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# UNIT 13 LEVERAGE ANALYSIS

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## Objectives

This unit will enable you to:

- acquire an understanding of leverage ratios
- examine the consequences of financial leverage for a business firm
- trace relationship between financial and operating leverages, and
- assess the risk implications of financial leverage.

## Structure

- 13.1 Introduction
- 13.2 Concept of Financial Leverage
- 13.3 Measures of Financial Leverage
- 13.4 Effects of Financial Leverage
- 13.5 Operating Leverage
- 13.6 Combined Leverage
- 13.7 Financial Leverage and Risk
- 13.8 Summary
- 13.9 Key Words
- 13.10 Self-assessment Questions / Exercises
- 13.11 Further readings

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## 13.1 INTRODUCTION

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You have familiarised yourself with the various kinds of financial ratios-both separately and in their broad groupings. Unit 12 on Financial Ratios introduced the four fundamental bases for ratios viz., **liquidity, leverage, activity, and profitability**. The ratios discussed in that unit were picked up on the basis of their relevance in controlling business activities. Accordingly, the liquidity and leverage ratios were not covered.

Even though a firm's management would always be interested in maintaining a satisfactory level of liquidity and solvency, it is the lender or the banker who would insist upon certain norms and would monitor movements in these ratios.

Leverage ratios, which reflect the solvency status of a firm, are covered here in detail. You will get an idea about the basic concept of leverage and will be exposed to the role and effects of financial leverage.

We had covered another leverage concept in the unit titled 'Cost-Volume-Profit Analysis', you will recall the 'break-even analysis' that was explained and illustrated in that unit. We derive from that discussion the term operating leverage and examine its importance. Our discussion will also help you to link-up the two concepts of leverage viz., financial leverage and operating leverage.



## 13.2 CONCEPT OF FINANCIAL LEVERAGE

Consider for a moment the common use of the terms 'level' and 'leverage'. Webster's dictionary defines them as follows:

'Lever' is an inducing or compelling force.

'Leverage' is the action of a lever or the mechanical advantage gained by it; it also means 'effectiveness' or 'power'

The common interpretation of leverage is derived from the use or manipulation of a tool or device termed as lever, which provides a substantive clue to the meaning and nature, of financial leverage. Could you guess it?

Your reply we guess, may well be in the negative.

Now, suppose we suggest that our lever is the use of debt or borrowed funds in financing the acquisition of assets. Would you get somewhere near the concept of the term financial leverage?

Probably, you need a little explanation. We will do that. You have to look at the following simple (and hypothetical) facts about the GTB (Gain Through Borrowing) Limited.

The GTB Limited wanted to purchase fixed assets worth Rs. 80 lakhs for the execution of a project, which was to be financed by raising share capital of Rs. 30 lakhs and term loans of Rs. 50 lakhs. The company was required to earn a minimum return of 20% on its share capital. Other companies of this type were earning this much and unless GTB Limited provided at least this return, no investor would be attracted to buy its shares. The GTB Limited pays tax at 40% and is not required to pay any tax on the interest charges on term-loans.

You may do your own calculations for the two situations. We now pose a question to you: What happens to the company's net return (after interest and taxes) on equity if (a) the whole of Rs. 80 lakhs is financed by selling share capital, and (b) the scheme of financing as envisaged in the problem is implemented? You may assume GTB's earning power to be 40% (before taxes and interest) on total assets of Rs. 80 lakhs.

We present for your verification a solution below:

**Table 3.1**  
**Effect of Financial Leverage**

	<b>Rs. 80 lakh as Share capital</b>	<b>Rs. 30 lakh of share capital plus 50 lakh</b>
	(Rs. Lakh)	(Rs. Lakh)
Earnings on assets of Rs. 80 lakh @ 40%	32.0	32.00
Less interest : 18% on Rs. 50 lakh	-----	9.00
Earnings after interest	32.00	23.00
Taxes @ 40%	12.8	9.20
Earnings after taxes	19.2	13.80
Earnings after interest and taxes as a % of share capital	24%	46%

If your solution tallies with ours, you may be wondering at the results. The net return on equity is 24% when no debt is used but it is 46% when debt is used. There is a considerable increase in the net return. It is conceivable that a similar outcome may be nowhere near in some other situations even if debt is employed. At this juncture, we would premise that the use of debt funds in a profit-making and



tax-paying business improves the net equity returns. **The effect which the use of debt funds produces on returns is called financial leverage.**

You would have noted in the above example that the increase of net equity returns from 24% to 46% has occurred at a certain level of debt viz., when the debt is Rs. 50 lakh against an equity of Rs. 30 lakh (i.e., when the debt - equity ratio is 5:3 or 167%) or when the debt is of Rs. 50 lakh against total assets of Rs. 80 lakh (i.e., when the debt- assets ratio is 5:8 or 62.5%). The sub-section below examines these and other measures of financial leverage. But before we proceed, let us sum up the concept of financial leverage as follows:

**Financial leverage refers to a firm's use of fixed-charge securities like debentures and preference shares (though the latter is not always included in debt) in its plan of financing the assets**

### Activity 13.1

Tick the correct answer for the following statements:

- |  |                              |                             |
|--|------------------------------|-----------------------------|
| a) Financial leverage is the use of fixed-return securities only.                        | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| b) Fixed-return securities include equity shares   | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| c) Preference shares always form part of debt  | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| d) Financial leverage improves net equity returns  | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| e) Net equity returns are measured on the basis of net earnings after interest and taxes | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| f) Financial leverage always improves the total return on capital employed.              | <input type="checkbox"/> Yes | <input type="checkbox"/> No |

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## 13.3 MEASURES OF FINANCIAL LEVERAGE

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The amount of debt which a firm employs or proposes to employ can be expressed in relation to total assets or total equity. Equity will include paid-up capital and reserves and total assets will be taken at net value. Even though, both equity shares and assets can be measured at market values, the present discussion will use only book values. Market values are difficult to obtain, fluctuate widely and are not available for new undertakings which also make use of the concept of financial leverage in planning their sources of finance.

We will illustrate two ratios viz., Debt-equity and Debt-assets ratios both of which are computed from Balance Sheet data and are inter-related. You may note that this section measures the use of financial leverage and not its effects. The latter is measured through Degree of Financial leverage, which is discussed in a later section.

We shall explain the concept of financial leverage with the help of an example. Bharat Engines Limited, plans to acquire total assets amounting to Rs. 1 crore. The company has only two sources of finance viz.; debt and equity. The Finance Director wants to know the changes that will take place in the Debt-equity and Debt-assets ratios for various debt levels i.e., (a) Zero (b) Rs. 10 lakh (c) Rs. 20 lakh (d) Rs. 30 lakh (e) Rs. 50 lakh (f) Rs. 80 lakh (g) Rs. 1 crore. The table 13.2 provides the required calculations:



**Table 13.2**  
**Debt-assets and Debt-equity Ratios**  
(Total investment in assets = Rs 100 lakh)

<b>Debt Rs. Lakh</b>	<b>Equity Rs. Lakh</b>	<b>Debt-assets Ratio</b>	<b>Debt-equity Ratio</b>
Zero	100	Zero	Zero
10	90	10%	11.1%
20	80	20%	25%
30	70	30%	43%
50	50	50%	100%
80	20	80%	400%
100	Zero	100%	∞

Please study the last two columns of the above table. The following analysis reflects the basic properties of the two ratios and indicate their inter-relationship:

- The Debt-assets ratio rises at a constant rate and reaches a maximum of 100%. The Debt-equity ratio grows exponentially and reaches infinity (∞)
- The two ratios are mathematically related and can be derived from each other. The following relationships may be used for such derivations:

$$\text{Debt - assets Ratio (D/A)} = \frac{\text{D/E Ratio}}{1 + \text{D / E Ratio}} \quad \dots(1)$$

$$\text{Debt - equity Ratio (D/E)} = \frac{\text{D / A Ratio}}{1 - \text{D/A Ratio}} \quad \dots(2)$$

The use of these formulas for deriving one ratio from the other can be demonstrated at any debt level. For example, at a debt level of Rs. 80 lakh, the Debt-assets ratio is 80%. The D/E ratio can be derived by using formula-(2) above:

$$\text{D/E Ratio} = \frac{80}{1 - 80} = \frac{80}{20} = 4.00 \text{ or } 400\%$$

Similarly, with a given D/E ratio of 400% or 4:00, the D/A ratio can be derived by using formula (1) above :

$$\text{D/A Ratio} = \frac{4.00}{1 + 4.00} = \frac{4.00}{5.00} = 80 \text{ or } 80\%$$

Both D/A and D/E ratios are used to measure the amount of financial leverage. You may note that the D/E ratio overstates the amount of financial leverage for all levels of debt and becomes indeterminate when debt employed is one hundred per cent. It may, therefore be technically more feasible to employ the Debt-asset ratio as indicator of the use of financial leverage.

You may come across some ratios in contemporary literature which attempt to measure the use of financial leverage. They are:

$$a) \frac{\text{Debt}}{\text{Total Value of the Firm (at market Price)}}$$

$$b) \frac{\text{Return on Equity}}{\text{Return on Total Capital}}$$



### Activity 13.2

Answer the following :

- a) Amount of leverage and degree of leverage are the same  Yes  No
- b) Debt-equity ratio overstates the use of leverage  Yes  No
- c) A firm (to be established) can use market values  Yes  No  
for its leverage ratios
- d) The D/E ratio is infinite at 100% debt  Yes  No
- e) D/A and D/E ratios can be derived from each other  Yes  No
- f) When the D/E ratio is 200%, D/A ratio would be  Yes  No  
(i) 80% (ii) 100% (iii) 67% (iv) 45% (v) None of these

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## 13.4 EFFECTS OF FINANCIAL LEVERAGE

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The example in Table 13.I introduced you to a possible effect of financial leverage on return on equity. You must have noted one important consideration in the use of borrowed funds, that is, the improvement in net equity returns which such a move brings about.

In fact, the effect of financial leverage is also measured through another variable viz., earnings per share (EPS). This is done in the case of joint stock companies which have raised their proprietary capital by selling units of such capital known as equity shares. Earnings per share are obtained by dividing earnings (after interest and taxes) by total equity. You may note that if a company has preference shares also on its capital structure, net equity earnings will be arrived at after deducting interest, taxes and preference dividends. **Capital structure** refers to the permanent long-term financing of a company represented by a mix of long-term debt, preference shares, and net-worth (which included paid-up capital, reserves and surpluses). When the sum total of capital structure components is added to short-term debt, it is known as **Financial structure**. Financial Leverage and its effects are a crucial consideration in planning and designing capital structures.

We may reiterate that the effects of financial leverage are not always clear and identical in various states of profitability and debt proportions. It may be necessary to explore these effects before a particular long-term finance-mix is recommended for implementation. We shall illustrate the effects of financial leverage by extending the example taken in the previous section. Bharat Engines is considering four alternative debt ratios (i.e. D/A ratios): 0%, 20%, 50% and 80%. The corresponding D/E ratios are: 0%, 25%, 100% and 400%.

The equity capital of the company is divided into shares of Rs. 10 each which can be sold in the market at their face value only.

The firm estimates a net profit (before tax) of 25% on total assets of Rs. 1 core if business conditions are favourable, a net profit (before tax) of 50% on total assets if conditions are highly favourable, and net loss (before tax) of 25% if conditions are unfavorable. Bharat Engines is assessed to income tax at 40%. In the event of loss, the company could assume a tax credit at this rate.

The average interest rate on borrowings by the company is estimated at 15%.

Table 13.3 provides an analysis of the effects of all four alternative debt levels on the return on equity as well as on the earnings per share.



Table 13.3

## Financial Leverage, Equity Returns &amp; EPS

Total Investment Rs. 1 Crore

Alternative Estimates of Earnings Before Interest  
& Taxes (EBIT) (in Rs. Lakhs) as of Total Assets

Capital Structure	(-25%)	+25%	+50%
<b>I : Debt = Zero, Equity = Rs. 1 Crore</b>			
EBIT	(-25.00)	25.00	50.00
Less interest (at 15%)	zero	zero	zero
Earnings (before tax)	(-25.00)	25.00	50.00
Less tax at 40%	10.00	10.00	20.00
Net Income (after tax)	(-15.00)	15.00	30.00
Return on Equity	(-15%)	15%	30%
Earnings per share (in Rs. 10,00,000 shares of Rs. 10 each)	(-1.50)	1.50	3.00
<b>II : Debt = Rs. 20 lakh, Equity = Rs. 80 lakh</b>			
EBIT	(-25.00)	25.00	50.00
Less interest (at 15%)	3.00	3.00	3.00
Earnings before tax	(-28.00)	22.00	47.00
Less tax at 40%	11.20	8.80	18.80
Net income	(-16.80)	13.20	28.20
Return on equity of Rs. 80 lakh	(-21%)	16.5%	35.25%
Earnings per share (Rs. 8,00,000 shares of Rs. 10 each)	(2.1)	1.65	35.25
<b>III : Debt = Rs. 50 lakh, Equity = Rs. 50 lakh</b>			
EBIT	(-25.00)	25.00	50.00
Less interest (at 15%)	7.50	7.50	7.50
Earnings before tax	(-32.50)	17.50	42.50
Less tax at 40%	3.00	7.00	17.00
Net income	(19.50)	10.50	25.50
Return on equity of Rs. 50 lakh	(-39%)	21%	51%
Earnings per share (Rs. 5,00,000 shares of Rs. 10 each)	(-3.9)	2.1	5.1
<b>IV : Debt = Rs. 80 lakh, Equity = Rs. 20 lakh</b>			
EBIT	(-25.00)	25.00	50.00
Less interest (15%)	12.00	12.00	12.00
Earnings before tax	(-37.00)	13.00	38.00
Less tax at 40%	14.80	5.20	15.20
Net income	(-22.20)	7.80	22.80
Return on Equity of Rs. 20 lakh	(-111%)	39%	114%
Earnings per share (Rs. 2,00,000 shares of Rs. 10 each)	(-11.1)	3.9	11.40

You may now have a closer look at the effects of leverage. Please note that the analysis presented in Table 13.3 above assumes:

- an average tax rate of 40% or a tax credit at the same rate in a year of loss
- four different levels of debt
- three different states of economy viz., bad, good, and very good
- the fact that equity shares of the company can be sold only at par i.e., at Rs. 10 per share.



