GLOBAL EDITION

Weygandt's MANAGERIAL ACCOUNTING

TOOLS FOR BUSINESS DECISION MAKING

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6 Cost-Volume-Profit Analysis: Additional Issues

Learning Objectives

6.1	Apply basic CVP concepts.
6.2	Explain the term sales mix and its effects on break-even sales.
6.3	Determine sales mix when a company has limited resources.
6.4	Indicate how operating leverage affects profitability.

LEARNING OBJECTIVE 6.1

Apply basic CVP concepts.

CVP analysis is:

- The study of the effects of changes in costs and volume on a company's profit.
- Important to profit planning.
- Critical in management decisions such as:
  - determining product mix,
  - maximizing use of production facilities,
  - setting selling prices.

LO 1

Basic Concepts

- Management often wants the information reported in a **special format** income statement.
- **CVP income statement** is for internal use only:
  - Costs and expenses classified as fixed or variable.
  - Reports contribution margin as a total amount and on a per unit basis.

LO 1

Basic Concepts

Fandi Electronics
CVP Income Statement
For the Month Ended June 30, 2020

	Total	Per Unit
Sales (1,600 cell phones)	€800,000	€500
Variable costs	480,000	300
Contribution margin	**320,000**	**€200**
Fixed costs	200,000	
Net income	**€120,000**	

Illustration 6-1
Basic CVP income statement

LO 1

Basic Concepts

Illustration 6-2
Detailed CVP income statement

Fandi Electronics
CVP Income Statement
For the Month Ended June 30, 2020

	Total		Per Unit
Sales		€800,000	€500
Variable expenses			
Cost of goods sold	€400,000		
Selling expenses	60,000		
Administrative expenses	20,000		
Total variable expenses		480,000	300
Contribution margin		**320,000**	**€200**
Fixed expenses			
Cost of goods sold	120,000		
Selling expenses	40,000		
Administrative expenses	40,000		
Total fixed expenses		200,000	
Net income		**€120,000**	

LO 1

Basic Computations

BREAK-EVEN ANALYSIS

Illustration: Fandi Electronics' CVP income statement (Ill. 6-2) shows that total contribution margin is €320,000, and the company's contribution margin per unit is €200. Contribution margin can also be expressed in the form of the **contribution margin ratio** which in the case of Fandi is 40% (€200 ÷ €500).

Fixed Costs	÷	Unit Contribution Margin	=	Break-Even Point in Units
	÷		=	

Fixed Costs	÷	Contribution Margin Ratio	=	Break-Even Point in Sales
	÷		=	

Illustration 6-3 and 6-4

LO 1

Basic Computations

TARGET NET INCOME

Once a company achieves break-even sales, a sales goal can be set that will result in a target net income

Illustration: Assuming Fandi's target net income is €250,000, required sales in units and dollars to achieve this are:

(Fixed Costs + Target Net Income)	÷	Unit Contribution Margin	=	**Required Sales in Units**
(€200,000 + €250,000)	÷	€200	=	**2,250 units**

Illustration 6-5
Target net income in units

LO 1

Basic Computations

TARGET NET INCOME

Once a company achieves break-even sales, a sales goal can be set that will result in a target net income

Illustration: The contribution margin ratio is used to compute required sales in dollars.

(Fixed Costs + Target Net Income)	÷	Contribution Margin Ratio	=	**Required Sales**
(€200,000 + €250,000)	÷	.40	=	**€1,125,000**

Illustration 6-6
Target net income

LO 1

Basic Computations

MARGIN OF SAFETY

- tells us how far sales can drop before the company will operate at a loss.
- can be expressed in sales or as a ratio.

Illustration: Assume Fandi's sales are €800,000:

Actual (Expected) Sales	-	Break-Even Sales	=	**Margin of Safety**
€800,000	-	€500,000	=	**€300,000**

Illustration 6-7
Margin of safety

LO 1

Basic Computations

MARGIN OF SAFETY

- tells us how far sales can drop before the company will operate at a loss.
- can be expressed in sales or as a ratio.

Illustration: Fandi's sales could drop by €300,000, or 37.5%, before the company would operate at a loss.

Margin of Safety	–	Actual (Expected) Sales	=	**Margin of Safety in Ratio**
€300,000	–	€800,000	=	**37.5%**

Illustration 6-8
Margin of safety ratio

LO 1

CVP and Changes in the Business Environment

Illustration: Original cell phone sales and cost data for Fandi Electronics:

Unit selling price	€500
Unit variable cost	€300
Total fixed costs	€200,000
Break-even sales	€500,000 or 1,000 units

Illustration 6-9

LO 1

CVP and Changes in the Business Environment

Case I: A competitor is offering a 10% discount on the selling price of its cell phones. Management must decide whether to offer a similar discount.

Question: What effect will a 10% discount on selling price (€500 x 10% = €50) have on the break-even point?

