Chapter 12
Leverage and Capital Structure

Principles of Managerial Finance

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Part one : Leverage

Leverage

Refers to the effects that fixed costs have on the returns that shareholders earn; higher leverage generally results in higher but more volatile returns.

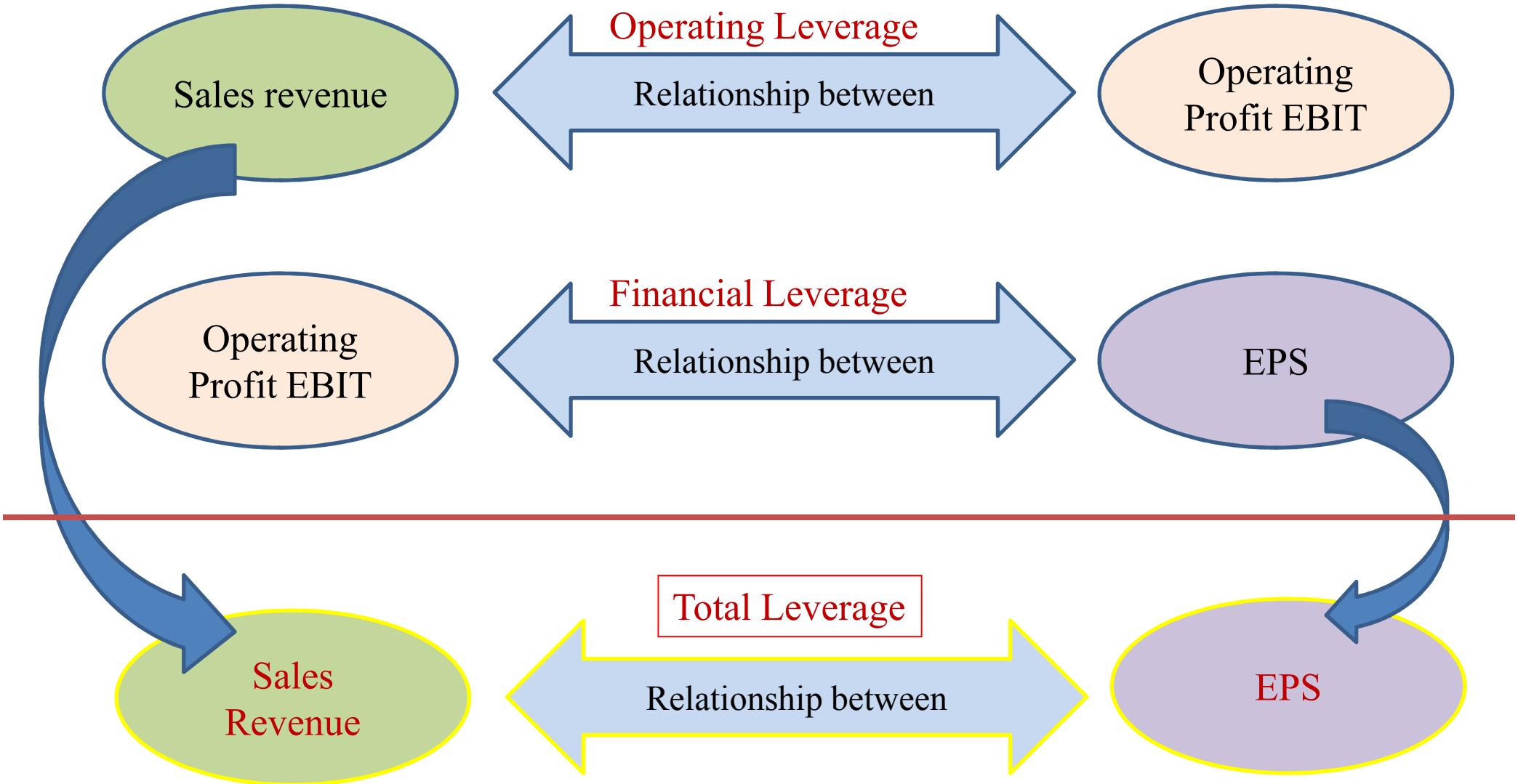
Types of leverage include:

1.Operating Leverage

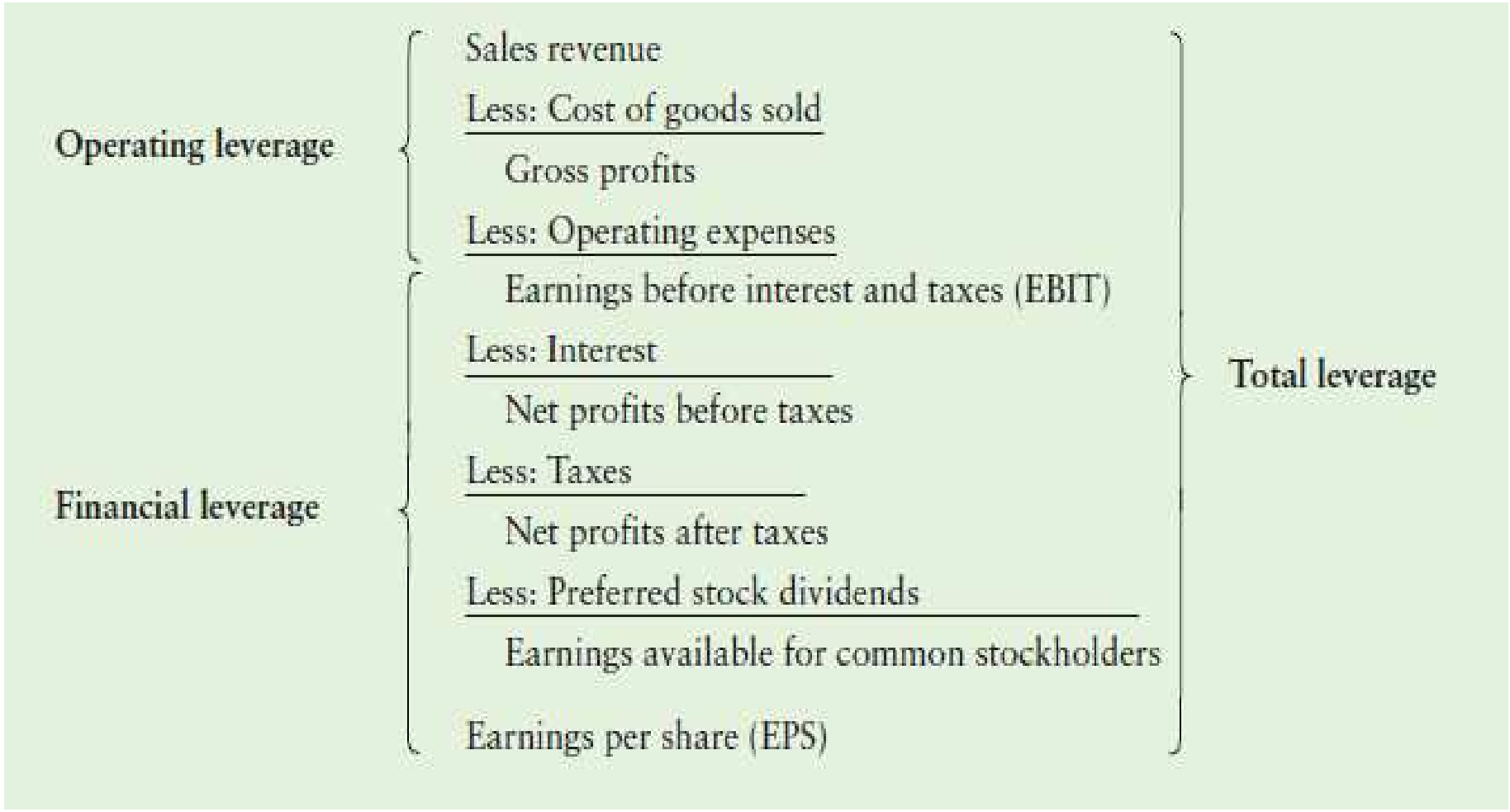
2.Financial Leverage

3.Total Leverage

Types of leverage



General Multistep Income Statement Format and Types of Leverage



Contribution Margin Income Statement Format

	Sales
-	**Variable production expenses (such as materials, supplies, and variable overhead)**
-	**Variable selling and administrative expenses**
=	**Contribution margin**
-	**Fixed production expenses (including most overhead)**
-	**Fixed selling and administrative expenses**
=	**Net operating income or loss**

A *contribution margin income statement* is an income statement in which all variable expenses are deducted from sales to arrive at a contribution margin, from which all fixed expenses are then subtracted to arrive at the net operating income or loss for the period.

Using Contribution Margin Concept to determine Operating Breakeven Point

Operating Leverage	Sales Revenue		(P × Q)
	Less : Variable Operating Expenses	-	(VC × Q)
	Less: Fixed Operating Expenses	-	FC
	Earning before Interest and Taxes		EBIT

P	=	sales price per unit
Q	=	sales quantity in units
FC	=	fixed operating costs per period
VC	=	variable operating costs per unit
EBIT	=	operating profit

Rewriting the algebraic calculations

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

Operating Breakeven Point is:

The level of sales necessary to cover all operating costs; the point at which EBIT =$0.

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

To determine the operating breakeven point let EBIT =$0.

$$Zero = Q_{O.B.E}\ (P - VC) - FC$$

$$Q_{O.B.E}\ (P - VC) = FC$$

$$Q_{O.B.E} = \frac{FC}{(P - VC)} \qquad Q_{O.B.E} = \frac{\text{Fixed Operating Cost}}{\text{Unit Contribution Margin}}$$

