

Operating and Financial Leverage



[compiled from L. J. Gitman and other books]

Leverage

TABLE 12.1

General Income Statement Format and Types of Leverage

Operating leverage	Sales revenue	} Total leverage
	Less: Cost of goods sold	
	<hr/> Gross profits	
	Less: Operating expenses	
	<hr/> Earnings before interest and taxes (EBIT)	
Financial leverage	Less: Interest	
	<hr/> Net profits before taxes	
	Less: Taxes	
	<hr/> Net profits after taxes	
	Less: Preferred stock dividends	
	<hr/> Earnings available for common stockholders	
	Earnings per share (EPS)	

Breakeven Analysis

- Breakeven (cost-volume-profit) Analysis is used to:
 - determine the level of operations necessary to cover all operating costs, and
 - evaluate the profitability associated with various levels of sales.
- The firm's operating breakeven point (OBP) is the level of sales necessary to cover all operating expenses.
- At the OBP, operating profit (EBIT) is equal to zero.

Breakeven Analysis

- To calculate the OBP, cost of goods sold and operating expenses must be categorized as fixed or variable.
- Variable costs vary directly with the level of sales and are a function of volume, not time.
- Examples would include direct labor and shipping.
- Fixed costs are a function of time and do not vary with sales volume.
- Examples would include rent and fixed overhead.

Break-even Analysis

Algebraic Approach

- Using the following variables, the operating portion of a firm's income statement may be recast as follows:

P = sales price per unit

Q = sales quantity in units

FC = fixed operating costs per period

VC = variable operating costs per unit

$$EBIT = (P \times Q) - FC - (VC \times Q)$$

- Letting $EBIT = 0$ and solving for Q , we get:

Breakeven Analysis

Algebraic Approach

- Using the following variables, the operating portion of a firm's income statement may be recast as follows:

P = sales price per unit

Q = sales quantity in units

FC = fixed operating costs per period

VC = variable operating costs per unit

$$Q = \frac{FC}{P - VC}$$

Breakeven Analysis

Algebraic Approach

TABLE 12.2

Operating Leverage, Costs, and Breakeven Analysis

	Item	Algebraic representation
Operating leverage	Sales revenue	$(P \times Q)$
	Less: Fixed operating costs	$- FC$
	Less: Variable operating costs	$-(VC \times Q)$
	Earnings before interest and taxes	$EBIT$

Break-even Analysis

Algebraic Approach

- Example: Omnibus Posters has fixed operating costs of \$2,500, a sales price of \$10/poster, and variable costs of \$5/poster. Find the OBP.

$$Q = \frac{\$2,500}{\$10 - \$5} = 500 \text{ posters}$$

- This implies that if Omnibus sells exactly 500 posters, its revenues will just equal its costs (EBIT = \$0).

Break-even Analysis

Algebraic Approach

- We can check to verify that this is the case by substituting as follows:

$$\text{EBIT} = (P \times Q) - \text{FC} - (\text{VC} \times Q)$$

$$\text{EBIT} = (\$10 \times 500) - \$2,500 - (\$5 \times 500)$$

$$\text{EBIT} = \$5,000 - \$2,500 - \$2,500 = \$0$$

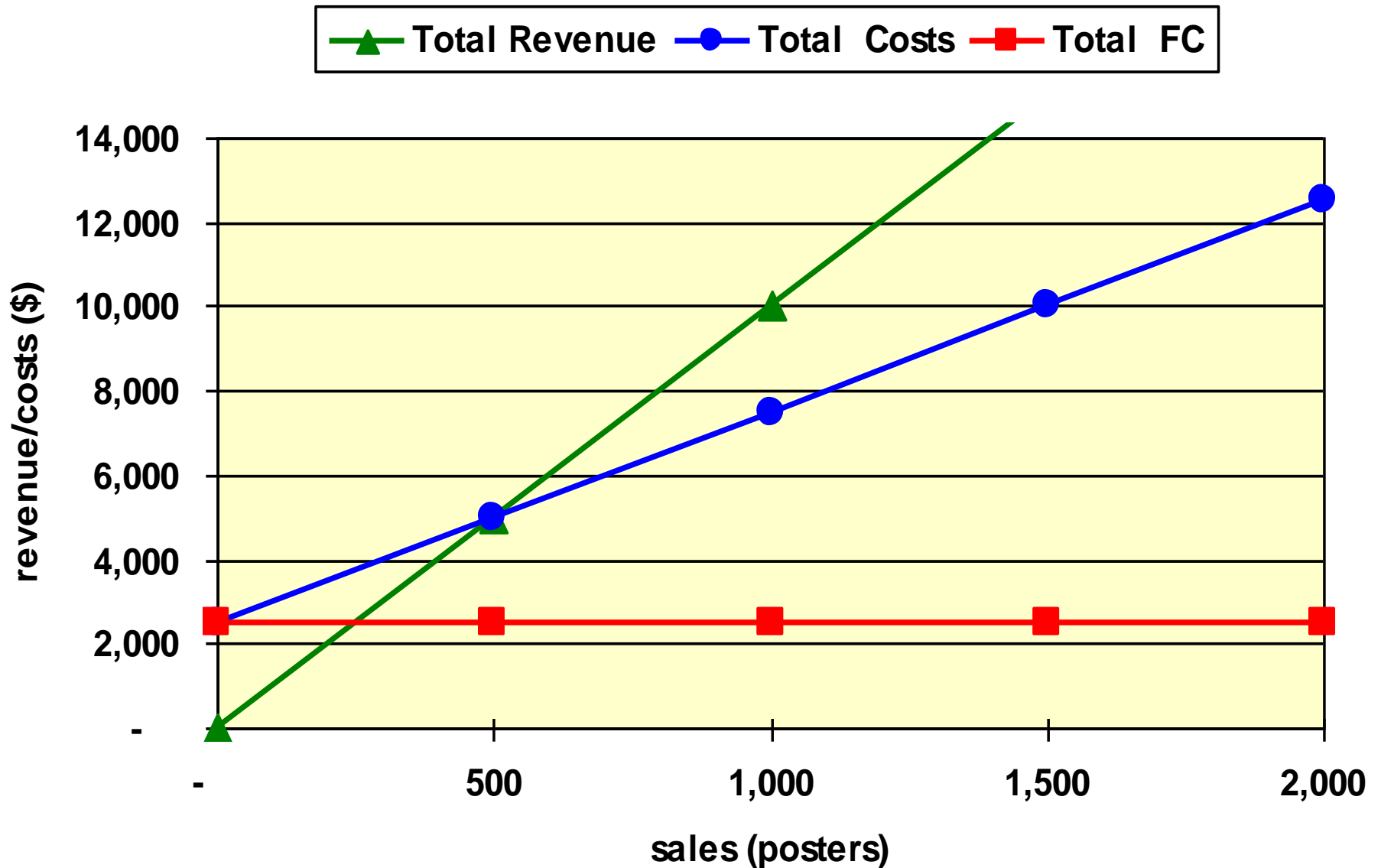
Breakeven Analysis

Graphic Approach

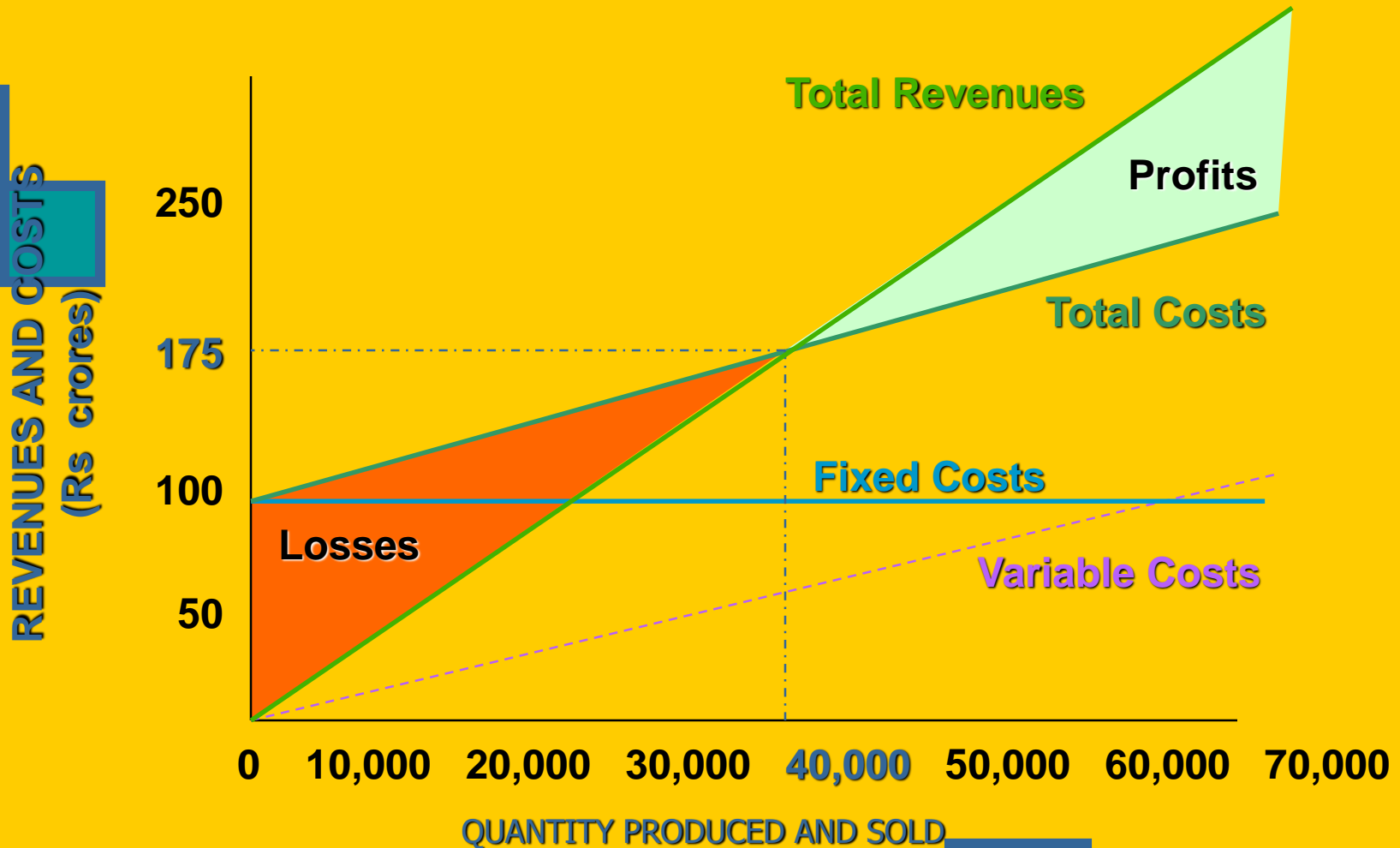
EBIT at Various Levels of Quantity Sold

Quantity Sold	Total Revenue	Total Costs	Total FC	Total VC	EBIT
-	-	2,500	2,500	-	(2,500)
500	5,000	5,000	2,500	2,500	-
1,000	10,000	7,500	2,500	5,000	2,500
1,500	15,000	10,000	2,500	7,500	5,000
2,000	20,000	12,500	2,500	10,000	7,500
2,500	25,000	15,000	2,500	12,500	10,000
3,000	30,000	17,500	2,500	15,000	12,500

Breakeven Analysis



Break-Even Chart: Tata Motors CVs



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	Earnings per share (EPS)	

Operating & Financial Leverage

Effects of Leverage on the Income Statement

	Scenario 1	Scenario 2	Scenario 3
	10% Sales	Sales Remain	10% Sales
	Decrease	Unchanged	Increase
Net Sales	\$ 630,000	\$ 700,000	\$ 770,000
Less: Variable Costs			
(60% of Sales)	378,000	420,000	462,000
Less: Fixed Costs	200,000	200,000	200,000
EBIT	52,000	80,000	108,000
Less: Interest Expens	20,000	20,000	20,000
EBT	32,000	60,000	88,000
Less: Taxes (30%)	9,600	18,000	26,400
Net Income	\$ 22,400	\$ 42,000	\$ 61,600

Operating & Financial Leverage

Degree of Operating Leverage

- The degree of operating leverage (DOL) measures the sensitivity of changes in EBIT to changes in Sales.
- A company's DOL can be calculated in two different ways: One calculation will give you a point estimate, the other will yield an interval estimate of DOL.
- Only companies that use fixed costs in the production process will experience operating leverage.