Fixed Costs	÷	Unit Contribution Margin	=	**Break-Even Sales**
€200,000	÷	€150	=	**1,333 units (rounded)**

Illustration 6-10
Computation of break-even sales in units

LO 1

CVP and Changes in the Business Environment

Case II: Management invests in new robotic equipment that will lower the amount of direct labor required to make cell phones. Estimates are that total fixed costs will increase 30% and that variable cost per unit will decrease 30%.

Question: What effect will the new equipment have on the sales volume required to break even?

Fixed Costs	÷	Unit Contribution Margin	=	**Break-Even Sales in units**
€260,000	÷	(€500 - €210)	=	**897 units** (rounded)

Illustration 6-11
Computation of break-even sales in units

LO 1

CVP and Changes in the Business Environment

Case III: Fandi's principal supplier of raw materials has just announced a price increase. The higher cost is expected to increase the variable cost of cell phones by €25 per unit. Management decides to hold the line on the selling price of the cell phones. It plans a cost-cutting program that will save €17,500 in fixed costs per month. Fandi is currently realizing monthly net income of €80,000 on sales of 1,400 camcorders.

Question: What increase in units sold will be needed to maintain the same level of net income?

LO 1

CVP and Changes in the Business Environment

Case III:

Variable cost per unit increases to €

Fixed costs are reduced to €

Contribution margin per unit becomes €1

(Fixed Cost + Target Net Income)	÷	Unit Contribution Margin	=	**Required Sales in Units**
(€182,500 + €80,000)	÷	€175	=	1,500

Illustration 6-12
Computation of required sales in units

LO 1

Basic Concepts

Question

Croc Catchers calculates its contribution margin to be less than zero. Which statement is true?

a. Its fixed costs are less than the variable cost per unit.

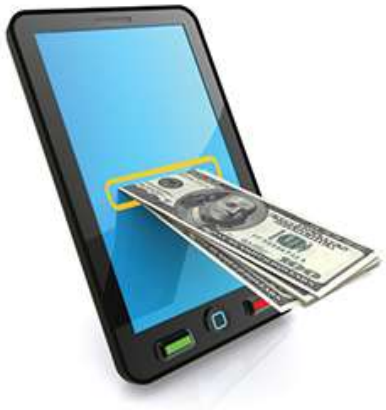
b. Its profits are greater than its total costs.

c. The company should sell more units.

d. Its selling price is less than its variable costs.

LO 1

Management Insight Amazon.com



Warchi/iStockphoto

Don't Just Look—Buy Something

When analyzing an Internet business such as **Amazon.com** (USA), analysts closely watch the so-called "conversion rate." This rate is calculated by dividing the number of people who actually take action at an Internet site (buy something) by the total number of people who visit the site. Average conversion rates are from 3% to 5%. A rate below 2% is poor, while a rate above 10% is great.

Conversion rates have an obvious effect on the break-even point. Suppose you spend $10,000 on your site, which then attracts 5,000 visitors. If you get a 2% conversion rate (100 purchases), your site costs $100 per purchase ($10,000 ÷ 100). A 4% conversion rate lowers your cost to $50 per transaction, and an 8% conversion rate gets you down to $25. Studies show that conversion rates increase if the site has an easy-to-use interface, fast-performing screens, a convenient ordering process, and advertising that is both clever and clear.

Sources: J. William Gurley, "The One Internet Metric That Really Counts" *Fortune* (March 6, 2000), p. 392; and Milind Mody, "Chief Mentor: How Startups Can Win Customers Online," *Wall Street Journal Online,* (May 11, 2011).

Besides increasing their conversion rates, what steps can online merchants use to lower their break-even points? (Go to the book's companion website for this answer and additional questions.)

DO IT! 6.1 CVP Analysis

Kuncoro Company reports the following operating results for the month of June 2020 (Rp in thousands).

	Total	Per Unit
Sales (5,000 units)	Rp300,000	Rp60
Variable costs	180,000	36
Contribution margin	120,000	Rp24
Fixed expenses	100,000	
Net income	Rp 20,000	

To increase net income, management is considering reducing the selling price by 10%, with no changes to unit variable costs or fixed costs. Management is confident that this change will increase unit sales by 25%. Using the contribution margin technique, compute the break-even point in units and sales and margin of safety, (a) assuming no changes to sales price or costs, and (b) assuming changes to sales price and volume as described above. (c) Comment on your findings.

LO 1

DO IT! 6.1 CVP Analysis

Kuncoro Company reports the following operating results for the month of June 2020 (Rp in thousands).

	Total	Per Unit
Sales (5,000 units)	Rp300,000	Rp60
Variable costs	180,000	36
Contribution margin	120,000	Rp24
Fixed expenses	100,000	
Net income	Rp 20,000	

Solution

a. Assuming no changes to sales price or costs:
Break-even point in units =
Break-even point in sales =
Margin of safety =
[a]Rp24 ÷ Rp60

LO 1

DO IT! 6.1 CVP Analysis

Kuncoro Company reports the following operating results for the month of June 2020 (Rp in thousands).