$Q_{O.B.E}$: *is operating breakeven point in Unit Sales*

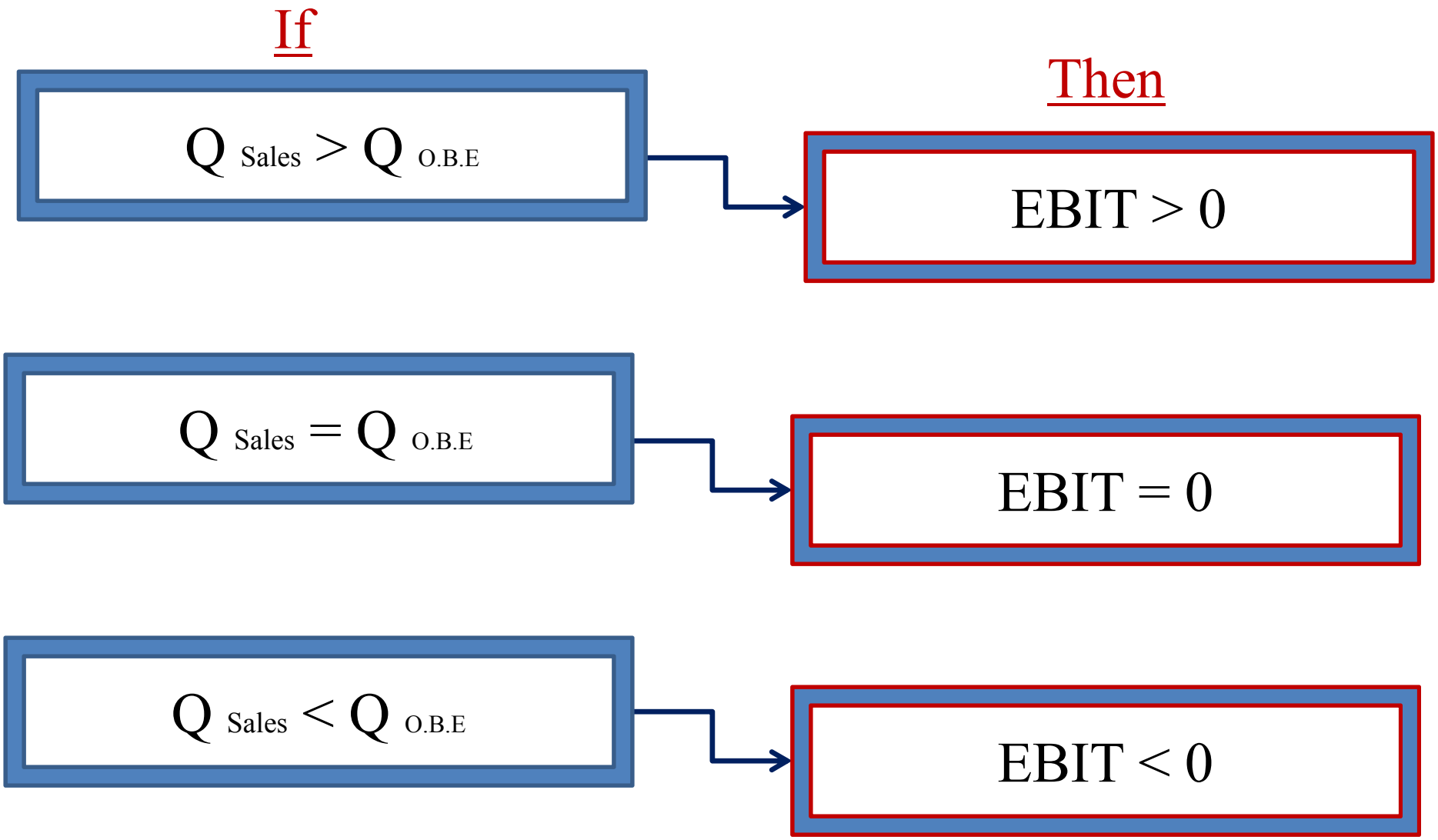
($Q_{O.B.E}$ x P) : *is operating breakeven point in dollar Sales*

How changes in FC, P , FC will change Q O.B.E

$$Q_{O.B.E} = \frac{FC}{(P - VC)}$$

Variable	Change	Effect on Q *O.B.E.*
Fixed operating cost (FC)	Increase	Increase
	Decrease	Decrease
Selling price per unit (P)	Increase	Decrease
	Decrease	Increase
Variable operating cost (VC)	Increase	Increase
	Decrease	Decrease

