.6667 Q - 29,04,000$$

$$\therefore Q = \frac{29,04,000}{10.6667} = 27,2250 \text{ units}$$

c. If the firm follows the policy of seeking to maximize EPS it should finance through debt where the firm should choose common stock financing if it follows the policy of seeking to maximize MPS.

d. Calculation of expected EPS and MPS

Under Common Stock financing

$$\begin{aligned}\text{Expected EPS} &= \sum \text{probability} \times \text{EPS} \\ &= 0.2 \times 0.6 + 0.3 \times 13.14 + 0.3 \times 20.03 + 0.2 \times 27.43 \\ &= \text{Rs. } 1.673\end{aligned}$$

Expected MPS =  $\sum \text{probability} \times \text{MPS}$

$$\begin{aligned}&= 0.2 \times 6 + 0.3 \times 13.14 + 0.3 \times 20.3 + 0.2 \times 27.43 \\ &= \text{Rs. } 16.718\end{aligned}$$

Under Debt financing:

$$\begin{aligned}\text{Expected EPS} &= \sum \text{probability} \times \text{EPS} \\ &= 0.2 \times 0.29 + 0.3 \times 1.29 + 0.3 \times 2.29 + 0.2 \times 3.29 \\ &= \text{Rs. } 1.79\end{aligned}$$

Expected MPS =  $\sum \text{probability} \times \text{MPS}$

$$\begin{aligned}&= 0.2 \times 2.32 + 0.3 \times 10.32 + 0.3 \times 18.32 + 0.2 \times 26.32 \\ &= \text{Rs. } 14.32\end{aligned}$$

e. Degree of operating risk and financial risk should also be considered while choosing between the two forms of financing.

**Problem 7.11**

Soln

a. Profit (EBIT) =  $Q(s-v) - FC$

$$\text{Firm A} = 18,770(32-17) - 120,350 = \text{Rs. } 163,200$$

$$\text{Firm B} = 2500(875-400) - 850,000 = \text{Rs. } 337,500$$

$$\text{Firm C} = 11000(97-87) - 89,500 = \text{Rs. } 20,500$$

b. Degree of operating leverage (DOL) =  $\frac{CM}{EBIT} = \frac{Q(s-v)}{Q(s-v) - FC}$

$$\text{Firm A} = \frac{18,770(32-17)}{18,770(32-17) - 120,350} = 3.75 \text{ times}$$

$$\text{Firm B} = \frac{2500(875-400)}{2500(875-400) - 850,000} = 3.52 \text{ times}$$

$$\text{Firm C} = \frac{11000(97-87)}{11000(97-87) - 89,500} = 5.36 \text{ times}$$

c. If sales were to decline, Firm C would suffer from the largest relative decline in profitability due to higher leverage.

### Problem 7.12

Soln

Given:

$$\text{Selling price per unit } (s) = \text{Rs.} 35$$

$$\text{Variable cost per unit } (v) = \text{Rs.} 19$$

$$\text{Fixed cost } (Fc) = \text{Rs.} 200,000$$

$$\text{Interest } (I) = 300,000 \times 0.12 = \text{Rs.} 36,000$$

$$\text{Tax rate } (t) = 40\%$$

$$\text{Net Income } (NI) = \text{Rs.} 600,000$$

a. Sales Unit ( $Q$ ) = ?

We know that,

$$NI = [Q(s-v) - FC - I](1-t)$$

$$600,000 = [Q(35-19) - 200,000 - 36,000](1-0.40)$$

$$600,000 = 16Q - 236,000$$

$$0.60$$

$$1,000,000 + 236,000 = 16Q$$

$$Q = \frac{12,360,000}{16} = 77,250 \text{ units}$$

b. Degree of Operating Leverage (DOL) =  $\frac{Q(s-v)}{Q(s-v) - FC}$

$$= \frac{77,250(35-19)}{77,250(35-19) - 200,000}$$

$$= 1.19 \text{ times}$$

$$\begin{aligned}
 \text{Degree of Financial Leverage (DFL)} &= \frac{\Delta(S-V) - FC}{\Delta(S-V) - FC - I} \\
 &= \frac{77,250(35-19) - 200,000}{77,250(35-19) - 200,000 - 36000} \\
 &= 1.036 \text{ times}
 \end{aligned}$$

$$\begin{aligned}
 \text{Degree of Combined leverage (DCL)} &= DOL \times DFL \\
 &= 1.19 \times 1.036 \\
 &= 1.23 \text{ times}
 \end{aligned}$$