	Total	Per Unit
Sales (5,000 units)	Rp300,000	Rp60
Variable costs	180,000	36
Contribution margin	120,000	Rp24
Fixed expenses	100,000	
Net income	Rp 20,000	

Solution

b. Assuming changes to sales price and volume:
Break-even point in units =
Break-even point in sales =
Margin of safety =

LO 1

DO IT! 6.1 CVP Analysis

Kuncoro Company reports the following operating results for the month of June 2020 (Rp in thousands)..

	Total	Per Unit
Sales (5,000 units)	Rp300,000	Rp60
Variable costs	180,000	36
Contribution margin	120,000	Rp24
Fixed expenses	100,000	
Net income	Rp 20,000	

(c) The increase in the break-even point and the decrease in the margin of safety indicate that management should not implement the proposed change. The increase in sales volume will result in contribution margin of Rp112,500 (6,250 x Rp18), which is Rp7,500 less than the current amount.

LO 1

LEARNING OBJECTIVE 6.2

Explain the term sales mix and its effects on break-even sales.

Break-Even Sales in Units

- **Sales mix** is the relative percentage in which a company sells its products.
- If a company's unit sales are 80% printers and 20% computers, its sales mix is 80% to 20%.
- Sales mix is important because different products often have very different contribution margins.

LO 2

Break-Even Sales in Units

Companies can compute break-even sales for a mix of two or more products by determining the **weighted-average unit contribution margin** of all the products.

Illustration: Fandi Electronics sells not only cell phones but TV sets as well. Fandi sells its two products in the following amounts: 1,500 cell phones and 500 TVs. The sales mix, expressed as a function of total units sold, is shown in Illustration 6-13.

Cell Phones	TVs
1,500 units ÷ 2,000 units = 75%	500 units ÷ 2,000 units = 25%

Illustration 6-13
Sales mix as a percentage of units sold

LO 2

Break-Even Sales in Units

Additional information related to Fandi Electronics.

Cell Phones	TVs
1,500 units ÷ 2,000 units = 75%	500 units ÷ 2,000 units = 25%

Illustration 6-13

Unit Data	Cell Phones	TVs
Selling price	€500	€1,000
Variable costs	300	500
Contribution margin	€200	€500
Sales mix—units	75%	25%
Fixed costs = €275,000		

Illustration 6-14
Per unit data–sales mix

LO 2

Break-Even Sales in Units

First, determine the **weighted-average contribution margin**.

Unit Data	Cell Phones	TVs
Selling price	€500	€1,000
Variable costs	300	500
Contribution margin	€200	€500
Sales mix—units	75%	25%

Fixed costs = €275,000

Illustration 6-14

Cell Phones				TVs				
(Unit Contribution Margin	×	Sales Mix Percentage)	+	(Unit Contribution Margin	×	Sales Mix Percentage)	=	Weighted-Average Unit Contribution Margin
☐	×	☐	+	☐	×	☐	=	☐

Illustration 6-15
Weighted-average unit contribution margin

LO 2

Break-Even Sales in Units

Second, use the weighted-average unit contribution margin to compute the break-even point in units.

Illustration 6-15

Cell Phones				TVs				
(Unit Contribution Margin	×	Sales Mix Percentage)	+	(Unit Contribution Margin	×	Sales Mix Percentage)	=	Weighted-Average Unit Contribution Margin
(€200	×	.75)	+	(€500	×	.25)	=	€275

Fixed Costs	÷	Weighted-Average Unit Contribution Margin	=	Break-Even Point in Units
	÷		=	

Illustration 6-16
Break-even point in units

LO 2

Break-Even Sales in Units

- With a break-even of 1,000 units, Fandi must sell:
  - 750 cell phones (1,000 units x 75%)
  - 250 TVs (1,000 units x 25%)
- At this level, the total contribution margin will equal the fixed costs of €275,000.

Product	Unit Sales	×	Unit Contribution Margin	=	Total Contribution Margin
Cell phones	750	×	€200	=	€150,000
TVs	250	×	500	=	125,000
	1,000				€275,000

Illustration 6-17
Break-even proof–sales units

LO 2

Break-Even Sales

- Works well if the company has many products.
- Calculates break-even point in terms of sales dollars for
  - divisions or
  - product lines,
  - NOT individual products.

LO 2

Break-Even Sales

Illustration: Kale Garden Supply has two divisions.

	Indoor Plant Division	Outdoor Plant Division	Company Total
Sales	£ 200,000	£ 800,000	£1,000,000
Variable costs	120,000	560,000	680,000
Contribution margin	£ 80,000	£ 240,000	£ 320,000
Sales mix percentage (Division sales ÷ Total sales)	£ 200,000 / £1,000,000 = .20	£ 800,000 / £1,000,000 = .80	

Illustration 6-18
Cost-volume-profit data for Kale Garden Supply

	Indoor Plant Division	Outdoor Plant Division	Company Total
Contribution margin ratio (Contribution margin ÷ Sales)	£ 80,000 / £200,000 = .40	£240,000 / £800,000 = .30	£ 320,000 / £1,000,000 = .32

Illustration 6-19
Contribution margin ratio for each division

LO 2

Break-Even Sales

First, determine the **weighted-average contribution margin**.