We offer the following **comments on Table 13.3** for further study and analysis by you:

- a) At zero debt level (viz., capital structure I), the after-tax return on total assets is 60% of the before tax return because the tax rate is 40%. Also, the after-tax return on total assets is equal to the after-tax return on equity.
- b) Financial leverage in general is favourable when the return on assets exceeds the cost of debt. This is true of all the four capital structures when the return levels are 25% and 50%.
- c) When the return on assets is high, both the net return on equity and earnings per share increase with a rise in the debt ratio. You may notice that when the return on assets is the highest at 50% (last column of Table 13.3), the return on equity increases from 30% at zero debt to 114% at 80% debt level. The corresponding increase in EPS is from Rs. 3.00 to Rs. 11.40.
- d) The amount of interest affects the relationship of after-tax return on assets and return on equity at different levels of leverage. The numerators of both the ratios bear the following relationship:

$$\text{EBIT} (1 - t) = \text{Net Income} + (1 - t) \text{ Interest charges} \text{-----} 3$$

Where  $t$  = tax rate

You may note that the term to the left of the equation is the numerator of return on assets and the term to the right is the numerator of return on equity. You may verify this relationship at any debt level. For example, take capital structure - II in Table 13.3 at an EBIT level of Rs. 25 lakh and substitute relevant values in equation (3). You will get :

$$25,00,000 (1 - .40) = 13,20,000 + (1 - .40) 3,00,000 \text{ Rs. } 15,00,000 \\ = \text{Rs. } 15,00,000$$

- e) It is significant that while higher amounts of leverage improve equity returns and earnings per share, they produce a higher degree of volatility also in such returns. Table 13.4 below summarizes the minimum, maximum and the range of equity returns at different debt levels on the basis of the data furnished in Table 13.3.

**Table 13.4**  
**Financial Leverage and Equity Returns**

Amount of Financial Leverage (Debt-assets Ratio)	Return on Equity (ROE)		
	Minimum	Maximum	Range
0%	-15%	30%	45%
20%	-21%	35.25%	56.25%
50%	-39%	51%	90%
80%	-111%	114%	225%

You may observe that the Return on Equity (ROE) varies within a range of 45% when the debt ratio is zero, but the range increases to 225% when the debt ratio rises to 80%. This increased **volatility** will also be found to be true if you measure the equity return by net income or earnings per share. From this analysis we may, conclude: **Financial leverage magnifies the volatility of return whether measured by net income or return on equity or earnings per share.**

It would, thus, be seen that financial leverage is a double-edged sword. It magnifies returns and also increases their volatility. Increased volatility implies greater risk in the wake of a riding interest burden, which, if not met, may lead to bankruptcy. In the perception of equity shareholders as well as lenders, the riskiness of the firm







(or “leveraged”) effect on profits. Notice that as the operating leverage (i.e., fixed costs), goes higher, so does the break-even sales volume. Hence greater is the impact on profits of a given change in sales volume. Also notice that Financial Leverage adds another element of fixed expenses i.e., fixed financial charges, and serves to further magnify the impact of total leverage on profits.

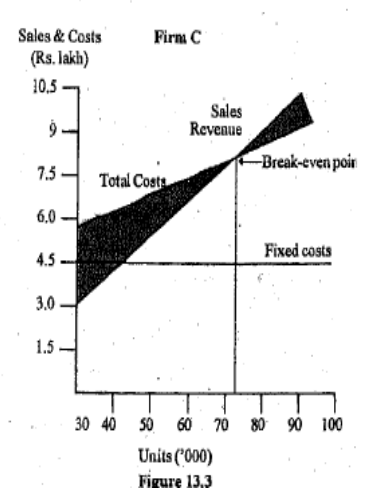
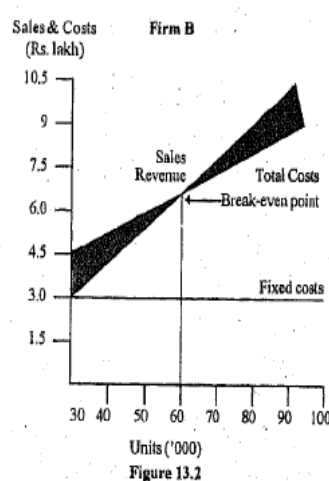
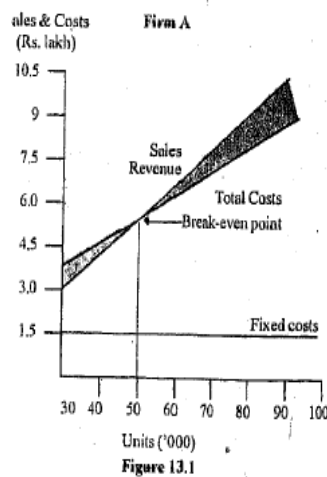
**Operating Leverage :** We present the following hypothetical volume - costs - profit profile of three firms A, B and C.

**Table 13.5**  
**Operating Leverage**

		Rs. in lakh					
Units sold	Sales @ Rs. 10/ per unit	Firm A		Firm B		Firm C	
		Cost	Profit	Cost	Profit	Cost	Profit
30,000	3.00	3.60	-.60	4.50	-1.50	5.70	-2.70
40,000	4.00	4.30	-.30	5.00	-1.00	6.10	-2.10
50,000	5.00	5.00	0.00	5.50	-.50	6.50	-1.50
60,000	6.00	5.70	.30	6.00	0.00	7.00	-.90
70,000	7.00	6.40	.60	6.50	.50	7.30	-.30
80,000	8.00	7.10	.90	7.00	1.00	7.70	.30
90,000	9.00	7.80	1.20	7.50	1.50	8.10	.90
1,00,000	10.00	8.50	1.50	8.00	2.00	8.50	1.50
Fixed Costs:		Rs. 1.5 lakh		Rs. 3.0 lakh		Rs. 4.5 lakh	
Variable cost per unit:		Rs. 7.00		Rs. 5.00		Rs. 4.00	

You may have noticed the characteristics of the three firms from Table 13.5. They are

- Sales volume in units, selling price per unit, and sales value realisation are identical for all the three firms.
- Fixed costs are the lowest *for firm A*, medium for B, and highest for C. Firm A has the least automated plant, lowest depreciation charges, low fixed costs, and a higher per unit variable cost. Firm B has a moderately automated plant. Firm C has the most highly automated plant which needs very little labour per unit of output. Its variable costs rise slowly and its overhead burden is relatively higher. Firm C has the lowest variable cost per unit at Rs. 4.00.





### Activity 13.4

Look at Figures 13.1, 13.2 and 13.3. Comment upon the main features of each firm's volume cost relationships.

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**Degree of operating leverage :** Degree of operating leverage measures the effect of change in volume on net operating income or earnings before interest and taxes. This may be obtained by using the following formula:

Degree of operating leverage

$$(DOL) = \frac{\% \text{ change in net operating income}}{\% \text{ change in units sold or sales}}$$

Degree of operating leverage will be calculated for a firm when it moves over from one level of sales (volume or value) to another. For example, the degree of leverage for firm B in Table 13.5, when it shifts from a volume of 80,000 units to 90,000 units, would be as below: -

$$(DOL) =$$

Where  $\Delta$  NOI is the change in Net Operating Income

NOI is net operating income or earnings before interest and taxes

$\Delta$  Q is the change in quantity or volume, and

Q is quantity or volume

Thus, DOL for firm B for a change in output from 80,000 units to 90,000 units would be:

$$= \frac{1,50,000 - 1,00,000 / 1,00,000}{(90,000 - 80,000) / 80,000} = \frac{50,000 / 1,00,000}{10,000 / 80,000}$$

$$= \frac{50\%}{12.5\%}$$

$$= 4$$

To be able to understand the implications of DOL, you may compare Firm A (least operating leverage) with Firm C (highest operating leverage) at any two given levels of output, say for a change in output from 80,000 units to 90,000 units i.e. an increase of 12.5%.

$$DOL_A \text{ at } 80,000 \text{ units} = \frac{.30 / .90}{10,000 / 80,000} = 2.67$$

$$DOL_C \text{ at } 80,000 \text{ units} = \frac{.60 / .30}{10,000 / 80,000} = 16.00$$



You may now notice the manner in which profits change in response to change in volume. Thus, for 12.5% increase in output, profits will increase by 26.7% for Firm A (which is low-leveraged firm) and by 160% for Firm C (which is high leveraged firm). You will find fluctuations in profits to be more steep for firms which are highly leveraged. Thus, **the higher the degree of operating leverage the greater will be the fluctuations in profits in response to changes in volume.** And this relationship works both ways i.e. when volume increases as well as when it declines.

