Risk and Return

OUTLINE

- Risk and Return of a Single Asset
- Risk and Return of a Portfolio
- Measurement of Market Risk
- Relationship between Risk and Return

Past Returns:

$$\text{Holding Period Return} = \frac{\text{Dividend} + (\text{Price at the End} - \text{Price at the beginning})}{\text{Price at the beginning}}$$

$$\text{Annualised Return} = \frac{\text{Holding Period Return}}{\text{Holding period in months}} \times 12 \text{ months}$$

RISK AND RETURN OF A SINGLE ASSET

$$\text{Rate of Return} = \underbrace{\frac{\text{Annual income}}{\text{Beginning price}}}_{\text{Current yield}} + \underbrace{\frac{\text{Ending price-Beginning price}}{\text{Beginning price}}}_{\text{Capital gains /loss yield}}$$

Example

- Consider the following information for an equity stock
- Price at the beginning of the year : Rs. 60
- Dividend paid at the end of the year : Rs. 2.40
- Price at the end of the year : Rs. 69
- Calculate the total return on this stock

- Soln : =(2.40/60 + (69-60)/60) *100 = 19%

AVERAGE ANNUAL RETURNS

The arithmetic mean is defined as:

$$\bar{R} = \frac{\sum_{i=1}^{n} R_i}{n} \quad (8.$$

where $\bar{R}$ is the arithmetic mean , R_i is the i the value of the total return (i= 1,...n) n is the number of total returns.

To illustrate, suppose the total returns from stock A over a five year period are as follows:

Year	Total return (percentage)
1	19.0
2	14.0
3	22.0
4	-12.0
5	5.0

The arithmetic mean return for stock A is:

$$\bar{R} = \frac{19 + 14 + 22 - 12 + 5}{5} = 9.6 \text{ percent}$$

AVERAGE ANNUAL RETURNS

To calculate the average compound rate of growth over a period of time, the **geometric mean** is used. The geometric mean is defined as follows:

$$GM = \left[(1+R_1)(1+R_2)\ldots.(1+R_n)\right]^{1/n} - 1 \qquad (8.3)$$

where GM is the geometric mean return, R_i is the total return for period $i (i = 1, \ldots. n)$, and n is the number of time periods.

To illustrate, consider the total return relative $(1+R_i)$ for stock A over a 5- year period:

Year	Total return (%)	Return relative ($1+R_i$)
1	19	1.19
2	14	1.14
3	22	1.22
4	-12	0.88
5	5	1.05

The geometric mean of the returns over the 5 year period is:

$$GM = \left[(1.19)(1.14)(1.22)(0.88)(1.05)\right]^{1/5} - 1$$

$$= 1.089 - 1 = 0.089 \text{ or } 8.9 \text{ percent}$$

DATA ON THE NIFTY INDEX

Year ending	*NIFTY*	*Annual return (%)*	*Year ending*	*NIFTY*	*Annual return (%)*
1990	331	-	2002	1094	3.25
1991	559	68.84	2003	1880	71.90
1992	761	36.28	2004	2081	10.68
1993	1043	36.95	2005	2837	36.34
1994	1182	13.40	2006	3966	39.83
1995	909	-23.15	2007	6139	54.77
1996	899	-1.04	2008	2959	-51.79
1997	1079	20.05	2009	5201	75.76
1998	884	-18.08	2010	6135	17.95
1999	1480	67.42	2011	4624	-24.62
2000	1264	-14.65	2012	5905	27.70
2001	1059	-16.18	2013	6304	6.76
			2014	8284	31.41

DATA ON THE NIFTY INDEX

The return for the year ended 1991 is 559/331- 1 = 68.88 percent. The returns for other years have been calculated the same way. The means of the returns are calculated as under:

Arithmetic Mean = (68.84 + 36.28 +----------+ 6.76 + 31.41)/ 24 = 19.57 percent

Geometric Mean=$(1.6884 \times 1.3628 \text{----------} \times 1.0676 \times 1.3141)^{1/24} - 1$ = (25.0378)1/24-1 = 14.36 percent

VARIANCE OF RETURNS

$$\sigma^2 = \frac{\sum_{i=1}^{n} (R_i - \bar{R})^2}{n-1} \qquad (8.4)^1$$

where σ^2 is the variance of return, σ is the standard deviation of return, Ri is the return from the stock in period i (i =1,…., n), R is the arithmetic return, and n is the number of periods.

VARIANCE OF RETURNS

To illustrate, consider the returns from a stock over a 6 year period:

$R_1 = 15\%$, $R_2 = 12\%$, $R_3 = 20\%$, $R_4 = -10\%$, $R_5 = 14\%$, and $R_6 = 9\%$

The variance and standard deviation of returns are calculated below:

Period	Return	Deviation	Square of deviation
		$(R_i - \overline{R})$	$(R_i - \overline{R})^2$
1	15	5	25
2	12	2	4
3	20	10	100
4	-10	-20	400
5	14	4	16
6	9	-1	1
	$\sum R_i = 60$ $\overline{R} = 10$		$\sum (R_i - \overline{R})^2 = 546$

$$\sigma^2 = \left(\frac{\sum (R_i - \overline{R})^2}{n-1} \right) = 109.2 \quad \sigma = \left(\frac{\sum (R_i - \overline{R})^2}{n-1} \right)^{1/2} = \left(\frac{546}{6-1} \right)^{1/2} = 10.45$$

PROBABILITY DISTRIBUTION AND EXPECTED RATE OF RETURN

		Rate of Return (%)	
State of the Economy	*Probability of Occurrence*	*Bharat Foods*	*Oriental Shipping*
Boom	0.30	16	40
Normal	0.50	11	10
Recession	0.20	6	-20

$$E(R) = \sum_{i=1}^{n} p_i R_i \qquad (8.1)$$

Similarly, the expected rate of return on Oriental Shipping stock is:

$E(Ro) = (0.30)\ (40\%) + (0.50)\ (10\%) + (0.20)\ (-20\%) = 13.0\%$

STANDARD DEVIATION

Illustration of the Calculation of Standard Deviation

Bharat Foods Stock

i. State of the Economy	p_i	R_i	p_iR_i	R_i-$E(R)$	$(R_i$-$E(R))^2$	$p_i(R_i$-$E(R))^2$
1. Boom	0.30	16	4.8	4.5	20.25	6.075
2. Normal	0.50	11	5.5	-0.5	0.25	0.125
3. Recession	0.20	6	1.2	-5.5	30.25	6.050

$\Sigma p_i R_i = 11.5$ $\Sigma p_i (R_i - E(R))^2 = 12.25$

$\sigma = [\Sigma p_i (R_i\text{-}E(R))^2]^{1/2} = (12.25)^{1/2} = 3.5\%$

Oriental Shipping Stock

1. Boom	0.30	40	12.0	27.0	729.0	218.7
2. Normal	0.50	10	5.0	-3.0	0.25	4.5
3. Recession	0.20	-20	-4.0	-33.0	1089.00	217.8

$\Sigma p_i R_i = 13.0$ $\Sigma p_i (R_i - E(R))^2 = 441.0$

$\sigma = [\Sigma p_i (R_i\text{-}E(R))^2]^{1/2} = (441.0)^{1/2} = 21.0\%$

RISK AVERSION AND REQUIRED RETURNS

The relationship of a person's certainty equivalent to the expected monetary value of a risky investment defines his attitude toward risk. If the certainty equivalent is less than the expected value, the person is *risk-averse*; if the certainty equivalent is equal to the expected value, the person is *risk-neutral*; finally, if the certainty equivalent is more than the expected value, the person is *risk-loving*.

In general, investors are risk-averse. This means that risky investments must offer higher expected returns than less risky investments to induce people to invest in them. Remember, however, that we are talking about *expected* returns; the *actual* return on a risky investment may well turn out to be less than the *actual* return on a less risky investment.

Put differently, risk and return go hand in hand. This indeed is a well-established empirical fact, particularly over long periods of time.

EXPECTED RETURN ON A PORTFOLIO

- The expected return on a portfolio is simply the weighted average of the expected returns on the assets comprising the portfolio. For example, when a portfolio consists of two securities, its expected return is:
- $E(R_p) = w_1 E(R_1) + (1-w_1) E(R_2)$

- Where $E(R_p)$ = Expected return on a portfolio,
- $E(R_1)$ = expected return on a security 1
- $(1-w_1)$ = the proportion of portfolio invested in security 2
- $E(R_2)$ = expected return on a security 2

EXPECTED RETURN ON A PORTFOLIO

- Illustration – consider a portfolio consisting of five securities with the following expected returns
- $E(R_1) = 10\%$, $E(R_2) = 12\%$, $E(R_3) = 15\%$, $E(R_4) = 18\%$, $E(R_5) = 20\%$. The portfolio proportions invested in these securities are w1 = 0.1, w2 = 0.2, w3= 0.3, w4 = 0.2, w5 = 0.2. What is the expected return on portfolio?

$$E(R_p) = \Sigma\, w_i\, E(R_i)$$

$$= 0.1 \text{ x } 10 + 0.2 \text{ x } 12 + 0.3 \text{ x } 15 + 0.2 \text{ x } 18 + 0.2 \text{ x } 20$$

$$= 15.5 \text{ percent}$$

DIVERSIFICATION AND PORTFOLIO RISK

Probability Distribution of Returns

State of the Econcmy	*Probability*	*Return on Stock A*	*Return on Stock B*	*Return on Portfolio*
1	0.20	15%	-5%	5%
2	0.20	-5%	15	5%
3	0.20	5	25	15%
4	0.20	35	5	20%
5	0.20	25	35	30%

Expected Return

Stock A : $0.2(15\%) + 0.2(-5\%) + 0.2(5\%) + 0.2(35\%) + 0.2(25\%) = 15\%$

Stock B : $0.2(-5\%) + 0.2(15\%) + 0.2(25\%) + 0.2(5\%) + 0.2(35\%) = 15\%$

Portfolio of A and B : $0.2(5\%) + 0.2(5\%) + 0.2(15\%) + 0.2(20\%) + 0.2(30\%) = 15\%$

Standard Deviation

Stock A : $\sigma^2_A = 0.2(15-15)^2 + 0.2(-5-15)^2 + 0.2(5-15)^2 + 0.2(35-15)^2 + 0.20\,(25-15)^2$