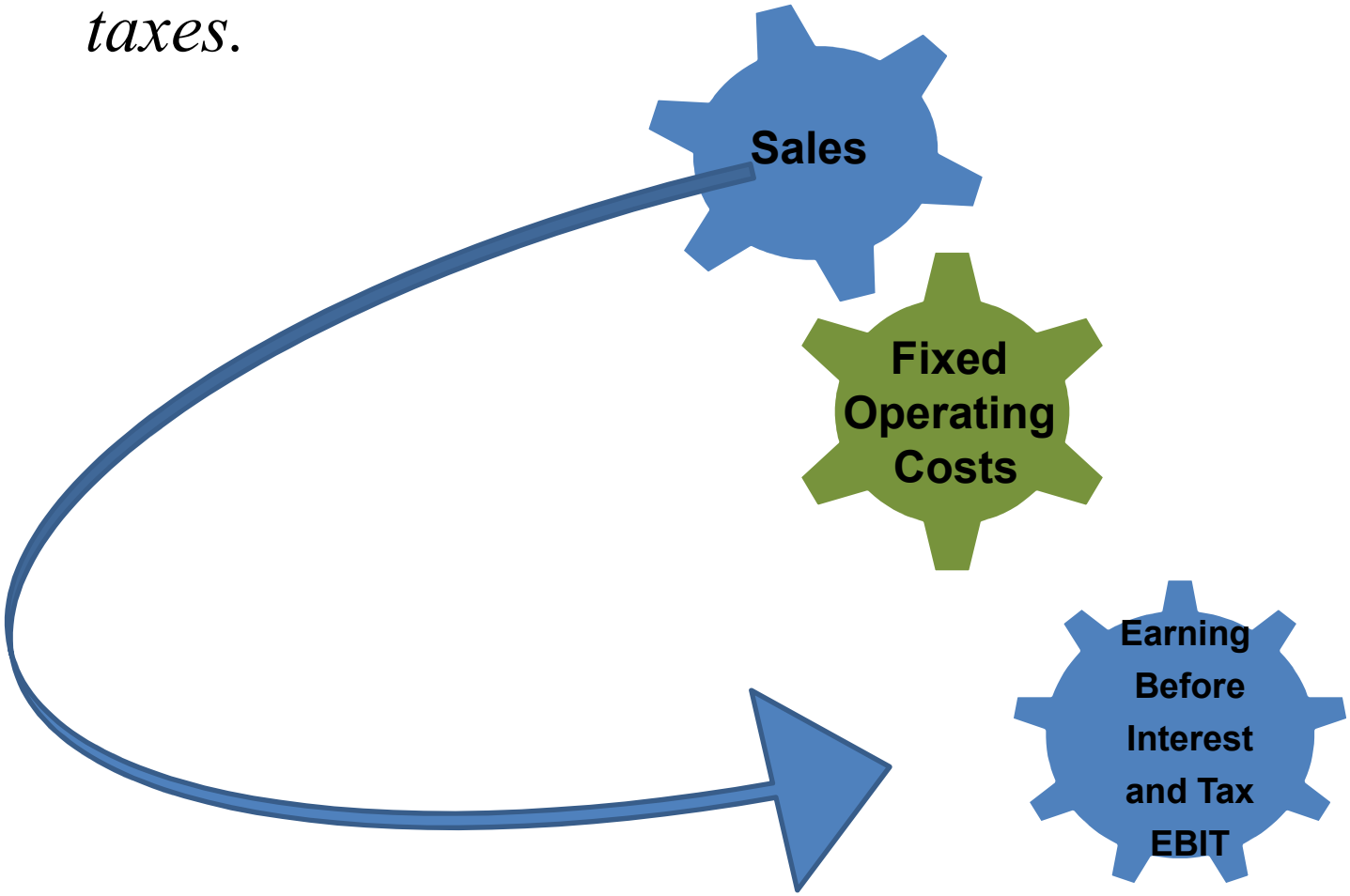
Conclusions of Operating Breakeven Point



Breakeven analysis can be called Cost-Volume-Profit analysis

operating leverage

The use of fixed operating costs to magnify the effects of changes in sales on the firm's earnings before interest and taxes.



Measuring the Degree of Operating Leverage : Equation 1

Degree of Operating Leverage (DOL)

The numerical measure of the firm's operating leverage.

For any real number a, the absolute value of a, denoted by |a| is itself if a ≥ 0, and -a if a < 0. Thus |a| is positive expect when a = 0

$$DOL = \frac{\text{Percentage change in EBIT}}{\text{Percentage change in sales}}$$

$$DOL = \frac{\%\ \Delta\ \text{EBIT}}{\%\ \Delta\ \text{sales}}$$

Operating Leverage exists when :

percentage change in EBIT > percentage change in sales

$$\%\ \Delta \text{EBIT} > \%\ \Delta \text{sales}$$

As long as DOL > 1 Operating Leverage exists

If DOL = 1 then Operating Leverage does not exist

Measuring the Degree of Operating Leverage : Equation 2

$$\text{DOL } \textit{at base sales level } Q = \frac{Q * (P - VC)}{Q * (P - VC) - FC}$$

$$\text{DOL } \textit{at base sales level } Q = \frac{Q * \textit{Unit Contribution Margin}}{Q * \textit{Unit Contribution Margin} - FC}$$

The higher the Fixed Cost the higher the Degree of Operating Leverage

Measuring the Degree of Operating Leverage : Equation 3

$$\text{DOL } \textit{at base sales level } Q = \frac{Q * (P - VC)}{Q * (P - VC) - FC}$$

$$\text{DOL } \textit{at base dollar sales } TR = \frac{\text{Sales} - \text{Total Variable Cost}}{\text{Sales} - \text{Total Variable Cost} - FC}$$

$$\text{DOL } \textit{at base dollar sales } TR = \frac{TR - TVC}{TR - TVC - FC} = \frac{TCM}{EBIT}$$

Q = total sales in units
TR = total sales in dollars
TVC= Q x VC
TCM = Q x Unit Contribution Margin = Q x (P-VC)
*EBIT = (Q x P) – (Q x VC) – FC = Q * (P - VC) - FC*

financial leverage

The use of fixed financial costs to magnify the effects of changes in earnings before interest and taxes on the firm's earnings per share.

Degree of financial leverage (DFL)

The numerical measure of the firm's financial leverage.

The two most common fixed financial costs are:

(1) interest on debt (I)

(2) preferred stock dividends (PD)

$$\text{Financial breakeven point} = I + \frac{PD}{(1 - \text{tax rate})}$$

Measuring the Degree of Financial Leverage : Equation1 + 2

$$DFL = \frac{\text{Percentage change in EPS}}{\text{Percentage change in EBIT}} = \frac{\%\ \Delta\ EPS}{\%\ \Delta EBIT}$$

$$\text{DFL } \textit{at base level EBIT} = \frac{EBIT}{EBIT - \textit{Fixed Financial Cost}}$$

$$\text{DFL } \textit{at base level EBIT} = \frac{EBIT}{EBIT - I - \left[PD \times \frac{1}{(1-T)} \right]}$$

Used to change dividends from after tax to before tax, because all other items are before tax

$$\text{DFL } \textit{at base level EBIT} = \frac{EBIT}{EBIT - I - [\ PD \times (1-T)\ ]^{-1}}$$

Measuring the Degree of Financial Leverage : Equation1 + 2

$$\text{DFL } \textit{at base level EBIT} = \frac{EBIT}{EBIT - \textit{Fixed Financial Cost}}$$

$$\text{DFL } \textit{at base level EBIT} = \frac{EBIT}{EBIT - I - \left[PD \times \frac{1}{(1-T)} \right]}$$

$$\text{DFL } \textit{at base level } Q = \frac{[\,Q * (P - VC) - FC\,]}{[\,Q * (P - VC) - FC] - I - \left[PD \times \frac{1}{(1-T)} \right]}$$

Total Leverage

The use of fixed costs, both operating and financial, to magnify the effects of changes in sales on the firm's earnings per share.

