
UNIT 11 LEVERAGE ANALYSIS

Objectives:

The study of 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

- 11.1 Introduction
- 11.2 Concept of Financial Leverage
- 11.3 Measures of Financial Leverage
- 11.4 Effects of Financial Leverage
- 11.5 Operating Leverage
- 11.6 Combined Leverage
- 11.7 Financial Leverage and Risk
- 11.8 Summary
- 11.9 Key Words
- 11.10 Self Assessment Questions/Exercises
- 11.11 Further Readings

11.1 INTRODUCTION

You have been familiar with the numerous types of financial ratios. The four-fundamental classes of ratios, namely liquidity, leverage, activity, and profitability, were discussed in Unit-14 Financial Ratios of MMPC-004 Accounting for Managers. The ratios covered in that unit were chosen based on their use in managing business operations.

Despite the fact that a company's management is always interested in maintaining a reasonable level of liquidity and solvency, it is the lender or banker who will insist on particular standards and monitor changes in these ratios. The leverage ratios, which reflect a company's insolvent position, are discussed in depth here. You will get an understanding of the fundamental concept of leverage as well as the role and repercussions of financial leverage by studying this unit.

Another concept of leverage was discussed in the Unit titled "Cost-Volume-Profit Analysis," and you may recall the "break-even analysis" that was presented and illustrated in that unit (MMPC-004). We have discussed the term 'operating leverage' and its significance in that unit. This unit will help you in connecting these two types of leverage concepts; financial and operating leverages.

11.2 CONCEPT OF FINANCIAL LEVERAGE

Consider how the phrases 'lever' and 'leverage' are commonly used. The following is how Webster's dictionary defines them:

The word 'lever' means 'inducing' or 'compelling.' The action of a lever or the mechanical advantage acquired by it is referred to as 'leverage'. It also refers to 'effectiveness' or 'power'. The use or manipulation of a tool or equipment known as a lever, which provides a substantive clue to the meaning and nature of financial leverage, is the most frequent interpretation of leverage. Could you figure it out?

Your response, we assume, will be negative.

Let us say we propose that our lever is the utilization of debt or borrowed funds for asset acquisition. Would you be able to grasp the meaning of the word "financial leverage"? Most likely, you require some clarification. That is something we will do. Take a look at the simple (and hypothetical) facts regarding GTB Limited below:

The GTB Limited intended to buy fixed assets worth Rs. 80 lakhs for the completion of a project, which would be financed with a Rs. 30 lakhs share capital and Rs. 50 lakhs in term loans at an 18% interest rate. On its share capital, the corporation was expected to achieve a minimum return of 20%. Other companies of similar type were earning this much, and unless GTB Limited could match that, no investor would be interested in purchasing its stock. The GTB Limited pays tax at the rate of 40% and is exempt from paying any tax on interest payments on term loans.

Now let us see what happens to the company's net return on equity (after interest and taxes) if (a) the entire Rs. 80 lakhs are raised through share sales, and (b) the financing arrangement proposed in the problem is implemented? You might estimate GTB's earning potential to be 40% (before taxes and interest) on total assets of Rs. 80 lakhs. GTB's earnings are taxed at the rate of 40%.

We present for your understanding the solution below:

Table-11.1 Effect of Financial Leverage

	Rs. 80 lakhs as Share capital (Rs. Lakh)	Rs. 30 lakh of share capital plus 50 lakhs of debt (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%	12.80	9.20
Earnings after taxes	19.20	13.80
Earnings after interest and taxes as a % of share capital	24%	46%

When no debt is utilised, the net return on equity is 24 percent, but when debt is used, it is 46 percent. There has been a significant increase in the net return. We would assume at this point that using debt financing in a profitable and tax-paying corporation boosts net equity returns. Financial leverage refers to the effect of using debt financing on the returns of the firm.