$= 200$

$\sigma_A = (200)^{1/2} = 14.14\%$

Stock B : $\sigma^2_B = 0.2(-5-15)^2 + 0.2(15-15)^2 + 0.2(25-15)^2 + 0.2(5-15)^2 + 0.2\,(35-15)^2$

$= 200$

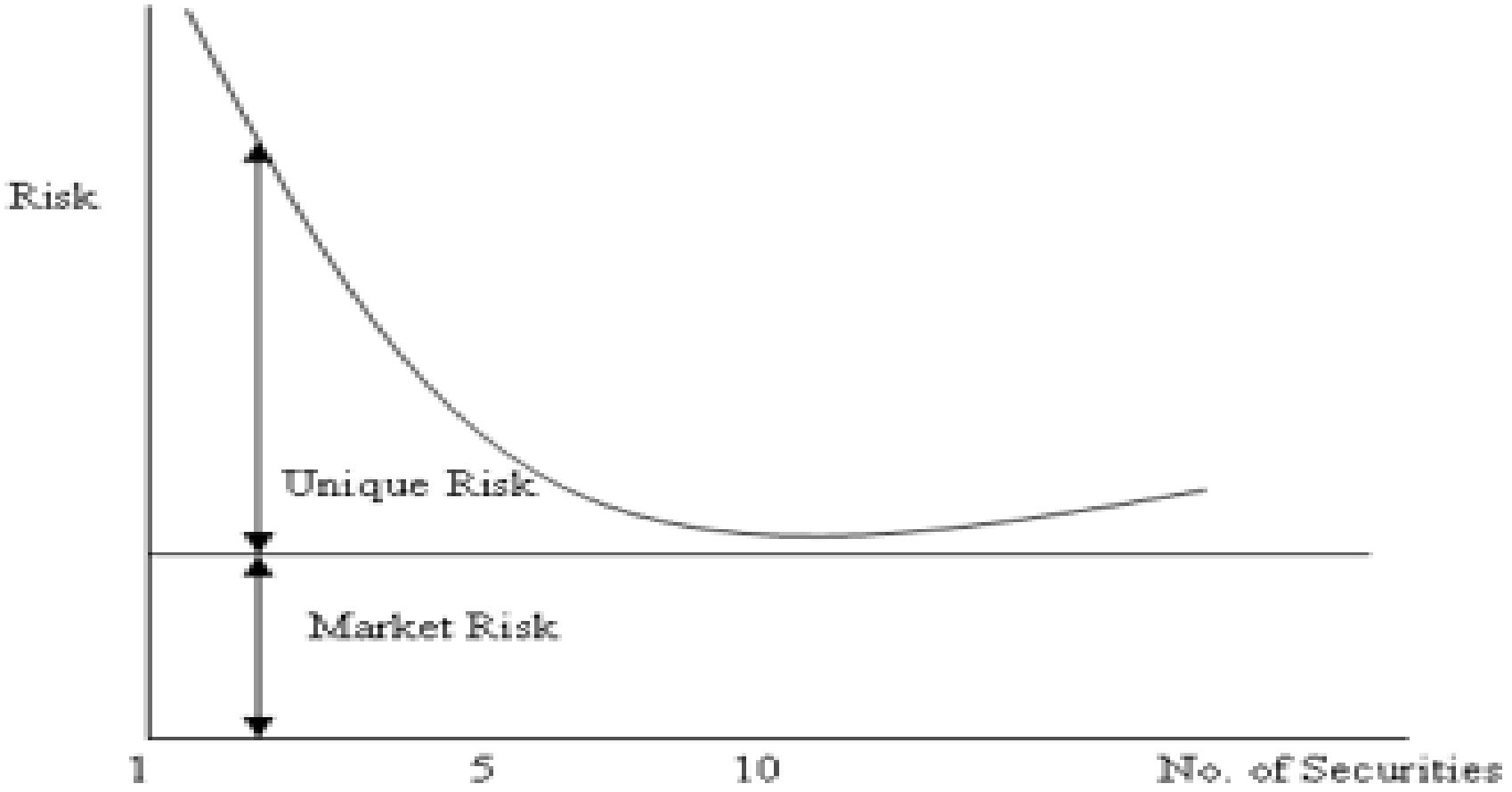
$\sigma_B = (200)^{1/2} = 14.14\%$

Portfolio : $\sigma^2_{(A+B)} = 0.2(5-15)^2 + 0.2(5-15)^2 + 0.2(15-15)^2 + 0.2(20-15)^2 + 0.2(30-15)^2$

$= 90$

$\sigma_{A+B} = (90)^{1/2} = 9.49\%$

RELATIONSHIP BETWEEN DIVERSIFICATION AND RISK



MARKET RISK VS UNIQUE RISK

Total Risk = Unique risk + Market risk

Unique risk of a security represents that portion of its total risk which stems from company-specific factors.

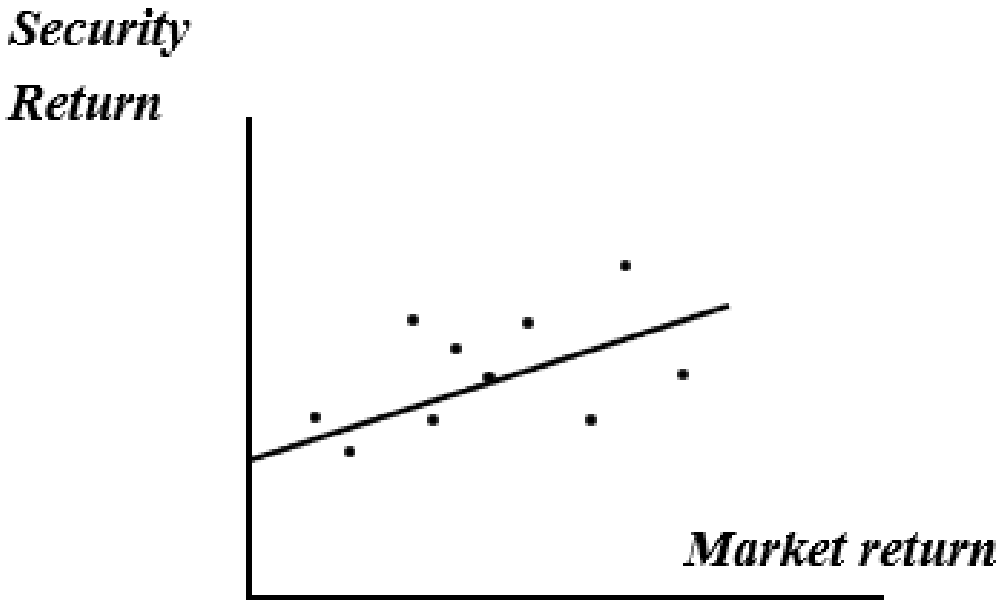
Market risk of security represents that portion of its risk which is attributable to economy –wide factors.

MEASUREMENT OF MARKET RISK

The sensitivity of a security to market movements is called beta .

Beta reflects the slope of a linear regression relationship between the return on the security and the return on the portfolio

Relationship between Security Return and Market Return



CALCULATION OF BETA

For calculating the beta of a security, the following market model is employed:

$$R_{jt} = \alpha_j + \beta_j R_{Mt} + e_j$$

where R_{jt} = **return of security *j* in period *t***

α_j = **intercept term alpha**

β_j = **regression coefficient, beta**

R_{Mt} = **return on market portfolio in period *t***

e_j = **random error term**

Beta reflects the slope of the above regression relationship. It is equal to:

$$\beta_j = \frac{\text{Cov}\,(R_j, R_M)}{\sigma^2_M} = \frac{\rho_{jM}\,\rho_j\,\sigma_M}{\sigma^2_M} = \frac{\rho_{jM}\,\sigma_j}{\sigma_M}$$

where Cov = covariance between the return on security *j* and the return on market portfolio *M*. It is equal to:

$$\sum_{i=1}^{n} (R_{jt} - \bar{R}_j)(R_{Mt} - \bar{R}_M)/(n-1)$$

CALCULATION OF BETA

Historical Market Data

Year	R_{jt}	R_{Mt}	$R_{jt}-\bar{R}_j$	$R_{Mt}-\bar{R}_M$	$(R_{jt}-\bar{R}_j)(R_{Mt}-\bar{R}_M)$	$(R_{Mt}-\bar{R}_M)^2$
1	10	12	-2	-1	2	1
2	6	5	-6	-8	48	64
3	13	18	1	5	5	25
4	-4	-8	-16	-21	336	441
5	13	10	1	-3	-3	9
6	14	16	2	3	6	9
7	4	7	-8	-6	48	36
8	18	15	6	2	12	4
9	24	30	12	17	204	289
10	22	25	10	12	120	144

$\Sigma R_{jt} = 120$ $\Sigma R_{Mt} = 130$ $\Sigma (R_{jt}-\bar{R}j)(R_{Mt}-\bar{R}_M) = 778$ $\Sigma(R_{Mt}-\bar{R}_M)^2 = 1022$

$\bar{R}_j = 12$ $\bar{R}_M = 13$ $Cov(R_{jt}, R_{Mt}) = 778/9 = 86.4$ $\sigma^2{}_M = 1022/9 = 113.6$

$$\text{Beta}: \beta j = \frac{Cov(R_{jt}, R_{Mt})}{\sigma^2{}_M} = \frac{86.4}{113.6} = 0.76$$

$$\text{Alpha}: a_j = \bar{R}_j - \beta_j \bar{R}_M = 12 - (0.76)(13) = 2.12\%$$

RECAPITULATION OF THE STORY SO FAR

- Securities are risky because their returns are variable.
- The most commonly used measure of risk or variability in finance is standard deviation.
- The risk of a security can be split into two parts: unique risk and market risk.
- Unique risk stems from firm-specific factors, whereas market risk emanates from economy-wide factors.
- Portfolio diversification washes away unique risk, but not market risk. Hence, the risk of a fully diversified portfolio is its market risk.
- The contribution of a security to the risk of a fully diversified portfolio is measured by its beta, which reflects its sensitivity to the general market movements.

IMPLICATIONS

- Diversification is important. Owning a portfolio dominated by a small number of stocks is a risky proposition.
- While diversification is desirable , an excess of it is not. There is hardly any gain in extending diversification beyond 10 to 12 stocks.
- The performance of well –diversified portfolio more or less mirrors the performance of the market as a whole.
- In a well ordered market, investors are compensated primarily for bearing market risk, but not unique risk. To earn a higher expected rate on return, one has to bear a higher degree of market risk.