Operating & Financial Leverage

Degree of Operating Leverage

Effects of Operating Leverage on the Income Statement

	Scenario 1	Scenario 2	Scenario 3
	Sales Decrease	Sales Remain	Sales Increase
	10.0%	Unchanged	10.0%
Net Sales	\$ 630,000	\$ 700,000	\$ 770,000
Less: Variable Costs			
(60% of Sales)	378,000	420,000	462,000
Less: Fixed Costs	200,000	200,000	200,000
EBIT	52,000	80,000	108,000
	Ebit Decreases		Ebit Increases
	35.0%		35.0%

Operating & Financial Leverage

Degree of Operating Leverage

■ Interval Estimate

$$\text{DOL} = \frac{\% \text{ Change in EBIT}}{\% \text{ Change in Sales}} = \frac{35\%}{10\%} = 3.50$$

Because of the presence of fixed costs in the firm's production process, a 10% increase in Sales will result in a 35% increase in EBIT. Note that in the absence of operating leverage (if Fixed Costs were zero), the DOL would equal 1 and a 10% increase in Sales would result in a 10% increase in EBIT.

Operating & Financial Leverage

Degree of Operating Leverage

■ Point Estimate

$$\text{DOL} = \frac{\text{Sales} - \text{VC}}{\text{Sales} - \text{VC} - \text{FC}} = \frac{700 - 420}{700 - 420 - 200} = 3.50$$

Care must be taken when using the point estimate because the DOL will be different at different levels of sales. For Example, if sales increase to 770, DOL will decline as follows:

$$\text{DOL} = \frac{\text{Sales} - \text{VC}}{\text{Sales} - \text{VC} - \text{FC}} = \frac{770 - 462}{770 - 462 - 200} = 2.08$$

Interpretation of the DOL

DEGREE OF OPERATING
LEVERAGE (DOL)



Interpretation of the DOL

- DOL is a quantitative measure of the “sensitivity” of a firm’s operating profit to a change in the firm’s sales.
- The closer that a firm operates to its break-even point, the higher is the absolute value of its DOL.
- When comparing firms, the firm with the highest DOL is the firm that will be most “sensitive” to a change in sales.

Operating & Financial Leverage

Degree of Financial Leverage

- The degree of financial leverage (DFL) measures the sensitivity of changes in EPS to changes in EBIT.
- Like the DOL, DFL can be calculated in two different ways: One calculation will give you a point estimate, the other will yield an interval estimate of DFL.
- Only companies that use debt or other forms of fixed cost financing (like preferred stock) will experience financial leverage.

Operating & Financial Leverage

Degree of Financial Leverage

Effects of Financial Leverage on the Income Statement

	Scenario 1	Scenario 2	Scenario 3
	EBIT Dcrease	Sales Remain	EBIT Increase
	35.00%	Unchanged	35.00%
EBIT	52,000	80,000	108,000
Less: Interest Expens	20,000	20,000	20,000
EBT	32,000	60,000	88,000
Less: Taxes (30%)	9,600	18,000	26,400
Net Income	\$ 22,400	\$ 42,000	\$ 61,600
EPS (42,000 shares)	\$ 0.53	\$ 1.00	\$ 1.47
	EPS Decreases		EPS Increases
	46.67%		46.67%

Operating & Financial Leverage

Degree of Financial Leverage

■ Interval Estimate

$$\text{DFL} = \frac{\% \text{ Change in EPS}}{\% \text{ Change in EBIT}} = \frac{46.67\%}{35.00\%} = 1.33$$

In this case, the DFL is greater than 1 which indicates the presence of debt financing. In general, the greater the DFL, the greater the financial leverage and the greater the financial risk.

