9 Inventory Costing and Capacity Analysis

Learning Objectives

1. Identify what distinguishes variable costing from absorption costing
2. Compute income under absorption costing and variable costing, and explain the difference in income
3. Understand how absorption costing can provide undesirable incentives for managers to build up inventory
4. Differentiate throughput costing from variable costing and absorption costing
5. Describe the various capacity concepts that can be used in absorption costing
6. Examine the key factors in choosing a capacity level to compute the budgeted fixed manufacturing cost rate
7. Understand other issues that play an important role in capacity planning and control

Few numbers capture the attention of managers and shareholders more than operating profits.

In industries that require significant upfront investments in capacity, the decisions made regarding the level of such fixed investments, and the extent to which the capacity is eventually utilized to meet customer demand, have a substantial impact on corporate profits. Unfortunately, the choice of compensation and reward systems, as well as the choice of inventory-costing methods, may induce managerial decisions that benefit short-term earnings at the expense of a firm's long-term health. It may take a substantial external shock, like a sharp economic slowdown, to motivate firms to make the right capacity and inventory choices, as the following article illustrates.

Lean Manufacturing Helps Companies Reduce Inventory and Survive the Recession[1]

Can changing the way a mattress is pieced together save a company during an economic downturn? For Sealy, the world's largest mattress manufacturer, the answer is a resounding "yes!"

Sealy is among thousands of manufacturers that have remained profitable during the recession by using lean manufacturing to become more cost-efficient. Lean manufacturing involves producing output in an uninterrupted flow, rather than as part of unfinished batches, and producing only what customers order. Driving this lean movement is an urgent need to pare inventory, which reduces inventory costs.

Before the adoption of lean practices, the company used to manufacture units at peak capacity. That is, it made as many mattresses as its resources allowed. Sealy employees were also paid based on the number of mattresses produced each day. While factories operated at peak capacity, inventory often piled up, which cost the company millions of dollars each year.

While Sealy launched its lean strategy in 2004, its efforts intensified during the recession. Old processes were reconfigured to be more efficient. As a result, each bed is now completed in 4 hours, down from 21. Median delivery times have been cut to 60 hours from 72, and plants have cut their raw-material inventories by 50%.

Additionally, the company now adheres to a precise production schedule that reflects orders from retailers such as Mattress Discounters

[1] *Source*: Paul Davidson. 2009. Lean manufacturing helps companies survive recession. *USA Today*, November 2; Sealy Corporation. 2009. Annual Report. Trinity, NC: Sealy Corporation, 2010. http://ccbn.10kwizard.com/xml/download.php?repo=tenk&ipage=6709696&format=PDF

and Macy's. While factories no longer run at full capacity, no mattress is made now until a customer orders it.

Sealy's manufacturing and inventory strategy has been key to its survival during the recession. While 2009 sales were 14% less than 2008 sales, earnings rose more than $16 million. Moreover, a large part of the earnings increase was due to reductions in inventory costs, which were lower by 12%, or nearly $8 million, in 2009.

Managers in industries with high fixed costs, like manufacturing, must manage capacity levels and make decisions about the use of available capacity. Managers must also decide on a production and inventory policy (as Sealy did). These decisions and the accounting choices managers make affect the operating incomes of manufacturing companies. This chapter focuses on two types of cost accounting choices:

1. *The inventory-costing choice* determines which manufacturing costs are treated as inventoriable costs. Recall from Chapter 2 (p. 37), *inventoriable costs* are all costs of a product that are regarded as assets when they are incurred and expensed as cost of goods sold when the product is sold. There are three types of inventory costing methods: absorption costing, variable costing, and throughput costing.
2. *The denominator-level capacity choice* focuses on the cost allocation base used to set budgeted fixed manufacturing cost rates. There are four possible choices of capacity levels: theoretical capacity, practical capacity, normal capacity utilization, and master-budget capacity utilization.

Variable and Absorption Costing

The two most common methods of costing inventories in manufacturing companies are *variable costing* and *absorption costing*. We describe each next and then discuss them in detail, using a hypothetical lens-manufacturing company as an example.

Variable Costing

Variable costing is a method of inventory costing in which all variable manufacturing costs (direct and indirect) are included as inventoriable costs. All fixed manufacturing costs are excluded from inventoriable costs and are instead treated as costs of the period in which they are incurred. Note that *variable costing* is a less-than-perfect term to

Learning Objective 1

Identify what distinguishes variable costing

. . . fixed manufacturing costs excluded from inventoriable costs

from absorption costing

. . . fixed manufacturing costs included in inventoriable costs

describe this inventory-costing method, because only variable manufacturing costs are inventoried; variable nonmanufacturing costs are still treated as period costs and are expensed. Another common term used to describe this method is **direct costing**. This is also a misnomer because variable costing considers variable manufacturing overhead (an indirect cost) as inventoriable, while excluding direct marketing costs, for example.

Absorption Costing

Absorption costing is a method of inventory costing in which all variable manufacturing costs and all fixed manufacturing costs are included as inventoriable costs. That is, inventory "absorbs" all manufacturing costs. The job costing system you studied in Chapter 4 is an example of absorption costing.

Under both variable costing and absorption costing, all variable manufacturing costs are inventoriable costs and all nonmanufacturing costs in the value chain (such as research and development and marketing), whether variable or fixed, are period costs and are recorded as expenses when incurred.

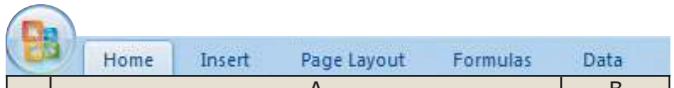
Comparing Variable and Absoption Costing

The easiest way to understand the difference between variable costing and absorption costing is with an example. We will study Stassen Company, an optical consumer-products manufacturer, in this chapter. We focus in particular on its product line of high-end telescopes for aspiring astronomers.

Stassen uses standard costing:

- Direct costs are traced to products using standard prices and standard inputs allowed for actual outputs produced.
- Indirect (overhead) manufacturing costs are allocated using standard indirect rates times standard inputs allowed for actual outputs produced.