SUMMARY

- Risk is present in virtually every decision. Assessing risk and incorporating the same in the final decision is an integral part of financial analysis.
- The **rate of return** on an asset for a given period (usually a period of one year) is defined as follows:

$$\text{Rate of return} = \frac{\text{Annual income} + (\text{Ending price} - \text{Beginning price})}{\text{Beginning price}}$$

- Based on the probability distribution of the rate of return, two key parameters may be computed: expected rate of return and standard deviation.
- The **expected rate of return** is the weighted average of all possible returns multiplied by their respective probabilities. In symbols,

$$E(R) = \Sigma\, p_i\, R_i$$

SUMMARY

- Risk refers to the dispersion of a variable. It is commonly measured by the variance or the standard deviation.
- The **variance** of a probability distribution is the sum of the squares of the deviations of actual returns from the expected return, weighted by the associated probabilities. In symbols,

$$\sigma^2 = \Sigma\, p_i\, (R_i - R)^2$$

- **Standard deviation** is the square root of variance.
- The expected return on a portfolio is simply the weighted average of the expected returns on the assets comprising the portfolio. In general, when the portfolio consists of n securities, its expected return is:

$$E(R_{p)} = \Sigma w_i\, \mathrm{E}(\mathrm{R_i})$$

- If returns on securities do not move in perfect lockstep, diversification reduces risk.

SUMMARY

- As more and more securities are added to a portfolio, its risk decreases, but at a decreasing rate. The bulk of the benefit of **diversification** is achieved by forming a portfolio of about 10 securities.
- The following relationship represents a basic insight of **modern portfolio theory**:

  Total risk = Unique risk + Market risk
- The **unique risk** of a security represents that portion of its total risk which stems from firm-specific factors. It can be washed away by combining it with other securities. Hence, unique risk is also referred to as diversifiable risk or **unsystematic risk.**
- The **market risk** of a security represents that portion of its risk which is attributable to economy-wide factors. It is also referred to as **systematic risk** (as it affects all securities) or non-diversifiable risk (as it cannot be diversified away).
- The market risk of a security reflects its sensitivity to market movements. It is called **beta.**

3.1 Operating & Financial Leverage

Leverage

- **Leverage refers to the use of an asset or source of funds which involves fixed costs or fixed returns. As a result, the earnings available to the shareholders/owners are affected as also their risk. There are three types of leverage, namely,**

1) **Operating**
2) **Financial**
3) **Combined**

Operating Leverage

•Leverage associated with asset acquisition or investment activities is referred to as the operating leverage. It refers to the firm's ability to use fixed operating costs to magnify the effect of changes in sales on its operating profits (EBIT) and results in more than a proportionate change (±) in EBIT with change in the sales revenue.

Degree of operating leverage (DOL) is computed in two ways:

- **Percentage change in EBIT/Percentage change in sales and**
- **(Sales – Variable costs)/EBIT.**

Operating Leverage

- **The operating leverage is favourable when increase in sales volume has a positive magnifying effect on EBIT. It is unfavourable when a decrease in sales volume has a negative magnifying effect on EBIT. Therefore, high DOL is good when sales revenues are rising and bad when they are falling.**
- **The DOL is a measure of the business/operating risk of the firm. Operating risk is the risk of the firm not being able to cover its fixed operating costs. The larger is the magnitude of such costs, the larger is the volume of sales required to recover them. Thus, the DOL depends on fixed operating costs.**

Example 1

A firm sells products for Rs 100 per unit, has variable operating costs of Rs 50 per unit and fixed operating costs of Rs 50,000 per year. Show the various levels of EBIT that would result from sale of (i) 1,000 units (ii) 2,000 units and (iii) 3,000 units.

Solution

If sales level of 2,000 units are used as a base for comparison, the operating leverage is illustrated in Table 1

Table 1 EBIT for Various Sales Levels

	Case 2 – 50%	Base	Case 1 + 50%
1. Sales in units	1,000	2,000	3,000
2. Sales revenue	Rs 1,00,000	Rs 2,00,000	Rs 3,00,000
3. Less: Variable operating cost	50,000	1,00,000	1,50,000
4. Contribution	50,000	1,00,000	1,50,000
5. Less: Fixed operating cost	50,000	50,000	50,000
6. EBIT	Zero	50,000	1,00,000
	–100%		+100%

From the results contained in Table 1, certain generalisations follow:

1) Case 1: A 50 per cent increase in sales (from 2,000 to 3,000 units) results in a 100 per cent increase in EBIT (from Rs 50,000 to Rs 1,00,000).
2) Case 2: A 50 per cent decrease in sales (from 2,000 to 1,000 units) results in a 100 per cent decrease in EBIT (from Rs 50,000 to zero).

Example 2

A firm sells its products for Rs 50 per unit, has variable operating costs of Rs 30 per unit and fixed operating costs of Rs 5,000 per year. Its current level of sales is 300 units. Determine the degree of operationg leverage. What will happen to EBIT if sales change: (a) rise to 350 units, and (b) decrease to 250 units?

Solution: The EBIT for various sales levels is computed in Table 2.

Table 2: EBIT at Various Sales Levels

	Case 2 –16.7%	Base	Case 1 +16.7%
1. Sales in units	250	300	350
2. Sales revenue	Rs 12,500	Rs 15,000	Rs 17,500
3. Less: Variable cost	7,500	9,000	10,500
4. Contribution	5,000	6,000	7,000
5. Less: Fixed operating cost	5,000	5,000	5,000
6. EBIT	Zero	1,000	2,000
	– 100%		+ 100%

Interpretation

In case 2, 16.7 per cent decrease in sales volume (from 300 units to 250 units) leads to 100 per cent decline in the EBIT (from Rs 1,000 to zero). On the other hand, a 16.7 per cent increase in the sales level in case 1 (from 300 units to 350 units) results in 100 per cent increase in EBIT (from Rs 1,000 to Rs 2,000).

The two illustrations (Tables 1 and 2) clearly show that when a firm has fixed operating costs, an increase in sales volume results in a more than proportionate increase in EBIT. Similarly, a decrease in the level of sales has an exactly opposite effect. This is operating leverage; the former being favourable leverage, while the latter is unfavourable. Leverage, thus, works in both directions.

Alternative definition of Operating Leverage

When proportionate change in EBIT as a result of a given change in sales is more than the proportionate change in sales, operating leverage exists. The greater the DOL, the higher is the operating leverage. Symbolically,

$$DOL = \frac{\text{Percentage change in EBIT}}{\text{Percentage change in sales}} > 1 \qquad (1)$$

$$\text{Alternatively, } DOL = \frac{\Delta EBIT \div EBIT}{\Delta Q \div Q}$$

$$EBIT = Q(S - V) - F, \; \Delta EBIT = \Delta Q(S - V)$$

Where

Q = Sales quantity in units

S = Selling price per unit

V = Variable cost per unit

F = Total fixed costs.

$$DOL = \frac{\Delta Q(S - V)}{Q(S - V) - F} \times \frac{Q}{\Delta Q} = \frac{Q(S - V)}{Q(S - V) - F} = \frac{\text{Total Contribution (at base level)}}{\text{EBIT (at base level)}} \qquad (2)$$

Applying Equations 1 and 2 to Example 1 we get,

$$\text{DOL} = \frac{+100\%}{+50\%} = 2 \text{ (Case 1)}, \frac{-100\%}{-50\%} = 2 \text{ (Case 2)}$$

$$= \frac{\text{Rs } 1,00,000}{\text{Rs } 50,000} = 2$$

Similarly, in Example 2,

$$\text{DOL} = \frac{+100\%}{+16.7\%} = 6 \text{ (Case 1)}, \frac{-100\%}{-16.7\%} = 6 \text{ (Case 2)}$$

$$= \frac{\text{Rs } 6,000}{\text{Rs } 1,000} = 6$$

Since the DOL exceeds 1 in both the illustrations, operating leverage exists. However, the degree of operating leverage is higher (3 times) in the case of the firm in Example 2 as compared to the firm in Example 1, the respective quotients being 6 and 2. The quotients mean that for every 1 per cent change in sales, there will be 6 per cent (Examples 2) and 2 per cent (Example 1) change in EBIT in the direction the sales change.

Operating leverage exists only when there are fixed operating costs. If there are no fixed operating costs, there will be no operating leverage. Consider Example 3.

Example 3

Particulars	Base Level	New Level
1. Units sold	1,000	1,100
2. Sales price per unit	Rs 10	Rs 10
3. Variable cost per unit	6	6
4. Fixed operating cost	Nil	Nil

Solution The relevant computations are given in Table 3.

TABLE 3 EBIT for Various Sales Volume

Particulars	Base Level	New Level
1. Sales revenues	Rs 10,000	Rs 11,000
2. Less: Variable costs	6,000	6,600
3. Less: Fixed costs	—	—
4. EBIT	4,000	4,400

Applying Equation 1, DOL = 1. Since the quotient is 1, there is no operating leverage.

Financial Leverage

- **Financial leverage is related to the financing activities of a firm. It results from the presence of fixed financial charges (such as interest on debt and dividend on preference shares). Since such financial expenses do not vary with the operating profits, financial leverage is concerned with the effect of changes in EBIT on the earnings available to equity-holders. It is defined as the ability of a firm to use fixed financial charges to magnify the effect of changes in EBIT on the earnings per share (EPS).**

Financial Leverage

- **Financial leverage involves the use of funds obtained at a fixed cost in the hope of increasing the return to the equity-holders. When a firm earns more on the assets purchased with the funds than the fixed cost of their use, the financial leverage is favourable. Unfavourable leverage occurs when the firm does not earn as much as the funds cost.**
- **High fixed financial costs increase the financial leverage and, thus, financial risk. The financial risk refers to the risk of the firm not being able to cover its fixed financial costs. In case of default, the firm can be technically forced into liquidation. The larger is the amount of fixed financial costs, the larger is EBIT required to recover them. Thus, the DFL depends on fixed financial costs.**

Example 4

The financial manager of the Hypothetical Ltd expects that its earnings before interest and taxes (EBIT) in the current year would amount to Rs 10,000. The firm has 5 per cent bonds aggregating Rs 40,000, while the 10 per cent preference shares amount to Rs 20,000. What would be the earnings per share (EPS)? Assuming the EBIT being (i) Rs 6,000, and (ii) Rs 14,000, how would the EPS be affected? The firm can be assumed to be in the 35 per cent tax bracket. The number of outstanding ordinary shares is 1,000.

