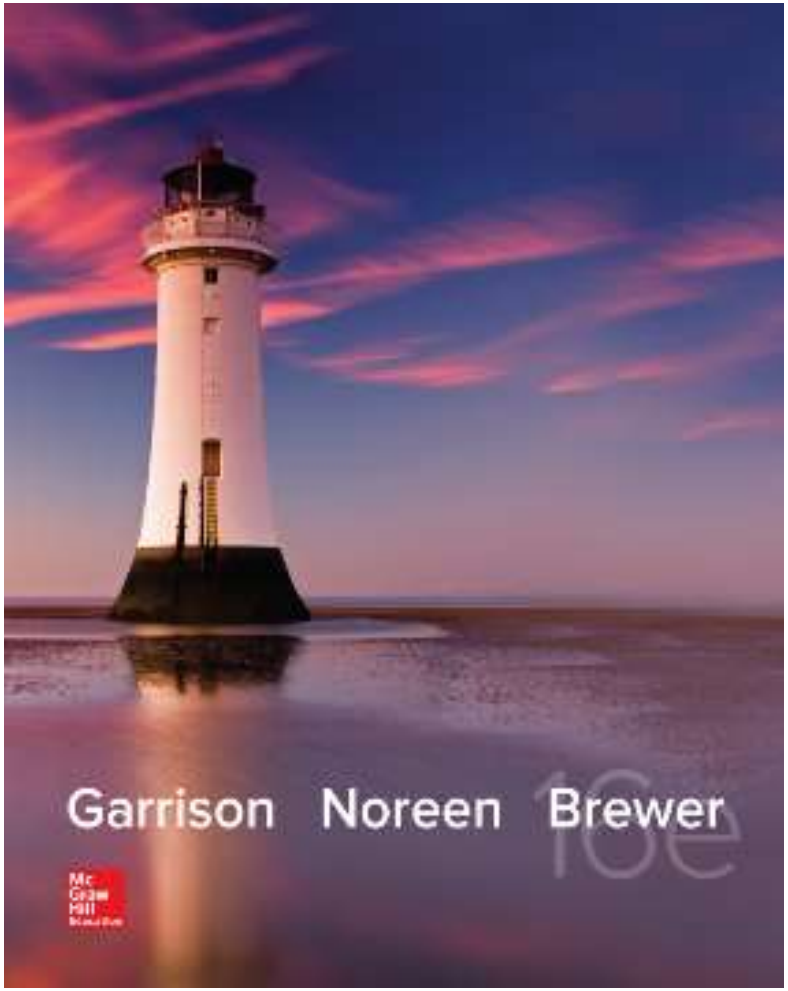
Managerial Accounting

Sixteenth Edition



Chapter 6

Variable Costing and Segment Reporting: Tools for Management

Learning Objective 1

Explain how variable costing differs from absorption costing and compute unit product costs under each method.

Three Simplifying Assumptions

1. This chapter uses actual costing rather than the normal costing approach that was used in the job-order costing chapters.
2. This chapter always uses the actual number of units produced as the allocation base for assigning actual fixed manufacturing overhead costs to products.
3. This chapter always assumes that the variable manufacturing costs per unit and the total fixed manufacturing overhead cost per period remain constant.

Overview of Variable and Absorption Costing (1 of 2)

Variable Costing

- Product Costs
  - Direct Materials
  - Direct Labor
  - Variable Manufacturing Overhead
- Period Costs
  - Fixed Manufacturing Overhead
  - Variable Selling and Administrative Expenses
  - Fixed Selling and Administrative Expenses

Overview of Variable and Absorption Costing (2 of 2)

Absorption Costing

- Product Costs
  - Direct Materials
  - Direct Labor
  - Variable Manufacturing Overhead
  - Fixed Manufacturing Overhead
- Period Costs
  - Variable Selling and Administrative Expenses
  - Fixed Selling and Administrative Expenses

Quick Check 1

Which method will produce the highest values for work in process and finished goods inventories?

a. Absorption costing.

b. Variable costing.

c. They produce the same values for these inventories.

d. It depends…

Quick Check 1a

Which method will produce the highest values for work in process and finished goods inventories?

a. Absorption costing.

b. Variable costing.

c. They produce the same values for these inventories.

d. It depends. . .