You may have noticed in the above example that the increase in net equity returns from 24% to 46% occurred at a certain level of debt, namely when the debt is Rs. 50 lakhs against an equity of Rs. 30 lakh (i.e., when the debt-to-equity ratio is 5:3 or 167%) or when the debt is Rs. 50 lakhs against total assets of Rs. 80 lakhs (i.e., when the debt- assets ratio is 5:8 or 62.5 percent). These and other financial leverage measurements are examined in the following section. But, before we go any further, let us summarise the concept of financial leverage.

Financial leverage refers to a company's plan of financing assets with fixed-charge securities such as debentures and preference shares (though the latter is not necessarily included in debt). The term "financial leverage" refers to a company's financing activity. It occurs as a result of the existence of fixed financial expenses in the Capital Structure. Expenses like this are unaffected by operating earnings (EBIT). Regardless of the amount of EBIT available to pay them, they must be paid. The EBIT belongs to the shareholders after the expenses in relation to the debt capital have been paid. The effect of changes in EBIT on the earnings available to shareholders is referred to as financial leverage (EPS). It can be characterized as a company's ability to magnify the impact of changes in EBIT on EPS by using fixed financial costs.

The financial leverage is calculated as a percentage change in EPS divided by a percentage change in EBIT.

11.3 MEASURES OF FINANCIAL LEVERAGE

The quantity of debt that a company uses or intends to use might be stated in terms of total assets or total equity. Total assets will be taken at net value, and equity will include paid-up capital and reserves. Despite the fact that both shares and assets can be valued at market prices, the current discussion will solely employ book prices. Market values are difficult to get, change widely, and are not available for new ventures that plan their sources of capital using the notion of financial leverage.

The debt-equity and debt-assets ratios, which are both computed using Balance Sheet data and are inter-related, will be demonstrated. It's worth noting that this section assesses the usage of financial leverage rather than its consequences. The latter is determined by the Degree of Financial Leverage, which is explored in more detail in the following section.

With the help of an example, we will illustrate the notion of financial leverage. Bharat Engines Limited intends to purchase assets for Rs. 1 crore. The corporation has two financing options: debt and equity. The Finance Director wants to know how the debt-equity and debt-assets ratios will vary at different debt levels of (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-11.2 provides the required calculations:

Table-11.2: Debt-assets and Debt-equity Ratios (Total investment in assets = Rs 100 lakh)

Debt Rs. Lakh	Equity Rs. Lakh	Debt-assets Ratio	Debt-equity Ratio
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 pay attention to the final two columns in the table above. The following analysis illustrates the fundamental aspects of the two ratios and shows how they are related:

- The debt-to-assets ratio rises at a consistent rate, eventually reaching 100% and the debt-to-equity ratio rises inexorably until it approaches infinity (∞) as the amount of debt rises in the capital structure.
- The two ratios are mathematically connected and can be calculated from one another. For such derivations, the following relationships can be used:

$$\text{Debt-Assets Ratio } \left(\frac{D}{A}\right) = \frac{\frac{D}{E} \text{ Ratio}}{1 + \frac{D}{E} \text{ Ratio}} \dots\dots\dots (1)$$

$$\text{Debt-Equity Ratio } \left(\frac{D}{E}\right) = \frac{\frac{D}{A} \text{ Ratio}}{1 - \frac{D}{A} \text{ Ratio}} \dots\dots\dots (2)$$

At every debt level, the usage of these methods to derive one ratio from another can be proved. The debt-to-assets ratio is 80 percent with a debt amount of Rs. 80 lakhs, for example. Formula-(2) can be used to get the D/E ratio:

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

Similarly, with a given D/E ratio of 400% or 4.00, the D/A ratio can be derived by using formula (1) above:

$$\frac{D}{A} \text{ Ratio} = \frac{4.00}{1 + 4.00} = \frac{4.00}{5.00} = 0.80 \text{ or } 80\%$$

The D/A and D/E ratios are both used to calculate financial leverage. It is worth noting that the D/E ratio exaggerates the amount of financial leverage at all levels of debt and becomes unclear at 100% debt. As a result, using the debt-to-asset ratio as a measure of financial leverage may be more technically

possible.