Solution

TABLE 4 EPS for Various EBIT Levels

	Case 2	Base	Case 1
	–40%		+40%
EBIT	Rs 6,000	Rs 10,000	Rs 14,000
Less: Interest on bonds	2,000	2,000	2,000
Earnings before taxes (EBT)	4,000	8,000	12,000
Less: Taxes (35%)	1,400	2,800	4,200
Earning after taxes (EAT)	2,600	5,200	7,800
Less: Preference dividend	2,000	2,000	2,000
Earnings available for ordinary shareholders	600	3,200	5,800
Earnings per share (EPS)	0.6	3.2	5.8
	– 81.25%		+81.25%

The interpretation of Table 4 is as follows:

Case 1:

A 40 per cent increase in EBIT (from Rs 10,000 to Rs 14,000) results in 81.25 per cent increase in EPS (from Rs 3.2 to Rs 5.8).

Case 2:

A 40 per cent decrease in EBIT (from Rs 10,000 to Rs 6,000) leads to 81.25 per cent decrease in EPS (from Rs 3.2 to Re 0.6).

Example 5

A company has Rs 1,00,000, 10% debentures and 5,000 equity shares outstanding. It is in the 35 per cent tax-bracket. Assuming three levels of EBIT (i) Rs 50,000, (ii) Rs 30,000, and (iii) Rs 70,000, calculate the change in EPS (base level of EBIT = Rs 50,000).

Solution

TABLE 5 EPS at Various EBIT Levels

	Case 2	Base	Case 1
	–40%		+40%
EBIT	Rs 30,000	Rs 50,000	Rs 70,000
Less: interest	10,000	10,000	10,000
Earnings before taxes	20,000	40,000	60,000
Less: Taxes	7,000	14,000	21,000
Earning after taxes	13,000	26,000	39,000
Earnings per share (EPS)	2.6	5.2	7.8
	– 50%		+50%

Thus, a 40 per cent increase in EBIT in case 2 from the base level of EBIT has led to 50 per cent increase in EPS. And a decrease of 40 per cent in EBIT has decreased the EPS by 50 per cent.

Alternative Definition of Financial Leverage

The procedure outlined above is merely indicative of the presence or absence of financial leverage. Financial leverage can be more precisely expressed in terms of the degree of financial leverage (DFL). The DFL can be calculated by Eq. (3)

$$\text{DFL} = \frac{\text{Percentage change in EPS}}{\text{Percentage change in EBIT}} > 1 \qquad (3)$$

$$\text{Alternatively, DFL} = \frac{\Delta\text{EPS} \div \text{EPS}}{\Delta\text{EBIT} \div \text{EBIT}}$$

$$\text{EPS} = \frac{[(\text{EBIT} - I)(1-t) - D_p]}{N}$$

$$= \frac{[Q(S-V) - F - I](1-t) - D_p}{N}$$

Since, F, I and D_p are constants,

$$\Delta\text{EPS} = [\Delta Q(S-V)](1-t)/N$$

$$\frac{\Delta\text{EPS}}{\text{EPS}} = \frac{[\Delta Q(S-V)](1-t)}{[Q(S-V) - F - I](1-t) - D_p}$$

Dividing numerator and denominator by $(1-t)$

$$= \frac{[\Delta Q(S-V)]}{[Q(S-V) - F - I] - D_p/(1-t)}$$

$$\text{DFL} = \frac{[\Delta Q(S-V)]}{[Q(S-V) - F - I] - D_p/(1-t)} \times \frac{Q(S-V) - F}{Q(S-V)}$$

$$= \frac{Q(S-V) - F}{[Q(S-V) - F - I] - D_p/(1-t)} = \frac{\text{EBIT}}{\text{EBIT} - I - D_p/(1-t)} \qquad (4)$$

Applying Equations 3 to Case 1 and Case 2 in Examples 4 and 5,

(i) For Example 4 : Case 1 $= \frac{+81.25\%}{+40\%} = 2.03$, Case 2 $= \frac{-81.25}{-40\%} = 2.03$

$$= \frac{\text{Rs } 10,000}{\text{Rs } 10,000 - \text{Rs}2,000 - [\text{Rs } 2,000/(1-0.35)]} = 2.03$$

(ii) Example 5 : Case 1 $= \frac{+50\%}{+40\%} = 1.25$, Case 2 $= \frac{-50\%}{-40\%} = 1.25$

$$= \frac{\text{Rs } 50,000}{\text{Rs } 50,000 - \text{Rs } 10,000} = 1.25$$

As a rule, when a percentage change in EPS resulting from a given percentage change in EBIT is greater than the percentage change in EBIT, financial leverage exists. In other words, financial leverage occurs when the quotient in Equation 3 is more than one.

In both the examples, the relevant quotient is larger than one. Therefore, financial leverage exists. But the degree of financial leverage is higher in Example 4 (2.03) than in Example 5 (1.25). The higher the quotient of percentage change in EPS due to percentage change in EBIT, the greater is the degree of financial leverage. The quotient of 2.03 implies that 1 per cent change in EBIT will cause 2.03 per cent change in EPS in the same direction (± increase/decrease) in which the EBIT changes. With 1.25 quotient the proportionate change in EPS as a result of 1 per cent change in EBIT will be comparatively less, that is, 1.25 per cent in either direction.

There will be, however, no financial leverage, if there is no fixed-charged financing. (Table 6).

TABLE 6 EPS at Various EBIT Levels

	Case 2	Base	Case 1
	– 40%		+40%
EBIT	Rs 30,000	Rs 50,000	Rs 70,000
Less: Taxes (0.35)	10,500	17,500	24,500
Earnings available for equity-holders	19,500	32,500	45,500
Number of shares	10,000	10,000	10,000
EPS	1.95	3.25	4.55
	– 40%		+40%

Degree of financial leverage (DFL): Applying Eq. (3)

(i) Case 1 = (+40% / + 40%) = 1

(ii) Case 2 = (-40% / -40%) = 1

Thus, the quotient is 1. Its implication is that 1 per cent change in EBIT will result in 1 per cent change in EPS, that is, proportionate. There is, therefore, no magnification in the EPS.

COMBINED LEVERAGE: TOTAL RISK

Combined leverage is the product of operating leverage and financial leverage.

Total risk is the risk associated with combined leverage.

DCL = DOL X DFL (11)

$$DCL = \frac{\%\text{change in EBIT}}{\%\text{ change in sales}} \times \frac{\%\text{change in EPS}}{\%\text{change in EBIT}} = \frac{\%\text{change in EPS}}{\%\text{change in sales}} \quad (12)$$

$$DCL = \frac{\text{Contributi on}}{\text{EIBT}} \times \frac{\text{EBIT}}{\text{EBIT} - I} = \frac{\text{Contributi on}}{\text{EBIT} - I} \quad (13)$$

Thus, the DCL measures the percentage change in EPS due to percentage change in sales. If the degree of operating leverage of a firm is 6 and its financial leverage is 2.5, the combined leverage of this firm would be 15(6 x 2.5). That is, 1 per cent change in sales would bring about 15 per cent change in EPS in the direction of the change in sales. The combined leverage can work in either direction. It will be favourable if sales increase and unfavourable when sales decrease because changes in sales will result in more than proportionate returns in the form of EPS.

PROBLEM 14.4 Consider the following information for Kaunark Enterprise:

	₹ *in lakh*
EBIT	1,120
PBT	320
Fixed cost	700

Calculate percentage change in earnings per share if sales increased by 5 per cent.

SOLUTION:

(*a*) Degree of operating leverage

$$\text{DOL} = \frac{\text{Contribution}}{\text{EBIT}} = \frac{\text{EBIT + Fixed Cost}}{\text{EBIT}}$$

$$= \frac{1{,}120 + 700}{1{,}120} = 1.625$$

(*b*) Degree of financial leverage

$$\text{DFL} = \frac{\text{EBIT}}{\text{PBT}} = \frac{1{,}120}{320} = 3.5$$

(*c*) Degree of combined leverage

$$\text{DCL} = \text{DOL} \times \text{DFL} = 1.625 \times 3.5 = 5.6875$$

Change in EPS can be calculated as:

$$\text{DCL} = \frac{\%\ \text{Change in EPS}}{\%\ \text{Change in Sales}}$$

$$5.6875 = \frac{\%\ \text{Change in EPS}}{5}$$

$$\%\ \text{change in EPS} = 5 \times 5.6875 = 28.4375\%$$

PROBLEM 14.1 *AB* Ltd needs ₹10 lakh (one million) for expansion. The expansion is expected to yield an annual EBIT of ₹160,000. In choosing a financial plan, *AB* Ltd has an objective of maximizing earnings per share. It is considering the possibility of issuing equity shares and raising debt of ₹100,000, or ₹400,000 or ₹600,000. The current market price per share is ₹25 and is expected to drop to ₹20 if the funds are borrowed in excess of ₹500,000. Funds can be borrowed at the rates indicated below: (*a*) up to ₹100,000 at 8%; (*b*) over ₹100,000 up to ₹500,000 at 12%; (*c*) over ₹500,000 at 18%.

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

Solution

SOLUTION:

The EPS is determined as follows:

	Alternatives		
	I (₹100,000 debt) ₹	*II* (₹400,000 debt) ₹	*III* (₹600,000 debt) ₹
EBIT	160,000	160,000	160,000
Interest	8,000	44,000	74,000
PBT	152,000	116,000	86,000
Taxes at 50%	76,000	58,000	43,000
PAT	76,000	58,000	43,000
No. of shares	36,000	24,000	20,000
EPS	2.11	2.42	2.15

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

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

Interest Calculation, Alternative II

₹		₹
100,000 @	8%	8,000
300,000 @	12%	36,000
	Total	44,000

Interest Calculation, Alternative III

₹		₹
100,000 @	8%	8,000
400,000 @	12%	48,000
100,000 @	18%	18,000
	Total	74,000

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

EBIT-EPS Analysis

To devise an appropriate capital structure, the amount of EBIT under various financing plans should be related to EPS. The EBIT-EPS analysis is a widely-used method of examining the effect of financial leverage/use of debt. A financial alternative that ensures the largest EPS is preferred, given the level of EBIT.