Indoor Plant Division				Outdoor Plant Division				
(Contribution Margin Ratio	×	Sales Mix Percentage)	+	(Contribution Margin Ratio	×	Sales Mix Percentage)	=	Weighted-Average Contribution Margin Ratio
	×		+		×		=	

Illustration 6-20
Calculation of weighted-average contribution margin

Second, calculate break-even point in sales.

Fixed Costs	÷	Weighted-Average Contribution Margin Ratio	=	Break-Even Point in Sales
	÷		=	

Illustration 6-21
Calculation of break-even point in sales

LO 2

Break-Even Sales

- With break-even sales of £937,500 and a sales mix of 20% to 80%, Kale must sell:
  - £187,500 from the Indoor Plant division
  - £750,000 from the Outdoor Plant division
- If the sales mix becomes 50% to 50%, the weighted average contribution margin ratio changes to 35%, resulting in a lower break-even point of £857,143.

LO 2

Break-Even Sales

Question

Net income will be:

a. Greater if more higher-contribution margin units are sold than lower-contribution margin units.

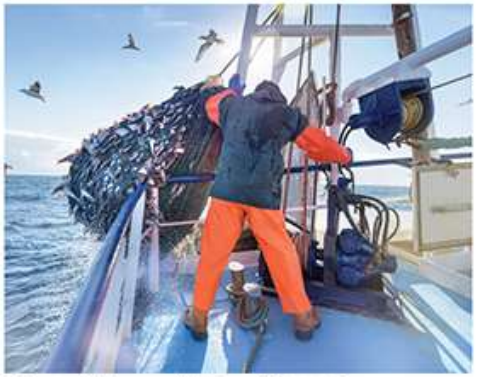
b. Greater if more lower-contribution margin units are sold than higher-contribution margin units.

c. Equal as long as total sales remain equal, regardless of which products are sold.

d. Unaffected by changes in the mix of products sold.

LO 2

Service Company Insight — Falfish



Monty Rakusen/Cultura/Getty Images

Weatherproofing Profits

Seafood processor **Falfish** (GBR) saw its profit margin and bottom-line profit fall for the year ended March 31, 2016, even though the company experienced an increase in sales. This was the second year in a row that this had happened. Although the company continued to see savings in its production-processing initiatives, the change in sales mix, due to extreme winter storms, resulted in decreased overall gross profits margins. While sales rose 15% during the past year, cost of sales rose 20.2%. To combat these changes, the firm said its business strategy remains to maximize value from investments made over the past four years and focus on its key skill sets and sourcing capability, to support both U.K. and international customers. As a result, Falfish invested in a new subsidiary and a new joint venture to diversify its product range to help ensure the supply of seafood products.

Source: N. Ramsden, "Falfish Sees Profits Fall on Changed Product Mix," *Undercurrent News* (January 9, 2017).

When sales rose 15% and cost of sales rose 20.2%, did Falfish's contribution margin ratio increase or decrease? How did this change in the contribution margin ratio affect break-even sales? (Go to the book's companion website for this answer and additional questions.)

LO 2

DO IT! 6.2 Sales Mix Break-Even

Zhou Bicycles International produces and sells three different types of mountain bikes. Information regarding the three models is shown below.

	Pro	Intermediate	Standard	Total
Units sold	5,000	10,000	25,000	40,000
Selling price	HK$8,000	HK$5,000	HK$3,500	
Variable costs	HK$5,000	HK$3,000	HK$2,500	

The company's total fixed costs to produce the bicycles are HK$75,000,000.

(a) Determine the sales mix as a function of units sold for the three products.

LO 2

DO IT! 6.2 Sales Mix Break-Even

(a) Determine the sales mix as a function of units sold for the three products.

	Pro	Intermediate	Standard	Total
Units sold	5,000	10,000	25,000	40,000
Selling price	HK$8,000	HK$5,000	HK$3,500	
Variable costs	HK$5,000	HK$3,000	HK$2,500	

Solution

a. The sales mix percentages as a function of units sold are:

Pro	Intermediate	Standard

LO 2

DO IT! 6.2 Sales Mix Break-Even

(b) Determine the weighted-average unit contribution margin.

	Pro	Intermediate	Standard	Total
Units sold	5,000	10,000	25,000	40,000
Selling price	HK$8,000	HK$5,000	HK$3,500	
Variable costs	HK$5,000	HK$3,000	HK$2,500	

Solution

b. The weighted-average unit contribution margin is:

LO 2

DO IT! 6.2 Sales Mix Break-Even

(c) Determine the total number of units that the company must sell to break even.

	Pro	Intermediate	Standard	Total
Units sold	5,000	10,000	25,000	40,000
Selling price	HK$8,000	HK$5,000	HK$3,500	
Variable costs	HK$5,000	HK$3,000	HK$2,500	

Solution

c. The break-even point in units is:

LO 2

DO IT! 6.2 Sales Mix Break-Even

(d) Determine the number of units of each model that the company must sell to break even.