C. Debt = 1m

$$\text{Interest} = 1000,000 \times 0.12 = \text{Rs. } 120,000$$

#### Income statement

Particulars	Amount
Sales ( $77,250 \times 35$ )	Rs. 2703,750
less: Variable Cost ( $77,250 \times 19$ )	Rs. 1467,750
Contribution Margin	Rs. 12,36,000
less: fixed cost	Rs. 200,000
EBIT	Rs. 10,36,000
less: Interest	Rs. 120,000
EBT	Rs. 9,16,000
less: Tax @ 40%	Rs. 3,66,400
NI	Rs. 549,600

$$\therefore \text{Degree of Combined leverage (DCL)} = \frac{CM}{EBT} = \frac{12,36,000}{9,16,000} = 1.35 \text{ times}$$

### Problem 7.13

Soln

a. Degree of Operating leverage (DOL) =  $\frac{CM}{EBIT} = \frac{10,800}{4,320} = 2.5\text{-times}$

Degree of financial leverage (DFL) =  $\frac{EBIT}{EBT} = \frac{4320}{1440} = 3\text{-times}$

Degree of Total leverage (DTL) = DOL × DFL  
=  $2.5 \times 3 = 7.5\text{-times}$

b. DOL at 2.5 times states that 1% change in Sales brings 2.5% change in EBIT.

DFL at 3 times states that 1% change in EBIT brings 3% change in Net Income.

DCL at 7.5 times states that 1% change in Sales brings 7.5% change in Net Income.

c. The firm can reduce its degree of total leverage either by reducing fixed operating cost or by reducing fixed financial costs or by reducing both.

**Problem 7.14**

SQM

Given:

$$\text{Selling price per unit (S)} = \text{Rs.} 5$$

$$\text{Variable cost of goods sold (V)} = 75\% \text{ of } 5 = 3.75$$

$$\text{Fixed operating cost (Fc)} = \text{Rs.} 50,000$$

$$\text{Interest expenses (I)} = \text{Rs.} 10,000$$

$$\text{Preferred Dividend (PD)} = 0$$

$$\text{Marginal tax rate (t)} = 40\%$$

$$\text{Number of common shares (N)} = 20,000 \text{ shares}$$

$$\text{If Sales} = \text{Rs.} 300,000$$

$$VC = 75\% \text{ of } 300,000 = \text{Rs.} 225,000$$

$$\begin{aligned} \text{Degree of operating leverage (DOL)} &= \frac{CM}{EBIT} = \frac{\text{Sales} - VC}{\text{Sales} - VC - FC} \\ &= \frac{300,000 - 225,000}{300,000 - 225,000 - 50,000} \\ &= 3 \text{ times} \end{aligned}$$

$$\begin{aligned} \text{Degree of financial leverage (DFL)} &= \frac{EBIT}{EBIT - I - \frac{PD}{1-t}} \\ &= \frac{25000}{25000 - 10,000 - 0} \\ &= 1.67 \text{ times} \end{aligned}$$

$$\begin{aligned}\text{Degree of total leverage (DTL)} &= \text{DOL} \times \text{DFL} \\ &= 3 \times 1.67 \\ &= 5 \text{ times}\end{aligned}$$

If Sales = Rs. 270,000

Based on Degree of total leverage, Eps = ?

$$\text{DTL} = \frac{\% \text{ change in EPS}}{\% \text{ change in sales}}$$

$$5 = \frac{\% \text{ change in EPS}}{-10\%}$$

$$\therefore \% \text{ change in Eps} = -50\%$$

Where,

$$\begin{aligned}\% \text{ change in sales} &= \frac{\text{New Sales} - \text{Old Sales}}{\text{Old sales}} = \frac{270,000 - 300,000}{300,000} \\ &= -10\%\end{aligned}$$

$$\text{Old Eps} = \frac{[\text{Sales} - \text{VC} - \text{FC} - \text{I}] (1-t) - \text{PD}}{N}$$

$$= \frac{[300,000 - 225,000 - 50,000 - 10,000] (1 - 0.40) - 0}{20,000}$$

$$= \text{Rs. } 0.45 \text{ per share}$$

$$\text{New Eps} = 0.45 - 50\% \text{ of } 0.45 = \text{Rs. } 0.225 \text{ per share}$$