Example 6

Suppose a firm has a capital structure exclusively comprising of ordinary shares amounting to Rs 10,00,000. The firm now wishes to raise additional Rs 10,00,000 for expansion. The firm has four alternative financial plans:

(A) It can raise the entire amount in the form of equity capital.

(B) It can raise 50 per cent as equity capital and 50 per cent as 5% debentures.

(C) It can raise the entire amount as 6% debentures.

(D) It can raise 50 per cent as equity capital and 50 per cent as 5% preference capital.

Further assume that the existing EBIT are Rs 1,20,000, the tax rate is 35 per cent, outstanding ordinary shares 10,000 and the market price per share is Rs 100 under all the four alternatives.

Which financing plan should the firm select?

Solution

TABLE 7 EPS Under Various Financial Plans

Particulars	Financing plans			
	A	B	C	D
EBIT	Rs 1,20,000	Rs 1,20,000	Rs 1,20,000	Rs 1,20,000
Less: Interest	—	25,000	60,000	—
Earnings before taxes	1,20,000	95,000	60,000	1,20,000
Taxes	42,000	33,250	21,000	42,000
Earnings after taxes	78,000	61,750	39,000	78,000
Less: Preference dividend	—	—	—	25,000
Earnings available to ordinary shareholders	78,000	61,750	39,000	53,000
Number of shares	20,000	15,000	10,000	15,000
Earnings per share (EPS)	3.9	4.1	3.9	3.5

The calculations in Table 7 reveal that given a level of EBIT of Rs 1,20,000, the financing alternative B, which involves 50 per cent ordinary shares and 50 per cent debt, is the most favourable with respect to EPS. Another disclosure of the table is that although the proportion of ordinary shares in the total capitalisation under the financing plan D is also 50 per cent, that is, equal to plan B, EPS is considerably different (lowest). The difference in the plans B and D is due to the fact that interest on debt is tax-deductible while the dividend on preference shares is not. With 35 per cent income tax, the explicit cost of preference shares would be higher than the cost of debt.

Indifference point EBIT level beyond which benefits of financial leverage accrue with respect to EPS.

The indifference point between two methods of financing can be obtained mathematically (algebraic approach) as well as graphically.

Algebraic Approach

Mathematically, the indifference point can be obtained by using the following symbols:

- X = earnings before interest and taxes (EBIT) at the indifference point
- N_1 = number of equity shares outstanding if only equity shares are issued
- N_2 = number of equity shares outstanding if both debentures and equity shares are issued
- N_3 = number of equity shares outstanding if both preference and equity shares are issued
- N_4 = number of equity shares outstanding if both preference shares and debentures are issued
- I = the amount of interest on debentures
- D_P = the amount of dividend on preference shares
- t = corporate income tax rate
- D_t = tax on preference dividend

For a New Company

The indifference point can be determined by using the following equations:

(i)Equity shares versus Debentures : $$\frac{X(1-t)}{N_1}=\frac{(X-I)(1-t)}{N_2} \quad (6)$$

(ii)(a) Equity shares versus Preference shares : $$\frac{X(1-t)}{N_1}=\frac{X(1-t)-D_p}{N_3} \quad (7)$$

(ii)(b) Equity shares versus Preference shares with tax on Preference dividend :

$$\frac{X(1-t)}{N_1}=\frac{X(1-t)-D_p(1+Dt)}{N_3} \quad (7A)$$

(iii)Equity shares versus Preference shares and Debentures : $$\frac{X(1-t)}{N_1}=\frac{(X-I)(1-t)-D_p}{N_4} \quad (8)$$

For an Existing Company

If the debentures are already outstanding, let us assume I_1 = interest paid on existing debt, and I_2 = interest payable on additional debt, then the indifference point would be determined by Equation 9.

$$\frac{(X-I_1)(1-t)}{N_1}=\frac{(X-I_1-I_2)(1-t)}{N_2} \quad (9)$$

Example 7

The financial manager of a company has formulated various financial plans to finance Rs 30,00,000 required to implement various capital budgeting projects:

1) Either equity capital of Rs 30,00,000 or Rs 15,00,000 10% debentures and Rs 15,00,000 equity;
2) Either equity capital of Rs 30,00,000 or 13% preference shares of Rs 10,00,000 and Rs 20,00,000 equity;
3) Either equity capital of Rs 30,00,000 or 13% preference capital of Rs 10,00,000, (subject to dividend tax of 10 per cent), Rs 10,00,000 10% debentures and Rs 10,00,000 equity; and
4) Either equity share capital of Rs 20,00,000 and 10% debentures of Rs 10,00,000 or 13% preference capital of Rs 10,00,000, 10% debentures of Rs 8,00,000 and Rs 12,00,000 equity.

You are required to determine the indifference point for each financial plan, assuming 35 per cent corporate tax rate and the face value of equity shares as Rs 100.

Solution

$$(i)\ \frac{X(1-t)}{N_1} = \frac{(X-I)(1-t)}{N_2}$$

$$Or\ \frac{X(1-0.35)}{30,000} = \frac{(X-Rs\,1,50,000)(1-0.35)}{15,000}$$

$$Or\ \frac{0.65X}{30,000} = \frac{0.65X - Rs\,97,500}{15,000}$$

$$Or\ 0.65X = 1.3X - Rs\,1,95,000$$

$$Or\ -0.65X = -Rs\,1,95,000$$

$$X = Rs\,1,95,000 / 0.65 = Rs\,3,00,000$$

Confirmation Table

Particulars	Equity financing	Equity + debt financing
EBIT	Rs 3,00,000	Rs 3,00,000
Less: Interest	—	1,50,000
Earning before taxes	3,00,000	1,50,000
Less: Taxes	1,05,000	52,500
Earnings for equity-holders	1,95,000	97,500
Number of equity shares	30,000	15,000
EPS	6.5	6.5

(ii) $\frac{X(1-t)}{N_1} = \frac{(X-I)-D_p}{N_3}$

Or $\frac{X(1-0.35)}{30,000} = \frac{(1-0.35)-Rs\,1,30,000}{20,000}$

Or $\frac{0.65X}{30,000} = \frac{0.65X-Rs1,30,000}{20,000}$

$X = Rs\,6,00,000$

Confirmation Table

Particulars	Equity financing	Equity + Preference financing
EBIT	Rs 6,00,000	Rs 6,00,000
Less: Taxes	2,10,000	2,10,000
Earning after taxes	3,90,000	3,90,000
Less: Dividends on preference shares	—	1,30,000
Earnings for equity-holders	3,90,000	2,60,000
Number of equity shares	30,000	20,000
EPS	13	13

$$(iii)\ \frac{X(1-t)}{N_1} = \frac{(X-I)-D_p(1+Dt)}{N_2}$$

$$Or\ \frac{X(1-0.35)}{30{,}000} = \frac{(X-Rs\,1{,}00{,}000)(1-0.35)-Rs\,1{,}30{,}000(1+0.1)}{10{,}000}$$

$$Or\ \frac{0.65X}{30{,}000} = \frac{0.65X-Rs\,65{,}000-Rs\,1{,}43{,}000}{10{,}000}$$

$$X = Rs\,4{,}80{,}000$$

Confirmation Table

Particulars	Equity financing	Equity + Preference + Debentures financing
EBIT	Rs 4,80,000	Rs 4,80,000
Less: Interest	—	1,00,000
Earnings after interest	4,80,000	3,80,000
Less: Taxes	1,68,000	1,33,000
Earning after taxes	3,12,000	2,47,000
Less: Dividends including dividend tax on preference shares	—	1,43,000
Earnings available for equity holders	3,12,000	1,04,000
Number of equity shares	30,000	10,000
EPS	18.4	18.4

$$(iv)\ \frac{(X-1)(1-t)}{N_2}=\frac{(X-I)(1-t)-D_p}{N_4}$$

$$Or\ \frac{(X-Rs\,1,00,000)(1-0.35)}{20,000}=\frac{(X-80,000)(1-0.35)-1,30,000}{12,000}$$

$$X=Rs\,5,50,000$$

Confirmation Table

Particulars	Equity financing	Equity + Debt + Preference financing
EBIT	Rs 5,50,000	Rs 5,50,000
Less: Interest	1,00,000	80,000
Earnings before taxes	4,50,000	4,70,000
Less: Taxes	1,57,500	1,64,500
Earning after taxes	2,92,500	3,05,500
Less: Dividends on preference shares	—	1,30,000
Earnings for equity-holders	2,92,500	1,75,500
Number of equity shares	20,000	12,000
EPS	14.625	14.625

PROBLEM 14.2 A company needs ₹500,000 for construction of a new plant. The following three financial plans are feasible: (*i*) The company may issue 50,000 ordinary shares at ₹10 per share. (*ii*) The company may issue 25,000 ordinary shares at ₹10 per share and 2,500 debentures of ₹100 denominations bearing a 8 per cent rate of interest. (*iii*) The company may issue 25,000 ordinary shares at ₹10 per share and 2,500 preference shares at ₹100 per share bearing a 8 per cent rate of dividend.

If the company's earnings before interest and taxes are ₹10,000, ₹20,000 ₹40,000, ₹60,000 and ₹100,000, what are the earnings per share under each of the three financial plans? Which alternative would you recommend and why? Determine the indifference points by formulae and graphically. Assume a corporate tax rate of 50 per cent.

The earnings per share under the three financial plans are calculated as follows:

First Alternative:

	₹	₹	₹	₹	₹
EBIT	10,000	20,000	40,000	60,000	1,00,000
Interest	0	0	0	0	0
PBT	10,000	20,000	40,000	60,000	1,00,000
Taxes @ 50%	5,000	10,000	20,000	30,000	50,000
PAT	5,000	10,000	20,000	30,000	50,000
No. of shares	50,000	50,000	50,000	50,000	50,000
EPS	0.10	0.20	0.40	0.60	1.00

Second Alternative:

	₹	₹	₹	₹	₹
EBIT	10,000*	20,000	40,000	60,000	100,000
Interest	20,000*	20,000	20,000	20,000	20,000

	₹	₹	₹	₹	₹
PBT	(10,000)*	0	20,000	40,000	80,000
Taxes @ 50%	(5,000)*	0	10,000	20,000	40,000
PAT	(5,000)*	0	10,000	20,000	40,000
No. of shares	25,000*	25,000	25,000	25,000	25,000
EPS	(0.20)*	0.00	0.40	0.80	1.60

*It is assumed that the company will be able to set-off losses against other profits. If the company has no profits from other operations, losses will be carried forward.