In recent literature, you may come across certain ratios that seek to quantify the use of financial leverage. They are as follows:

- 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-11.1:

1. Take any company's financial statements and analyse its financial leverage to demonstrate the notion of financial leverage.

.....

.....

.....

.....

.....

2. Answer the following:

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

11.4 EFFECTS OF FINANCIAL LEVERAGE

Table-11.1 shows an example mentioning that financial leverage could have an impact on return on equity. You have probably seen one crucial factor to consider when using borrowed funds; that is the increase in net equity returns that such a move results in.

In reality, another ratio, Earnings Per Share (EPS), is used to quantify the impact of financial leverage. This is done in the case of joint stock corporations that have raised capital by selling equity shares, which are units of that capital. Divide earnings (after interest and taxes) by total equity to get earnings per share. It is worth noting that if a company's capital structure includes preference shares, net equity earnings will be calculated after deducting interest, taxes, and preference dividends. A company's capital structure refers to its long-term funding, which is made up of a mix of long-term debt, preference shares, and net worth (which included paid-up capital,

reserves, and surpluses). Financial structure is defined as the total of capital structure components plus short-term debt. Financial leverage and its consequences are critical considerations in capital structure planning and design.

We should emphasize that the effects of financial leverage are not always obvious and consistent across different levels of profitability and debt proportions. Before recommending a specific long-term financing mix for implementation, it may be required to investigate these impacts.

We will use an example from the last section to demonstrate the implications of financial leverage.

Bharat Engines is exploring four different debt ratios (D/A ratios): 0%, 20%, 50%, and 80%. The D/E ratios are 0 percent, 25%, 100 percent, and 400 percent, respectively.

The company's equity capital is divided into shares of Rs. 10 each, which can only be sold in the market for their face value. If business conditions are favourable, the firm forecasts a net profit (before tax) of 25% on total assets of Rs. 1 crore, a net profit (before tax) of 50% on total assets if conditions are highly favourable, and a net loss (before tax) of 25% if conditions are unfavorable. Bharat Engines is subject to a 40% income tax rate. The company's average interest rate on borrowings is projected to be 15%.

Table-11.3 shows how each of the four different debt levels affects the return on equity and earnings per share.

Table-11.3 Financial Leverage, Equity Returns & EPS

Total Investment Rs. 1 Crore

Alternative Estimates of EBIT (in Rs. Lakhs) as of Total Assets

Probable Profitability outcomes	(-25%)	+25%	+50%
CAPITAL STRUCTURE			
I: Debt = Zero, Equity = Rs. 1 Crore			
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

II: Debt=Rs.20 lakh, Equity=Rs. 80 lakh			
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%	11.2	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	3.525
III: Debt = Rs. 50 lakh, Equity = Rs. 50 lakh			
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%	13.00	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
IV: Debt = Rs. 80 lakh, Equity = Rs. 20 lakh			
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 -11.3 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.

The following can be observed from the Table-11.3 for further study and analysis:

- Because the tax rate is 40%, the after-tax return on total assets at zero debt (i.e., capital structure I) is 60% of the before-tax return. In addition, the after-tax return on total assets and the after-tax return on equity are the same.

- b) When the return on assets exceeds the cost of debt, financial leverage is advantageous. When the return levels are 25% and 50%, this holds true for all four capital structures.
- c) When the return on assets is high, the debt ratio causes the net return on equity and earnings per share to rise. You will see that when the return on assets is at its highest (50%) (Final column of Table-11.3), the return on equity jumps from 30% at zero debt to 114 percent at 80 percent debt. The EPS has risen from Rs. 3.00 to Rs. 11.40 as a result of this increase.
- d) At various degrees of leverage, the amount of interest has an impact on the connection between after-tax return on assets and return on equity. The numerators of both ratios are related in the following way:

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

Where, 't' = tax rate

You will notice that the numerator of return on assets is to the left of the equation, whereas the numerator of return on equity is to the right.