Degree of total leverage (DTL)

The numerical measure of the firm's total leverage.

$$DTL = DOL \times DFL$$

$$= \frac{\text{Total Contribution Margin}}{\cancel{EBIT}} \times \frac{\cancel{EBIT}}{EBIT - \text{Fixed Financial Cost}}$$

$$= \frac{\text{Total Contribution Margin}}{EBIT - \text{Fixed Financial Cost}}$$

Measuring the Degree of Total Leverage : Equation 1+2

$$DTL = \frac{\text{Percentage change in EPS}}{\text{Percentage change in Sales}} = \frac{\%\ \Delta\ EPS}{\%\ \Delta\ Sales}$$

$$\text{DTL } \textit{at base level } Q = \frac{[\ Q * (P - VC)\ ]}{[\ Q * (P - VC) - FC\ ] - I - \left[PD \times \frac{1}{(1 - T)} \right]}$$

$$\text{DTL } \textit{at base level EBIT} = \frac{[\ \textit{Sales} - \textit{Total Variable Cost}\ ]}{\textit{EBIT} - \textit{Fixed Financial Costs}}$$

Summary for calculating Degree of Leverage

$$DOL = \frac{T.\ CM}{EBIT}$$

$$DFL = \frac{EBIT}{EBIT - Fixed\ Financial\ Cost}$$

$$DTL = \frac{T.\ CM}{EBIT - Fixed\ Financial\ Cost}$$

$$DOL = \frac{\%\ \Delta\ EBIT}{\%\ \Delta\ Sales}$$

$$DFL = \frac{\%\ \Delta EPS}{\%\ \Delta EBIT}$$

$$DTL = \frac{\%\ \Delta EPS}{\%\ \Delta Sales}$$

$$DTL = DOL \times DFL$$

$$= \frac{Total\ Contribution\ Margin}{\cancel{EBIT}} \times \frac{\cancel{EBIT}}{EBIT - Fixed\ Financial\ Cost}$$

$$= \frac{Total\ Contribution\ Margin}{EBIT - Fixed\ Financial\ Cost}$$

$$DTL = DOL \times DFL$$

$$= \frac{\%\ \cancel{\Delta\ EBIT}}{\%\ \Delta\ Sales} \times \frac{\%\ \Delta EPS}{\%\ \cancel{\Delta EBIT}}$$

$$= \frac{\%\ \Delta EPS}{\%\ \Delta\ Sales}$$

E–1

Canvas Reproductions has fixed operating costs of $12,500 and variable operating costs of $10 per unit and sells its paintings for $25 each. At what level of unit sales will the company break even in terms of EBIT?

Given :

FC= $12,500

VC= $10 per unit

P= $25 per unit

$Q_{O.B.E}$ = ??

Break Even point in dollar sales = ??

Solution :

$$Q_{O.B.E} = \frac{FC}{(P - VC)}$$

$$Q_{O.B.E} = \frac{12{,}500}{(25 - 10)}$$

$$Q_{O.B.E} = 833.33 \text{ Unit}$$

$$Q_{O.B.E} = 833.33 \times 25$$

Break Even point in dollar sales = $ 20,833.25

E–2

The Great Fish Taco Corporation currently has fixed operating costs of $15,000, sells its premade tacos for $6 per box, and incurs variable operating costs of $2.50 per box. If the firm has a potential investment that would simultaneously raise its fixed costs to $16,500 and allow it to charge a per-box sale price of $6.50 due to better-textured tacos, what will the impact be on its operating breakeven point in boxes?

Given :

FC_1= $15,000

P_1= $6 per unit

VC= $2.5 per unit

$Q_{O.B.E\ 1}$= ??

$$Q_{O.B.E} = \frac{FC}{(P - VC)}$$

$$Q_{O.B.E} = \frac{15{,}000}{(6 - 2.5)}$$

$Q_{O.B.E\ 1}$= 4285.7 units

Given :

FC_2= $16,500

P_2= $6.5 per unit

VC= $2.5 per unit

$Q_{O.B.E\ 2}$= ??

$$Q_{O.B.E} = \frac{FC}{(P - VC)}$$

$$Q_{O.B.E} = \frac{16{,}500}{(6.5 - 2.5)}$$

$Q_{O.B.E\ 1}$= 4125units

Impact of changes in fixed operating cost and in price per unit on operating breakeven point:

$$Q_{O.B.E\ 1} = 4285.7 > Q_{O.B.E\ 2} = 4125$$

which means that even though there was an increase in fixed operating costs that have a positive effect on breakeven point in case 2, but there was also an increase in price per unit that have a negative effect on breakeven point, and the negative effect had a larger impact than the positive one.