Third Alternative:

	₹	₹	₹	₹	₹
EBIT	10,000	20,000	40,000	60,000	100,000
Interest	0	0	0	0	0
PBT	10,000	20,000	40,000	60,000	100,000
Taxes @ 50%	5,000	10,000	20,000	30,000	50,000
PAT	5,000	10,000	20,000	30,000	50,000
Pref. Dividend	20,000	20,000	20,000	20,000	20,000
PAT for ordinary shareholders	(15,000)	(10,000)	0	10,000	30,000
No. of shares	25,000	25,000	25,000	25,000	25,000
EPS	(0.60)	(0.40)	0.00	0.40	1.20

The choice of the financial plan will depend on the state of economic conditions. If the company's sales are increasing, the earnings per share will be maximum under the second financial alternative. Under favourable conditions, debt financing gives more benefit than equity or preference financing. Debt capital is cheaper than preference capital because interest on debt is tax deductible while preference dividend is not.

The indifference points are determined by formula and graphically as follows:

(*i*) Indifference point between first and second alternatives:

$$\frac{(1-T)\text{EBIT}}{N_1} = \frac{(\text{EBIT}-\text{INT})(1-T)}{N_2}$$

$$\text{EBIT} = \frac{N_1}{N_1 - N_2} \times \text{INT}$$

$$= \frac{50,000}{50,000 - 25,000} \times 20,000$$

$$\text{EBIT} = 2 \times 20,000 = ₹40,000$$

(*ii*) Indifference point between first and thir alternatives:

$$\frac{(1-T)\text{EBIT}}{N_1} = \frac{(1-T)\text{EBIT} - \text{PDIV}}{N_2}$$

$$\text{EBIT} = \frac{N_1}{N_1 - N_2} \times \frac{\text{PDIV}}{1-T}$$

$$= \frac{50,000}{50,000 - 25,000} \times \frac{20,000}{1-0.5}$$

$$\text{EBIT} = 2 \times 40,000 = ₹80,000$$

PROBLEM 14.3 Two firms *A* and *B* have the following information:

(₹ lakh)

	Sales	*Variable Costs*	*Fixed Costs*
Firm *A*	1,800	450	900
Firm *B*	1,500	750	375

You are required to calculate (*a*) profit to sales ratio, (*b*) break-even point, and (*c*) the degree of operating leverage for both firms.

SOLUTION:

(*a*) (*i*) Contribution ratio: Contribution/Sales

$$Firm\ A: \frac{1{,}800-450}{1{,}800} = \frac{1{,}350}{1{,}800} = 0.75 \text{ or } 75\%$$

$$Firm\ B: \frac{1{,}500-750}{1{,}500} = \frac{750}{1{,}500} = 0.50 \text{ or } 50\%$$

(*ii*) Profit margin: Profit/Sales

$$Firm\ A: \frac{1{,}350-900}{1{,}800} = \frac{450}{1{,}800} = 0.25 \text{ or } 25\%$$

$$Firm\ B: \frac{750-375}{1{,}500} = \frac{370}{1{,}500} = 0.25 \text{ or } 25\%$$

(*b*) Break-even point

$$Firm\ A: \frac{900}{0.75} = ₹1{,}200$$

$$Firm\ B: \frac{375}{0.50} = ₹750$$

(c) Degree of operating leverage: Contribution/EBIT

$$\textit{Firm A: } \frac{1{,}350}{450} = 3.0$$

$$\textit{Firm B: } \frac{750}{375} = 2.0$$

PROBLEM 14.4 Consider the following information for Kaunark Enterprise:

	₹ *in lakh*
EBIT	1,120
PBT	320
Fixed cost	700

Calculate percentage change in earnings per share if sales increased by 5 per cent.

SOLUTION:

(*a*) Degree of operating leverage

$$\text{DOL} = \frac{\text{Contribution}}{\text{EBIT}} = \frac{\text{EBIT + Fixed Cost}}{\text{EBIT}}$$

$$= \frac{1{,}120 + 700}{1{,}120} = 1.625$$

(*b*) Degree of financial leverage

$$\text{DFL} = \frac{\text{EBIT}}{\text{PBT}} = \frac{1{,}120}{320} = 3.5$$

(*c*) Degree of combined leverage

$$\text{DCL} = \text{DOL} \times \text{DFL} = 1.625 \times 3.5 = 5.6875$$

Change in EPS can be calculated as:

$$\text{DCL} = \frac{\%\text{ Change in EPS}}{\%\text{ Change in Sales}}$$

$$5.6875 = \frac{\%\text{ Change in EPS}}{5}$$

$$\%\text{ change in EPS} = 5 \times 5.6875 = 28.4375\%$$

Chapter 14

THE COST OF CAPITAL

COST OF CAPITAL

The cost of capital of any investment (project, business, or company) is the rate of return the suppliers of capital would expect to receive if the capital were invested elsewhere in an investment (project, business, or company) of comparable risk

- The cost of capital reflects expected return
- The cost of capital represents an opportunity cost

WEIGHTED AVERAGE COST OF CAPITAL (WACC)

$$WACC = w_E r_E + w_p r_p + w_D r_D (1 - t_c)$$

w_E = proportion of equity

r_E = cost of equity

w_p = proportion of preference

r_p = cost of preference

w_D = proportion of debt

r_D = pre-tax cost of debt

t_c = corporate tax rate

KEY POINTS

- Only three types of capital (equity; nonconvertible, noncallable preference; and nonconvertible, noncallable debt) are considered.
- Debt includes long-term debt as well as short-term debt.
- Non-interest bearing liabilities, such as trade creditors, are not included in the calculation of WACC.

COMPANY COST OF CAPITAL AND PROJECT COST OF CAPITAL

- The company cost of capital is the rate of return expected by the existing capital providers.
- The project cost of capital is the rate of return expected by capital providers for a new project the company proposes to undertake
- The company cost of capital (WACC) is the right discount rate for an investment which is a carbon copy of the existing firm.

COST OF DEBT

$$P_0 = \sum_{t=1}^{n} \frac{I}{(1 + r_D)^t} + \frac{F}{(1 + r_D)^n}$$

P_0 = current price of the debenture

I = annual interest payment

n = number of years left to maturity

F = maturity value

r_D is computed through trial-and-error. A very close approximation is:

$$r_D = \frac{I + (F - P_0)/n}{0.6P_0 + 0.4F}$$

ILLUSTRATION

Face value = 1,000

Coupon rate = 12 percent

Period to maturity = 4 years

Current market price = Rs.1040

The approximate yield to maturity of this debenture is :

$$r_D = \frac{120 + (1000 - 1040) / 4}{0.6 \times 1040 + 0.4 \times 1000} = 10.7 \text{ percent}$$

COST OF PREFERENCE

Given the fixed nature of preference dividend and principal repayment commitment and the absence of tax deductibility, the cost of preference is simply equal to its yield.

ILLUSTRATION

Face value : Rs.100

Dividend rate : 11 percent

Maturity period : 5 years

Market price : Rs.95

Approximate yield :

$$\frac{11 + (100 - 95) / 5}{0.6 \times 95 + 0.4 \times 100} = 12.37 \text{ percent}$$

COST OF EQUITY

- Equity finance comes by way of (a) retention of earnings and (b) issue of additional equity capital.
-

APPROACHES TO ESTIMATE COST OF EQUITY

- Security Market Line Approach
- Bond Yield Plus Risk Premium Approach
- Dividend Growth Model Approach
- Earnings-Price Ratio Approach

SECURITY MARKET LINE APPROACH

$r_E = R_f + \beta_E [E(R_M) - R_f]$

r_E = required return on the equity of the company

R_f = risk-free rate

β_E = beta of the equity of the company

$E(R_M)$ = expected return on the market portfolio

Illustration

$R_f = 7\%, \quad \beta_E = 1.2, \quad E(R_M) = 15\%$

$r_E = 7 + 1.2 [15 - 7] = 16.6\%$

DIVIDEND GROWTH MODEL APPROACH

If the dividend per share grows at a constant rate of g percent.

$$P_0 = \frac{D_1}{r_E - g}$$

$$\text{So, } r_E = \frac{D_1}{P_0} + g$$

Thus, the expected return of equity shareholders, which in equilibrium is also the required return, is equal to the dividend yield plus the expected growth rate

EARNINGS-PRICE RATIO APPROACH

Cost of equity = E_1 / P_O

where E_1 = the expected EPS for the next year

P_O = the current market price

WACC

Source of Capital	*Proportion (1)*	*Cost (2)*	*Weighted Cost [(1) x (2)]*
Debt	**0.60**	**16.0%**	**9.60%**
Preference	**0.05**	**14.0%**	**0.70%**
Equity	**0.35**	**8.4%**	**2.94%**
			WACC = 13.24%

Exercise

- 1) Abascus Limited issued 15 year, 14 precent bonds five years ago. The bond which has a face value of Rs. 100 is currently selling for Rs. 108
- A) what is the pre-tax cost of debt?
- B) what is the after-tax cost of debt? (Assume a 35% tax rate)

- Q.2 Omega Enterprises issued 10 year, 9 precent preference shares four years ago. The preferences share which has a face value of Rs. 100 is currently selling for Rs. 92. What is the cost of preference shares?
- Q.3 Rao corporation has a target capital structure of 60% equity and 40% debt. Its cost of equity is 18% and its pre-tax cost of debt is 13%. If the relevant tax is 35%, what is Ro Corporations WACC?

- Q.4 Unix Limiteds equity beta is 1.2. The market risk premium is 7% and the risk free rate is 10%. Unix has a debt equity ratio of 2:3. Its pre-tax cost of debt is 14%. If the tax rate is 35%, what is the WACC?
- Q.5 Amar corporations WACC is 12% and its tax rate is 35%. Amar's pre-tax cost of debt is 14% and its debt equity ratio is 1:1. Th risk-free rate is 11% and the market risk premium is 8%. Wat is the beta of Amar's equity?

- Q. 6 Suman corporation manufactures speciality chemicals. Its debt-equity ratio is 0.8. Its WACC is 15% and its tax rate is 30%.
- A) If Suman's cost of equity is 20%, what is its pre-tax cost of debt?
- B) If Suman can issue debt at an interest rate of 13%, what is its cost of equity?