This relationship can be verified at any debt level. Take, for example, capital structure-II in Table-11.3 at a Rs. 25 lakh EBIT level and replace relevant values in equation (3). You will receive:

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

- e) While larger levels of leverage boost equity returns and earnings per share, they also cause higher levels of volatility in those returns. On the basis of the data in Table-11.3, Table-11.4 highlights the lowest, maximum, and range of equity returns at various debt levels.

Table-11.4 Financial Leverage and Equity Returns

Debt/Equity ratio	Debt-assets Ratio Range	Return on Equity (ROE)		
		Unfavourable conditions	Favourable	Highly Favourable
0%	0%	-25%	30%	45%
25%	20%	-28%	35.25%	56.25%
100%	50%	-65%	51%	90%
400%	80%	185%	114%	225%

When the debt ratio is zero, the Return on Equity (ROE) ranges within a 45 percent range, but when the debt ratio climbs to 80 percent, the range climbs to 225 percent. If you look at the equity return in terms of net income or earnings per share, you will notice that it is more volatile. From the above we can conclude that financial leverage magnifies return volatility, whether measured by net income, return on equity, or earnings per share.

As a result, financial leverage appears to be a two-edged sword. It enhances the volatility of returns while magnifying them. Increased volatility means more risk in the event of a mounting interest burden, which if not fulfilled could result in bankruptcy. The riskiness of the company may increase in the eyes of equity shareholders and lenders. This aspect of financial leverage is covered in the last section of this unit.

Activity-11.2

Draw a graph illustrating the position of the four capital structures using the data in Table-11.3. The X-axis should reflect EBIT as a percentage of total assets, and the Y-axis should indicate return on equity as a percentage of total assets. What conclusions do the graphics lead you to? Are they in line with the results of the above-mentioned analysis in Table-11.3?

.....

.....

.....

.....

11.5 OPERATING LEVERAGE

The financial Leverage, as mentioned and demonstrated in the preceding section, multiplies the danger of bankruptcy, i.e., the financial risk. We now have a new concept of leverage, which is closely linked to business risk. This is referred to as operating leverage. Indeed, operating leverage has an impact on company risk, which may be defined as the uncertainty that comes with forecasting future operating income.

We can better appreciate the concept of operating leverage if we review what we learned about break-even analysis in the Accounting for Managers (MMPC-004) course. It is worth noting that operating leverage refers to the extent to which a company has built in fixed expenses as a result of its specific or unique manufacturing process.

In many cases, a company would be able to exercise some control over the technology it uses and the production processes that go with it. Highly mechanized and automated operations are typically associated with high fixed costs but low variable costs. The degree of operating leverage is often high with such processes, the break-even threshold is relatively greater, and so variations in sales have a magnified (or "leveraged") influence on profitability. The break-even sales volume increases when the operating leverage (i.e., fixed expenses) increases. As a result, change in sales from the given volume has a higher influence on profitability. Financial Leverage, on the other hand, adds another aspect of fixed cost, namely fixed financial charges, and serves to exacerbate the impact of overall leverage on profitability.

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

Table-11.5 Operating Leverage

(Rs. in lakhs)

Units Sold	Sales at 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	.00	5.50	-.50	6.50	-1.50
60,000	6.00	5.70	.30	6.00	.00	6.90	-.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		3.0 lakh		4.5 lakh	
Variable cost per unit (Rs.):		7.00		5.00		4.00	

You may have noticed the characteristics of the three firms from Table-11.5. They are:

- Sales volume in units, selling price per unit, and sales value realization are identical for all the three firms. As a result, a change in sales volume has a greater impact on profit.
- Firm-A has the lowest fixed costs, firm-B has a medium fixed cost, and firm C has the highest fixed cost. Firm-A has the least automated machinery, lowest depreciation charges, low fixed costs, and a higher per unit variable cost. Firm- B has a plant that is moderately automated. Firm-C has the most advanced plant, requiring very minimal labour per unit of output. It has a slower rate of increase in variable expenses and a higher overhead burden. With a variable cost per unit of Rs. 4.00, Firm-C has the lowest variable cost.