E–3

Chico's has sales of 15,000 units at a price of $20 per unit. The firm incurs fixed operating costs of $30,000 and variable operating costs of $12 per unit. What is Chico's *degree of operating leverage (DOL) at a base level of sales of 15,000 units?*

Given :

Sales= 15,000 Unit

P= $20 per unit

FC= $30,000

VC= $12 per unit

DOL= ??

$$DOL = \frac{\text{Total Contribution Margin}}{EBIT}$$

$$DOL = \frac{Q\,(P - VC)}{Q\,(P - VC) - FC}$$

$$DOL = \frac{15{,}000\,(20 - 12)}{15{,}000\,(20 - 12) - 30{,}000}$$

$$DOL = \frac{120{,}000}{90{,}000}$$

$$DOL = 1.33$$

E–4

Parker Investments has EBIT of $20,000, interest expense of $3,000, and preferred dividends of $4,000. If it pays taxes at a rate of 38%, what is Parker's *degree of financial leverage (DFL) at a base level of EBIT of $20,000?*

Given :

Sales= $ 20,000

I= $ 3,000

PD= $4,000

T= 38%

DFL= ??

$$DFL = \frac{EBIT}{EBIT - I - \left[PD \times \frac{1}{(1-T)}\right]}$$

$$DFL = \frac{20{,}000}{20{,}000 - 3{,}000 - \left[4{,}000 \times \frac{1}{(1-.38)}\right]}$$

$$DFL = \frac{20{,}000}{10{,}548}$$

$$DFL = 1.89$$

P–1

Kate Rowland wishes to estimate the number of flower arrangements she must sell at $24.95 to break even. She has estimated fixed operating costs of $12,350 per year and variable operating costs of $15.45 per arrangement. How many flower arrangements must Kate sell to break even on operating costs?

Given :

P= $24.95 per unit

FC= $12,350

VC= $15.45 per unit

$Q_{O.B.E}$ = ??

Solution :

$$Q_{O.B.E} = \frac{FC}{(P - VC)}$$

$$Q_{O.B.E} = \frac{12{,}350}{(24.95 - 15.45)}$$

$$Q_{O.B.E} = 1{,}300 \text{ Unit}$$

P-2

Given the price and cost data shown in the accompanying table for each of the three firms, F, G, and H, answer the questions that follow.

Firm	F	G	H
Sale price per unit	$ 18.00	$ 21.00	$ 30.00
Variable operating cost per unit	6.75	13.50	12.00
Fixed operating cost	45,000	30,000	90,000

a. What is the *operating breakeven point in units for each firm?*

b. How would you rank these firms in terms of their risk?

a. $Q_{O.B.E} = \dfrac{FC}{(P - VC)}$

Firm F: $Q = \dfrac{\$45{,}000}{(\$18.00 - \$6.75)} = 4{,}000 \text{ units}$

Firm G: $Q = \dfrac{\$30{,}000}{(\$21.00 - \$13.50)} = 4{,}000 \text{ units}$

Firm H: $Q = \dfrac{\$90{,}000}{(\$30.00 - \$12.00)} = 5{,}000 \text{ units}$

b. From least risky to most risky: F and G are of equal risk, then H. It is important to recognize that operating leverage is only one measure of risk.

Firm F = *Firm G* ⟶ less risky

Firm H ⟶ More risky

The higher the operating breakeven point the higher the risk

P-3

Fine Leather Enterprises sells its single product for $129.00 per unit. The firm's fixed operating costs are $473,000 annually, and its variable operating costs are $86.00 per unit. Find the firm's *operating breakeven point in units*.

Given :

P= $129 per unit

FC= $473,000

VC= $86 per unit

$Q_{O.B.E}$ = ??

Solution :

$$Q_{O.B.E} = \frac{FC}{(P - VC)}$$

$$Q_{O.B.E} = \frac{473{,}000}{(129 - 86)}$$

$$Q_{O.B.E} = 11{,}000 \text{ Unit}$$

P-4

Breakeven analysis Barry Carter is considering opening a music store. He wants to estimate the number of CDs he must sell to break even. The CDs will be sold for $13.98 each, variable operating costs are $10.48 per CD, and annual fixed operating costs are $73,500.

a. Find the *operating breakeven point in number of CDs.*
b. Calculate the total operating costs at the breakeven volume found in part a.
c. If Barry estimates that at a minimum he can sell 2,000 CDs *per month, should he* go into the music business?
d. How much EBIT will Barry realize if he sells the minimum 2,000 CDs per month noted in part c?

a. $$Q = \frac{\$73{,}500}{(\$13.98 - \$10.48)} = 21{,}000 \text{ CDs}$$ per year

b. Total operating costs = FC + TVC
= FC + (Q x VC)
= [73,500 + (21,000 × 10.48)]
= $293,580

d. EBIT = Sales– TVC - FC

Sales	P x Q	$13.98 x 24,000
- Total Variable cost	(VC x Q)	($10.48 x 24,000)
- FC	(FC)	($73,500)
= EBIT		= $10,500

c. 2,000 ×12 = 24,000 CDs per year.
24,000 – 21,000 = 3,000 unit of CDs above breakeven point.
Barry sales exceeds the operating breakeven by 3,000 records per year.
Barry should go into the CD business.