- Q.7 Mehta Ltd. WACC is 11% and its tax rate is 35%. Mehta's pre-tax cost of debt is 10% and its debt-equity ratio is 0.6:1. The risk free rate is 8% and the market risk premium is 7%. What is beta of Mehta's equity?

- Q. 7 soln
- =0.6/1.6 * 10% * (1-0.35) + (1.0/1.6 *re) = 11%
- RE = 13.7%
- = 8+ B*7 = 13.7%
- B = 0.814

Answer

- Q.1 a 12.60 b 8.19
- Q.2 10.85%
- Q.3 14.18%
- Q.4 14.68%
- Q. 5 0.49

Factors Affecting the Weighted Average Cost of Capital :

Factors outside a Firm's control:

1. The Level of Interest rates: If interest rates in the economy rise, the cost of debt to firms increases and vice versa. Interest rates also have similar bearing on the cost of preference and cost of equity.
2. Market Risk Premium: The market risk premium reflects the perceived riskiness of equity stocks and investor aversion of risk. The market risk premium affects the cost of equity directly and the cost of debt indirectly (through a substitution effect)
3. Tax Rates: The tax policy of the Government has a bearing on cost of capital. The corporate tax rate has a direct impact on the cost of debt as used in the weighted average cost of capital. The capital gains tax rate relative to the rate an ordinary income has an indirect effect on the cost of equity relative to cost of debt.

Factors Affecting the Weighted Average Cost of Capital :

Factors within Firm's Control:

1. Investment Policy: If a firm plans to invest in assets similar to those currently used, then its marginal cost of capital would be more or less the same as its current cost of capital. On the other hand, if the riskiness of its proposed investments is likely to be very different from the riskiness of its existing investments, its marginal cost of capital should reflect the riskiness of the proposed investments.
2. Capital structure policy: Firm can change its capital structure and such a change is likely to affect the cost of capital because the post – tax cost of debt is lower than the cost of equity.
3. Dividend Policy: The dividend policy of a firm may affect its cost of equity.

EXE Ltd. has the following capital structure as an 31st March, 2000:

10% Debentures	300000
9% Preference Shares	200000
Equity Shares of ₹ 100 each	500000
Total	1000000

The equity shares of the company are quoted at ₹ 102 and the company is expected to declare a dividend of ₹ 9 per share for the year.

Required:

a. Assuming the tax rate applicable to the company to be 50%, calculate the cost of capital.
b. Assuming that the company can raise additional term loan at 12% for ₹ 500000 to finance an expansion, calculate the revised weighted cost of capital. The company's assessment is that it will be in a position to increase dividend from ₹ 9 per share to ₹ 10 per share, but the business risk associated with the new financing may bring down market price from ₹ 102 to ₹ 96 per share.

[Ans: 7.71% ; 7.67%]

Calculate the marginal cost of capital from the following:

Equity	400 lacs
Internal generation	200 lacs
12% Preference shares	100 lacs
13% Debentures	800 lacs
12% cash credit from banks	700 lacs
Current Liabilities	300 lacs
	2500 lacs

The required after – tax rate of return on equity is 18% and on internal cash generation is 15%. The tax rate is 40%.

(Ans: rd = 7.8%; WACC – 11.76%)

1. Ferguson purchased 18 shares of Manchester Ltd., for ₹ 1510 per share on 1/1/2008, during the time span of 2.5 years. Manchester Ltd., paid following dividends per share 2008 - ₹ 120, 2009 - ₹ 170, 2010 - ₹ 230. Ferguson sold the shares on 30-6-2010 for ₹ 2750 per share, find out the holding period returns earned by Ferguson [Ans: 116.56%]
   HPR = ((120+170+230)+(2750-1510))/1510*100) = 116.56%

2. Calculate expected returns from the following information for GEC Ltd.

Month	Returns
April	0.085
May	-0.15
June	-0.295
July	0.1675
August	-0.1575
September	-0.1975
October	-0.1475
November	0.67
December	0.445
January	0.4775
February	-0.1775
March	-0.1375

[Ans: 4.85%]

Arithmetic mean = 0.5825/12 = 0.0485*100 = 4.85%

3. Investor's assessment of return on a share of X Ltd. under three different situations is as follows:

Economic situation	Chance (P)	Return (%)
1	0.20	30
2	0.60	20
3	0.20	30

Calculate the expected rate of return, variance and standard deviation. [Ans: E(R)=20% σ = 6.32%]

4. The current price of stock 'M' is ₹ 210. The future prices with probabilities are given below:

Future Prices (₹)	178.50	199.50	252	283.50	315
Probability	0.15	0.25	0.30	0.2	0.1

Assuming that the company will not pay any dividend you are required to find out expected returns and standard deviation of the stock. [Return = 14.50% σ =21.09%]

Current Price	**210**						
Future Prices	178.5	199.5	252	283.5	315		
Return (r)	**-15**	**-5**	**20**	**35**	**50**		
Probability (P)	0.15	0.25	0.3	0.2	0.1		
pR	-2.25	-1.25	6	7	5	**14.5**	**Exp Ret**
R-Er	-29.5	-19.5	5.5	20.5	35.5		
(R-Er)^2	870.25	380.25	30.25	420.25	1260.25		
p*(R-Er)^2	130.5375	95.0625	9.075	84.05	126.025	**444.75**	**Variance**
						21.0891	**SD**

5. The stock of Box Limited performs well relative to the other stocks during recessionary periods. The stock of Cox Limited, on the other hand, does well during growth periods. Both the stocks are currently selling for Rs. 100 per share. You assess the rupee return (dividend plus price) of these stocks for the next year as follows:

Economic condition	Probability	Return on Box's stock	Return on Cox's stock
High growth	0.3	100	150
Low growth	0.4	110	130
Stagnation	0.2	120	90
Recession	0.1	140	60

Calculate the expected return and standard deviation of investing:

(a) Rs. 1000 in the equity stock of Box Limited [Ans: E(R)=1120 and SD = 116.6]

(b) Rs. 1000 in the equity stock of Cox Limited [Ans: E(R)=1210 and SD = 291.4]

(c) Rs. 500 each in the equity stock of Box Limited and Cox Limited.[Ans: E(R) = 1165 and SD = 89.6]

Box ' s stock							
Economic situation	**Chance (P)**	**Return (%)**	**Overall Return**	**pR**	**Overall R-Er**	**(R-Er)^2**	**p*(R-Er)^2**
High Growth	0.3	100	1000	300	-120	14400	4320
Low Growth	0.4	110	1100	440	-20	400	160
Stagnation	0.2	120	1200	240	80	6400	1280
Recession	0.1	140	1400	140	280	78400	7840
			Er =	1120		**Var =**	13600

Expected (Er)	**1120**
Variance (Var)	**13600**
STD Dev (SD)	**116.62**

Cox's stock							
Economic situation	**Chance (P)**	**Return (%)**	**Overall Return**	**pR**	**Overall R-Er**	**(R-Er)^2**	**p*(R-Er)^2**
High Growth	0.3	150	1500	450	290	84100	25230
Low Growth	0.4	130	1300	520	90	8100	3240
Stagnation	0.2	90	900	180	-310	96100	19220
Recession	0.1	60	600	60	-610	372100	37210
			Er =	1210		**Var =**	84900

Expected (Er)	**1210**
Variance (Var)	**84900**
STD Dev (SD)	**291.38**

If 500 in Box & 500 in Cox stock invested

Economic situation	Chance (P)	Overall Return	pR	Overall R-Er	(R-Er)^2	p*(R-Er)^2
High Growth	0.3	1250	375	85	7225	2167.5
Low Growth	0.4	1200	480	35	1225	490
Stagnation	0.2	1050	210	-115	13225	2645
Recession	0.1	1000	100	-165	27225	2722.5
		Er =	1165		**Var =**	8025

Expected (Er) =	**1165**
Variance (Var) =	**8025**
STD Dev (SD) =	**89.58**

Risk and Return

1. Miss Jyoti purchased 10 shares of Xavier Ltd. on 1/1/2020 for ₹ 75 per share, during the year 2020 Xavier Ltd. paid dividend of ₹ 12 per share. The market price of the share on 31/12/2020 was ₹ 93 per share. You are required to find out the returns earned by Ms. Jyoti during the year 2020.
   Return = [Dividend + (Price at the end – price at the beginning)]/price at the beginning *100
   Return =[12+(93-75)]/75*100 = 40%
2. Ms. Pallai purchased 100 shares of Kumar Ltd on 1/1/2020 for ₹ 95 per share, during the year 2020 Kumar Ltd. paid dividend of ₹ 17 per share. The market price of the share on 31/12/2020 was ₹ 106.50 per share. You are required to find out the returns earned by Ms. Pallai during the year 2020.
   Return = [17+(106.50-95)]/95*100 = 30%
3. Mukesh purchased 5 shares of Multan Ltd. for ₹ 57 each on 1/4/2020, during the year 2020-2021 company paid a dividend of ₹ 5 per share. Mr. Mukesh sold the share on 31/3/2021 for ₹ 50 each. You are required to find out the returns earned by Mukesh during the year 2020-21.
   Return = [5+(50-57)]/57*100 = -3.5%

4. Jones purchased 12 shares of Liverpool Ltd., for ₹ 190 per share on 1/1/2017, during the time span of 3 years Liverpool Ltd., paid following dividends per share 2017 - ₹ 7, 2018 - ₹ 9, 2019 - ₹ 12. Jones sold the shares on 31-12-2019 for ₹ 225 per share, find out the holding period returns earned by Jones. Calculate Annualised returns also.
   Holding period return = [total dividend +(Pe-Pb)]/Pb *100
   HPR = [(7+9+12)+(225-190)]/190*100 = 33.2%
   Annualised Return = 33.2/3 = 11.1%
5. Torres purchased some shares of Ronaldo Ltd. for ₹ 1770 per share on 1/4/2020, he sold the shares on 30/9/2020 for ₹ 2250 per share, during this time period Ronaldo Ltd. paid normal dividends of ₹ 70 per share. Find out the holding period returns of Torres. Also find out Annualised return.
   HPR = [70+(2250-1770)]/1770*100 = 31%
   Annualised Return = 31/6*12 = 62%

6. XYZ Ltd. paid the following dividend per share and had following market price per share during the period 2015 – 2018.

Year	Dividend per share	Market price per share
2015	7	95
2016	9	105
2017	11	90
2018	12	158

   Calculate the annual rate of return for last 3 years.