Answer: a

Unit Cost Computations – Part 1

Harvey Company produces a single product with the following information available:

Number of units produced annually	25,000
Variable costs per unit:	
Direct materials, direct labor, and variable mfg. overhead	$ 10
Selling & administrative expenses	$ 3
Fixed costs per year:	
Manufacturing overhead	$ 150,000
Selling & administrative expenses	$ 100,000

Unit Cost Computations – Part 2

Unit **product cost** is determined as follows:

	Absorption Costing	Variable Costing
Direct materials, direct labor, and variable mfg. overhead	$ 10	$ 10
Fixed mfg. overhead ($150,000 ÷ 25,000 units)	6	-
Unit product cost	$ 16	$ 10

Under absorption costing, all production costs, variable and fixed, are included when determining unit product cost. Under variable costing, only the variable production costs are included in product costs.

Learning Objective 2

Prepare income statements using both variable and absorption costing.

Variable and Absorption Costing Income Statements

- Let's assume the following additional information for Harvey Company.
  - 20,000 units were sold during the year at a price of $30 each.
  - There is no beginning inventory.
- Now, let's compute net operating income using both absorption and variable costing.

Variable Costing Contribution Format Income Statement

- Variable cost of goods sold (20,000 × $ 10) $200,00: Variable manufacturing costs only.
- Fixed manufacturing overhead $150,000: All fixed manufacturing overhead is expensed.

	Variable Costing	Variable Costing
Sales (20,000 x $30)		$ 600,000
Less variable expenses:		
Variable cost of goods sold (30,000 x $10)	$ 200,000	
Variable selling and administrative expenses (30,000 x $3)	60,000	
Total variable expenses		260,000
Contribution margin		340,000
Less fixed expenses:		
Fixed manufacturing overhead	$ 150,000	
Fixed selling and administrative expenses	100,000	250,000
Net Operating Income		$ 90,000

Absorption Costing Income Statement

Cost of goods sold (20,000 × $16): Unit product cost.

	Absorption Costing	
Sales (20,000 × $30)		$ 600,000
Cost of goods sold (20,000 × $16)		320,000
Gross margin		280,000
Less selling & administrative expenses:		
Variable (20,000 × $3)	$ 60,000	
Fixed	100,000	160,000
Net operating income		$ 120,000

Fixed manufacturing overhead deferred in inventory is 5,000 units × $6 = $30,000.

Learning Objective 3

Reconcile variable costing and absorption costing net operating incomes and explain why the two amounts differ.

Comparing the Two Methods – Part 1

	Cost of Goods Sold	Ending Inventory	Period Expense	Total
Absorption costing				
Variable mfg. expenses	$ 200,00	$ 50,000	$ -	$ 250,000
Fixed mfg. expenses	120,000	30,000	-	150,000
	$ 320,000	$ 80,000	$ -	$ 400,000
Variable costing				
Variable mfg. expenses	$ 200,000	$ 50,000	$ -	$ 250,000
Fixed mfg. expenses	-	-	150,000	150,000
	$ 200,000	$ 50,000	$ 150,000	$ 400,000

Comparing the Two Methods – Part 2

We can reconcile the difference between absorption and variable income as follows:

Variable costing net operating income	$ 90,000
Add: Fixed mfg. overhead costs deferred in inventory (5,000 units × $6 per unit)	30,000
Absorption costing net operating income	$ 120,000

$$\frac{\text{Fixed mfg.overhead}}{\text{Units produced}} = \frac{\$150{,}000}{25{,}000 \text{ units}} = \$6 \text{ per unit}$$

Extended Comparisons of Income Data Harvey Company – Year Two

Number of units produced	25,000
Number of units sold	30,000
Units in beginning inventory	5,000
Units sales price	$ 30
Variable costs per unit:	
Direct materials, direct labor, and variable mfg. overhead	$ 10
Selling & administrative expenses	$ 3
Fixed costs per year:	
Manufacturing overhead	$ 150,000
Selling & administrative expenses	$ 100,000

Unit Cost Computations

	Absorption on Costing	Variable Costing
Direct materials, direct labor, and variable mfg. overhead	$ 10	$ 10
Fixed mfg. overhead ($150,000 ÷ 25,000 units)	6	-
Unit product cost	$ 16	$ 10

Since the variable costs per unit, total fixed costs, and the number of units produced remained unchanged, the unit cost computations also remain unchanged.

Variable Costing (1 of 2)

- Variable cost of goods sold (30,000 × $10): Variable manufacturing costs only.
- Fixed manufacturing overhead $ 150,000: All fixed manufacturing overhead is expensed.