The degree of leverage has implications for a number of business and financial policy areas. The following examples based on the DOL of Firm C illustrate some of these areas :

- a. The high degree of operating leverage for Firm C suggests that volume may be increased to gain a steep rise in profits. If Firm C could increase its volume from 1,00,000 units to 2,00,000 units by reducing the selling price to Rs. 9.00 per unit, the net operating income with this price revision would be:

$$\begin{aligned} \text{NOI} &= PQ - VQ - F \text{ Where P is price per unit, y is variable cost per unit,} \\ &\quad Q \text{ is volume in units and F is total fixed cost.} \\ &= \text{Rs. } 9 \times 2,00,000 - \text{Rs. } 4 \times 2,00,000 - \text{Rs. } 4.5 \text{ lakhs} \\ &= \text{Rs. } 18 \text{ lakhs} - \text{Rs. } 8 \text{ lakhs} - \text{Rs. } 4.5 \text{ lakhs} \\ &= \text{Rs. } 5.5 \text{ lakhs} \end{aligned}$$

You may note that Firm C is able to increase its profits from Rs. 1.50 lakhs at a volume of 1,00,000 units to Rs. 5.50 lakhs at a volume of 2,00,000 units. Thus, a doubling of output (by a 10% reduction in sales price from Rs. 10 to Rs. 9) results in profits becoming about 3.6 times. Firm C with a high degree of operating leverage may, therefore, adopt an aggressive price policy.

- b. A high degree of operating leverage also suggests that profits will swing widely as volume fluctuates: If, Firm C belongs to an industry where sales are greatly affected by changes in the overall level of the economy resulting in wild fluctuation of profits, **the degree of financial leverage appropriate to Firm C will be lower** than the one for a firm which belongs to an industry not so sensitive to changes in the economy.

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## 13.6 COMBINED LEVERAGE

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The degree of operating leverage may be combined with the degree of financial leverage. In fact, degree of operating leverage (DOL) is viewed as the first-stage leverage and degree of financial leverage (DFL) as the second-stage leverage. Since financial leverage measures the effect of changes in EBIT on earnings available to equity shareholders, it may be calculated by using the following formula:

$$\text{Degree of financial leverage} = \frac{\% \text{ change in Net Income}}{\% \text{ change in EBIT}}$$

The use of this formula may be illustrated before demonstrating the implications of combining DOL and DFL. The data of Table 13.3 for the leverage factors of 20% debt and 80% debt may be utilised to show the effect of an increase of EBIT from Rs. 25 lakhs to Rs. 50 lakhs. The following calculations may be noticed:

DFL (80%) the degree of financial leverage at 80% debt.

DFL (20%) the degree of financial leverage at 20% debt.



$$\begin{aligned} \text{DFL (80\%)} &= \frac{(22.80 - 7.80) / 7.80}{(50.00 - 25.00) / 25.00} \\ &= \frac{(15.00 - 7.80)}{25.00 / 25.00} = \frac{2.92}{1.00} = 2.92 \\ \text{DFL (20\%)} &= \frac{(28.20 - 13.20) / 13.20}{(50.00 - 25.00) / 25.00} = \frac{15.00 / 13.20}{25.00 / 25.00} = 1.14 \end{aligned}$$

The Figures 2.92 and 1.14 can be easily understood. The former implies that when the debt ratio (or the leverage factor) is 80%, a 10% increase in EBIT produces a 29.2% (10 x 2.92) increase in net income available to equity shareholders. At a leverage factor of 20%, a 10% increase in EBIT brings about only an 11.4% (10 x 1.14) increase in net income or earnings available to equity shareholders. You may conclude **that a high degree of leverage brings about a higher magnification of equity earnings.**

In the absence of debt, the degree of financial leverage (DFL) will be 1.00 (i.e. unity). The use of debt will lead to DFL above 1.00 or 100%. The DFL may be viewed as a multiplication factor, and when this multiplication factor is 1.00, there is no magnification in net income or return on equity, or in earnings per share.

A combination of operating and financial leverage measures the degree of magnification in Net Income (NI), Return on Equity (ROE), and Earnings per Share (EPS) for a given increase in sales. When the **use of operating and financial leverage is considerable, small changes in sales will produce wide fluctuations in NI, ROE and EPS.**

The Degree of Combined Leverage (DCL) may be measured by using the following formula:

$$\text{DCL} = \text{DOL} \times \text{DFL}$$

$$\begin{aligned} \text{DCL} &= \frac{\% \text{ change in Net Income EBIT}}{(\% \text{ change in sales})} \times \frac{\% \text{ change in net income}}{(\% \text{ change in EBIT})} \\ &= \frac{\% \text{ change in net Income}}{\% \text{ change in sales}} \end{aligned}$$

You may note that a number of combinations of DOL and DFL may produce the same DCL. And if management has a target DCL, changes in DOL or DFL may be made to attain the targeted DCL. For instance, if the firm has a high degree of operating leverage due to the nature of its operations, the degree of financial leverage may be suitably lowered so as not to lower the targeted combined leverage and vice versa.

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## 13.7 FINANCIAL LEVERAGE AND RISK

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We posed the question of risk at the beginning of this unit. You would have noted from our discussion so far that the concepts of operating, financial, and combined leverage have been examined to assess the quantum or risk (business, financial and combined), which the firm faces as a result of decisions to change the various degrees of leverage. In fact, the extent to which the various measures of net income fluctuate, for given variations in sales or EBIT, has a direct bearing on many business and financial policies.



There are several statistical measures, which help us to quantify risk. We propose to calculate one such measure known as coefficient of variation by using data in Table 13.3 and the additional data given in Table 13.6 below:

**Table 13.6**  
**Cost Structure of Bharat Engines Ltd.**

Sales (units)	Rs. in lakhs		
	1875	8125	11250
Sales @ Rs. 1,000 per unit	18.75	81.25	112.50
Fixed operating cost	40.00	40.00	40.00
Variable operating costs (20% of sales in Rs)	3.75	16.25	22.50
Earnings before interest and taxes (EBIT)	-25.00	25.00	50.00
Pre-tax return on total assets (%)	-25.00	25.00	50.00

The total cost can be estimated as follows:

$$\begin{aligned} \text{Total Cost} &= \text{Fixed operating costs} + \text{Variables operating costs per unit (Sales)} \\ &= 40 \text{ lakhs} + 0.20 (\text{sales}) \end{aligned}$$

In order to obtain a measure of coefficient of variation, the first step is the assignment of probabilities to the possible levels of sales that the management has forecast. Probability in brief is the chance of some event occurring. If it is absolutely definite, it is 1, otherwise probability is always a fraction of unity (1).

The state of the economy is beyond the control of management, but corporate policies are within its control and can be reasonably forecast.