	Pro	Intermediate	Standard	Total
Units sold	5,000	10,000	25,000	40,000
Selling price	HK$8,000	HK$5,000	HK$3,500	
Variable costs	HK$5,000	HK$3,000	HK$2,500	

Solution

d. The break-even units to sell for each product are:

Pro:
Intermediate:
Standard:

LO 2

LEARNING OBJECTIVE 6.3

Determine sales mix when a company has limited resources.

Determining Sales Mix with Limited Resources

- All companies have limited resources whether it be floor space, raw materials, direct labor hours, etc.
- Management must decide which products to sell to maximize net income.

Illustration: Fandi Electronics makes cell phones and TVs. Machine capacity is limited to 3,600 hours per month.

	Cell Phones	TVs
Unit contribution margin	€200	€500
Machine hours required per unit	.2	.625

Illustration 6-22
Contribution margin and machine hours

LO 3

Sales Mix with Limited Resources

Calculate the **contribution margin per unit of limited resource**.

	Cell Phones	TVs
Unit contribution margin (a)	€200	€500
Machine hours required (b)	0.2	0.625
Contribution margin per unit of limited resource [(a) ÷ (b)]	**€1,000**	**€800**

Illustration 6-23
Contribution margin per unit of limited resource

Management should produce more cell phones if demand exists or else increase machine capacity.

LO 3

Sales Mix with Limited Resources

If Fandi is able to increase machine capacity from 3,600 hours to 4,200 hours, the additional 600 hours could be used to produce either the cell phones or TVs.

	Cell Phones	TVs
Machine hours (a)	600	600
Contribution margin per unit of limited resource (b)	€ 1,000	€ 800
Contribution margin [(a) × (b)]	**€600,000**	**€480,000**

Illustration 6-24
Incremental analysis—computation of total contribution margin

To maximize net income, all 600 hours should be used to produce and sell cell phones.

LO 3

Sales Mix with Limited Resources

Theory of Constraints

- Approach used to identify and manage constraints so as to achieve company goals.
- Company must continually
  - identify its constraints and
  - find ways to reduce or eliminate them, where appropriate.

LO 3

Sales Mix with Limited Resources

Question

If the contribution margin per unit is €15 and it takes 3.0 machine hours to produce the unit, the contribution margin per unit of limited resource is:

a. €25.

b. €5.

c. €4.

d. No correct answer is given.

LO 3

Management Insight Aurobindo Pharma

smartboy10/Getty Images

Generic Drugs Boost Financial Health

Aurobindo Pharma (IND) is among the top five listed pharmaceutical companies in India. The company met investor expectations for the first quarter of 2016–2017, indicating that revenue growth was 14% higher than the same time a year earlier, with net profit increasing by 24% and a strong contribution margin. Between 2012–2013 and 2015–2016, its revenue and net profit reported a compound annual growth rate of 33% and 89%, respectively.

Approximately 90% of Aurobindo's sales come from the international markets, spread across 150 countries, with the majority from the United States and Europe. Since the penetration of generic drugs is low in the European countries of France, Spain, and Italy, Aurobindo sees this as a good opportunity and is also focusing on the emerging markets of Brazil, South Africa, Ukraine, and Mexico. By setting up a plant in Brazil, Aurobindo plans to improve its profit margin as a result of this change in sales mix and penetration through local manufacturing facilities.

Source: N. Nathan, "Improved Margins, Better Sales Mix Make Aurobindo Pharma Stock Analysts' Top Pick," *Economic Times* (September 5, 2016).

If Aurobindo Pharma's sales mix is trending toward a larger percentage of generic drugs, do the generics have a higher or lower contribution margin ratio than other product lines? (Go to the book's companion website for this answer and additional questions).

DO IT! 6.3 Sales Mix with Limited Resources

Chiu Ltd. manufactures and sells three different types of high-quality sealed ball bearings for mountain bike wheels. The bearings vary in terms of their quality specifications–primarily with respect to their smoothness and roundness. They are referred to as Fine, Extra-Fine, and Super-Fine bearings. Machine time is limited. More machine time is required to manufacture the Extra-Fine and Super-Fine bearings. Additional information is provided below.

	Product		
	Fine	**Extra-Fine**	**Super-Fine**
Selling price	NT$180	NT$300	NT$480
Variable costs and expenses	120	195	330
Contribution margin	NT$60	NT$105	NT$150
Machine hours required	0.02	0.04	0.08

LO 3

DO IT! 6.3 Sales Mix with Limited Resources

	Product		
	Fine	Extra-Fine	Super-Fine
Selling price	NT$180	NT$300	NT$480
Variable costs and expenses	120	195	330
Contribution margin	NT$60	NT$105	NT$150
Machine hours required	0.02	0.04	0.08

(a) Ignoring the machine time constraint, what strategy would appear optimal?

Solution

The Super-Fine bearings have the highest unit contribution margin. Thus, ignoring any manufacturing constraints, it would appear that the company should shift toward production of more Super-Fine units.