Variable Costing (2 of 2)

	Variable Costing	Variable Costing
Sales (30,000 × $30)		$ 900,000
Less variable expenses:		
Variable cost of goods sold (30,000 × $10)	$ 300,000	
Variable selling & administrative expenses (30,000 × $3)	90,000	
Total variable expenses		390,000
Contribution margin		510,000
Less fixed expenses:		
Fixed manufacturing overhead	**$ 150,000**	
Fixed selling & administrative expenses	100,000	250,000
Net operating income		$ 260,000

Absorption Costing

Cost of goods sold (30,000 ×$16): Unit product cost.

	Absorption Costing	
Sales (30,000 × $ 30)		$ 900,000
Cost of goods sold (30,000 × $16)		480,000
Gross margin		420,000
Less selling & administrative expenses:		
Variable (30,000 × $16)	$ 90,000	
Fixed	100,000	190,000
Net operating income		$ 230,000

Fixed manufacturing overhead released from inventory is 5,000 units × $6 = $30,000.

Reconciling the Difference – Part 1

We can reconcile the difference between absorption and variable income as follows:

Variable costing net operating income	$ 260,000
Deduct : Fixed manufacturing overhead costs released from inventory (5,000 units × $6 per unit)	30,000
Absorption costing net operating income	$230,000

$$\frac{\text{Fixed mfg.overhe ad}}{\text{Units produced}} = \frac{\$150{,}000}{25{,}000 \text{ units}} = \$6 \text{ per unit}$$

Reconciling the Difference – Part 2

Costing Method	1st Period	2nd Period	Total
Absorption	$ 120,000	$ 230,000	$ 350,000
Variable	90,000	260,000	350,000

Summary of Key Insights

Relation between production and sales	Effect on inventory	Relation between variable and absorption incomes
Units produced = Units sold	No change in inventory	Absorption = Variable
Units produced > Units sold	Inventory increases	Absorption > Variable
Units produced < Units sold	Inventory decreases	Absorption < Variable

Enabling CVP Analysis

- Variable costing categorizes costs as variable and fixed so it is much easier to use this income statement format for CVP analysis.
- Because absorption costing assigns fixed manufacturing overhead costs to units produced ($6 per unit for Harvey Company), a portion of fixed manufacturing overhead resides in inventory when units remain unsold. The potential result is positive operating income when the number of units sold is less than the breakeven point.

Explaining Changes in Net Operating Income

- Variable costing income is only affected by changes in unit sales. It is not affected by the number of units produced. As a general rule, when sales go up, net operating income goes up, and vice versa.
- Absorption costing income is influenced by changes in unit sales and units of production. Net operating income can be increased simply by producing more units even if those units are not sold.

Supporting Decision Making

- Variable costing correctly identifies the additional variable costs incurred to make one more unit ($10 per unit for Harvey Company). It also emphasizes the impact of total fixed costs on profits.
- Because absorption costing assigns fixed manufacturing overhead costs to units produced ($6 per unit for Harvey Company), it gives the impression that fixed manufacturing overhead is variable with respect to the number of units produced, but it is not. The result can be inappropriate pricing decisions and product discontinuation decisions.

Learning Objective 4

Prepare a segmented income statement that differentiates traceable fixed costs from common fixed costs and use it to make decisions.

Decentralization and Segment Reporting

A **segment** is any part or activity of an organization about which a manager seeks cost, revenue, or profit data.

- An Individual Store
- A Service Center
- A Sales Territory

Keys to Segmented Income Statements

- There are two keys to building segmented income statements:
- A contribution format should be used because it separates fixed from variable costs and it enables the calculation of a contribution margin.
- Traceable fixed costs should be separated from common fixed costs to enable the calculation of a segment margin.

Identifying Traceable Fixed Costs

- **Traceable fixed costs** arise because of the existence of a particular segment and would disappear over time if the segment itself disappeared.
- Examples of traceable fixed costs include:
  - The salary of the Fritos product manager at PepsiCo is a traceable fixed cost of the Fritos business segment of PepsiCo.
  - The maintenance cost for the building in which Boeing 747s are assembled is a traceable fixed cost of the 747 business segment of Boeing.

Identifying Common Fixed Costs

- **Common fixed costs** arise because of the overall operation of the company and would not disappear if any particular segment were eliminated.
- Examples of common fixed costs include:
  - The salary of the CEO of General Motors is a common fixed cost of the various divisions of General Motors.
  - The cost of heating a Safeway or Kroger grocery store is a common fixed cost of the various departments.