The state of the economy may range from 'very poor' to 'very good' and may accordingly be incorporated in the management's attitudes of pessimism or optimism.

Assume that the management of Bharat Engines Ltd., has assigned the following probabilities based on the aforesaid consideration:

**Table 13.7**  
**Estimated Probabilities**

Stage of economy	Expected sales (Rs. lakh)	Probability of expected sales
A	18.75	.2
B	81.25	.5
C	112.50	.3

*Note* : All probabilities must add up to 1.00

Now we use information from Tables I3.3, 13.6 and 13.7 and present computations of coefficient of variations in Table 13.8 below:



**Table 13.8**  
**Calculation of Coefficient of Variation (Cv)**

Capital Structure	State of the economy	Probability	Return on equity (ROE)	$P_s \times ROE$	$(ROE - \overline{ROE})$	$P_s \times (ROE - \overline{ROE})^2$
	S	P				
Zero Debt	A	.2	-.15	-.03	-.285	.0162
	B	.5	.15	.075	.015	.0001
	C	.3	.30	.090	.165	.0082
				$\overline{ROE} = .135$		$.0245 = \sigma^2$
$\sigma = .157; CV = \frac{\sigma}{\overline{ROE}} = \frac{.157}{.135} = 1.163$						
20% Debt	A	.2	-.21	-.0420	-.3563	.0254
	B	.5	.165	.825	.0187	.0002
	C	.3	.3525	.1058	.2062	.0128
				$\overline{ROE} = .1463$		$.0384 = \sigma^2$
$\sigma = .1959; CV = \frac{\sigma}{\overline{ROE}} = \frac{.1959}{.1463} = 1.339$						
5% Debt	A	.2	-.39	-.078	-.530	.05618
	B	.5	.13	.065	.010	.00005
	C	.3	.51	.153	.370	.04107
				$\overline{ROE} = .1463$		$.09730 = \sigma^2$
$\sigma = .3119; CV = \frac{\sigma}{\overline{ROE}} = \frac{.3119}{.140} = 2.228$						
80% Debt	A	.2	-1.11	-.222	-1.275	.3251
	B	.5	.39	.195	.225	.0253
	C	.3	.64	.192	.475	.04107
				$\overline{ROE} = .165$		$.4181 = \sigma^2$
$\sigma = .6466; CV = \frac{\sigma}{\overline{ROE}} = \frac{.6466}{.165} = 3.919$						

**Legend :**

- S = State of the economy i.e. bad, good, very good
- $P_s$  = Probability of occurrence of the state of the economy
- ROE = Return on Equity
- $P_s \times ROE$  = Probability  $\times$  Return on Equity.
- $\overline{ROE}$  = Expected value of Return on Equity (Mean)
- $\sigma^2$  = Variance
- $\sigma$  = Standard Deviation
- Cv = Coefficient of Variation

You may study Table 13.8 and its results carefully. The four sections of the table depict the four capital structures viz., zero debt, 20% debt, 50% debt and 80% debt. You may notice that as the leverage factor (viz., Debt ratio) rises, the coefficient of variation also goes up. Thus, for zero debt, the Cv is 1.163 and for 80% debt it shoots up to 3.919. On the basis of the data furnished and probability information generated, it may be concluded that the business risk (which is the sum of operating risk and financial risk) rises with financial risk in the case of Bharat Engines Ltd.



Calculations similar to those given in Table 13.7 can be performed for determining the risk character of the firm in response to amounts of financial leverage stipulated. This analysis helps to plan capital structure.

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## 13.8 SUMMARY

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Concepts of financial and operating leverages are important for evaluating business and financial risk of a firm. Operating leverage refers to the use of fixed costs in operations and it is related to the firm's production processes. The greater the operating leverage the higher is the risk in operations. At the same time, a high degree of operating leverage causes profits to rise rapidly after the break-even point is reached.

Financial leverage refers to the use of debt in financing non-current assets. If the return on assets exceeds the cost of debt, the leverage is successful i.e., it improves returns on equity. While this being so, a high financial leverage magnifies financial risk. At some degree of financial leverage the cost of debt rises because of increased risk with the higher fixed charges. When this happens, riskiness of the firm also increases in the eyes of equity investors who start expecting a higher return to compensate for the increased risk burden.

Financial leverage and operating leverage are related with each other. Both have similar effects on profits. A greater use of either i.e., operating or financial leverage leads to following results:

- a) The break-even point is raised
- b) The impact of change in the level of sales on profits is magnified.

Operating and financial leverages have reinforcing effects. Operating, or first-stage leverage affects earnings before interest and taxes (i.e., net operating income) while financial, or second-stage leverage affects earnings after interest and taxes (i.e., net income available to equity shareholders).

Operating and financial leverages are measured in relative terms to assess their impact on profitability of a firm. These measures are given by the degrees of operating and financial leverage. A combined degree of financial and operating leverage can also be calculated to evaluate effects of changes in sales on net-income or earnings per share.

Financial leverage and risk are related variables and the statistical measures known as coefficient of variation can be computed to estimate the risk of the firm at different levels of leverage or debt ratio.

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## 13.9 KEY WORDS

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**Financial Leverage** refers to the use of debt in the financing of a firm. It denotes the presence of fixed-return securities in the capital structure of the firm.

**Operating Leverage** is the use of fixed costs in operations. A high operating leverage factor indicates the presence of automated production processes.

**Leverage Factor** refers to the ratio of long-term debt to total assets.

**Capital Structure** is the long-term financing plan of a firm. It covers debentures, preference shares, other fixed-return securities, long-term loans, equity shares, and reserves and surplus.

**Financial Structure** is the total financing plan of a firm, which, besides all components of capital structure, also includes short-term debt.



**Degree of Operating Leverage** is the percentage change in net operating income in response to a percentage change in sales (volume or value).

**Degree of Financial Leverage** is the percentage change in net income available to equity investors in relation to changes in earnings before interest and taxes.

**Degree of Combined Leverage** is the percentage in net income after interest and taxes in response to percentage variations in sales (volume or value).

Risk includes both operating risk (as given by the degree of operating leverage) and financial risk (as reflected by the degree of financial leverage) and is evaluated by a statistical measure known as coefficient of variation.

### 13.10 SELF-ASSESSMENT QUESTIONS/ EXERCISES

1. Is the use of financial leverage justifiable from a socio-economic standpoint? Explain by listing some advantages and disadvantages.
2. How does the use of financial leverage affects the break-even point? Illustrate.
3. In what way is financial leverage related, to operating leverage? Discuss with an example.
4. 'Risk increases proportionately with financial leverage'. Refute this statement with reasons.
5. 'Other things remaining the same , firms with relatively stable sales are able to incur relatively high debt ratios.; Do you agree With the statement?
6. Why is EBIT (Earnings before Interest and Taxes or Net Operating Income) generally Considered to be independent of financial leverage?: Why should EBIT actually be influenced by financial leverage at high debt' levels?
7. State whether the following are True or False :
  - a) Financial leverage affects both net income and BBIT, while operating leverage affect only BBIT  True  False
  - b) Two firms with identical financial and operating leverage may have different degrees of business risk as measured by the coefficient of variation of their respective ROE.  True  False
  - c) **Business risk** refers primarily to uncertainty about future EBIT, While **financial risk** refers to the added uncertainty about future net income that is caused by the use of debt  True  False
8. Other things being constant,' if Firm A has more **Operating leverage** than Firm B, then a given percentage decline in sales will cause a larger percentage decline for Firm A than for Firm B in
  - a) EBIT
  - b) Net Income
  - c) Both (a) and (b)
  - d) Neither (a) nor (b)
  - e) None of these
9. One of the components of a firm's financial structure that is not a component of its capital structure is:
  - a) debentures
  - b) reserves