LO 3

DO IT! 6.3 Sales Mix with Limited Resources

	Product		
	Fine	Extra-Fine	Super-Fine
Selling price	NT$180	NT$300	NT$480
Variable costs and expenses	120	195	330
Contribution margin	NT$60	NT$105	NT$150
Machine hours required	0.02	0.04	0.08

(b) What is the contribution margin per unit of limited resource for each type of bearing?

Solution

	Fine	Extra-Fine	Super-Fine
$\frac{\text{Unit contribution margin}}{\text{Limited resource consumed per unit}}$			

LO 3

DO IT! 6.3 Sales Mix with Limited Resources

	Product		
	Fine	Extra-Fine	Super-Fine
Selling price	NT$180	NT$300	NT$480
Variable costs and expenses	120	195	330
Contribution margin	NT$60	NT$105	NT$150
Machine hours required	0.02	0.04	0.08

(c) If additional machine time could be obtained, how should the additional capacity be used?

Solution

The Fine bearings have the highest contribution margin per unit of limited resource even though they have the lowest unit contribution margin. Given the resource constraint, any additional capacity should be used to make Fine bearings.

LO 3

LEARNING OBJECTIVE 6.4

Indicate how operating leverage affects profitability.

Cost Structure is the relative proportion of fixed versus variable costs that a company incurs.

- May have a significant effect on profitability.
- Company must carefully choose its cost structure.

LO 4

Cost Structure

Illustration: Fandi Electronics and one of its competitors, New Wave Company, both make cell phones. Fandi Electronics uses a traditional, labor-intensive manufacturing process. New Wave Company has invested in a completely automated system. The factory employees are involved only in setting up, adjusting, and maintaining the machinery.

Illustration 6-25
CVP income statements for two companies

	Fandi Electronics	New Wave Company
Sales	€800,000	€800,000
Variable costs	480,000	160,000
Contribution margin	320,000	640,000
Fixed costs	200,000	520,000
Net income	€120,000	€120,000

LO 4

Effect on Contribution Margin Ratio

Illustration 6-25

First let's look at the contribution margin ratios.

	Fandi Electronics	New Wave Company
Sales	€800,000	€800,000
Variable costs	480,000	160,000
Contribution margin	320,000	640,000
Fixed costs	200,000	520,000
Net income	€120,000	€120,000

	Contribution Margin	÷	Sales	=	Contribution Margin Ratio
Fandi Electronics					
New Wave					

Illustration 6-26
Contribution margin ratio for two companies

LO 4

Effect on Contribution Margin Ratio

Illustration 6-26

	Contribution Margin	÷	Sales	=	Contribution Margin Ratio
Fandi Electronics	€320,000	÷	€800,000	=	.40
New Wave	€640,000	÷	€800,000	=	.80

- New Wave contributes 80 cents to net income for each dollar of increased sales while Fandi only contributes 40 cents.
- New Wave's cost structure which relies on fixed costs is more sensitive to changes in sales.

LO 4

Effect on Break-Even Point

Calculate the break-even point.

Illustration 6-27
Computation of break-even point for two companies

	Fixed Costs	÷	Contribution Margin Ratio	=	Break-Even Point in Sales
Fandi Electronics		÷		=	
New Wave		÷		=	

- New Wave needs to generate €150,000 more in sales than Fandi to break-even.
- Because of the greater break-even sales required, New Wave is a riskier company than Fandi.

LO 4

Effect on Margin of Safety

Computation of margin of safety ratio

Illustration 6-28
Computation of margin of safety ratio for two companies

	(Actual Sales	–	Break-Even Sales)	÷	Actual Sales	=	Margin of Safety Ratio
Fandi Electronics	(€800,000	–	€500,000)	÷	€800,000	=	.38
New Wave	(€800,000	–	€650,000)	÷	€800,000	=	.19

- The difference in ratios reflects the difference in risk between New Wave and Fandi.
- Fandi can sustain a 38% decline in sales before operating at a loss versus only a 19% decline for New Wave.

LO 4

Operating Leverage

- Extent that net income reacts to a given change in sales.
- Higher fixed costs relative to variable costs cause a company to have higher operating leverage.
- When sales revenues are increasing, high operating leverage means that profits will increase rapidly.
- When sales revenues are declining, too much operating leverage can have devastating consequences.

LO 4

Operating Leverage

DEGREE OF OPERATING LEVERAGE

- Provides a measure of a company's earnings volatility.
- Computed by dividing total contribution margin by net income.

Illustration 6-29

	Contribution Margin	÷	Net Income	=	Degree of Operating Leverage
Fandi Electronics	€320,000	÷	€120,000	=	2.67
New Wave	€640,000	÷	€120,000	=	5.33

New Wave's earnings would go up (or down) by about two times (5.33 ÷ 2.67 = 1.99) as much as Fandi's with an equal increase in sales.

LO 4

Operating Leverage

Question

The degree of operating leverage:

a. Can be computed by dividing total contribution margin by net income.