Problem 7.15

Soln

a. Degree of operating leverage (DOL) =  $\frac{CM}{EBIT} = \frac{22,950,000}{16,750,000}$   
= 1.37 times

b. Degree of financial leverage (DFL) =  $\frac{EBIT}{EBT} = \frac{16,750,000}{15,400,000}$   
= 1.09 times

c. Degree of Total leverage (DTL) =  $\frac{CM}{EBT} = \frac{22,950,000}{15,400,000}$   
= 1.49 times

d. Increase in Sales = 25%  
Increase in EBT or NI = ?

DTL = % change in EBT or NI

% change in sales

1.49 = % change in EBT or NI  
25%

∴ % change in EBT or NI = 37.25%

### Problem 7.17

Soln

- Given:

$$EBIT = \text{Rs. } 67,500$$

$$\text{Interest (I)} = \text{Rs. } 22,500$$

$$\text{Number of shares outstanding (N)} = 15,000 \text{ shares}$$

$$\text{Tax Rate (t)} = 40\%$$

a.  $DFL = \frac{EBIT}{EBIT - I} = \frac{67,500}{67,500 - 22,500} = 1.5 \text{ times}$

b. Preference Dividend (PD) =  $1000 \times 6 = \text{Rs. } 6,000$

$$DFL = \frac{EBIT}{\frac{EBIT - I - PD}{1-t}}$$
$$= \frac{67,500}{\frac{67,500 - 22,500 - 6,000}{1 - 0.40}} = 1.93 \text{ times}$$

c. DFL in part b. is higher due to use of preference dividend.

Problem 7.18

Soln

Given:

$$DOL = 2.5 \text{ times}$$

$$\text{Sales unit (Q)} = 25,000 \text{ units}$$

$$\text{Operating profit (EBIT)} = \text{Rs. } 18,000$$

a. If Sales increase by 20%.

$$DOL = \frac{\% \text{ change in EBIT}}{\% \text{ change in sales}}$$

$$2.5 = \frac{\% \text{ change in EBIT}}{20\%}$$

$$\therefore \% \text{ change in EBIT} = 50\%$$

$$\begin{aligned}\therefore \text{New Operating profit (EBIT)} &= 18,000 + 50\% \text{ of } 18,000 \\ &= 18,000 + 9,000 \\ &= \text{Rs. } 27,000\end{aligned}$$

b. If Sales unit = 30,000 units

$$\begin{aligned}\text{New DOL} &= \frac{\text{New CM}}{\text{New EBIT}} \\ &= \frac{54,000}{27,000} \\ &= 2 \text{ times}\end{aligned}$$

$$\text{W.N} \quad DOL = \frac{CM}{EBIT}$$

$\% \text{ change in sales} = \frac{30000 - 25000}{25000} = 20\%$

$$2.5 = \frac{CM}{18000}$$

$\therefore \text{Old CM} = \text{Rs. } 45000$

If Sales increase by 20%, CM will also increase by 20%.

$$\therefore \text{New CM} = 45000 + 20\% \text{ of } 45000$$

$$= 45000 + 9000$$

$$= \text{Rs. } 54000$$

### Problem 7.19

SOL

Given:

$$\text{Number of shares (N)} = 10,00,000$$

$$100 = 10,000 \text{ shares}$$

$$\text{Interest (I)} = 10\% \text{ of } 10,00,000 = \text{Rs. } 100,000$$

$$\text{Sales unit (Q)} = 100,000 \text{ units and } 120,000 \text{ units}$$

$$\text{Selling price per Unit (S)} = \text{Rs. } 10$$

$$\text{Variable cost per unit (V)} = \text{Rs. } 6$$

$$\text{Fixed operating cost (Fc)} = \text{Rs. } 200,000$$

$$\text{Income tax rate (t)} = 35\%$$

$$\begin{aligned}
 \text{a. } \text{EPS}_{\text{old}} &= \frac{[Q(s-v) - FC - I](1-t) - PD}{N} \\
 &= \frac{[100,000(10-6) - 200,000 - 100,000](1-0.35) - 0}{10,000} \\
 &= \text{Rs. 6.5 per share}
 \end{aligned}$$