Traceable Fixed Costs

- It is important to realize that the traceable fixed costs of one segment may be a common fixed cost of another segment.
- For example, the landing fee paid to land an airplane at an airport is traceable to the particular flight, but it is not traceable to first-class, business-class, and economy-class passengers.

Segment Margin

The **segment margin**, which is computed by subtracting the traceable fixed costs of a segment from its contribution margin, is the **best gauge** of the long-run profitability of a segment.

Traceable and Common Costs

- Fixed Costs
- Traceable
- Common
  - Don’t allocate common costs to segments.

Levels of Segmented Statements – Part 1

- Webber, Inc. has two divisions.
  1. Computer Division
  2. Television Division
- Let's look more closely at the Television Division's income statement.

Levels of Segmented Statements – Part 2 (1 of 2)

Our approach to segment reporting uses the contribution format.

Income Statement Contribution Margin Format Television Division		
Sales	$	300,000
Variable COGS		120,000
Other variable expenses		30,000
Total variable expenses		150,000
Contribution margin		150,000
Traceable fixed expenses		90,000
Division margin	$	60,000

Levels of Segmented Statements – Part 2 (2 of 2)

- Cost of goods sold consists of variable manufacturing costs.
- Fixed and variable costs are listed in separate sections.

Levels of Segmented Statements – Part 3 (1 of 2)

Our approach to segment reporting uses the contribution format.

Income Statement Contribution Margin Format Television Division		
Sales	$	300,000
Variable COGS		120,000
Other variable expenses		30,000
Total variable expenses		150,000
Contribution margin		150,000
Traceable fixed expenses		90,000
Division margin	$	60,000

Levels of Segmented Statements – Part 3 (2 of 2)

- Contribution margin is computed by taking sales minus variable costs.
- Segment margin is Television's contribution to profits.

Levels of Segmented Statements – Part 4

Income Statement			
	Company	Television	Computer
Sales	$ 500,000	$ 300,000	$ 200,000
Variable expenses	230,000	150,000	80,000
CM	270,000	150,000	120,000
Traceable FC	170,000	90,000	80,000
Division margin	100,000	$ 60,000	$ 40,000
Common expenses			
Net operating income			

Levels of Segmented Statements – Part 5

Income Statement			
	Company	Television	Computer
Sales	$ 500,000	$ 300,000	$ 200,000
Variable expenses	230,000	150,000	80,000
CM	270,000	150,000	120,000
Traceable FC	170,000	90,000	80,000
Division margin	100,000	$ 60,000	$ 40,000
Common expenses	25,000		
Net operating income	$ 75,000		

Common fixed expenses should **not** be allocated to the divisions. These expenses would remain even if one of the divisions were eliminated.

Traceable Fixed Costs Can Become Common Fixed Costs – Part 1

- As previously mentioned, fixed expenses that are traceable to one segment can become common fixed expenses if the company is divided into smaller segments.
- Let's see how this works using the Webber, Inc. example.

Traceable Fixed Costs Can Become Common Fixed Costs – Part 2

- Webber's Television Division has two product lines:
  1. Regular
  2. Big Screen

Traceable Fixed Costs Can Become Common Fixed Costs – Part 3

Income Statement			
	Television Division	Regular	Big Screen
Sales		$ 200,000	$ 100,000
Variable expenses		95,000	55,000
CM		105,000	45,000
Traceable FC		45,000	35,000
Product line margin		$ 60,000	$ 10,000
Common expenses			
Divisional margin			

We obtained the following information from the Regular and Big Screen segments.

Traceable Fixed Costs Can Become Common Fixed Costs – Part 4

Fixed costs directly traced to the Television Division $80,000 + $10,000 = $90,000

Income Statement			
	Television Division	Regular	Big Screen
Sales	$ 300,000	$ 200,000	$ 100,000
Variable expenses	150,000	95,000	55,000
CM	150,000	105,000	45,000
Traceable FC	80,000	45,000	35,000
Product line margin	70,000	$ 60,000	$ 10,000
Common expenses	10,000		
Divisional margin	$ 60,000		

Segmented Income Statements—Decision Making and Break-even Analysis

Once a company prepares a contribution format segmented income statement, it can use the statement to make decisions and perform break-even analysis.

