CHAPTER SEVEN

LEVERAGE IN BUSINESS

Meaning of leverage

- In business, leverage is the use of fixed costs in an attempt to increase or (lever up) profitability. These fixed costs could be fixed operating costs (e.g. depreciation) or fixed financing costs (e.g. interest) or in most cases both.
- It is the use of fixed costs with the intent of magnifying the returns of the firm.
- Leverage magnifies profit as sales increases, and magnifies loses as sales drops.

Types of leverage

1) **Operating leverage:** it is the use of fixed operating costs in the production activities or operations of the firm.

- It is the use of fixed operating costs to magnify the effects of changes in sales on the firm's profits before interest and taxes (PBIT).

Degree of operating leverage (DOL)

- Degree of operating leverage is the numerical measure of the firm's operating leverage. It quantifies the responsiveness of operating income to changes in the level of income.
- It is the variability of operating income (PBIT), due to the use of fixed operating costs. It is the percentage change in operating profit (PBIT) as a result of percentage change in sales.

$$DOL = \frac{percentage\ change \in PBIT}{percentage\ change \in Q}$$

Where,

DOL = Degree of operating leverage

PBIT = profit before interest and taxes (operating profit).

Q = sales (units to be sold).

$$DOL = \frac{sales - variable\ cost}{PBIT - Q(P - V) - F} = \frac{CM}{NOI}$$

- This ratio answers the following types of questions. If sales increases by 10%, by what percentage operating profit will increase, given a certain degree of operating leverage?

Example: if DOL = 2, then a 10% increase in the level of sales will increase operating profits by 20%.

- ☞ A large DOL indicates that small change in the level of sales will produce large changes in the level of operating profit.
- ☞ A firm with relatively high leverage level will experience more variability in operating income if sales changes, thus, a higher level of leverage can be associated with higher level of risk. Due to that decreases in sales results in a larger increase in lose if the use of leverage is increase.

Illustration: assume Lakew Company has the following income statement for the current year ended December 31, 2003.

Lakew Company

Income statement

For the year ended December 31, 2003

Sales (in units)……1, 000

Sales revenue……..birr 10,000

Less: variable operating costs……..5,000

Fixed operating costs……2, 500

PBIT (Operating income)…….birr 2,500

Less: interest……...500

Profit before tax……birr 2,000

Less: tax (40%)……...800

Profit after tax……...birr 1,200

Ato Lakew is the owner manager of the company, and he is planning to increase the sales volume to 1,500 units in the year 2004. He assumed the selling price per unit (SPU), VCU and the total fixed costs would remain the same as they were in the year2003.

Projected operating leverage for the year 2004,

Sales (in units)……...1, 500

Sales revenue……..birr 15,000

Less: variable operating costs (1, 5000 x 5)……7,500

Fixed operating costs……2, 500

PBIT (profit before interest and tax)…….birr **5,000**

$$\text{DOL} = = \frac{percentage\ change \in PBIT}{percentage\ change \in Q} = = \frac{birr\ \frac{5{,}000-2{,}500}{2{,}500}\ x\ 100}{\frac{1{,}500-1{,}000}{1{,}000}\ x\ 100} = = \frac{100\,\%}{50\,\%} = 2$$

This indicates that as the company's sales increases from 1,000 to 1,500, its PBIT will increase from birr 2,500 to birr 5,000. Or a 50% change in sales results in a 100% increase in PBIT.

DOL = 1, what does it imply? There is no fixed operating cost employed and there will be 1% change in PBIT for a 1% change in sales.

Example:

Given	amount	percentage of sales
Sales……..	birr 80,000…….	100%
Less: variable costs……..	32,000……...	40%
Contribution margin……	birr 48, 000…….	60%
Less: fixed costs…….	38, 000	
Net operating income……	birr 10,000	

Required:

1) Compute the company's DOL.
2) Using the DOL, estimate the impact on net income of a 5% change in sales.
3) Verify your estimate from the above by constructing a new contribution; forget income statement for the company and assuming a 5% increase in sales.

- ✓ When operating leverage exists, an increase in sales results in a more than proportional increase in operating profits and vice versa.

Alternative method of determining DOL

$$\text{DOL} = \frac{revenue - variable\ costs}{revenue - variable\ costs - ¿\ costs}$$

$$\text{DOL} = \frac{Q(P-V)}{Q(P-V)-F}$$ where, Q = the level of sales

P = the SPU

V = the VCU

F = the total fixed costs.