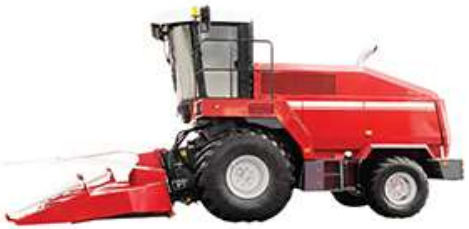
b. Provides a measure of the company's earnings volatility.

c. Affects a company's break-even point.

d. All of the above.

LO 4

Management Insight International Harvester Company



Vereshchagin Dmitry/Shutterstock

Operating Leverage Highs and Lows

International Harvester Company (IHC) (USA), a producer of trucks and heavy equipment, represents a historical case of a company whose operating leverage led to higher or lower profits. Since operating leverage describes the relationship between a firm's fixed and variable costs or operating income and sales, a firm with an operating leverage of 1.5 will experience a 1.5% increase in operating profit for every 1% increase in sales. Thus, a high degree of operating leverage only benefits a company as long as sales rise; profits quickly become losses when sales decline.

In 1974, IHC had $4.9 billion in gross revenue. As the environment began changing, both economically and socially, there was a push for improved fuel efficiency. As a result, IHC committed to an expensive modernization and expansion program, spending $175 million in 1974–1975, which was three times greater than the budgets of three to four years earlier. Although cash flow remained strong, the company took on greater debt to finance the expansion. For the first five years of the expansion period, sales rose more than 25% to nearly $8.4 billion in 1979 and operating leverage was greater than 1.0. However, when sales began to decline in 1979, the high operating leverage resulted in stark losses, complicated by high financing charges from the expansion. The company lost $822 million in 1982. Between 1979 and 1983, the cumulative net losses were $2.05 billion, which exhausted the company's working capital.

Source: H. Platt, *Why Companies Fail: Strategies for Detecting, Avoiding, and Profiting from Bankruptcy* (Beard Books, 1999), pp. 44–49.

What decision did IHC make in the mid-1970's that changed its degree of operating leverage? (Go to the book's companion website for this answer and additional questions.)

LO 4

DO IT! 6.4 Operating Leverage

Rexfield Ltd., a company specializing in crime scene investigations, is contemplating an investment in automated mass-spectrometers. Its current process relies on a high number of lab technicians. The new equipment would employ a computerized expert system. The company's CEO has requested a comparison of the old technology versus the new technology. The accounting department has prepared the following CVP income statements for use in your analysis.

	CSI Equipment	
	Old	**New**
Sales	£2,000,000	£2,000,000
Variable costs	1,400,000	600,000
Contribution margin	600,000	1,400,000
Fixed costs	400,000	1,200,000
Net income	£ 200,000	£ 200,000

LO 4

DO IT! 6.4 Operating Leverage

	CSI Equipment	
	Old	New
Sales	£2,000,000	£2,000,000
Variable costs	1,400,000	600,000
Contribution margin	600,000	1,400,000
Fixed costs	400,000	1,200,000
Net income	£ 200,000	£ 200,000

(a) Compute the degree of operating leverage for the company under each scenario.

Solution

a.

	Contribution Margin	÷	Net Income	=	Degree of Operating Leverage
Old	£600,000	÷	£200,000	=	3
New	£1,400,000	÷	£200,000	=	7

LO 4

DO IT! 6.4 Operating Leverage

	CSI Equipment	
	Old	New
Sales	£2,000,000	£2,000,000
Variable costs	1,400,000	600,000
Contribution margin	600,000	1,400,000
Fixed costs	400,000	1,200,000
Net income	£ 200,000	£ 200,000

(b) Discuss your results.

The degree of operating leverage measures the company's sensitivity to changes in sales. By switching to a cost structure dominated by fixed costs, the company would significantly increase its operating leverage. As a result, with a percentage change in sales, its percentage change in net income would be 2.33 (7 ÷ 3) times as much with the new technology as it would under the old.

LO 4

LEARNING OBJECTIVE 6.5

Explain the differences between absorption costing and variable costing.

Under **variable costing**, product costs consist of:

- Direct Materials
- Direct Labor
- Variable Manufacturing Overhead

The difference between absorption and variable costing is:

Illustration 6A-1
Difference between absorption costing and variable costing

LO 5

Variable versus Absorption Costing

The difference between absorption and variable costing:

- Under both costing methods, selling and administrative expenses are treated as period costs.
- Companies may not use variable costing for external financial reports because GAAP requires that fixed manufacturing overhead be treated as a product cost.

LO 5

Comparing Absorption with Variable Costing

Illustration: Premium Products manufactures a polyurethane sealant, called Fix-It, for car windshields. Relevant data for Fix-It in January 2020, the first month of production, are as follows.

Selling price	€20 per unit.
Units	Produced 30,000; sold 20,000; beginning inventory zero.
Variable unit costs	Manufacturing €9 (direct materials €5, direct labor €3, and variable overhead €1).
	Selling and administrative expenses €2.
Fixed costs	Manufacturing overhead €120,000.
	Selling and administrative expenses €15,000.