$$\begin{aligned}
 \text{EPS}_{\text{new}} &= \frac{[Q(s-v) - FC - I](1-t) - PD}{N} \\
 &= \frac{[120,000(10-6) - 200,000 - 100,000](1-0.35) - 0}{10,000} \\
 &= \text{Rs. 11.7 per share}
 \end{aligned}$$

$$\begin{aligned}
 \text{percentage increase in EPS} &= \frac{\text{EPS}_{\text{new}} - \text{EPS}_{\text{old}}}{\text{EPS}_{\text{old}}} \\
 &= \frac{11.7 - 6.5}{6.5} \\
 &\approx 80\%
 \end{aligned}$$

$$\text{b. Degree of financial leverage (DFL)} = \frac{Q(s-v) - FC}{Q(s-v) - FC - I}$$

$$\begin{aligned}
 \text{For 100,000 units} &= \frac{100,000(10-6) - 200,000}{100,000(10-6) - 200,000 - 100,000} \\
 &= 2 \text{ times}
 \end{aligned}$$

$$\begin{aligned}
 \text{For 120,000 units} &= \frac{120,000(10-6) - 200,000}{120,000(10-6) - 200,000 - 100,000} = 1.56 \text{ times}
 \end{aligned}$$

c. Degree of operating leverage (DOL) =  $\frac{Q(s-v)}{Q(s-v)-FC}$

For 100,000 units =  $\frac{100,000(10-6)}{100,000(10-6)-200,000} = 2 \text{ times}$

For 120,000 units =  $\frac{120,000(10-6)}{120,000(10-6)-200,000} = 1.71 \text{ times}$

d. The degree of operating leverage and financial leverage has been decreased with the increase in sales unit. This implies that firm's operating and financial risk can be reduced by increasing sales.

### Problem 7.20

Soln

Given:

$$\text{Fixed operating cost (Fc)} = \text{Rs. } 12 \text{ m}$$

$$\text{Variable cost ratio} = 0.60 \quad (60\% \text{ of sales})$$

$$\text{Interest (I)} = 25 \text{ m} \times 0.10 + 5 \text{ m} \times 0.12 \\ = 2.5 \text{ m} + 0.6 \text{ m} = 3.1 \text{ m}$$

$$\text{Preference Dividend (PD)} = 1 \text{ m} \times 4 = 4 \text{ m}$$

$$\text{Number of shares (N)} = 2 \text{ m shares}$$

$$\text{Tax rate (t)} = 40\%$$

$$\text{Sales} = \text{Rs. } 100 \text{ m}$$

$$VC = 60\% \text{ of } 100 \text{ m} = \text{Rs. } 60 \text{ m}$$

a. Degree of operating leverage (DOL) =  $\frac{\text{Sales} - \text{VC}}{\text{Sales} - \text{VC} - \text{FC}}$

=

=

b. Degree of financial leverage (DFL) =  $\frac{\text{Sales} - \text{VC} - \text{FC}}{\text{Sales} - \text{VC} - \text{FC} - I - PD}$

$I-t$

c. Sales = Rs. 80 m

VC = 60% of 80 m = Rs. 48 m

EPS =  $\frac{[\text{Sales} - \text{VC} - \text{FC} - I](1-t) - PD}{N}$

=

### Problem 7.21

Soln

Given:

$$\text{Selling price per unit } (s) = \text{Rs. } 100$$

$$\text{Fixed Cost } (Fc) = \text{Rs. } 200,000$$

$$\text{Variable cost per unit } (v) = \text{Rs. } 50$$

$$\text{Sales Unit } (Q) = 5000 \text{ units}$$

$$\text{EBIT} = \text{Rs. } 50,000$$

$$\text{Total Assets (All equity financed)} = \text{Rs. } 500,000$$

After change:

$$\text{Additional Investment} = \text{Rs. } 400,000$$

$$\text{New fixed cost} = \text{Rs. } 200,000 + \text{Rs. } 50,000 = \text{Rs. } 250,000$$

$$\text{New Variable Cost per Unit } (v) = \text{Rs. } 50 - \text{Rs. } 10 = \text{Rs. } 40$$

$$\text{New Sales Unit } (Q) = 5000 + 2000 = 7000 \text{ units}$$

$$\text{New Selling price per Unit } (s) = \text{Rs. } 95$$

$$\text{Tax Rate } (t) = 0$$

$$\text{Average Cost of Capital} = 10\%$$

a.