Stassen's management wants to prepare an income statement for 2012 (the fiscal year just ended) to evaluate the performance of the telescope product line. The operating information for the year is as follows:



	A	B
1		**Units**
2	Beginning inventory	0
3	Production	8,000
4	Sales	6,000
5	Ending inventory	2,000

Actual price and cost data for 2012 are as follows:

	A	B
10	Selling price	$ 1,000
11	Variable manufacturing cost per unit	
12	Direct material cost per unit	$ 110
13	Direct manufacturing labor cost per unit	40
14	Manufacturing overhead cost per unit	50
15	Total variable manufacturing cost per unit	$ 200
16	Variable marketing cost per unit sold	$ 185
17	Fixed manufacturing costs (all indirect)	$1,080,000
18	Fixed marketing costs (all indirect)	$1,380,000

For simplicity and to focus on the main ideas, we assume the following about Stassen:

- Stassen incurs manufacturing and marketing costs only. The cost driver for all variable manufacturing costs is units produced; the cost driver for variable marketing costs is units sold. There are no batch-level costs and no product-sustaining costs.
- There are no price variances, efficiency variances, or spending variances. Therefore, the *budgeted* (standard) price and cost data for 2012 are the same as the *actual* price and cost data.
- Work-in-process inventory is zero.
- Stassen budgeted production of 8,000 units for 2012. This was used to calculate the budgeted fixed manufacturing cost per unit of $135 ($1,080,000/8,000 units).
- Stassen budgeted sales of 6,000 units for 2012, which is the same as the actual sales for 2012.
- The actual production for 2012 is 8,000 units. As a result, there is no production-volume variance for manufacturing costs in 2012. Later examples, based on data for 2013 and 2014, do include production-volume variances. However, even in those cases, the income statements contain no variances other than the production-volume variance.
- All variances are written off to cost of goods sold in the period (year) in which they occur.

Based on the preceding information, Stassen's inventoriable costs per unit produced in 2012 under the two inventory costing methods are as follows:

	Variable Costing		Absorption Costing	
Variable manufacturing cost per unit produced:				
Direct materials	$110		$110	
Direct manufacturing labor	40		40	
Manufacturing overhead	50	$200	50	$200
Fixed manufacturing cost per unit produced		—		135
Total inventoriable cost per unit produced		$200		$335

To summarize, the main difference between variable costing and absorption costing is the accounting for fixed manufacturing costs:

- Under variable costing, fixed manufacturing costs are not inventoried; they are treated as an expense of the period.
- Under absorption costing, fixed manufacturing costs are inventoriable costs. In our example, the standard fixed manufacturing cost is $135 per unit ($1,080,000 ÷ 8,000 units) produced.

Decision Point

How does variable costing differ from absorption costing?

Variable vs. Absorption Costing: Operating Income and Income Statements

When comparing variable and absorption costing, we must also take into account whether we are looking at short- or long-term numbers. How does the data for a one-year period differ from that of a three-year period under variable and absorption costing?

Comparing Income Statements for One Year

What will Stassen's operating income be if it uses variable costing or absorption costing? The differences between these methods are apparent in Exhibit 9-1. Panel A shows the variable costing income statement and Panel B the absorption-costing income statement for Stassen's telescope product line for 2012. The variable-costing income statement uses the contribution-margin format introduced in Chapter 3. The absorption-costing income statement uses the gross-margin format introduced in Chapter 2. Why these differences in format? The distinction between variable costs and fixed costs is central to variable

Exhibit 9-1 Comparison of Variable Costing and Absorption Costing for Stassen Company: Telescope Product-Line Income Statements for 2012

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	A	B	C	D	E	F	G
1	**Panel A: VARIABLE COSTING**				**Panel B: ABSORPTION COSTING**		
2	Revenues: $1,000 × 6,000 units		$6,000,000		Revenues: $1,000 × 6,000 units		$6,000,000
3	Variable cost of goods sold:				Cost of goods sold:		
4	Beginning inventory	$ 0			Beginning inventory	$ 0	
5	Variable manufacturing costs: $200 × 8,000 units	1,600,000			Variable manufacturing costs: $200 × 8,000 unit	1,600,000	
6					Allocated fixed manufacturing costs: $135 × 8,000 units	1,080,000	
7	Cost of goods available for sale	1,600,000			Cost of goods available for sale	2,680,000	
8	Deduct ending inventory: $200 × 2,000 units	(400,000)			Deduct ending inventory: $335 × 2,000 units	(670,000)	
9	Variable cost of goods sold		1,200,000		Cost of goods sold		2,010,000
10	Variable marketing costs: $185 × 6,000 units sold		1,110,000				
11	Contribution margin		3,690,000		Gross Margin		3,990,000
12	Fixed manufacturing costs		1,080,000		Variable marketing costs: $185 × 6,000 units sold		1,110,000
13	Fixed marketing cost		1,380,000		Fixed marketing costs		1,380,000
14	Operating income		$1,230,000		Operating Income		$1,500,000
15							
16	Manufacturing costs expensed in Panel A:				Manufacturing costs expensed in Panel B:		
17	Variable cost of goods sold		$1,200,000				
18	Fixed manufacturing costs		1,080,000				
19	Total		$2,280,000		Cost of goods sold		$2,010,000

Learning Objective 2

Compute income under absorption costing

. . . using the gross-margin format

and variable costing,

. . . using the contribution-margin format

and explain the difference in income

. . . affected by the unit level of production and sales under absorption costing, but only the unit level of sales under variable costing

costing, and it is highlighted by the contribution-margin format. Similarly, the distinction between manufacturing and nonmanufacturing costs is central to absorption costing, and it is highlighted by the gross-margin format.

Absorption-costing income statements need not differentiate between variable and fixed costs. However, we will make this distinction between variable and fixed costs in the Stassen example to show how individual line items are classified differently under variable costing and absorption costing. In Exhibit 9-1, Panel B, note that inventoriable cost is $335 per unit under absorption costing: allocated fixed manufacturing costs of $135 per unit plus variable manufacturing costs of $200 per unit.

Notice how the fixed manufacturing costs of $1,080,000 are accounted for under variable costing and absorption costing in Exhibit 9-1. The income statement under variable costing deducts the $1,080,000 lump sum as an expense for 2012. In contrast, under absorption costing, the $1,080,000 ($135 per unit × 8,000 units) is initially treated as an inventoriable cost in 2012. Of this $1,080,000, $810,000 ($135 per unit × 6,000 units sold) subsequently becomes a part of cost of goods sold in 2012, and $270,000 ($135 per unit × 2,000 units) remains an asset—part of ending finished goods inventory on December 31, 2012.

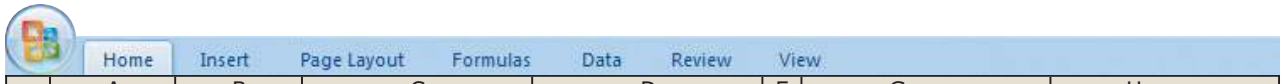
Operating income is $270,000 higher under absorption costing compared with variable costing, because only $810,000 of fixed manufacturing costs are expensed under absorption costing, whereas all $1,080,000 of fixed manufacturing costs are expensed under variable costing. Note that the variable manufacturing cost of $200 per unit is accounted for the same way in both income statements in Exhibit 9-1.