- c) convertible preference
  - d) shares
  - e) short-term debt
  - f) equity shares
10. Financial leverage is different from operating leverage in that it is concerned with
- a) capital structure
  - b) uncertainty of markets
  - c) inefficient financial managers
  - d) uncertain estimates of EBIT
  - e) None of these
11. In general, financial leverage is favourable whenever the return on assets exceeds the
- a) cost of equity share capital
  - b) total cost of capital
  - c) net return after taxes
  - d) cost of debt
  - e) none of these
12. Highly leveraged companies are most likely to be found in industries where sales are
- a) increasing around a trend line
  - b) relatively unstable
  - c) relatively stable
  - d) expected to decline
  - e) relatively uncertain with high margins
13. Fill in the blanks
- a) Firms that have a high ratio of fixed costs to variable costs are said to operate with a high degree of .....
  - b) Other things being constant firms with a ..... **degree** of operating leverage are better able to employ more..... in their capital structures.
  - c) Debt has a .....over equity **in that** .....is a deductible expense while .....is not.
14. A firm has a debt ratio of 75% , and it has total assets of **Rs. 20** crores. Before the creditors are **unprotected** these assets may **drop to** a value of
- a) Rs. 10 crores
  - b) Rs. 5 crores
  - c) Rs. 20 crores
  - d) Rs. 15 crores
  - e) none of these.
15. The debt ratio of Firms A and B are 60% and 30%, respectively. Both firms have assets totalling Rs. 50 crores and both have a cost of debt of 8 per cent. Firm A earns 12 per cent before interest and taxes on its total assets. Assume a 50 per cent tax rate and answer the following questions:
- a) What does A earn on equity after interest **and** taxes?



- b) If B is to earn the same rate on equity after taxes as A. What must it earn before interest and taxes on its assets?

	(A)	(B)
i)	15 %	7 %
ii)	9%	15%
iii)	7%	12%
iv)	9%	12%
v)	7%	15%

16. Triveni Dyes Ltd. desires to increase its assets by 50% to execute large government contracts it has received, the expansion could be financed by issuing additional equity shares at a net price of Rs. 45 per share (the price earnings ratio being 20). Alternatively, debt at a cost of 10% could be increased with a price earnings ratio of 15. The balance sheet is given below:

**Current Balance Sheet of Triveni Dyes Ltd.**

	Rs.		Rs.
Debt (8%)	20,000	Total assets	90,000
Equity shares of Rs. 10 each	60,000		
Reserves	10,000		
Total claims	Rs. 90,000	Total assets	Rs. 90,000

Assume that the gross profit margin is 12% of estimated sales of Rs. 4,00,000 and that the tax rate is 35%. What are the expected market prices, after expansion, under the two alternatives?

	<b>Debt</b>	<b>Equity Shares</b>
a)	Rs. 13.150	Rs. 20.20
b)	Rs. 29.30	Rs. 41.70
c)	Rs. 52.35	Rs. 66.20
d)	Rs. 68.10	Rs. 86.20
e)	Rs. 86,50	Rs. 99.20

17. Chakradhar Seshan has developed a revolutionary new computerized method of preparing tax returns for individuals. He has a choice of computers on which to install his new process. Under Plan L he would lease a computer for Rs. 5 lakhs per year and process returns with a variable cost of Rs. 2 per return. Under plan S he would lease a smaller, less efficient computer for Rs. one lakh per year, but processing costs under plan B will be Rs. 12 per return. Under either process; Seshan would charge Rs. 22 per return processed.

A. Answer the following questions:

- i) Which plan has a higher degree of operating leverage
- ii) Construct break-even charts of the two plans.
- iii) At what volume of tax returns would Seshan have the same operating profit under either plan?
- iv) Based on this information only, which plan is more risky?



- B. Assume that Seshan decides to use the large computer described under plan L. Seshan now needs Rs. 20 lakhs to build facilities, obtain working capital, and start operations. He has some money of his own with which he would buy stock and the balance of the required funds can be obtained in the form of debt or equity. If Seshan borrows part of the money, his interest charges will depend upon the amount borrowed according to the following schedule:

Amount borrowed	Percentage of debt at upper end of Class-interval in capital structure	Interest rate on total amount borrowed
Up to Rs. 2 Lakhs	10%	9.00%
More than Rs. 2lakhs and up to Rs. 4 lakhs	20%	9.50%
More than Rs. 4 lakhs and up to Rs. 6 lakhs	30%	10.00%
More than Rs. 6 lakhs and up to Rs. 8 lakhs	40%	15.00%
More than Rs. 8 lakhs up to 10 lakhs	50%	19.00%
More than Rs. 10 lakhs and up to Rs. 12 lakhs	60%	26.00%

Assume further that the equity shares can be sold at Rs, 20 per share regardless of the amount of debt the company uses. This will be the case at the time of initial offering of shares. Then, after the company begins operations, the price of its shares will be determined as a multiple of earnings per share. This multiple, viz., price-earnings (P/E) ratio will depend upon the capital structure as follows:

Debt-Assets Ratio	P/E Ratio
0 to 9.99%	12.5
10.00 to 19.99%	12.0
20.00 to 29.99%	11.5
30.00 to 39.99%	10.0
40.00 to 49.99%	8.0
50.00 to 59.99%	6.0
60.00 to 69.99%	5.0

If the company processes 50,000 returns annually and that its effective tax is 40%, calculate the company's EPS at different debt-assets ratios.

### Answers to Activities

#### Activity 13.1

1. (a) No (b) No (c) No (d) Yes (e) Yes (f) No

#### Activity 13.2

2. (a) No (b) Yes (c) No (d) Yes (e) Yes (f)

$$(iii) D/A \text{ ratio} = \frac{D/E \text{ ratio}}{1+D/E \text{ ratio}} = \frac{2.0}{1+2.00} = \frac{2.00}{3.00} = 67\%$$