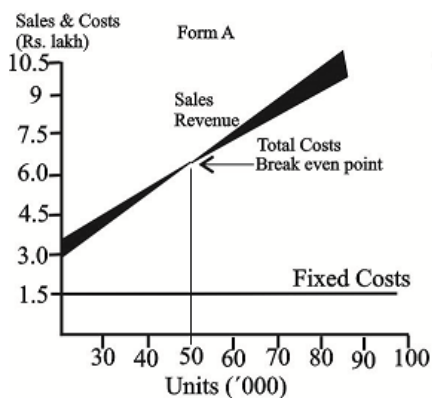


Figure 13.1

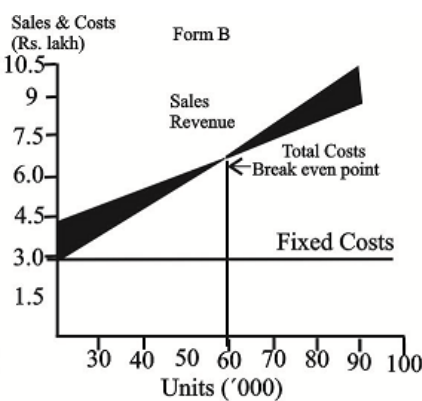


Figure 13.2

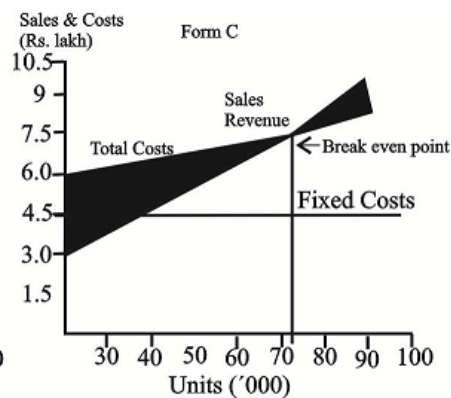


Figure 13.3

The effect of a change in volume on net operating income (profits before interest and taxes) is measured by the degree of operating leverage. The following formula can be used to obtain this:

Degree of Operating Leverage (DOL)

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

When a company advances from one level of sales (volume or value) to another, the degree of operating leverage is calculated. For example, when business 'B' in Table-11.5 increases its volume from 80,000 to 90,000 units, the degree of leverage is as follows: -

$$\text{DOL} = \{\Delta \text{ NOI}/\text{NOI}\}/\{\Delta \text{ Q}/\text{Q}\}$$

Where,

Δ NOI is the change in Net Operating Income Where

NOI is net operating income or earnings before interest and taxes.

Δ 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:

$$\begin{aligned} \frac{(1,50,000 - 1,00,000)/1,00,000}{(90,000 - 80,000)/80,000} &= \frac{50,000/1,00,000}{10,000/80,000} \\ &= \frac{0.50}{0.125} = 4 \end{aligned}$$

To understand the implications of DOL, compare Firm A (least operating leverage) with Firm C (most operational leverage) at any two levels of output, such as a shift in output from 80,000 to 90,000 units, or a 12.5 percent increase.

$$\text{DOL}_A \text{ at 80,000 Units} = \frac{.30/.90}{10,000/80,000} = 2.67$$

$$\text{DOL}_C \text{ at 80,000 Units} = \frac{.60/.30}{10,000/80,000} = 16.00$$

You may have noticed how earnings shift in response to volume changes. Profits will grow by 26.7 percent for Firm-A (a low-fixed cost) and by 160 percent for Firm- C for a 12.5 percent rise in output (which has high fixed cost). Profit swings will be more pronounced for companies having high fixed cost. As a result, the higher the degree of operating leverage, the bigger the profit variations in reaction to volume changes. This link exists in both directions, i.e., when volume grows and when volume decreases.