These points can be summarized as follows:

	Variable Costing	Absorption Costing
Variable manufacturing costs: $200 per telescope produced	Inventoriable	Inventoriable
Fixed manufacturing costs: $1,080,000 per year	Deducted as an expense of the period	Inventoriable at $135 per telescope produced using budgeted denominator level of 8,000 units produced per year ($1,080,000 ÷ 8,000 units = $135 per unit)

The basis of the difference between variable costing and absorption costing is how fixed manufacturing costs are accounted for. If inventory levels change, operating income will differ between the two methods because of the difference in accounting for

fixed manufacturing costs. To see this difference, let's compare telescope sales of 6,000; 7,000; and 8,000 units by Stassen in 2012, when 8,000 units were produced. Of the $1,080,000 total fixed manufacturing costs, the amount expensed in the 2012 income statement under each of these scenarios would be as follows:



	A	B	C	D	E	G	H
1			Variable Costing			Absorption Costing	
2						Fixed Manufacturing Costs	
3	Units	Ending	Fixed Manufacturing Costs			Included in Inventory	Amount Expensed
4	Sold	Inventory	Included in Inventory	Amount Expensed		=$135 × Ending Inv.	=$135 × Units Sold
5	6,000	2,000	$0	$1,080,000		$270,000	$ 810,000
6	7,000	1,000	$0	$1,080,000		$135,000	$ 945,000
7	8,000	0	$0	$1,080,000		$ 0	$1,080,000

In the last scenario, where 8,000 units are produced and sold, both variable and absorption costing report the same net income because inventory levels are unchanged. This chapter's appendix describes how the choice of variable costing or absorption costing affects the breakeven quantity of sales when inventory levels are allowed to vary.

Comparing Income Statements for Three Years

To get a more comprehensive view of the effects of variable costing and absorption costing, Stassen's management accountants prepare income statements for three years of operations, starting with 2012. In both 2013 and 2014, Stassen has a production-volume variance, because actual telescope production differs from the budgeted level of production of 8,000 units per year used to calculate budgeted fixed manufacturing cost per unit. The actual quantities sold for 2013 and 2014 are the same as the sales quantities budgeted for these respective years, which are given in units in the following table:

	E	F	G	H
1		2012	2013	2014
2	Budgeted production	8,000	8,000	8,000
3	Beginning inventory	0	2,000	500
4	Actual production	8,000	5,000	10,000
5	Sales	6,000	6,500	7,500
6	Ending inventory	2,000	500	3,000

All other 2012 data given earlier for Stassen also apply for 2013 and 2014.

Exhibit 9-2 presents the income statement under variable costing in Panel A and the income statement under absorption costing in Panel B for 2012, 2013, and 2014. As you study Exhibit 9-2, note that the 2012 columns in both Panels A and B show the same figures as Exhibit 9-1. The 2013 and 2014 columns are similar to 2012 *except for the production-volume variance line item under absorption costing in Panel B*. Keep in mind the following points about absorption costing as you study Panel B of Exhibit 9-2:

1. The $135 fixed manufacturing cost rate is based on the budgeted denominator capacity level of 8,000 units in 2012, 2013, and 2014 ($1,080,000 ÷ 8,000 units = $135 per unit). Whenever production (the quantity produced, not the quantity sold) deviates from the denominator level, there will be a production-volume variance. The amount of Stassen's production-volume variance is determined by multiplying $135 per unit by the difference between the actual level of production and the denominator level.

Exhibit 9-2 Comparison of Variable Costing and Absorption Costing for Stassen Company: Telescope Product-Line Income Statements for 2012, 2013, and 2014

	A	B	C	D	E	F	G
1	**Panel A: VARIABLE COSTING**						
2			**2012**		**2013**		**2014**
3	Revenues: $1,000 × 6,000; 6,500; 7,500 units		$6,000,000		$6,500,000		$7,500,000
4	Variable cost of goods sold:						
5	Beginning inventory: $200 × 0; 2,000; 500 units	$ 0		$ 400,000		$ 100,000	
6	Variable manufacturing costs: $200 × 8,000; 5,000; 10,000 units	1,600,000		1,000,000		2,000,000	
7	Cost of goods available for sale	1,600,000		1,400,000		2,100,000	
8	Deduct ending inventory: $200 × 2,000; 500; 3,000 units	(400,000)		(100,000)		(600,000)	
9	Variable cost of goods sold		1,200,000		1,300,000		1,500,000
10	Variable marketing costs: $185 × 6,000; 6,500; 7,500 units		1,110,000		1,202,500		1,387,500
11	Contribution margin		3,690,000		3,997,500		4,612,500
12	Fixed manufacturing costs		1,080,000		1,080,000		1,080,000
13	Fixed marketing costs		1,380,000		1,380,000		1,380,000
14	Operating income		$1,230,000		$1,537,500		$2,152,500
15							
16	**Panel B: ABSORPTION COSTING**						
17			**2012**		**2013**		**2014**
18	Revenues: $1,000 × 6,000; 6,500; 7,500 units		$6,000,000		$6,500,000		$7,500,000
19	Cost of goods sold:						
20	Beginning inventory: $335 × 0; 2,000; 500 units	$ 0		$ 670,000		$ 167,500	
21	Variable manufacturing costs: $200 × 8,000; 5,000; 10,000 units	1,600,000		1,000,000		2,000,000	
22	Allocated fixed manufacturing costs: $135 × 8,000; 5,000; 10,000 units	1,080,000		675,000		1,350,000	
23	Cost of goods available for sale	2,680,000		2,345,000		3,517,500	
24	Deduct ending inventory: $335 × 2,000; 500; 3,000 units	(670,000)		(167,500)		(1,005,000)	
25	Adjustment for production-volume variance[a]	0		405,000	U	(270,000)	F
26	Cost of goods sold		2,010,000		2,582,500		2,242,500
27	Gross Margin		3,990,000		3,917,500		5,257,500
28	Variable marketing costs: $185 × 6,000; 6,500; 7,500 units		1,110,000		1,202,500		1,387,500
29	Fixed marketing costs		1,380,000		1,380,000		1,380,000
30	Operating Income		$1,500,000		$1,335,000		$2,490,000
31							
32	[a]Production-volume variance = Budgeted fixed manufacturing costs – Fixed manufacturing overhead allocated using budgeted cost per output unit allowed for actual output produced (Panel B, line 22)						
33	2012: $1,080,000 – ($135 × 8,000) = $1,080,000 – $1,080,000 = $0						
34	2013: $1,080,000 – ($135 × 5,000) = $1,080,000 – $675,000 = $405,000 U						
35	2014: $1,080,000 – ($135 × 10,000) = $1,080,000 – $1,350,000 = ($270,000) F						
36							
37	Production volume variance can also be calculated as follows:						
38	Fixed manufacturing cost per unit × (Denominator level – Actual output units produced)						
39	2012: $135 × (8,000 – 8,000) units = $135 × 0 = $0						
40	2013: $135 × (8,000 – 5,000) units = $135 × 3,000 = $405,000 U						
41	2014: $135 × (8,000 – 10,000) units = $135 × (2,000) = ($270,000) F						

In 2013, production was 5,000 units, 3,000 lower than the denominator level of 8,000 units. The result is an unfavorable production-volume variance of $405,000 ($135 per unit × 3,000 units). The year 2014 has a favorable production-volume variance of $270,000 ($135 per unit × 2,000 units), due to production of 10,000 units, which exceeds the denominator level of 8,000 units.