$$\text{New EBIT} = \text{New } Q \cdot (s-v) - FC$$

$$= 7000(95 - 40) - 250,000$$

$$= \text{Rs. } 135,000$$

$$\text{Increase in EBIT} = 135,000 - 50,000 = \text{Rs. } 85,000$$

$$\therefore \text{Incremental ROA} = \frac{\text{Additional EBIT}}{\text{Additional Investment}} \times 100$$

$$= \frac{85,000}{400,000} \times 100 \\ = 21.25\%$$

CG should make the change because its incremental ROA is greater than the cost of capital.

b. Borrowed Amount = Rs. 400,000

$$\text{Interest Amount} = 400,000 \times 0.10 = \text{Rs. } 40,000$$

$$\begin{aligned}\text{New NI} &= \text{New } Q(S-V) - FC - I \\ &= 7000(95-40) - 250,000 - 40,000 \\ &= \text{Rs. } 95,000\end{aligned}$$

$$\therefore \text{Increase in NI} = 95,000 - 50,000 = \text{Rs. } 45,000$$

$$\begin{aligned}\% \text{ Incremental ROA} &= \frac{\text{Increase in NI}}{\text{Increase in Assets}} \times 100 \\ &= \frac{45,000}{400,000} \times 100 \\ &= 11.25\%\end{aligned}$$

CG should make the change because its incremental ROA is greater than the cost of capital.

### Problem 7.22

Sol:

Given: Company A

Average selling price ( $s$ ) = Rs. 5

Variable cost ( $v$ ) = 60% of sales

Fixed Operating Cost ( $F_c$ ) = Rs. 150,000

Number of shares ( $N$ ) = 5000 shares

Company B

Number of shares ( $N$ ) = 3000 shares

Debt = Rs. 50,000

Interest ( $I$ ) =  $50,000 \times 0.10 = \text{Rs. } 5,000$

Tax Rate ( $t$ ) = 40%

Sales Unit ( $\ell$ ) = 100,000 units

#### Income statement

	Company A	Company B
Sales Revenue (sales unit ( $\ell$ ) $\times s$ )	500,000	500,000
less: Variable cost ( $100,000 \times 0.60$ )	300,000	300,000
Contribution Margin	200,000	200,000
less: Fixed Cost	150,000	150,000
EBIT	50,000	50,000
less: Interest	0	5,000
EBT	50,000	45,000
less: Tax@ 40%	20,000	18,000
NI	30,000	27,000

$$\text{Degree of Operating Leverage (DOL)} = \frac{\text{CM}}{\text{EBIT}}$$

$$\text{Company A} = \frac{200,000}{50,000} = 4\text{-times}$$

$$\text{Company B} = \frac{200,000}{50,000} = 4\text{-times}$$

$$\text{Degree of financial leverage (DFL)} = \frac{\text{EBIT}}{\text{EBT}}$$

$$\text{Company A} = \frac{50,000}{50,000} = 1\text{-time}$$

$$\text{Company B} = \frac{50,000}{45,000} = 1.11\text{-times}$$

$$\text{Degree of Combined leverage (DCL)} = \text{DOL} \times \text{DFL}$$

$$\text{Company A} = 4 \times 1 = 4\text{-times}$$

$$\text{Company B} = 4 \times 1.11 = 4.44\text{-times}$$

(b) Company A and Company B, both have same operating risk due to equal DOL whereas Company B has more financial risk than that of Company A due to higher degree of financial leverage (DFL).