P-6

JWG Company publishes Creative Crosswords. Last year the book of puzzles sold for $10 with variable operating cost per book of $8 and fixed operating costs of $40,000. How many books must JWG sell this year to achieve the breakeven point for the stated operating costs, given the following different circumstances?

a. All figures remain the same as for last year.

b. Fixed operating costs increase to $44,000; all other figures remain the same.

c. The selling price increases to $10.50; all costs remain the same as for last year.

d. Variable operating cost per book increases to $8.50; all other figures remain the same.

e. What can you conclude from the previous results?

a. $$Q = \frac{FC}{(P - VC)} = \frac{\$40,000}{\$10 - \$8} = 20,000 \text{ book.}$$

b. $$Q = \frac{FC}{(P - VC)} = \frac{\$44,000}{\$10 - \$8} = 22,000 \text{ book.}$$

c. $$Q = \frac{FC}{(P - VC)} = \frac{\$40,000}{\$10.5 - \$8} = 16,000 \text{ book.}$$

d. $$Q = \frac{FC}{(P - VC)} = \frac{\$40,000}{\$10 - \$8.5} = 26,666.7 \text{ book.}$$

e.

Variable	Change	Effect on Q *O.B.E.*
Fixed operating cost (FC)	Increase	Increase
	Decrease	Decrease
Selling price per unit (P)	Increase	Decrease
	Decrease	Increase
Variable operating cost (VC)	Increase	Increase
	Decrease	Decrease

P-9

Grey Products has fixed operating costs of $380,000, variable operating costs of $16 per unit, and a selling price of $63.50 per unit.

a. Calculate the *operating breakeven point in units*.
b. Calculate the firm's EBIT at 9,000, 10,000, and 11,000 units, respectively.
c. With 10,000 units as a base, what are the percentage changes in units sold and EBIT as sales move from the base to the other sales levels used in part b?
d. Use the percentages computed in part c to determine the *degree of operating leverage (DOL)*.
e. Use the formula for degree of operating leverage to determine the DOL at 10,000 units.

a. $$Q = \frac{FC}{(P - VC)} = \frac{\$380,000}{\$63.5 - \$16} = 8{,}000 \text{ unit.}$$

b.

Level of sales in units	9,000 units	10,000 units	11,000 units
$ Sales (Q × P)	$571,500	$635,000	$698,500
- Variable costs (Q × VC)	(144,000)	(160,000)	(176,000)
- Fixed costs	(380,000)	(380,000)	(380,000)
= EBIT	$ 47,500	$ 95,000	$142,500

c.

2 ← 1 → 2

Change in Unit Sales	9,000 units 9,000 – 10,000 = - 1,000	10,000 Units base 0	11,000 units 11,000 – 10,000 = + 1,000
% Change in Sales	$\frac{9,000 - 10,000}{10,000}$ = - 10%	0	$\frac{11,000 - 10,000}{10,000}$ = + 10%
Change in EBIT	47,500 – 95,000 = -$47,500	95,000 EBIT base 0	142,500 – 95,000 = +$47,500
% Change in EBIT	$\frac{47,500 - 95,000}{95,000}$ = - 50%	0	$\frac{142,500 - 95,000}{95,000}$ = + 50%

d.

DOL	at 9,000 units	at 11,000 units
$DOL = \frac{\% \triangle EBIT}{\% \triangle Sales}$	$\frac{-50\%}{-10\%} = 5$	$\frac{+50\%}{+10\%} = 5$

e. DOL at 10,000 units.

$$DOL = \frac{[Q \times (P - VC)]}{[Q \times (P - VC)] - [FC]}$$

$$DOL = \frac{[10{,}000 \times (\$63.50 - \$16.00)]}{[10{,}000 \times (\$63.50 - \$16.00)] - [\$380{,}000]}$$

$$DOL = \frac{\$475{,}000}{\$95{,}000} = 5.00$$

P-11

Southland Industries has $60,000 of 16% (annual interest) bonds outstanding, 1,500 shares of preferred stock paying an annual dividend of $5 per share, and 4,000 shares of common stock outstanding. Assuming that the firm has a 40% tax rate, compute *earnings per share (EPS) for the following levels of EBIT:*

a. $24,600
b. $30,600
c. $35,000

$$EPS = \frac{\text{Earnings available to common shareholders}}{\text{Number of shares of common stock outstanding}}$$

	(a)	(b)	(c)
EBIT	$24,600	$30,600	$35,000
Less: Interest	9,600	9,600	9,600
Net profits before taxes	$15,000	$21,000	$25,400
Less: Taxes	6,000	8,400	10,160
Net profit after taxes	$9,000	$12,600	$15,240
Less: Preferred dividends	7,500	7,500	7,500
Earnings available to common shareholders	$1,500	$5,100	$7,740
EPS (4,000 shares)	$0.375	$1.275	$1.935

P-12

Northwestern Savings and Loan has a current capital structure consisting of $250,000 of 16% (annual interest) debt and 2,000 shares of common stock. The firm pays taxes at the rate of 40%.

a. Using EBIT values of $80,000 and $120,000, determine the associated *earnings per share (EPS).*
b. Using $80,000 of EBIT as a base, calculate the *degree of financial leverage (DFL).*
c. Rework parts a and b assuming that the firm has $100,000 of 16% (annual interest) debt and 3,000 shares of common stock.

Total interest amount = % annual interest × total debt value
= % 16 × 250,000 = $ 40,000

a.