Recall how standard costing works under absorption costing. Each time a unit is manufactured, $135 of fixed manufacturing costs is included in the cost of goods manufactured and available for sale. In 2013, when 5,000 units are manufactured, $675,000 ($135 per unit × 5,000 units) of fixed manufacturing costs is included in the cost of goods available for sale (see Exhibit 9-2, Panel B, line 22). Total fixed manufacturing costs for 2013 are $1,080,000. The production-volume variance of $405,000 U equals the difference between $1,080,000 and $675,000. In Panel B, note how, for each year, the fixed manufacturing costs included in the cost of goods available for sale plus the production-volume variance always equals $1,080,000.

2. The production-volume variance, which relates only to fixed manufacturing overhead, exists under absorption costing but not under variable costing. Under variable costing, fixed manufacturing costs of $1,080,000 are always treated as an expense of the period, regardless of the level of production (and sales).

Here's a summary (using information from Exhibit 9-2) of the operating-income differences for Stassen Company during the 2012 to 2014 period:

	2012	2013	2014
1. Absorption-costing operating income	$1,500,000	$1,335,000	$2,490,000
2. Variable-costing operating income	$1,230,000	$1,537,500	$2,152,500
3. Difference: (1) – (2)	$ 270,000	$ (202,500)	$ 337,500

The sizeable differences in the preceding table illustrate why managers whose performance is measured by reported income are concerned about the choice between variable costing and absorption costing.

Why do variable costing and absorption costing usually report different operating income numbers? In general, if inventory increases during an accounting period, less operating income will be reported under variable costing than absorption costing. Conversely, if inventory decreases, more operating income will be reported under variable costing than absorption costing. The difference in reported operating income is due solely to (a) moving fixed manufacturing costs into inventories as inventories increase and (b) moving fixed manufacturing costs out of inventories as inventories decrease.

The difference between operating income under absorption costing and variable costing can be computed by formula 1, which focuses on fixed manufacturing costs in beginning inventory and ending inventory:

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	A	B	C	D	E	F	G	H
1	**Formula 1**							
2						**Fixed manufacturing**		**Fixed manufacturing**
3		**Absorption-costing**	–	**Variable-costing**	=	**costs in ending inventory**	–	**costs in beginning inventory**
4		**operating income**		**operation income**		**under absorption costing**		**under absorption costing**
5	**2012**	$1,500,000	–	$1,230,000	=	($135 × 2,000 units)	–	($135 × 0 units)
6				$ 270,000	=	$270,000		
7								
8	**2013**	$1,335,000	–	$1,537,500	=	($135 × 500 units)	–	($135 × 2,000 units)
9				($ 202,500)		($202,500)		
10								
11	**2014**	$2,490,000	–	$2,152,500	=	($135 × 3,000 units)	–	($135 × 500 units)
12				$ 337,500	=	$337,500		

Fixed manufacturing costs in ending inventory are deferred to a future period under absorption costing. For example, $270,000 of fixed manufacturing overhead is deferred to 2013 at December 31, 2012. Under variable costing, all $1,080,000 of fixed manufacturing costs are treated as an expense of 2012.

Recall that,

$$\text{Beginning inventory} + \text{Cost of goods manufactured} = \text{Cost of goods sold} + \text{Ending Inventory}$$

Therefore, instead of focusing on fixed manufacturing costs in ending and beginning inventory (as in formula 1), we could alternatively look at fixed manufacturing costs in units produced and units sold. The latter approach (see formula 2) highlights how fixed manufacturing costs move between units produced and units sold during the fiscal year.

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	A	B	C	D	E	F	G	H
16	**Formula 2**							
17						**Fixed manufacturing costs**		**Fixed manufacturing costs**
18		**Absorption-costing**	–	**Variable-costing**	=	**inventoried in units produced**	–	**in cost of goods sold**
19		**operating income**		**operation income**		**under absorption costing**		**under absorption costing**
20	**2012**	$1,500,000	–	$1,230,000	=	($135 × 8,000 units)	–	($135 × 6,000 units)
21				$ 270,000	=	$270,000		
22								
23	**2013**	$1,335,000	–	$1,537,500	=	($135 × 5,000 units)	–	($135 × 6,500 units)
24				($ 202,500)	=	($202,500)		
25								
26	**2014**	$2,490,000	–	$2,152,500	=	($135 × 10,000 units)	–	($135 × 7,500 units)
27				$ 337,500	=	$337,500		

Decision Point

How does income differ under variable and absorption costing?

Managers face increasing pressure to reduce inventory levels. Some companies are achieving steep reductions in inventory levels using policies such as just-in-time production—a production system under which products are manufactured only when needed. Formula 1 illustrates that, as Stassen reduces its inventory levels, operating income differences between absorption costing and variable costing become immaterial. Consider, for example, the formula for 2012. If instead of 2,000 units in ending inventory, Stassen had only 2 units in ending inventory, the difference between absorption-costing operating income and variable-costing operating income would drop from $270,000 to just $270.

Variable Costing and the Effect of Sales and Production on Operating Income

Given a constant contribution margin per unit and constant fixed costs, the period-to-period change in operating income under variable costing is *driven solely by changes in the quantity of units actually sold*. Consider the variable-costing operating income of Stassen in (a) 2013 versus 2012 and (b) 2014 versus 2013. Recall the following:

$$\text{Contribution margin per unit} = \text{Selling price} - \text{Variable manufacturing cost per unit} - \text{Variable marketing cost per unit}$$

$$= \$1{,}000 \text{ per unit} - \$200 \text{ per unit} - \$185 \text{ per unit}$$

$$= \$615 \text{ per unit}$$

$$\text{Change in variable-costing operating income} = \text{Contribution margin per unit} \times \text{Change in quantity of units sold}$$

(a) 2013 vs. 2012: $\$1{,}537{,}500 - \$1{,}230{,}000 = \$615 \text{ per unit} \times (6{,}500 \text{ unit} - 6{,}000 \text{ units})$

$$\$307{,}500 = \$307{,}500$$

(b) 2014 vs. 2013: $\$2{,}152{,}500 - \$1{,}537{,}500 = \$615 \text{ per unit} \times (7{,}500 \text{ units} - 6{,}500 \text{ units})$

$$\$615{,}000 = \$615{,}000$$

Under variable costing, Stassen managers cannot increase operating income by "producing for inventory." Why not? Because, as you can see from the preceding computations, when using variable costing, only the quantity of units sold drives operating income. We'll explain later in this chapter that absorption costing enables managers to increase operating income by increasing the unit level of sales, as well as by producing more units. Before you proceed to the next section, make sure that you examine Exhibit 9-3 for a detailed comparison of the differences between variable costing and absorption costing.