Operating leverage has ramifications for a variety of commercial and financial policy issues. Some of them are illustrated in the following

instances based on the DOL of Firm-C:

- a) Given Firm-C's high operating leverage, it is possible that volume may be increased to achieve a significant increase in profits. If Firm-C could grow its volume from 1,00,000 to 2,00,000 units by lowering the selling price to Rs. 9.00 per unit, and with no change in fixed cost (Rs.4.5 lakh) and variable cost (Rs.4), then its net operating income would be:

$$\text{NOI} = \text{PQ} - \text{VQ} - \text{F}$$

Where,

P = price per unit

V = variable cost per unit

Q = volume in units, and

F = total fixed cost.

$$= \text{Rs. } 9 \times 2,00,000 - \text{Rs. } 4 \times 2,00,000 - \text{Rs. } 4.5 \text{ lakhs}$$

$$= \text{Rs. } 18 \text{ lakhs} - \text{Rs. } 8 \text{ lakhs} - \text{Rs. } 4.5 \text{ lakhs}$$

$$= \text{Rs. } 5.5 \text{ lakhs}$$

From the above we can see that Firm-C is able to improve 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. Doubling of output (due to a 10% reduction in sales price from Rs. 10 to Rs. 9) results in profits that are 3.6 times higher. Therefore, Firm-C, which has a significant degree of operating leverage, may pursue an aggressive pricing strategy.

- b) If Firm-C belongs to an industry where sales are greatly affected by changes in the overall level of the economy, resulting in wild profit fluctuations, the degree of financial leverage appropriate for Firm-C will be lower than one for a firm that belongs to an industry that is not as sensitive to changes in the economy.

11.6 COMBINED LEVERAGE

The degree of operating leverage and the degree of financial leverage can be mixed. In reality, degree of operating leverage (DOL) is considered the initial stage of leverage, whereas degree of financial leverage (DFL) is considered the second step. Financial leverage can be calculated using the following method, which evaluates the impact of changes in EBIT on earnings available to equity shareholders:

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

Before explaining the ramifications of merging DOL and DFL, the use of this formula could be demonstrated. Table-11.3's data for leverage factors of 20% debt and 80% debt can be used to demonstrate the impact of increasing EBIT from Rs. 25 lakhs to Rs. 50 lakhs. It is worth noting the following calculations:

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

$$\begin{aligned} \text{DFL (80\%)} &= \frac{(22.80 - 7.80) / 7.80}{50.00 - 25.00) / 25.00} \\ &= \frac{(15.00 / 7.80)}{25.00 / 25.00} = \frac{1.92}{1.00} = 1.92 \end{aligned}$$

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

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

The values of 1.92 and 1.14 are simple to comprehend. When the debt ratio (or leverage factor) is 80 percent, a ten percent rise in EBIT results in a 19.2 percent rise in net income available to equity shareholders (10 x 1.92). With a leverage factor of 20%, a 10% rise in EBIT only results in an increase of 11.4 percent (10 × 1.14) in net income or earnings available to equity shareholders. You can conclude that a high level of leverage magnifies equity earnings.

The degree of financial leverage (DFL) will be 1.00 if there is no debt (i.e., unity). DFL will rise above 1.00 or 100 percent if debt is used. The DFL can be thought of as a multiplication factor, and when it is 1.00, there is no magnification in net income or return on equity, or in earnings per share.

The degree of magnification in Net Income (NI), Return on Equity (ROE), and Earnings per Share (EPS) for a given increase in sales is measured using a mixture of operating and financial leverage. When a company uses a lot of operating and financial leverage, modest changes in sales can cause big swings in NI, ROE, and EPS.