   Return = [Dividend +(pe-pb)]/pb*100
   2016 = (9+(105-95))/95*100 = 20%

2017 = (11+(90-105))/105*100 = -3.81%

2018 = (12+(158-90))/90*100 = 88.89%

7. Find the expected returns of ABC Ltd.

Year	Dividend per share	Market price per share
2014	1.53	31.25
2015	1.53	20.75
2016	1.53	30.88
2017	2.00	67.00
2018	2.00	100.00
2019	3.00	154.00

Return = [Dividend +(pe-pb)]/pb*100

2015 = [1.53+(20.75-31.25)]/31.25 *100 = -28.7%

2016 = [1.53 + (30.88-20.75)]/20.75*100 = 55.8%

2017 = [2+(67-30.88)]/30.88*100 = 124%

2018 = [2+(100-67)]/67*100 = 52.23%

2019 = [3+(154-100)]/100*100 = 57%

8. Calculate expected returns from the following information for GEC Ltd.

Month	Returns
January	0.034
February	-0.06
March	-0.118
April	0.067
May	-0.063
June	-0.079
July	-0.059
August	0.268
September	0.178
October	0.191
November	-0.071
December	-0.055

Arithmetic mean return = 1.95%

9. Calculate expected returns, variance and standard deviation from the following information for XYZ Ltd.

Month	Returns
January	0.04
February	0.09
March	-0.06
April	0.075
May	-0.05
June	0.08

Month	**Returns**	**Var**
January	**0.04**	**0.000117**
February	**0.09**	**0.003701**
March	**-0.06**	**0.007951**

April	**0.075**	**0.002101**
May	**-0.05**	**0.006267**
June	**0.08**	**0.002584**
	0.175	**0.022721**

Return = 0.175/6 = 0.02917 =29.17%
Total Variance = 0.022721 = 2.27%
Standard Deviation = SQRT(total variance) = 0.061537 = 6.15%

10. Investor's assessment of return on a share of X Ltd. under three different situations is as follows:

Economic situation	Chance (P)	Return (%)
1	0.25	35
2	0.50	30
3	0.25	15

Calculate the expected rate of return, variance and standard deviation.

Economic situation	**Chance (P)**	**Return (%)**	**pR**	**R-Er**	**(R-Er)^2**	**p*(R-Er)^2**
1	0.25	35	8.75	7.5	56.25	14.0625
2	0.5	30	15	2.5	6.25	3.125
3	0.25	15	3.75	-12.5	156.25	39.0625
		Er =	**27.5**		**Var =**	**56.25**

Expected Return (Er) = 27.5%
Variance (Var) = 56.25%
Standard Deviation = SQRT (Var) = 7.5%

11. The current price of stock 'Q' is ₹ 150. The future prices with probabilities are given below:

Future Prices (₹)	120	150	180	210	240
Probability	0.1	0.2	0.4	0.2	0.1

Assuming that the company will not pay any dividend you are required to find out expected returns and standard deviation of the stock.

Current Price	150						
Future Prices	120	150	180	210	240		
Return	**-0.2**	**0**	**0.2**	**0.4**	**0.6**		
Probability	0.1	0.2	0.4	0.2	0.1		
pR	-0.02	0	0.08	0.08	0.06	**0.2**	**Exp Ret**
R-Er	-0.4	-0.2	0	0.2	0.4		
(R-Er)^2	0.16	0.04	0	0.04	0.16		
p*(R-Er)^2	0.016	0.008	0	0.008	0.016	**0.048**	**Variance**

						0.219089	**SD**

12. The risk free return is 10% and the return on market portfolio is 15%. Stock A's Beta is 1.5; its dividends & earnings are expected to grow at the constant rate of 8%. If the previous dividend per share of Stock A was 2. What should be the intrinsic value per share of stock A?
    Rf = 10% ; Rm =15% ; Beta = 1.5
    Ke (re) = Rf + Beta (Rm –Rf)
    Ke = 10+1.5 (15-10) = 10+1.5(5) = 17.5%
    Intrinsic value of share (P0) = D1/(Ke –g) *100
    D1 =D0(1+g)
    D1 =2(1+8%) =2(1.08) = 2.16
    P0 = 2.16/(17.5 – 8)*100 =22.74

13. The risk-free return is 8% and the expected return on a market portfolio is 12%. If the required return on a stock is 15%, what is its beta?
    Rf = 8%; Rm= 12%; Ke =15% ; Beat = ?
    Ke = Rf + Beta (Rm –Rf)
    15 = 8 + Beta (12-8)
    7 = Beta(4)
    Beta = 7/4 = 1.75

14. The risk-free return is 9%. The required return on a stock whose beta is 1.5 is 15%. What is the expected return on the market portfolio?
    Rf =9%; Beta = 1.5; Ke=15%; Rm=?
    Ke = Rf + Beta (Rm – Rf)
    15 = 9 + 1.5 (Rm – 9)
    6 = 1.5(Rm -9)
    4 =Rm -9
    Rm =13%

15. You are considering purchasing the equity stock of MVM company. The current price per share is Rs.10. You expect the dividend a year hence to be Rs. 1.00. You expect the price per share of MVM stock a year hence to have the following probability distribution.

Price a year hence	10	11	12
Probability	0.4	0.4	0.2

    a. What is the expected price per share a year hence?

       Expected price = (10*0.4)+(11*.4)+(12*0.2) = 10.8

16. The stock of Alpha company performs well relative to other stocks during recessionary periods. The stock of Beta company, on the other hand does well during growth periods.

Both stocks are currently selling for Rs.50 per share. The rupee return (dividend plus price change) of these stocks for the next year would be as follows:

Economic condition	Probability	Return on Alpha stock	Return on Beta stock
High growth	0.3	55	75
Low growth	0.3	50	65
Stagnation	0.2	60	50
Recession	0.2	70	40

Calculate the expected return and standard deviation of :

a. Rs. 1000 in the equity stock of Alpha
b. Rs. 1000 in equity stock of Beta

Investment of Rs. 1000 in stock Alpha

Economic situation	Chance (P)	Return (%)	Overall Return	pR	Overall R-Er	(R-Er)^2	p*(R-Er)^2
High Growth	0.3	55	1100	330	-50	2500	750
Low Growth	0.3	50	1000	300	-150	22500	6750
Stagnation	0.2	60	1200	240	50	2500	500
Recession	0.2	70	1400	280	250	62500	12500
			Er =	1150		**Var =**	20500

Expected (Er) =	**1150**
Variance (Var) =	**20500**
STD Dev (SD) =	**143.18**

Investment of Rs. 1000 in stock Beta

Economic situation	Chance (P)	Return (%)	Overall Return	pR	Overall R-Er	(R-Er)^2	p*(R-Er)^2
High Growth	0.3	75	1500	450	200	40000	12000
Low Growth	0.3	65	1300	390	100	10000	3000
Stagnation	0.2	50	1000	200	-200	40000	8000
Recession	0.2	40	800	160	-400	160000	32000
			Er =	1200		**Var =**	55000

Expected (Er) =	**1200**
Variance (Var) =	**55000**
STD Dev (SD) =	**234.52**

1. Calculate operating leverage, financial leverage and combined leverage under situation 1 and 2 in financial plans A & B from the following information relating to the operation and capital structure of a company.

Installed capacity – 2,000 units
Actual production and sales – 50% of the capacity
Selling price ₹20 per unit
Variable Cost ₹10 per unit
Fixed Cost:
Under Situation I ₹ 4,000
Under Situation II ₹ 5,000

Capital Structure:	**Financial Plan**	
	A (₹)	**B (₹)**
Equity	5,000	15,000
Debt (Rate of Interest 10%)	15,000	5,000
	20,000	20,000

Particulars	**Financial Plan A**		**Financial Plan B**	
	Situation 1	**Situation 2**	**Situation 1**	**Situation 2**
units	1000	1000	1000	1000
Sales	20000	20000	20000	20000
Less: Variable Cost	10000	10000	10000	10000
Contribution	10000	10000	10000	10000
Fixed Cost	4000	5000	4000	5000
EBIT	6000	5000	6000	5000
Less: Interest	1500	1500	500	500
EBT	4500	3500	5500	4500
DOL = contribution/EBIT	1.6666667	2	1.66666667	2
DFL = EBIT / EBT	1.3333333	1.4285714	1.09090909	1.1111111
DCL	2.2222222	2.8571429	1.81818182	2.2222222

2. The selected financial data for A, B and C companies for the year ended 31st March, 2014 were as follows:

	A	B	C
Variable cost as a % of sales	66.67	75	50
Interest Expense	200	300	1000
Degree of Operating Leverage	5	6	6
Degree of Financial Leverage	3	4	2
Income Tax rate	35%	35%	35%

Prepare an income statement for each of the companies.

Income Statement:

Particulars	A	B	C
Sales	9000	36000	24000
Less: Variable cost	6000	27000	12000
Contribution	3000	9000	12000
Less: Fixed cost	2400	7500	10000
EBiT	600	1500	2000
Less: Interest	200	300	1000
EBT	400	1200	1000
Less: Tax @ 35%	140	420	350
EAT	260	780	650
DFL	3	4	2
DFL = EBIT/EBT	x/x-200	x/x-300	x/x-1000
DOL	5	6	6
DOL = Contribution / EBIT			
Contribution = DOL * EBIT	5*600	6*1500	6*2000
Variable cost as a % of sales	66.67	75	50

3. From the following prepare income statement of Company A and B.

	A Co.,	B Co.,
Financial Leverage	4:1	5:1
Interest Expense	₹ 6,00,000	₹ 7,00,000
Operating Leverage	3:1	4:1
Variable cost as a % of sales	66.67	50
Income Tax rate	30%	40%
No. of Equity shares	100000	70000

Income Statement:

Particulars	A Co.,	B Co.,
Sales	7200000	7000000
Less: Variable cost	4800000	3500000
Contribution	2400000	3500000
Less: Fixed cost	1600000	2625000
EBiT	800000	875000
Less: Interest	600000	700000
EBT	200000	175000
Less: Tax @ 35%		
EAT		
DFL	4	5
DFL = EBIT/EBT	x/x-600000	x/x-700000
DOL	3	4

DOL = Contribution / EBIT		
Contribution = DOL * EBIT	3*800000	4*875000
Variable cost as a % of sales	66.67	50