Exhibit 9-3 Comparative Income Effects of Variable Costing and Absorption Costing

Question	Variable Costing	Absorption Costing	Comment
Are fixed manufacturing costs inventoried?	No	Yes	Basic theoretical question of when these costs should be expensed
Is there a production-volume variance?	No	Yes	Choice of denominator level affects measurement of operating income under absorption costing only
Are classifications between variable and fixed costs routinely made?	Yes	Infrequently	Absorption costing can be easily modified to obtain subclassifications for variable and fixed costs, if desired (for example, see Exhibit 9-1, Panel B)
How do changes in unit inventory levels affect operating income?[a]			Differences are attributable to the timing of when fixed manufacturing costs are expensed
Production = sales	Equal	Equal	
Production > sales	Lower[b]	Higher[c]	
Production < sales	Higher	Lower	
What are the effects on cost-volume-profit relationship (for a given level of fixed costs and a given contribution margin per unit)?	Driven by unit level of sales	Driven by (a) unit level of sales, (b) unit level of production, and (c) chosen denominator level	Management control benefit: Effects of changes in production level on operating income are easier to understand under variable costing

[a]Assuming that all manufacturing variances are written off as period costs, that no change occurs in work-in-process inventory, and no change occurs in the budgeted fixed manufacturing cost rate between accounting periods.

[b]That is, lower operating income than under absorption costing.

[c]That is, higher operating income than under variable costing.

Absorption Costing and Performance Measurement

Learning Objective 3

Understand how absorption costing can provide undesirable incentives for managers to build up inventory

. . . producing more units for inventory absorbs fixed manufacturing costs and increases operating income

Absorption costing is the required inventory method for external reporting in most countries. Many companies use absorption costing for internal accounting as well. Why? Because it is cost-effective and less confusing to managers to use one common method of inventory costing for both external and internal reporting and performance evaluation. A common method of inventory costing can also help prevent managers from taking actions that make their performance measure look good but that hurt the income they report to shareholders. Another advantage of absorption costing is that it measures the cost of all manufacturing resources, whether variable or fixed, necessary to produce inventory. Many companies use inventory costing information for long-run decisions, such as pricing and choosing a product mix. For these long-run decisions, inventory costs should include both variable *and* fixed costs.

One problem with absorption costing is that it enables a manager to increase operating income in a specific period by increasing production—even if there is no customer demand for the additional production! By producing more ending inventory, the firm's margins and income can be made higher. Stassen's managers may be tempted to do this to get higher bonuses based on absorption-costing operating income. Generally, higher operating income also has a positive effect on stock price, which increases managers' stock-based compensation.

To reduce the undesirable incentives to build up inventories that absorption costing can create, a number of companies use variable costing for internal reporting. Variable costing focuses attention on distinguishing variable manufacturing costs from fixed manufacturing costs. This distinction is important for short-run decision making (as in cost-volume-profit analysis in Chapter 3 and in planning and control in Chapters 6, 7, and 8).

Companies that use both methods for internal reporting—variable costing for short-run decisions and performance evaluation and absorption costing for long-run decisions—benefit from the different advantages of both. In the next section, we explore in more detail the challenges that arise from absorption costing.

Undesirable Buildup of Inventories

Recall that one motivation for an undesirable buildup of inventories could be because a manager's bonus is based on reported absorption-costing operating income. Assume that Stassen's managers have such a bonus plan. Exhibit 9-4 shows how Stassen's absorption costing operating income for 2013 changes as the production level changes. This exhibit assumes that the production-volume variance is written off to cost of goods sold at the end of each year. Beginning inventory of 2,000 units and sales of 6,500 units for 2013 are unchanged from the case shown in Exhibit 9-2. *As you review Exhibit 9-4, keep in mind that the computations are basically the same as those in Exhibit 9-2.*

Exhibit 9-4 shows that production of 4,500 units meets the 2013 sales budget of 6,500 units (2,000 units from beginning inventory + 4,500 units produced). Operating income at this production level is $1,267,500. By producing more than 4,500 units, commonly referred to as *producing for inventory*, Stassen increases absorption-costing operating income. Each additional unit in 2013 ending inventory will increase operating income by $135. For example, if 9,000 units are produced (the last column in Exhibit 9-4), ending inventory will be 4,500 units and operating income increases to $1,875,000. This amount is $607,500 more than the operating income with zero ending inventory ($1,875,000 – $1,267,500, or 4,500 units × $135 per unit = $607,500). Under absorption costing, the company, by producing 4,500 units for inventory, includes $607,500 of fixed manufacturing costs in finished goods inventory, so those costs are not expensed in 2013.

Can top management implement checks and balances that limit managers from producing for inventory under absorption costing? While the answer is yes, as we will see in

Exhibit 9-4 Effect on Absorption-Costing Operating Income of Different Production Levels for Stassen Company: Telescope Product-Line Income Statement for 2013 at Sales of 6,500 Units

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	A	B	C	D	E	F	G	H	I	J	K
1	**Unit Data**										
2	Beginning inventory	2,000		2,000		2,000		2,000		2,000	
3	Production	4,500		5,000		6,500		8,000		9,000	
4	Goods available for sale	6,500		7,000		8,500		10,000		11,000	
5	Sales	6,500		6,500		6,500		6,500		6,500	
6	Ending inventory	0		500		2,000		3,500		4,500	
7											
8	**Income Statement**										
9	Revenues	$6,500,000		$6,500,000		$6,500,000		$6,500,000		$6,500,000	
10	Cost of goods sold:										
11	Beginning inventory ($335 × 2,000)	670,000		670,000		670,000		670,000		670,000	
12	Variable manufacturing costs: $200 × production	900,000		1,000,000		1,300,000		1,600,000		1,800,000	
13	Allocated fixed manufacturing costs: $135 × production	607,500		675,000		877,500		1,080,000		1,215,000	
14	Cost of goods available for sale	2,177,500		2,345,000		2,847,500		3,350,000		3,685,000	
15	Deduct ending inventory: $335 × ending inventory	0		(167,500)		(670,000)		(1,172,500)		(1,507,500)	
16	Adjustment for production-volume variance[a]	472,500	U	405,000	U	202,500	U	0		(135,000)	F
17	Cost of goods sold	2,650,000		2,582,500		2,380,000		2,177,500		2,042,500	
18	Gross Margin	3,850,000		3,917,500		4,120,000		4,322,500		4,457,500	
19	Marketing costs: ($1,380,000 + $185 per unit × 6,500 units sold)	2,582,500		2,582,500		2,582,500		2,582,500		2,582,500	
20	Operating Income	$1,267,500		$1,335,000		$1,537,500		$1,740,000		$1,875,000	
21											
22	[a]Production-volume variance = Budgeted fixed manufacturing costs – Allocated fixed manufacturing costs (Income Statement, line 13)										
23	At production of 4,500 units: $1,080,000 – $607,500 = $472,500 U										
24	At production of 5,000 units: $1,080,000 – $675,000 = $405,000 U										
25	At production of 6,500 units: $1,080,000 – $877,500 = $202,500 U										
26	At production of 8,000 units: $1,080,000 – $1,080,000 = $0										
27	At production of 9,000 units: $1,080,000 – $1,215,000 = ($135,000) F										

the next section, producing for inventory cannot completely be prevented. There are many subtle ways a manager can produce for inventory that, if done to a limited extent, may not be easy to detect. For example, consider the following:

- A plant manager may switch to manufacturing products that absorb the highest amount of fixed manufacturing costs, regardless of the customer demand for these products (called "cherry picking" the production line). Production of items that absorb the least or lower fixed manufacturing costs may be delayed, resulting in failure to meet promised customer delivery dates (which, over time, can result in unhappy customers).
- A plant manager may accept a particular order to increase production, even though another plant in the same company is better suited to handle that order.
- To increase production, a manager may defer maintenance beyond the current period. Although operating income in this period may increase as a result, future operating income could decrease by a larger amount if repair costs increase and equipment becomes less efficient.