Example: A certain firm is able to sell a unit of product for birr 5, each unit has a variable cost of birr 3, and the fixed costs of operation are birr 1,000. What is the firm's DOL a5t 1,000 units of sales?

Solution:

- ☞ The nu ber……indicates that if the firm increases sales by 10%, operating profits or PBIT will rise by 20%. This increase is easily verified, for 1,000 units of sales, the level of operating profit is birr 1,000.

  Total Revenue = birr 5 x 1,000 = birr 5,000.

  Total cost = birr (3 x 1,000) + birr 1,000 = birr 4,000.
- ☞ Operating profit = birr **1,000.**
- ❖ If sales are increased by 10%, what would be the level of operating profit becomes?

  Increase in sales level = 1.1 x 1,000 = 1,100 units.

  Total revenue = birr 5 x 1,100 = birr 5,500.

  Total cost = birr (3 x 1,100) + 1,000 = birr 4,300
- ☞ Operating profit = birr **1,200**
- The greater the fixed costs, the smaller the denominator in the ratio, and hence the larger the degree of operating leverage.
- Firms with larger amounts of fixed costs have to sell a larger level of units in order to spread out these fixed costs, such firms have higher degrees of operating leverage.

Substitution of fixed operating costs for variable operating costs and its effect on operating leverage:

- ❖ Operating leverage is affected when the firm substitutes fixed operating costs for variable operating costs (e.g. substituting equipment for labor). This may increase degree of operating leverage (DOL) because fixed operating costs in a form of equipment depreciation, have increased.

Example: by using the earlier example, the firm's product sold for birr 5, and fixed and variable operating costs were birr 1,000 and birr 3 per unit respectively. Suppose the firm increase fixed costs to birr 1,500 but reduces variable operating costs from birr 3 to birr 2.50 per unit.

Solution: DOL = $\frac{1{,}000(birr\,5 - birr\,2.50)}{1{,}000(birr\,5 - birr\,2.50) - birr\,1{,}500}$ = **2.5**

- ☞ The higher the fixed operating costs, the higher the DOL will be. The DOL has increased from 2 to 2.5. I.e. if the firm were to increase sales by 10%, operating profit would increase by 25%.

Operating leverage and risk

- ☞ Operating profits will rise and fall more rapidly for a firm with a higher degree of operating leverage (high operating fixed costs).
- ☞ How operating leverage affects the level of risk associated with airlines and retailing businesses?
- ☞ Airlines industry has a large DOL because of depreciation on plans and equipments are so huge, i.e. high fixed costs.
- ☞ Retailing business has few fixed operating costs (example rent for a building) and many variable operating costs, as a result, they have a low degree of operating leverage.
- ☞ Business (operating risk) is the variability of earnings before interest and tax. Variability of earnings before interest and tax is due to variability of sales or variability of expenses (fixed and variable expenses). Or operating risk is the variability of EBIT caused by the use of operating leverage.
- ☞ Firms with high DOL (i.e. relatively large foxed operating costs) are generally riskier than firms with lower DOL (i.e. relatively lower fixed operating costs).
- ☞ The DOL shows how increase or decrease in the level of fixed operating costs will affect the firm's operating profits. Management needs to be aware of that an increase in fixed operating costs may increase:
    - ✓ Changes in operating profits as sales changes.
    - ✓ The level of sales necessary for the firm to be profitable, and
    - ✓ The level of business risk.

2) FINANCIAL LEVERAGE

- ❖ Financial leverage is the use of fixed costs in the financing of the firm's assets such as interest costs and preferred stock dividends.
- ❖ It is the use of fixed financing costs to magnify the effects of changes in operating profit on the firm's earnings per share (EPS).

- The two fixed financing costs are:
  a) Interest on debt financing, and
  b) Preferred stock dividends – these costs must be paid regardless of the amount of PBIT available to pay them.

Degree of financial leverage

- The Degree of Financial Leverage (DFL), like the DOL, is a measure of responsiveness.
- It measures the responsiveness of EPS (Earning per share) to changes in operating profits.
- It is the numerical measure of the firm's financial leverage.

$$DFL = \frac{percentage\ change \in EPS(earning\ per\ share)}{percentage\ change \in PBIT(profit\ before\ interest \wedge tax)}$$

Illustration: assume Nile Company has earned profit before interest and tax of birr 10,000 in the current year. It has an interest cost of birr 2,000 on its outstanding debt and 600 shares of birr 4 (annual preferred stock dividend per share) preferred stock outstanding. The firm is in the 40% tax bracket. Nile Company's financial manager, Mr. Abel, wants to see the effects of changes in operating profits on the company's EPS. Particularly, he is interested to see the effects of increase or decrease the current operating profit by 40%.