EBIT	$80,000	$120,000
Less: Interest	40,000	40,000
Net profits before taxes	$40,000	$80,000
Less: Taxes (40%)	16,000	32,000
Net profit after taxes	$24,000	$48,000
EPS (2,000 shares)	$12.00	$24.00

b.

$$DFL = \frac{EBIT}{\left[EBIT - I - \left(PD \times \frac{1}{(1 - T)}\right)\right]}$$

$$DFL = \frac{\$80,000}{[\$80,000 - \$40,000 - 0]} = 2$$

Total interest amount = % annual interest × total debt value
= % 16 × 100,000 = $ 16,000

c.

EBIT	$80,000	$120,000
Less: Interest	16,000	16,000
Net profits before taxes	$64,000	$104,000
Less: Taxes (40%)	25,600	41,600
Net profit after taxes	$38,400	$62,400
EPS (3,000 shares)	$12.80	$20.80

$$DFL = \frac{EBIT}{\left[EBIT - I - \left(PD \times \frac{1}{(1 - T)}\right)\right]}$$

$$DFL = \frac{\$80,000}{[\$80,000 - \$16,000 - 0]} = 1.25$$

P-15

Play-More Toys produces inflatable beach balls, selling 400,000 balls per year. Each ball produced has a variable operating cost of $0.84 and sells for $1.00. Fixed operating costs are $28,000. The firm has annual interest charges of $6,000, preferred dividends of $2,000, and a 40% tax rate.

a. Calculate the *operating breakeven point in units.*
b. Use the degree of operating leverage (DOL) formula to calculate *DOL.*
c. Use the degree of financial leverage (DFL) formula to calculate *DFL.*
d. Use the degree of total leverage (DTL) formula to calculate *DTL. Compare this* to the product of DOL and DFL calculated in parts b and c.

a. $Q = FC \div (P - VC)$ $Q = \$28{,}000 \div (\$1 - \$.84) = 175{,}000$ unit

b. $$DOL = \frac{[Q \times (P - VC)]}{[Q \times (P - VC)] - FC}$$

$$DOL = \frac{[400{,}000 \times (\$1.00 - \$0.84)]}{[400{,}000 \times (\$1.00 - \$0.84)] - \$28{,}000} = \frac{\$64{,}000}{\$36{,}000} = 1.78$$

c.

$$\begin{aligned} EBIT &= (P \times Q) - FC - (Q \times VC) \\ EBIT &= (\$1.00 \times 400{,}000) - \$28{,}000 - (400{,}000 \times \$0.84) \\ EBIT &= \$400{,}000 - \$28{,}000 - \$336{,}000 \\ EBIT &= \$36{,}000 \end{aligned}$$

$$DFL = \frac{EBIT}{\left[EBIT - I - \left(PD \times \frac{1}{(1 - T)} \right) \right]}$$

$$DFL = \frac{\$36{,}000}{\left[\$36{,}000 - \$6{,}000 - \left(\frac{\$2{,}000}{(1 - .4)} \right) \right]} = 1.35$$

d.

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

$$DTL = \frac{[400{,}000 \times (\$1.00 - \$0.84)]}{\left[400{,}000 \times (\$1.00 - \$0.84) - \$28{,}000 - \$6{,}000 - \left(\frac{\$2{,}000}{(1-.4)}\right)\right]}$$

$$DTL = \frac{\$64{,}000}{[\$64{,}000 - \$28{,}000 - \$9{,}333]} = \frac{\$64{,}000}{\$26{,}667} = 2.40$$

DTL = DOL x DFL

DTL = 1.78 x 1.35 = 2.40

The two formulas give the same result.

P-16

Firm R has sales of 100,000 units at $2.00 per unit, variable operating costs of $1.70 per unit, and fixed operating costs of $6,000. Interest is $10,000 per year. *Firm W* has sales of 100,000 units at $2.50 per unit, variable operating costs of $1.00 per unit, and fixed operating costs of $62,500. Interest is $17,500 per year. Assume that both firms are in the 40% tax bracket.

a. Compute the degree of operating, financial, and total leverage for firm R.
b. Compute the degree of operating, financial, and total leverage for firm W.
c. Compare the relative risks of the two firms.
d. Discuss the principles of leverage that your answers illustrate.

a. For Firm R :

$$DOL_R = \frac{[100{,}000 \times (\$2.00 - \$1.70)]}{[100{,}000 \times (\$2.00 - \$1.70)] - \$6{,}000} = \frac{\$30{,}000}{\$24{,}000} = 1.25$$

$$DFL_R = \frac{\$24{,}000}{[\$24{,}000 - \$10{,}000]} = 1.71$$

$$DTL_R = 1.25 \text{ x } 1.71 = 2.14$$

b. For Firm W :

$$DOL_W = \frac{[100{,}000 \times (\$2.50 - \$1.00)]}{[100{,}000 \times (\$2.50 - \$1.00)] - \$62{,}500} = \frac{\$150{,}000}{\$87{,}500} = 1.71$$

$$DFL_W = \frac{\$87{,}500}{[\$87{,}500 - \$17{,}500]} = 1.25$$

$DTL_w = 1.71 \times 1.25 = 2.14$

c. Firm R has less operating (business) risk but more financial risk than Firm W.

d. Two firms with differing operating and financial structures may be equally leveraged. Since total leverage is the product of operating and financial leverage, each firm may structure itself differently and still have the same amount of total risk.