The example in Exhibit 9-4 focuses on only one year (2013). A Stassen manager who built up ending inventories of telescopes to 4,500 units in 2013 would have to further increase ending inventories in 2014 to increase that year's operating income by producing for inventory. There are limits to how much inventory levels can be increased over time (because of physical constraints on storage space and management supervision and controls). Such limits reduce the likelihood of incurring some of absorption costing's undesirable effects.

Proposals for Revising Performance Evaluation

Top management, with help from the controller and management accountants, can take several steps to reduce the undesirable effects of absorption costing.

- Focus on careful budgeting and inventory planning to reduce management's freedom to build up excess inventory. For example, the budgeted monthly balance sheets have estimates of the dollar amount of inventories. If actual inventories exceed these dollar amounts, top management can investigate the inventory buildups.
- Incorporate a carrying charge for inventory in the internal accounting system. For example, the company could assess an inventory carrying charge of 1% per month on the investment tied up in inventory and for spoilage and obsolescence when it evaluates a manager's performance. An increasing number of companies are beginning to adopt this inventory carrying charge.
- Change the period used to evaluate performance. Critics of absorption costing give examples in which managers take actions that maximize quarterly or annual income at the potential expense of long-run income. When their performance is evaluated over a three- to five-year period, managers will be less tempted to produce for inventory.
- Include nonfinancial as well as financial variables in the measures used to evaluate performance. Examples of nonfinancial measures that can be used to monitor the performance of Stassen's managers in 2014 (see data on p. 305) are as follows:

$$\textbf{(a)}\ \frac{\text{Ending inventory in units in 2014}}{\text{Beginning inventory in units in 2014}} = \frac{3{,}000}{500} = 6$$

$$\textbf{(b)}\ \frac{\text{Units produced in 2014}}{\text{Units sold in 2014}} = \frac{10{,}000}{7{,}500} = 1.33$$

Top management would want to see production equal to sales and relatively stable levels of inventory. Companies that manufacture or sell several products could report these two measures for each of the products they manufacture and sell.

Decision Point

Why might managers build up finished goods inventory if they use absorption costing?

Comparing Inventory Costing Methods

Learning Objective 4

Differentiate throughput costing

. . . direct material costs inventoried

from variable costing

. . . variable manufacturing costs inventoried

and absorption costing

. . . variable and fixed manufacturing costs inventoried

Before we begin our discussion of capacity, we will look at *throughput costing*, a variation of variable costing, and compare the various costing methods.

Throughput Costing

Some managers maintain that even variable costing promotes an excessive amount of costs being inventoried. They argue that only direct materials are "truly variable" in output. **Throughput costing**, which also is called **super-variable costing**, is an extreme form of variable costing in which only direct material costs are included as inventoriable costs. All other costs are costs of the period in which they are incurred. In particular, variable direct manufacturing labor costs and variable manufacturing overhead costs are regarded as period costs and are deducted as expenses of the period.

Exhibit 9-5 is the throughput-costing income statement for Stassen Company for 2012, 2013, and 2014. *Throughput margin* equals revenues minus all direct material cost of the goods sold. Compare the operating income amounts reported in Exhibit 9-5 with those for absorption costing and variable costing:

	2012	2013	2014
Absorption-costing operating income	$1,500,000	$1,335,000	$2,490,000
Variable-costing operating income	$1,230,000	$1,537,500	$2,152,500
Throughput-costing operating income	$1,050,000	$1,672,500	$1,927,500

Decision Point

How does throughput costing differ from variable costing and absorption costing?

Only the $110 direct material cost per unit is inventoriable under throughput costing, compared with $335 per unit for absorption costing and $200 per unit for variable costing. When the production quantity exceeds sales as in 2012 and 2014, throughput costing results in the largest amount of expenses in the current period's income statement. Advocates of throughput costing say it provides less incentive to produce for inventory than either variable costing or, especially, absorption costing. Throughput costing is a more recent phenomenon in comparison with variable costing and absorption costing and has avid supporters, but so far it has not been widely adopted.[2]

Exhibit 9-5

Throughput Costing for Stassen Company: Telescope Product-Line Income Statements for 2012, 2013, and 2014

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	A	B	C	D
1		**2012**	**2013**	**2014**
2	Revenues: $1,000 × 6,000; 6,500; 7,500 units	$6,000,000	$6,500,000	$7,500,000
3	Direct material cost of goods sold			
4	Beginning inventory: $110 × 0; 2,000; 500 units	0	220,000	55,000
5	Direct materials: $110 × 8,000; 5,000; 10,000 units	880,000	550,000	1,100,000
6	Cost of goods available for sale	880,000	770,000	1,155,000
7	Deduct ending inventory: $110 × 2,000; 500; 3,000 units	(220,000)	(55,000)	(330,000)
8	Direct material cost of goods sold	660,000	715,000	825,000
9	Throughput margin[a]	5,340,000	5,785,000	6,675,000
10	Manufacturing costs (other than direct materials)[b]	1,800,000	1,530,000	1,980,000
11	Marketing costs[c]	2,490,000	2,582,500	2,767,500
12	Operating income	$1,050,000	$1,672,500	$1,927,500
13				
14	[a]Throughput margin equals revenues minus all direct material cost of goods sold			
15	[b]Fixed manuf. costs + [(variable manuf. labor cost per unit + variable manuf. overhead cost per unit)			
16	× units produced]; $1,080,000 + [($40 + $50) × 8,000; 5,000; 10,000 units]			
17	[c]Fixed marketing costs + (variable marketing cost per unit × units sold);			
18	$1,380,000 + ($185 × 6,000; 6,500; 7,500 units)			

[2] See E. Goldratt, *The Theory of Constraints* (New York: North River Press, 1990); E. Noreen, D. Smith, and J. Mackey, *The Theory of Constraints and Its Implications for Management Accounting* (New York: North River Press, 1995).

A Comparison of Alternative Inventory-Costing Methods

Variable costing and absorption costing (as well as throughput costing) may be combined with actual, normal, or standard costing. Exhibit 9-6 compares product costing under six alternative inventory-costing systems.