Preferred stock dividend = birr 4 x 600 = birr 2,400

Common stock outstanding = 1,000 shares.

The EPS (earning per share) for various levels of PBIT for Nile company:

	40% decrease in PBIT	current year PBIT	40% increase in PBIT
PBIT	birr 6,000	birr 10,000	birr 14,000
Less: interest	2,000	2, 000	2,000
Profit before tax	4,000	8, 000	12, 000
Less: tax (40%)	1,600	3, 200	4,800
Net profits after tax	2,400	4,800	7, 200
Less: preferred stock dividends	2,400	2,400	2,400
Earnings available for common stock holders	birr 0	birr 2,400	birr 4,800
EPS	$\frac{Birr\ 0}{1{,}000} =$ **birr 0**	$\frac{birr\ 2{,}400}{1{,}000} =$ **birr 2.40**	$\frac{Br\ 4{,}800}{1{,}000} =$ ¿ **Br4.80**

(1) When PBIT increases from birr 10,000 to birr 14,000, EPS increases from birr 2.4 to birr 4.8.

- ✓ Increase (change) in EPS = birr 4.8 – birr 2.4 = birr 2.4.
- ✓ Percentage increase (change) in EPS = $\frac{Birr\,2.4}{birr\,2.4}$ X 100 = 100%
- ✓ So, when PBIT increases by 40%, EPS will increase by 100%.

(2) When PBIT decreases from birr 10,000 to birr 6,000, EPS will decrease from birr 2.4 to Br 0.

- ✓ Decrease (changes) in EPS = birr 0 – birr 2.4 = -birr 2.4.
- ✓ Percentage decrease in EPS = $\frac{-birr\,2.4}{birr\,2.4}$ X 100 = -100%.

Similarly, a 40% decrease in PBIT results in a 100% decrease in EPS.

(3) What is the DFL for Nile Company?

DFL = $\frac{percentage\ change \in EPS}{percentage\ change \in PBIT}$ = DFL = $\frac{100\,\%}{40\,\%}$ = **2.5**

☞ The numerical value of DFL 2.5 means that a 40% change in the firm's operating profit results in a 100% change (i.e. 2.5 x40% = 100%) in earnings per share.

- Alternative formula:

DFL = $\frac{PBIT}{PBIT - I - \left(PD\ X \frac{1}{1-T}\right)}$ where, I = interest

PD = annual preferred stock dividend

T = Tax rate

Example: if PBIT = birr 10,000, I = birr 2,000, PD = birr 2,400, and I = 40%

DFL = $\frac{PBIT}{PBIT - I - \left(PD\ X \frac{1}{1-T}\right)}$—

DFL = $\frac{Birr\,10{,}000}{birr\,10{,}000 - birr\,2{,}000 - \left(birr\,2{,}400\ X \frac{1}{1-0.4}\right)}$

DFL = $\frac{birr\,10{,}000}{birr\,4{,}000}$ = **2.50**

Financial leverage and risk

❖ The use of financial leverage increases the owner's rate of return. When the firm's degree of financial leverage (DFL) increases, its financial risk also increases.

- Financial risk is the risk to a firm that it is unable to cover required financial obligations as they become due. The penalty for not meeting financial obligations is bankruptcy.
- Financial risk is the variability of EPS (earning per share) caused by the use of financial leverage. It is unavoidable risk if the firm decides to not to use any debt in its capital structure.

3) TOTAL (COMBINED) LEVERAGE AND EFFECTS OF LEVERAGE

- The combined effect, or total leverage can be defined as the potential use of fixed costs, both fixed operating costs and fixed financial costs, to magnify the effect of changes in sales on the firm's EPS (Earning per share).
- It is viewed as the total impact of the foxed costs in the operating and financial structure of the firm.

Degree of total leverage (DTL)

- Degree of combined or total leverage (DTL) is the numerical measure of the firm's total leverage.
- It is the percentage change in EPS divided by the percentage change in sales.

$$DTL = \frac{percentage\ change \in EPS}{percentage\ change \in sales}$$

⇒ **DTL = DOL X DFL**

  - Whenever, the percentage change in EPS resulting from a given percentage change in sales is greater than the percentage change in sales, combined or total leverage exists. I.e. as long as DTL is greater than 1, there is total leverage effect.

- To apply the above formula of DTL, we use the following changes and tables, in this table, a 50% increase in sales in a 60% increase in operating profits. In return, a 60% increase in operating profits result in a 300% increase in EPS. Or,

50% increase in sales……60% increase in operating profit……300% increase in EPS.