Return on Equity

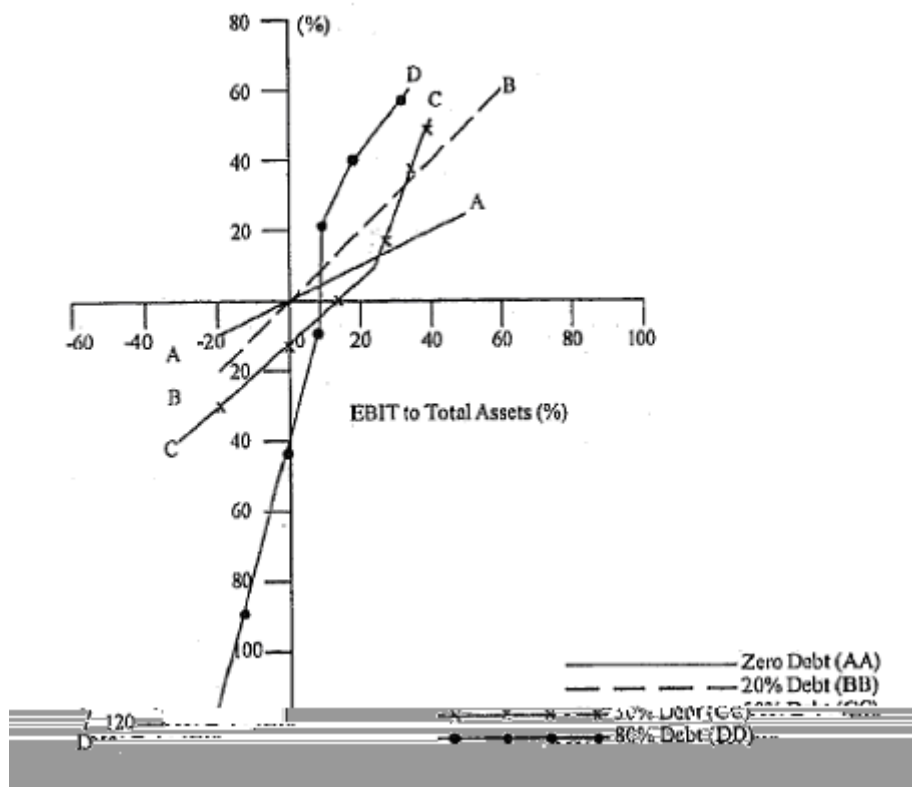


Figure : Financial Leverage and Variation in. Equity Returns Conclusions

- a) With zero debt, the ratio of ROE to Return on Total Assets (ROTA) as depicted by AA is a relatively flat line.
- b) With 80% debt, the ratio of ROE to ROTA as , shown by DD becomes.. very steep.

This implies that as the debt-assets ratio rises, the ratio of ROE to ROTA becomes steeper:

Thus, greater financial leverage produces greater volatility in the return on equity.

Conclusions are consistent with the analysis of Table 13.3.

4 Firm A has the lowest level of fixed costs and Firm C the highest.

Firm A has a steep total cost curve because the variable cost per unit is high and the low fixed costs of not permitting a net reduction in total costs.

Total cost curve of Firm C is relatively flat. The high fixed cost component ' enables the firm to try variable costs, particularly the labour costs.

The location of Break-even Points (BEP) is interesting. The BEP for Firm A is at the lowest level of sales of the three firms. For firm C, it is at the highest level of sales.

Firm, C which has a BEP at a higher volume is able to record a higher rate of increase in profits once it reaches the BEP, compared to the other two firms. At a high volume of operations, Firm. C begins to command a substantial cost superiority compared to the other two firms and more particularly Firm A. This result is now obvious at a



level of 1 lakh units. But if volume of sales rises to 2 lakh units, the per unit costs for the three firms would be as under:

Firm	Fixed cost	Variable cost for 2 lakh units	Total cost	Units of sales	Per unit cost
	(Rs.lakh)	(Rs.lakh)	(Rs.lakh)		
A	1.50	14.00	15.50	2,00,000	7.75
B	3.00	10.00	13.00	2,00,000	6.50
C	4.50	8.00	12.50	2,00,000	6.25

Firm C can use the cost advantage at higher levels of sales in competitive markets. This will be particularly relevant for export sales.

**Answers or approaches to Self-assessment Questions / Exercises Hints for some selected questions:**

**1 Advantages**

- a) It provides a method for some investors to hold securities with fixed and prior claims.
- b) It may encourage real investment.
- c) Financial leverage tends to stabilise economic functions by promoting contra cyclical investment: Debt is costly during booms and firms avoid it after a stage. Investment is reduced and a boom is not fed further. Similarly, debt is cheaper during depressions and it may result in higher investment, which pushes the economy out of unstable, to more stable conditions.

**Disadvantages**

A major disadvantage is that heavy fixed charges may cause forced liquidation of firms during business downswings and may aggravate the severity of business depressions.

If risk is defined as coefficient of variation, it is not possible to generalise the relationship with absolute certainty. With increased financial leverage, risk could rise proportionately, more than proportionately or, less than proportionately.

The example in the test of the unit demonstrates a case where risk or the  $C_v$  rises less than proportionately with the debt ratio. With some other set of data, a linear relationship could be established, or a relationship where risk increases at a decreasing rate with the debt ratio could be found. Note that in all these cases risk does increase to some extent.

5. If sales tend to fluctuate widely, then cash flows and the ability to service fixed charges will also vary. Consequently, the possibility that the firm is unable to meet its fixed obligations increases. For this reason, firms in unstable industries tend to minimise their use of debt.
6. Financial leverage has no effect on EBIT; it only affects equity earnings or net income, given EBIT. The EBIT is influenced by operating leverage.
7. (a) False (b) True (c) True 8 (c) 9 (d) 10 (a) 11 (d) 12 (c)
- 13 (a) Operating leverage (b) low; debt (c) tax; interest; dividends.



14 (b)

Total assets Rs. 20 crores.

Less : Debt

 $(.75 \text{ of Rs. } 20 \text{ crores}) = \text{Rs. } 15 \text{ crores}$ 

Equity = Rs. 5 crores

Rs. 5 crores representing owner's equity is the amount that assets could drop to before creditors would begin to lose protection.

15 (ii)

<b>Firm A</b>	<b>Firm B</b>
Debt 60 % Rs. 30 crores	30% Rs. 15 crores
Equity 40% Rs. 20 crores	70% Rs. 35 crores
Total Assets <u>100% Rs. 50 crores</u>	<u>100% Rs. 50 crores</u>
Firm A earns $.12 \times \text{Rs. } 50 \text{ crores}$	= Rs. 6.00 crores
Less : Interest $.08 \times \text{Rs. } 30 \text{ crores}$	= Rs. 2.40 crores
Taxable income	= Rs. 3.60 crores
Less : taxes	= Rs. 1.80 crores
Net income	= Rs. 1.80 crores

Rate of return on equity =  $\text{Rs. } 1.8 \text{ crores} / \text{Rs. } 20 \text{ crores} = 9 \%$ Firm B's net income  $.09 \times \text{Rs. } 35 \text{ crores} = \text{Rs. } 3.15 \text{ crores}$ 

Add : B's taxes = Rs. 3.15 crores

Taxable income = Rs. 6.30 crores

Add debt interest  $.08 \times \text{Rs. } 15 \text{ crores} = \text{Rs. } 1.20 \text{ crores}$ 

EBIT = Rs. 7.50 crores

Rate of return on assets =  $\text{Rs. } 7.5 \text{ crores} / \text{Rs. } 50 \text{ crores} = 15 \%$ 

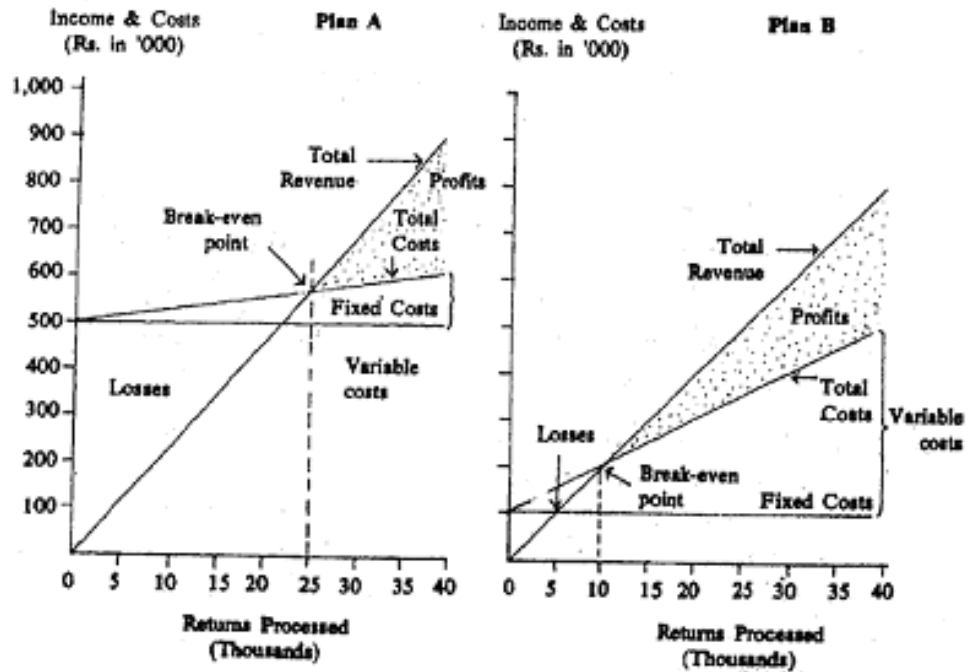
16 (d) EBIT = Gross profit margin X Sales.