Operating & Financial Leverage

Degree of Financial Leverage

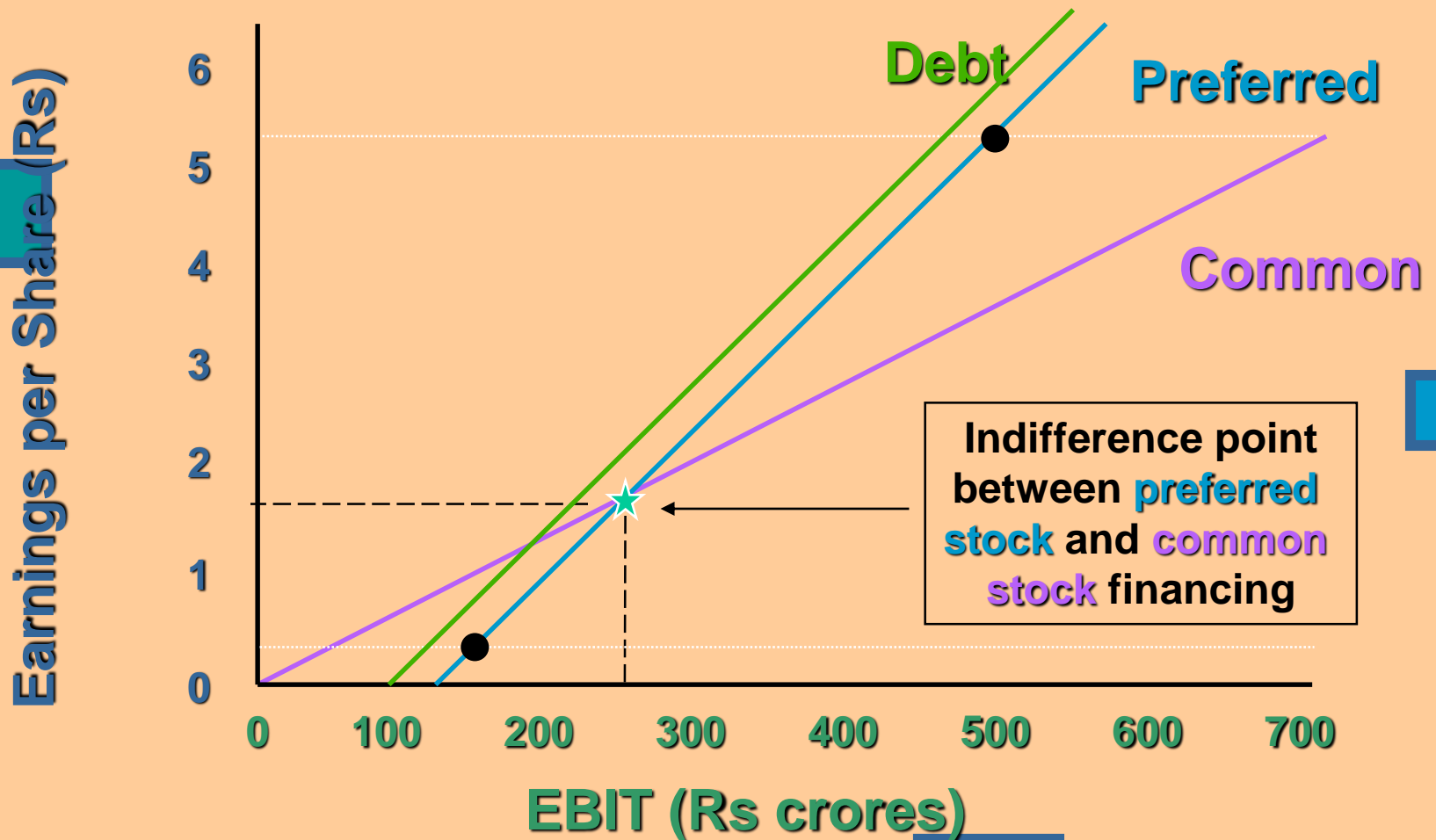
■ Point Estimate

$$DFL = \frac{EBIT}{EBIT - \text{Interest}} = \frac{80}{80 - 20} = 1.33$$

$$DFL = \frac{EBIT}{EBIT - \text{Interest}} = \frac{108}{108 - 20} = 1.23$$

In this case, we can see that the DFL is the same at the expected level of EBIT. However, the DFL declines if the firm performs better than expected. Note also, however, that the DFL will rise if the firm performs worse than expected.

EBIT-EPS Chart for a Car Co.



Operating & Financial Leverage

Degree of Total Leverage

Effects of Combined Leverage on the Income Statement			
	Scenario 1	Scenario 2	Scenario 3
	10% Sales Decrease	Sales Remain Unchanged	10% Sales Increase
Net Sales	\$ 630,000	\$ 700,000	\$ 770,000
Less: Variable Costs (60% of Sales)	378,000	420,000	462,000
Less: Fixed Costs	200,000	200,000	200,000
EBIT	52,000	80,000	108,000
Less: Interest Expens	20,000	20,000	20,000
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Less: Taxes (30%)	9,600	18,000	26,400
Net Income	\$ 22,400	\$ 42,000	\$ 61,600
EPS (42,000 shares)	\$ 0.53	\$ 1.00	\$ 1.47
	EPS Decreases		EPS Increases
	46.67%		46.67%

Operating & Financial Leverage

Degree of Total Leverage

■ Interval Estimate

$$\text{DTL} = \frac{\% \text{ Change in EPS}}{\% \text{ Change in Sales}} = \frac{46.7\%}{10\%} = 4.67$$

In this case, the DTL is greater than 1 which indicates the presence of both fixed operating and fixed financing costs. In general, the greater the DTL, the greater the financial leverage and the greater the financial risk.

Operating & Financial Leverage

Degree of Total Leverage

■ Point Estimate

$$DTL = \frac{Q \times (P - VC)}{Q \times (P - VC) - FC - I - [PD/(1-t)]}$$

$$DTL = \frac{700 - 420}{700 - 420 - 200 - 20 - 0} = 4.67$$

At our base level of sales of 700, the point estimate gives us the same result we obtained using the interval estimate.