Table: the total leverage effect: 50% →

Sales (in units)……	20, 000……	30, 000
Sales revenue……	100,000……	150, 000
Less: variable operating costs……	40, 000……	60, 000
Fixed operating costs……	10, 000……	10, 000

PBIT……50, 000……80, 000

60%

Less: interest……20, 000……20,000

Profit before tax……30, 000……60,000

Less: tax (40%)……12, 000……24,000

Profit after tax (PTA)……18, 000……36,000

Less: preferred stock dividend……12, 000……12,000

Earnings available for common stock holders……6, 000……24,000

EPS (earning per share)……$\frac{6,000}{5,000}$ = 1.20……$\frac{24,000}{5,000}$ = 4.80

+ 300%

%age change in PBIT = $\frac{(80,000-50,000)X\,100}{50,000}$ = 60%, and

%age change in Q = $\frac{(30,000-20,000)}{20,000}X\,100=50\,\%$

%age change in EPS = $\frac{(24,000-6,000)\,x\,100}{6,000}$ = **300%.**

Alternative methods of determining DTL

DTL = $\frac{Q(P-VC)}{Q(P-VC)-FC-I-\left(PD\,X\,\frac{1}{1-T}\right)}$

Example:

- ☞ Q (sales quantity) = 20,000
- ☞ P (SPU) = Birr 5
- ☞ VC(VCU) = Birr 2
- ☞ FC = Birr 10,000
- ☞ Interest = birr 20,000
- ☞ Annual preferred stock dividend = birr 12,000
- ☞ Tax rate (T) = 40%.

Required: determine the DTL.

Solution: **DTL** = $\frac{Q(P-VC)}{Q(P-VC)-FC-I-\left(PD\,X\,\frac{1}{1-T}\right)}$

$$\text{DTL} = \frac{20{,}000(Birr\,5 - birr\,2)}{20{,}000(birr\,5 - birr\,2) - birr\,10{,}000 - birr\,20{,}000 - \left(12{,}000\,X\,\frac{1}{1-0.4}\right)}$$

$$\text{DTL} = \frac{20{,}000(birr\,3)}{20{,}000(birr\,3) - birr\,30{,}000\left(12{,}000\,X\,\frac{1}{1-0.4}\right)}$$

$$\text{DTL} = \frac{birr\,60{,}000}{birr\,60{,}000 - birr\,30{,}000\left(\frac{12{,}000}{0.6}\right)}$$

$$\text{DTL} = \frac{birr\,60{,}000}{birr\,10{,}000} = \underline{\underline{6}}$$

- Degree of Total Leverage of a firm is the product of the firm's degree of operating leverage (DOL) and degree of financial leverage (DFL).
- **DTL = DOL X DFL ⟹ DTL = 1.2 X 5 = <u>6.0</u>**
- A numerical value DTL 6 means that a 50% increase in firm's sales results in a 300% (6 x 50% =300%) increase in EPS (Earning per share) or vice versa.

Total leverage and risk

The use of operating leverage increases business risk because the firm must now meet higher fixed costs to be profitable. The use of financial leverage increases financial risk because the firm must now meet costs (especialy interest and preferred stock dividend payments) associated with debt and preferred astock financing.

It is generally not wise to use a large amount of both financial and operating leverages. Any firm that has substantial amoun of fixed equipment and is financed with borrowed funds has both operating and financial leverages. The use of both sources of leverages will certainly increase the risk exposure of the firm.

Effect of leverage on return on equity(ROE) and earning per share (EPS)

Both return on equity (ROE) and earning per share (EPS) decline as more debt is used.

1) The financial leverage will have a favorable impact on EPS and ROE only when the firm's return on investment (ROI) exceeds the interest cost of debt.
   Example: the firm is paying 15% on debt and earning a return of 24% on funds employed.
2) The financial leverage will have unfavorable impact on EPS and ROE only when the firm's return on investment (ROI) is less than the interest cost of debt.

Example: the firm is paying 15% on debt and earning a return of 12% on funds employed. The shareholders will have to meet the deficit 3%, as a result, EPS and ROE decline.

3) If the rate of return on assets were just equal to the cost of debt, the financial leverage will have impact on the shareholders return. EPS and ROE would be the same under all plans.

☞ Effect of leverage on return on equity(ROE) and earning per share (EPS)

Favorable…….ROE> i

Unfavorable…….ROE< i

Neutral…….ROE = i.