Illustration 6A-2
Sealant sales and cost data for Premium Products

LO 5

Comparing Absorption with Variable Costing

Per unit manufacturing cost under each approach.

Type of Cost	Absorption Costing	Variable Costing
Direct materials	€ 5	€5
Direct labor	3	3
Variable manufacturing overhead	1	1
Fixed manufacturing overhead (€120,000 ÷ 30,000 units produced)	**4**	**0**
Manufacturing cost per unit	**€13**	**€9**

Illustration 6A-3

The manufacturing cost per unit is €4 (€13 – €9) higher for absorption costing because fixed manufacturing costs are treated as product costs.

LO 5

ABSORPTION COSTING EXAMPLE

Premium Products
Income Statement
For the Month Ended January 31, 2020
Absorption Costing

Sales (20,000 units × €20)		€400,000
Cost of goods sold		
Inventory, January 1	€ –0–	
Cost of goods manufactured (30,000 units × €13)	390,000	
Cost of goods available for sale	390,000	
Less: Inventory, January 31 (10,000 units × €13)	**130,000**	
Cost of goods sold (20,000 units × €13)		260,000
Gross profit		140,000
Variable selling and administrative expenses (20,000 × €2)	40,000	
Fixed selling and administrative expenses	15,000	55,000
Net income		**€ 85,000**

Illustration 6A-4
Absorption costing income statement

LO 5

VARIABLE COSTING EXAMPLE

Premium Products
Income Statement
For the Month Ended January 31, 2020
Variable Costing

Sales (20,000 units × €20)		€400,000
Variable cost of goods sold		
Inventory, January 1	€ –0–	
Variable cost of goods manufactured (30,000 units × €9)	270,000	
Variable cost of goods available for sale	270,000	
Less: Inventory, January 31 (10,000 units × €9)	**90,000**	
Variable cost of goods sold	180,000	
Variable selling and administrative expenses (20,000 units × €2)	40,000	220,000
Contribution margin		180,000
Fixed manufacturing overhead	120,000	
Fixed selling and administrative expenses	15,000	135,000
Net income		**€ 45,000**

Illustration 6A-5
Variable costing income statement

LO 5

Comparing Absorption with Variable Costing

Question

Fixed manufacturing overhead costs are recognized as:

a. Period costs under absorption costing.

b. Product costs under absorption costing.

c. Product costs under variable costing.

d. Part of ending inventory costs under both absorption and variable costing.

LO 5

Decision-Making Concerns

- Accounting standards require that absorption costing be used for the costing of inventory for external reporting purposes.
- Net income measured under absorption costing is often used internally as well to
  - evaluate performance,
  - justify cost reductions, or
  - evaluate new projects.

LO 5

Decision-Making Concerns

- Some companies have recognized that net income calculated using absorption costing does not highlight differences between variable and fixed costs and may lead to poor business decisions.
- These companies use variable costing for internal reporting purposes.

LO 5

Potential Advantages of Variable Costing

- The use of variable costing is consistent with cost-volume-profit analysis.
- Net income under variable costing is unaffected by changes in production levels. Instead, it is closely tied to changes in sales.
- The presentation of fixed costs in the variable costing approach makes it easier to identify fixed costs and to evaluate their impact on the company's profitability.

LO 5

DO IT! 6.5 Variable Costing

Youn Ltd. produces and sells tennis balls. The following costs are available for the year ended December 31, 2020. The company has no beginning inventory. In 2020, 8,000,000 units were produced, but only 7,500,000 units were sold. The unit selling price was ₩500 per ball. Costs and expenses were as follows.

Variable costs per unit	
Direct materials	₩100
Direct labor	50
Variable manufacturing overhead	80
Variable selling and administrative expenses	20
Annual fixed costs and expenses	
Manufacturing overhead	₩500,000
Selling and administrative expenses	100,000

LO 5

DO IT! 6.5 Variable Costing

Variable costs per unit	
Direct materials	₩100
Direct labor	50
Variable manufacturing overhead	80
Variable selling and administrative expenses	20
Annual fixed costs and expenses	
Manufacturing overhead	₩500,000
Selling and administrative expenses	100,000

(a) Compute the manufacturing cost of one unit of product using variable costing.

(b) Prepare a 2020 income statement for Youn Ltd. using variable costing.

LO 5

Solution

a. The cost of one unit of product under variable costing would be:

Direct materials	₩100
Direct labor	50
Variable manufacturing overhead	80
	₩230

b. The variable costing income statement would be as follows (amounts in thousands).

Youn Ltd.
Income Statement
For the Year Ended December 31, 2020
Variable Costing

Sales (7,500,000 × ₩500)		₩3,750,000
Variable cost of goods sold (7,500,000 × ₩230)	₩1,725,000	
Variable selling and administrative expenses (7,500,000 × ₩20)	150,000	1,875,000
Contribution margin		1,875,000
Fixed manufacturing overhead	500,000	
Fixed selling and administrative expenses	100,000	600,000
Net income		₩1,275,000

LO 5

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