Segmented Income Statements—Decision Making (1 of 2)

Income Statement			
	Television Division	Regular	Big Screen
Sales	$ 315,000	$ 210,000	$ 105,000
Variable expenses	157,500	99,750	57,750
CM	157,500	110,250	47,250
Traceable FC	80,000	45,000	35,000
Product line margin	77,500	$ 65,250	$ 12,250
Common expenses	15,000		
Divisional margin	$ 62,500		

Segmented Income Statements—Decision Making (2 of 2)

- 5% increase in sales: Sales Television Division $210,000
- $5,000 additional advertising: Common expenses Television division 15,000
- Division margin increases by $2,500: Divisional margin: Television Division $ 62,500
- Margin increases by $5,250 CM: Regular 110,250, product line margin $ 65,250
- Margin increases by $2,250 CM: Regular 47,250 product line margin $ 12,250

Learning Objective 5

Compute companywide and segment break-even points for a company with traceable fixed costs.

Segmented Income Statements — Break-even Analysis – Part 1

Income Statement			
	Company	Television	Computer
Sales	$ 500,000	$ 300,000	$ 200,000
Variable expenses	230,000	150,000	80,000
CM	270,000	150,000	120,000
Traceable FC	170,000	90,000	80,000
Division margin	100,000	$ 60,000	$ 40,000
Common expenses	25,000		
Net operating income	$ 75,000		

Segmented Income Statements — Break-even Analysis – Part 2

Income Statement			
	Company	Television	Computer
Sales	$ 500,000	$ 300,000	$ 200,000
Variable expenses	230,000	150,000	80,000
CM	270,000	150,000	120,000
Traceable FC	170,000	90,000	80,000
Division margin	100,000	$ 60,000	$ 40,000
Common expenses	25,000		
Net operating income	$ 75,000		

Calculate the company-wide break-even point.

Segmented Income Statements — Break-even Analysis – Part 3

The companywide break-even point is computed by dividing the sum of the company's traceable fixed expenses and common fixed expenses by the company's overall contribution margin ratio.

$$\text{Break - even point} = \frac{\$170{,}000 + \$25{,}000}{0.54} = \$361{,}111$$

$$\text{Contribution Margin Ratio} = \frac{\$270{,}000}{\$500{,}000} = 0.54$$

Segmented Income Statements — Break-even Analysis – Part 4

Income Statement			
	Company	Television	Computer
Sales	$ 500,000	$ 300,000	$ 200,000
Variable expenses	230,000	150,000	80,000
CM	270,000	150,000	120,000
Traceable FC	170,000	90,000	80,000
Division margin	100,000	$ 60,000	$ 40,000
Common expenses	25,000		
Net operating income	$ 75,000		

Calculate break-even point for each business segment.

Segmented Income Statements — Break-even Analysis – Part 5

A business segment's break-even point is computed by dividing its traceable fixed expenses by its contribution margin ratio.

Television

$$\text{Break-even Point} = \frac{\$90,000}{0.50} = \$180,000$$

$$\text{Contribution Margin Ratio} = \frac{\$150,000}{\$300,000} = 0.50$$

Computer

$$\text{Break-even Point} = \frac{\$80,000}{0.60} = \$133,333$$

$$\text{Contribution Margin Ratio} = \frac{\$120,000}{\$200,000} = 0.60$$

Segmented Income Statements — Break-even Analysis – Part 6

Income Statement			
	Company	Television	Computer
Sales	$ 500,000	$ 300,000	$ 200,000
Variable expenses	230,000	150,000	80,000
CM	270,000	150,000	120,000
Traceable FC	170,000	90,000	80,000
Division margin	100,000	$ 60,000	$ 40,000
Common expenses	25,000		
Net operating income	$ 75,000		

Notice the $25,000 of companywide common fixed expenses are excluded from the segment break-even calculations because the common fixed expenses are not traceable to segments and are not influenced by segment-level decisions.

Omission of Costs

- Costs assigned to a segment should include all costs attributable to that segment from the company's entire **value chain.**
- Business Functions Making Up The Value Chain

R&D	Product Design	Manufacturing	Marketing	Distribution	Customer Service

Inappropriate Methods of Allocating Costs Among Segments

- **Failure to trace costs directly**
  - Costs that can be traced directly to specific segments of a company should not be allocated to other segments.
- **Inappropriate allocation base**
  - Some companies allocate costs to segments using arbitrary bases. Costs should be allocated to segments only when the allocation base actually drives the cost being allocated.

Common Costs and Segments

- Common costs should not be arbitrarily allocated to segments based on the rationale that "someone has to cover the common costs" for two reasons:

1. This practice may make a profitable business segment appear to be unprofitable.
2. Allocating common fixed costs forces managers to be held accountable for costs they cannot control.