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

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

$$\text{DCL} = \frac{\% \text{change in EBIT}}{\% \text{change in sales}} \times \frac{\% \text{change in EPS}}{\% \text{change in EBIT}}$$

$$\text{DCL} = \frac{\% \text{change in EPS}}{\% \text{change in sales}}$$

It is worth noting that different DOL and DFL combinations can result in the same DCL. If management has a target DCL, DOL or DFL changes may be made to meet the target DCL. For example, if a firm's operating leverage is high due to the nature of its operations, the financial leverage may be appropriately reduced to avoid lowering the targeted combined leverage, and vice versa.

11.7 FINANCIAL LEVERAGE AND RISK

At the beginning of this unit, we discussed the concept of risk. As you may recall from our previous discussion, the concepts of operating, financial, and combined leverage have all been studied in order to determine the amount of risk (business, financial, and combination) that the firm bears as a result of actions to adjust the various degrees of leverage. In fact, the degree to which various metrics of net income fluctuate in response to changes in sales or EBIT has a direct impact on a variety of business and financial strategies.

Risk can be quantified by using a variety of statistical methods. Let us, calculate one such metric known as coefficient of variation using the data given below alongwith data in Table 11.3.

Table-11.6 Cost Structure of Bharat Engines Ltd.

	Rs. in lakhs		
Sales (units)	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:

$$\text{Total Cost} = \text{Fixed operating costs} + \text{Variables operating costs per unit} \times \text{Sales} = 40 \text{ lakhs} + 0.20 \text{ sales}$$

The assignment of probabilities to the possible levels of sales that the management has anticipated is the first step in obtaining a measure of coefficient of variation. In a nutshell, probability is the likelihood of an event occurring. Probability is 1.0 if it is certain; otherwise, it is always a fraction of unity (1).

Management has no control over the status of the economy, but it does have power over company policies, which can be reliably predicted. The state of the economy might range from "extremely poor" to "extremely good," and managerial attitudes of pessimism or optimism might reflect this. Assume that Bharat Engines Ltd.'s management has assigned the following probabilities based on the above-mentioned consideration:

Table-11.7 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-11.3, 11.6 and 11.7 and present computations of coefficient of variations in Table-11.8 below:

Table-11.8: Calculation of Coefficient of Variation (CV)

Capital Structure	State of the Economy (S)	Probability (P _s)	Return on Equity	P _s × ROE	(ROE-ROĒ)	P _s × (ROE-ROĒ) ²
Zero Debt	A	.2	-.15	-.03	-.285	.0162
	B	.5	.15	.075	.015	.0001
	C	.3	.30	.090	.165	.0082
	ROĒ=.135 σ = .157; CV= σ/ ROĒ= .157/.135=1.163					.0245=σ ²
20% Debt	A	.2	-.21	-.0420	-.3563	.0254
	B	.5	.165	.825	.0187	.0002
	C	.3	.3525	.1058	.2062	.0128
	ROĒ=.1463 σ = .1959; CV= σ/ ROĒ= .1959/.1463=1.339					.0384=σ ²
50% Debt	A	.2	-.39	-.078	-.530	.05618
	B	.5	.13	.065	.010	.00005
	C	.3	.51	.153	.370	.04107
	ROĒ=.1463 σ = .3119; CV= σ/ ROĒ= .3119/.140=2.228					.9730=σ ²
80% Debt	A	.2	-1.11	-.222	-1.275	.3251
	B	.5	.39	.195	.225	.0253
	C	.3	.64	.192	.475	.04107
	ROĒ=.165 σ = .6466; CV= σ/ ROĒ= .6466/.165=3.919					.4181=σ ²

Legend: S = State of Economy, i.e., bad, good, very good

P_s = Probability of occurrence of the state of the economy

ROE = Return on equity

P_s×ROE = Probability × Return on equity

ROĒ=Expected Value of Return on Equity (Mean)

σ² = Variance

σ = Standard Deviation

CV = coefficient of variation

Let us study Table-11.8 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-11.7 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.