Variable Costing	Absorption Costing
Actual costing	Actual costing
Standard costing	Standard costing
Normal costing	Normal costing

Variable costing has been controversial among accountants, not because of disagreement about the need to delineate between variable and fixed costs for internal planning and control, but as it pertains to *external reporting*. Accountants who favor variable costing for external reporting maintain that the fixed portion of manufacturing costs is more closely related to the capacity to produce than to the actual production of specific units. Hence, fixed costs should be expensed, not inventoried.

Accountants who support absorption costing for *external reporting* maintain that inventories should carry a fixed-manufacturing-cost component. Why? Because both variable manufacturing costs and fixed manufacturing costs are necessary to produce goods. Therefore, both types of costs should be inventoried in order to match all manufacturing costs to revenues, regardless of their different behavior patterns. For external reporting to shareholders, companies around the globe tend to follow the generally accepted accounting principle that all manufacturing costs are inventoriable.

Similarly, for tax reporting in the United States, direct production costs, as well as fixed and variable indirect production costs, must be taken into account in the computation of inventoriable costs in accordance with the "full absorption" method of inventory costing. Indirect production costs include items such as rent, utilities, maintenance, repair expenses, indirect materials, and indirect labor. For other indirect cost categories (including depreciation, insurance, taxes, officers' salaries, factory administrative expenses, and strike-related costs), the portion of the cost that is "incident to and necessary for production or manufacturing operations or processes" is inventoriable for tax

Exhibit 9-6 Comparison of Alternative Inventory-Costing Systems

			Actual Costing	Normal Costing	Standard Costing
Absorption Costing	Variable Costing	Variable Direct Manufacturing Cost	Actual prices × Actual quantity of inputs used	Actual prices × Actual quantity of inputs used	Standard prices × Standard quantity of inputs allowed for actual output achieved
		Variable Manufacturing Overhead Costs	Actual variable overhead rates × Actual quantity of cost-allocation bases used	Budgeted variable overhead rates × Actual quantity of cost-allocation bases used	Standard variable overhead rates × Standard quantity of cost-allocation bases allowed for actual output achieved
		Fixed Direct Manufacturing Costs	Actual prices × Actual quantity of inputs used	Actual prices × Actual quantity of inputs used	Standard prices × Standard quantity of inputs allowed for actual output achieved
		Fixed Manufacturing Overhead Costs	Actual fixed overhead rates × Actual quantity of cost-allocation bases used	Budgeted fixed overhead rates × Actual quantity of cost-allocation bases used	Standard fixed overhead rates × Standard quantity of cost-allocation bases allowed for actual output achieved

purposes if (and only if) it is treated as inventoriable for the purposes of financial reporting. Accordingly, costs must often be allocated between those portions related to manufacturing activities and those not related to manufacturing.[3]

Denominator-Level Capacity Concepts and Fixed-Cost Capacity Analysis

Learning Objective 5

Describe the various capacity concepts that can be used in absorption costing

. . . supply-side: theoretical and practical capacity; demand-side: normal and master-budget capacity utilization

We have seen that the difference between variable and absorption costing methods arises solely from the treatment of fixed manufacturing costs. Spending on fixed manufacturing costs enables firms to obtain the scale or capacity needed to satisfy the expected demand from customers. Determining the "right" amount of spending, or the appropriate level of capacity, is one of the most strategic and most difficult decisions managers face. Having too much capacity to produce relative to that needed to meet market demand means incurring some costs of unused capacity. Having too little capacity to produce means that demand from some customers may be unfilled. These customers may go to other sources of supply and never return. Therefore, both managers and accountants should have a clear understanding of the issues that arise with capacity costs.

We start by analyzing a key question in absorption costing: Given a level of spending on fixed manufacturing costs, what capacity level should be used to compute the fixed manufacturing cost per unit produced? We then study the broader question of how a firm should decide on its level of capacity investment.

Absorption Costing and Alternative Denominator-Level Capacity Concepts

Earlier chapters, especially Chapters 4, 5, and 8, have highlighted how normal costing and standard costing report costs in an ongoing timely manner throughout a fiscal year. The choice of the capacity level used to allocate budgeted fixed manufacturing costs to products can greatly affect the operating income reported under normal costing or standard costing and the product-cost information available to managers.

Consider the Stassen Company example again. Recall that the annual fixed manufacturing costs of the production facility are $1,080,000. Stassen currently uses absorption costing with standard costs for external reporting purposes, and it calculates its budgeted fixed manufacturing rate on a per unit basis. We will now examine four different capacity levels used as the denominator to compute the budgeted fixed manufacturing cost rate: theoretical capacity, practical capacity, normal capacity utilization, and master-budget capacity utilization.

Theoretical Capacity and Practical Capacity

In business and accounting, capacity ordinarily means a "constraint," an "upper limit." **Theoretical capacity** is the level of capacity based on producing at full efficiency all the time. Stassen can produce 25 units per shift when the production lines are operating at maximum speed. If we assume 360 days per year, the theoretical annual capacity for 2 shifts per day is as follows:

$$25 \text{ units per shift} \times 2 \text{ shifts per day} \times 360 \text{ days} = 18{,}000 \text{ units}$$

Theoretical capacity is theoretical in the sense that it does not allow for any plant maintenance, shutdown periods, interruptions because of downtime on the assembly lines, or any other factors. Theoretical capacity represents an ideal goal of capacity utilization. Theoretical capacity levels are unattainable in the real world but they provide a target to which a company can aspire.

[3] Details regarding tax rules can be found in Section 1.471-11 of the U.S. Internal Revenue Code: Inventories of Manufacturers (see http://ecfr.gpoaccess.gov). Recall from Chapter 2 that costs not related to production, such as marketing, distribution, or research expenses, are treated as period expenses for financial reporting. Under U.S. tax rules, a firm can still consider these costs as inventoriable for tax purposes provided that it does so consistently.

Practical capacity is the level of capacity that reduces theoretical capacity by considering unavoidable operating interruptions, such as scheduled maintenance time, shutdowns for holidays, and so on. Assume that practical capacity is the practical production rate of 20 units per shift (as opposed to 25 units per shift under theoretical capacity) for 2 shifts per day for 300 days a year (as distinguished from 360 days a year under theoretical capacity). The practical annual capacity is as follows:

$$20 \text{ units per shift} \times 2 \text{ shifts per day} \times 300 \text{ days} = 12{,}000 \text{ units}$$

Engineering and human resource factors are both important when estimating theoretical or practical capacity. Engineers at the Stassen facility can provide input on the technical capabilities of machines for cutting and polishing lenses. Human-safety factors, such as increased injury risk when the line operates at faster speeds, are also necessary considerations in estimating practical capacity. With difficulty, practical capacity is attainable.