**Problem 7.23**

Soln

Given:

$$\text{Additional Capital} = 50\% \text{ of } 200,000 = \text{Rs.} 100,000$$

Common Stock

$$\text{New Shares (N)} = \frac{100,000}{25}$$

$$= 4000 \text{ shares}$$

$$\text{PE Ratio} = 12 \text{ times}$$

$$\text{Old shares (N)} = \frac{60,000}{10}$$

$$= 6000 \text{ shares}$$

Debt (8%)

$$\text{New Interest} = \frac{100,000 \times 0.08}{25}$$

$$= \text{Rs.} 8000$$

$$\text{PE Ratio} = 10 \text{ times}$$

$$\text{Old interest} = \frac{60,000 \times 0.06}{10}$$

$$= \text{Rs.} 3600$$

a. Calculation of Market price using common stock financing

Sales

$$\text{Rs.} 500,000$$

$$\text{Rs.} 10,00,000$$

$$\text{EBIT (32\% of sales)} \quad \text{Rs.} 60,000$$

$$\text{Rs.} 120,000$$

$$\text{less: Interest} \quad \text{Rs.} 3600$$

$$\text{Rs.} 3600$$

$$\text{EBT} \quad \text{Rs.} 56,400$$

$$\text{Rs.} 116,400$$

$$\text{less: Tax @ 50 \%} \quad \text{Rs.} 28,200$$

$$\text{Rs.} 58,200$$

$$\text{NI} \quad \text{Rs.} 28,200$$

$$\text{Rs.} 58,200$$

$$\text{EPS} = \frac{\text{NI}}{\text{No. of shares}}$$

$$28,200$$

$$58,200$$

$$10,000$$

$$10,000$$

$$= \text{Rs.} 2.82$$

$$\text{Rs.} 5.82$$

$$\text{MPS} = \text{EPS} \times \text{PE Ratio}$$

$$2.82 \times 12$$

$$5.82 \times 12$$

$$= \text{Rs.} 33.84$$

$$= \text{Rs.} 69.84$$

### Calculation of market price using Debt financing:

Sales	Rs. 500,000	Rs. 10,00,000
EBIT (12% of sales)	Rs. 60,000	Rs. 120,000
less: Interest (3600+8000)	Rs. 11,600	Rs. 11,600
EBT	Rs. 48,400	Rs. 108,400
less: Tax @ 50%	Rs. 24,200	Rs. 54,200
NI	Rs. 24,200	Rs. 54,200
EPS = $\frac{NI}{\text{No. of shares}}$	= $\frac{24,200}{6000}$	= $\frac{54,200}{6000}$
	= Rs. 4.03	= Rs. 9.03
MPS = EPS X PE Ratio	4.03 X 10	9.03 X 10
	= Rs. 40.3	= Rs. 90.3

b.

Given:

$$\text{Sales} = \text{Rs. } 500,000$$

$$\text{Average selling price per unit (s)} = \text{Rs. } 10$$

$$\text{Variable cost per unit (v)} = \text{Rs. } 4$$

$$\text{Total fixed cost (Fc)} = \text{Rs. } 240,000$$

$$\text{Unit of output (Q)} = 50,000 \text{ units}$$

### Debt Financing:

$$\text{Degree of operating leverage (DOL)} = \frac{Q(s-v)}{Q(s-v) - Fc} = \frac{50,000(10-4)}{50,000(10-4) - 240,000} = 5 \text{ times}$$

$$\text{Degree of Financial leverage (DFL)} = \frac{\text{EBIT}}{\text{EBT}} = \frac{60,000}{48,400} = 1.24\text{-times}$$

$$\text{Degree of Combined leverage (DCL)} = \text{DOL} \times \text{DFL} = 5 \times 1.24 = 6.2\text{-times}$$

Common stock financing:

$$\begin{aligned}\text{Degree of Operating leverage (DOL)} &= \frac{Q(s-v)}{Q(s-v) - FC} \\ &= \frac{50,000(10-4)}{50,000(10-4) - 240,000} \\ &= 5\text{-times}\end{aligned}$$

$$\text{Degree of financial leverage (DFL)} = \frac{\text{EBIT}}{\text{EBT}} = \frac{60,000}{56,400} = 1.06\text{-times}$$

$$\begin{aligned}\text{Degree of combined leverage (DCL)} &= \text{DOL} \times \text{DFL} \\ &= 5 \times 1.06 = 5.3\text{-times}\end{aligned}$$

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