Operating & Financial Leverage

Degree of Total Leverage

The relationship between the DTL, DOL, and DFL is illustrated in the following equation:

$$DTL = DOL \times DFL$$

Applying this to our example at a sales level of \$77, we get:

$$DTL = 3.50 \times 1.33 = 4.6$$

Which is the same result we obtained using either the point or interval estimates at that sales level.

What is an Appropriate Amount of Financial Leverage?

Debt Capacity -- The maximum amount of debt (and other fixed-charge financing) that a firm can adequately service.

- Firms must first analyze their expected future cash flows. The greater and more stable the expected future cash flows, the greater the debt capacity.
- Fixed charges include: debt principal and interest payments, lease payments, and preferred stock dividends.

Coverage Ratios

Income Statement Ratios

Coverage Ratios

Indicates a firm's ability to cover interest charges.

Interest Coverage

EBIT

Interest expenses

A ratio value equal to 1 indicates that earnings are just sufficient to cover interest charges.

Coverage Ratios

Income Statement Ratios

Coverage Ratios

Indicates a firm's ability to cover interest expenses and principal payments.

Debt-service Coverage

EBIT

$$\frac{\text{EBIT}}{\{ \text{Interest expenses} + [\text{Principal payments} / (1-t)] \}}$$

Allows us to examine the ability of the firm to meet all of its debt payments. Failure to make principal payments is also default.

Summary of the Coverage Ratio Discussion

- ◆ The debt-service coverage ratio accounts for required annual principal payments.
- A single ratio value cannot be interpreted identically for all firms as some firms have greater debt capacity.
- Annual financial lease payments should be added to both the numerator and denominator of the debt-service coverage ratio as financial leases are similar to debt.