Quick Check 2

Income Statement			
	Hoagland's Lakeshore	Bar	Restaurant
Sales	$ 800,000	$ 100,000	$ 700,000
Variable expenses	310,000	60,000	250,000
CM	490,000	40,000	450,000
Traceable FC	246,000	26,000	220,000
Segment margin	244,000	$ 14,000	$ 230,000
Common expenses	200,000		
Net operating profit	$ 44,000		

Assume that Hoagland's Lakeshore prepared its segmented income statement as shown.

Quick Check 2a

How much of the common fixed expense of $200,000 can be avoided by eliminating the bar?

a. None of it.
b. Some of it.
c. All of it.

Quick Check 2b

How much of the common fixed expense of $200,000 can be avoided by eliminating the bar?

a. None of it.
b. Some of it.
c. All of it.

Answer: a

Common fixed expenses cannot be eliminated by dropping one of the segments.

Quick Check 2c

Suppose square feet is used as the basis for allocating the common fixed expense of $200,000. How much would be allocated to the bar if the bar occupies 1,000 square feet and the restaurant 9,000 square feet?

a. $20,000
b. $30,000
c. $40,000
d. $50,000

Quick Check 2d

Suppose square feet is used as the basis for allocating the common fixed expense of $200,000. How much would be allocated to the bar if the bar occupies 1,000 square feet and the restaurant 9,000 square feet?

a. $20,000
b. $30,000
c. $40,000
d. $50,000

Answer: a

The bar would be allocated $^{1}/_{10}$ of the cost or $20,000.

Quick Check 2e

If Hoagland's allocates its common fixed expenses to the bar and the restaurant, what would be the reported profit of each segment?

Quick Check 2f

Income Statement			
	Hoagland's Lakeshore	Bar	Restaurant
Sales	$ 800,000	$ 100,000	$ 700,000
Variable expenses	310,000	60,000	250,000
CM	490,000	40,000	450,000
Traceable FC	246,000	26,000	220,000
Segment margin	244,000	$ 14,000	$ 230,000
Common expenses	200,000	20,000	180,000
Net operating profit (loss)	$ 44,000	$ (6,000)	$ 50,000

Quick Check 2g

Income Statement			
	Hoagland's Lakeshore	Bar	Restaurant
Sales	$ 800,000	$ 100,000	$ 700,000
Variable expenses	310,000	60,000	250,000
CM	490,000	40,000	450,000
Traceable FC	246,000	26,000	220,000
Segment margin	244,000	$ 14,000	$ 230,000
Common expenses	200,000	20,000	180,000
Net operating profit (loss)	$ 44,000	$ (6,000)	$ 50,000

Do you think the Bar should be eliminated?

Quick Check 2h

Should the bar be eliminated?

a. Yes
b. No

Quick Check 2i (1 of 2)

Should the bar be eliminated?

a. Yes

b. No

Answer: b

Quick Check 2i (2 of 2)

The profit was $44,000 before eliminating the bar. If we eliminate the bar, profit drops to $30,000!

Income Statement			
	Hoagland's Lakeshore	Bar	Restaurant
Sales	$ 700,000		$ 700,000
Variable expenses	250,000		250,000
CM	450,000		450,000
Traceable FC	220,000		220,000
Segment margin	230,000		$ 230,000
Common expenses	200,000		200,000
Net operating profit (loss)	$ 30,000		$ 30,000

Company-wide Income Statements

- Both U.S. GAAP and IFRS require absorption costing for external reports.
- Since absorption costing is required for external reporting, most companies also use it for internal reports rather than incurring the additional cost of maintaining a separate variable cost system for internal reporting.

Variable versus Absorption Costing

- **Absorption Costing**
  - Fixed manufacturing costs must be assigned to products to properly match revenues and costs.
- **Variable Costing**
  - Fixed manufacturing costs are capacity costs and will be incurred even if nothing is produced.

Segmented Financial Information

Both U.S. GAAP and IFRS require publically traded companies to include segmented financial data in their annual reports.

1. Companies must report segmented results to shareholders using the **same methods** that are used for internal segmented reports.
2. This requirement motivates managers to **avoid using the contribution approach** for internal reporting purposes because if they did they would be required to:
    a. Share this sensitive data with the public.
    b. Reconcile these reports with applicable rules for consolidated reporting purposes.

End of Presentation