=  $12 \times \text{Rs. } 4,00,000 = \text{Rs. } 48,000$ 

	<b>Debt</b>	<b>Equity</b>
EBIT	Rs. 48,000	Rs. 48,000
Interest expenses: (Rs. 1600 + $.10 \times \text{Rs. } 45,000$ )	-6,100	-1,600
Taxable Income	Rs. 41,900	Rs. 46,400
Tax % 35%	Rs. 14,665	16,240
	Rs. 27,235	Rs. 30,160
Earning per share	$27,235 \div 6,000$	$30,160 \div 7,000$
	= Rs. 4.54	= Rs. 4.31
Price Earning (P/E) ratios	15	20
Expected Market price (EPS x PE ratio)	Rs. 68.10	Rs. 86.20



17. A. i) Plan A has greater operating leverage owing to higher fixed costs  
 ii) Break-even charts for Plan A and Plan B.3



iii) Profit under Plan A = (Price - VC) Units – FC

$$= (\text{Rs. } 22 - \text{Rs. } 2) (x) - 5,00,000$$

where x is the indifference number of units

Profit under Plan B = (Rs. 22-Rs. 12) (x) - Rs. 1,00,000

Set the equation for profits under the two plans equal to one another and solve for x:

$$(\text{Rs. } 22 - \text{Rs. } 2) (x) - \text{Rs. } 5,00,000 = (\text{Rs. } 22 - \text{Rs. } 12) (x) - \text{Rs. } 1,00,000$$

$$\text{Rs. } 20 \times \text{Rs. } 5,00,000 = \text{Rs. } 10x - \text{Rs. } 1,00,000$$

$$10x = \text{Rs. } 4,00,000$$

$$x = \text{Rs. } 40,000 \text{ returns processes.}$$

Thus, if fewer than 30,000 returns are processed, Plan B is better but if more than 40,000 returns are handled, Plan A is more profitable.

- iv) Plan A is more risky because if sales fall below 25,000 units, losses will be incurred. The break-even of Plan B is only 10,000 forms.

B. The following steps are suggested for the solution:

i) Calculation of EBIT = Rs. 11,00,000

Sales in Rs. = (50,000) (Rs. 22) = 5,00,000

Less : Fixed costs = 1,00,000

Variable costs =(50,000) (Rs. 2) =

EBIT = Rs. 5,00,000



- ii) Calculation of EPS at each Debt-assets ratio using the formula:  $EPS = (EBIT - I) (1-t) / \text{No. of equity shares outstanding}$

Where

$I = \text{Interest Charges} = (\text{Rupees of debt}) (\text{interest rate at each D/A ratio}).$

$\text{No. of shares outstanding} = (\text{Assets} - \text{Debt}) / \text{Initial price per share}.$

$$= (\text{Rs. } 20,00,000 - \text{debt}) / \text{Rs. } 20.00$$

The calculations made are:

$$\begin{aligned} \text{D/A} = \text{zero} : \text{EPS} &= (5,00,000) (1-.4) / (\text{Rs. } 20,00,000 / \text{Rs. } 20.000) \\ &= (\text{Rs. } 5,00,000) (.6) / 1,00,000 = \text{Rs. } 3.00 \\ \text{D/A} = 10\% : \text{EPS} &= (\text{Rs. } 5,00,000) - (.09) (\text{Rs. } 2,00,000) (.6) / (\text{Rs. } 18,00,000 / \text{Rs. } 20) \\ &= (\text{Rs. } 4,82,000) (.6) / 90,000 \\ &= (\text{Rs. } 2,89,200 / 90,000) = \text{Rs. } 3.21 \\ \text{D/A} = 20\% : \text{EPS} &= (\text{Rs. } 5,00,000) - (.095) (\text{Rs. } 4,00,000) (.6) / (\text{Rs. } 16,00,000 / \text{Rs. } 20) \\ &= (\text{Rs. } 4,62,000) (.6) / 80,000 = \text{Rs. } 2,77,200 / 80,000 = \text{Rs. } 3.47 \\ \text{D/A} = 30\% : \text{EPS} &= (\text{Rs. } 5,00,000) - (.10) (\text{Rs. } 6,00,000) (.6) / (\text{Rs. } 14,00,000 / \text{Rs. } 20) \\ &= (\text{Rs. } 4,40,000) (.6) / 70,000 = \text{Rs. } 2,64,000 / 70,000 = \text{Rs. } 3.77 \\ \text{D/A} = 40\% : \text{EPS} &= (\text{Rs. } 5,00,000) - (.15) (\text{Rs. } 8,00,000) (.6) / (\text{Rs. } 1,20,000 / \text{Rs. } 20) \\ &= (\text{Rs. } 3,80,000) (.6) / 60,000 = \text{Rs. } 2,28,000 / 60,000 = \text{Rs. } 3.80 \\ \text{D/A} = 50\% : \text{EPS} &= (\text{Rs. } 5,00,000) - (.19) (\text{Rs. } 10,00,000) (.6) / (\text{Rs. } 10,00,000 / \text{Rs. } 20) \\ &= (\text{Rs. } 3,10,000) (.6) / 50,000 = \text{Rs. } 1,86,000 / 50,000 = \text{Rs. } 3.72 \\ \text{D/A} = 60\% : \text{EPS} &= (\text{Rs. } 5,00,000) - (.26) (\text{Rs. } 12,00,000) (.6) / (\text{Rs. } 8,00,000 / \text{Rs. } 20) \\ &= (\text{Rs. } 1,88,000) (.6) / 40,000 = \text{Rs. } 1,22,800 / 40,000 = \text{Rs. } 2.82 \end{aligned}$$

- iii) Calculation of Sheshan Ltd's expected equity share price at different debt-assets ratios

D/A Ratio	(PE)	(EPS) Rs.	Expected Price Rs.
0%	(12.5)	(3.00) =	37.50
10%	(12.0)	(3.21) =	38.52
20%	(11.5)	(3.47) =	39.91
30%	(10.0)	(3.77) =	37.70
40%	(8.0)	(3.80) =	30.40
50%	(6.0)	(3.72) =	22.32
60%	(5.0)	(2.82) =	14.10

- iv) Amount of debt which Seshan should use:

The debt ratio at which share price is maximised will give the desired debt level. This is 20% or Rs. 4,00,000 of debt. Note that the EPS, is also not the maximum at this debt level. For this to happen, the debt ratio must be 40% and the corresponding debt level must be Rs. 8,00,000

## 13.11 FURTHER READINGS

Van Horne, James C. 2002. *Financial Management Policy, 12th edition*, Prentice-Hall of India : New Delhi. (Chapter 10&12).

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