11.8 SUMMARY

The financial and operating leverages are crucial concepts to understand when assessing a company's business and financial risk. The use of fixed expenses in operations is referred to as operating leverage, and it is tied to the firm's production processes. The larger the operating leverage, the larger the operational risk. Simultaneously, a high level of operating leverage causes profits to rise quickly after the break-even point is reached.

The use of debt to finance non-current assets is referred to as financial leverage. Leverage is successful if the return on assets exceeds the cost of debt, i.e., it improves returns on equity. As a result, a high level of financial leverage multiplies financial risk. Because of the increased risk associated with greater fixed costs, the cost of debt rises to some extent when financial leverage is used. When this occurs, the firm's riskiness rises in the view of equity investors, who begin to demand a larger return to compensate for the increased risk. 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.

The impacts of operating and financial leverage are mutually reinforcing. Operating, or first-stage leverage, affects earnings before interest and taxes (i.e., net operating income), whereas financial, or second-stage leverage, affects earnings after interest and taxes (i.e., net operating income) (i.e., net income available to equity shareholders).

To analyse their impact on a company's profitability, operating and financial leverages are quantified in relative terms. The degrees of operating and financial leverage are used to get these figures. To measure the consequences of changes in sales on net income or earnings per share, a combined degree of financial and operating leverage can be estimated.

The financial leverage and risk are connected variables, and the coefficient of variation, a statistical metric, can be used to quantify the firm's risk at various levels of leverage or debt ratio.

11.9 KEY WORDS

Financial Leverage refers to the use of debt in the financing of a firm. It indicates the presence of fixed-return securities in the company's capital structure.

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. Debentures, preference shares, other fixed-return instruments, long-term loans, equity shares, reserves, and surplus are all covered.

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 ratio of changes in earnings before interest and taxes to changes in net income available to equity investors.

Degree of Combined Leverage is the percentage change in net income after interest and taxes as a result of a change 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.

11.10 SELF ASSESSMENT QUESTIONS/ EXERCISES

1. How does the use of financial leverage affect the break-even point? Illustrate.
2. In what way financial leverage is related to operating leverage? Discuss with an example.
3. 'Risk increases proportionately with financial leverage'. Refute this statement with reasons.
4. Other things remaining the same, firms with relatively stable sales are able to incur relatively high debt ratios. Do you agree with this statement?
5. Why EBIT is generally considered to be independent of financial leverage? Why should EBIT actually be influenced by financial leverage at high debt levels?
6. 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) None of these
7. 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) Short-term debt
8. 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

9. 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
10. 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) relatively uncertain with high margins
11. The debt ratio of Firms A and B are 60% and 30%, respectively. Both firms have assets totaling 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%

12. 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	90,000	Total assets	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?

Debt (Rs.)	Equity Shares (Rs.)
(a) 13.15	20.20
(b) 29.30	41.70
(c) 52.35	66.20

(d) 68.10 86.20

(e) 86,50 99.20

13. 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 B 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 riskier?

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	% of debt a upper end of class-interval in capital structure	Interest rate of 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.

11.11 FURTHER READINGS

1. Chandra, Prasanna. 2019, Financial Management, Theory and Practice, Mc Graw-Hill, New Delhi
2. Pandey. I.M., 2021, Financial Management, Pearson Education India, New Delhi
3. Sheridan Titman, Arthur J. Keown, and John D. Martin, 2019, Financial Management: Principles and Applications, Pearson Education India, New Delhi.
4. M.Y. Khan. M. Y and Jain. P.K., 2018, Financial Management, McGraw Hill Education, New Delhi
5. Eugene F. Brigham, Joel F. Huston, 2018, Fundamental of Financial Management, Cengage Learning India, New Delhi.
6. Richard Brealey, Stewart Myres & Franklin Allen, 2019, Principles of Corporate Finance, Mc Graw Hill, New Delhi.