Normal Capacity Utilization and Master-Budget Capacity Utilization

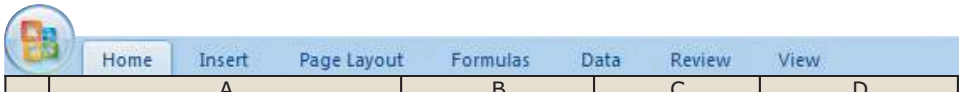
Both theoretical capacity and practical capacity measure capacity levels in terms of what a plant can *supply*—available capacity. In contrast, normal capacity utilization and master-budget capacity utilization measure capacity levels in terms of *demand* for the output of the plant, that is, the amount of available capacity the plant expects to use based on the demand for its products. In many cases, budgeted demand is well below production capacity available.

Normal capacity utilization is the level of capacity utilization that satisfies average customer demand over a period (say, two to three years) that includes seasonal, cyclical, and trend factors. **Master-budget capacity utilization** is the level of capacity utilization that managers expect for the current budget period, which is typically one year. These two capacity-utilization levels can differ—for example, when an industry, such as automobiles or semiconductors, has cyclical periods of high and low demand or when management believes that budgeted production for the coming period is not representative of long-run demand.

Consider Stassen's master budget for 2012, based on production of 8,000 telescopes per year. Despite using this master-budget capacity-utilization level of 8,000 telescopes for 2012, top management believes that over the next three years the normal (average) annual production level will be 10,000 telescopes. It views 2012's budgeted production level of 8,000 telescopes to be "abnormally" low because a major competitor has been sharply reducing its selling price and spending large amounts on advertising. Stassen expects that the competitor's lower price and advertising blitz will not be a long-run phenomenon and that, by 2014 and beyond, Stassen's production and sales will be higher.

Effect on Budgeted Fixed Manufacturing Cost Rate

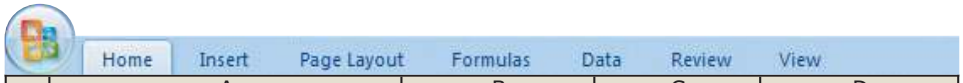
We now illustrate how each of these four denominator levels affects the budgeted fixed manufacturing cost rate. Stassen has budgeted (standard) fixed manufacturing overhead costs of $1,080,000 for 2012. This lump-sum is incurred to provide the capacity to produce telescopes. The amount includes, among other costs, leasing costs for the facility and the compensation of the facility managers. The budgeted fixed manufacturing cost rates for 2012 for each of the four capacity-level concepts are as follows:



	A	B	C	D
1		**Budgeted Fixed**	**Budget**	**Budgeted Fixed**
2	**Denominator-Level**	**Manufacturing**	**Capacity Level**	**Manufacturing**
3	**Capacity Concept**	**Costs per Year**	**(in units)**	**Cost per Unit**
4	**(1)**	**(2)**	**(3)**	**(4) = (2) / (3)**
5	Theoretical capacity	$1,080,000	18,000	$ 60
6	Practical capacity	$1,080,000	12,000	$ 90
7	Normal capacity utilization	$1,080,000	10,000	$108
8	Master-budget capacity utilization	$1,080,000	8,000	$135

The significant difference in cost rates (from $60 to $135) arises because of large differences in budgeted capacity levels under the different capacity concepts.

Budgeted (standard) variable manufacturing cost is $200 per unit. The total budgeted (standard) manufacturing cost per unit for alternative capacity-level concepts is as follows:



	A	B	C	D
1		Budgeted Variable	Budgeted Fixed	Budgeted Total
2	Denominator-Level	Manufacturing	Manufacturing	Manufacturing
3	Capacity Concept	Cost per Unit	Cost per Unit	Cost per Unit
4	(1)	(2)	(3)	(4) = (2) + (3)
5	Theoretical capacity	$200	$ 60	$260
6	Practical capacity	$200	$ 90	$290
7	Normal capacity utilization	$200	$108	$308
8	Master-budget capacity utilization	$200	$135	$335

Decision Point

What are the various capacity levels a company can use to compute the budgeted fixed manufacturing cost rate?

Because different denominator-level capacity concepts yield different budgeted fixed manufacturing costs per unit, Stassen must decide which capacity level to use. Stassen is not required to use the same capacity-level concept, say, for management planning and control, external reporting to shareholders, and income tax purposes.

Choosing a Capacity Level

Learning Objective 6

Examine the key factors in choosing a capacity level to compute the budgeted fixed manufacturing cost rate

. . . managers must consider the effect a capacity level has on product costing, capacity management, pricing decisions, and financial statements

As we just saw, at the start of each fiscal year, managers determine different denominator levels for the different capacity concepts and calculate different budgeted fixed manufacturing costs per unit. We now discuss the problems with and effects of different denominator-level choices for different purposes, including (a) product costing and capacity management, (b) pricing, (c) performance evaluation, (d) external reporting, and (e) tax requirements.

Product Costing and Capacity Management

Data from normal costing or standard costing are often used in pricing or product-mix decisions. As the Stassen example illustrates, use of theoretical capacity results in an unrealistically small fixed manufacturing cost per unit because it is based on an idealistic and unattainable level of capacity. Theoretical capacity is rarely used to calculate budgeted fixed manufacturing cost per unit because it departs significantly from the real capacity available to a company.

Many companies favor practical capacity as the denominator to calculate budgeted fixed manufacturing cost per unit. Practical capacity in the Stassen example represents the maximum number of units (12,000) that Stassen can reasonably expect to produce per year for the $1,080,000 it will spend annually on capacity. If Stassen had consistently planned to produce fewer units, say 6,000 telescopes each year, it would have built a smaller plant and incurred lower costs.

Stassen budgets $90 in fixed manufacturing cost per unit based on the $1,080,000 it costs to acquire the capacity to produce 12,000 units. This level of plant capacity is an important strategic decision that managers make well before Stassen uses the capacity and even before Stassen knows how much of the capacity it will actually use. That is, budgeted fixed manufacturing cost of $90 per unit measures the *cost per unit of supplying the capacity*.

Demand for Stassen's telescopes in 2012 is expected to be 8,000 units, which is 4,000 units lower than the practical capacity of 12,000 units. However, it costs Stassen $1,080,000 per year to acquire the capacity to make 12,000 units, so the cost of *supplying* the capacity needed to make 12,000 units is still $90 per unit. The capacity and

its cost are fixed *in the short run*; unlike variable costs, the capacity supplied does not automatically reduce to match the capacity needed in 2012. As a result, not all of the capacity supplied at $90 per unit will be needed or used in 2012. Using practical capacity as the denominator level, managers can subdivide the cost of resources supplied into used and unused components. At the supply cost of $90 per unit, the manufacturing resources that Stassen will use equal $720,000 ($90 per unit × 8,000 units). Manufacturing resources that Stassen will not use are $360,000 [$90 per unit × (12,000 – 8,000) units].

Using practical capacity as the denominator level sets the cost of capacity at the cost of supplying the capacity, regardless of the demand for the capacity. Highlighting the cost of capacity acquired but not used directs managers' attention toward managing unused capacity, perhaps by designing new products to fill unused capacity, by leasing unused capacity to others, or by eliminating unused capacity. In contrast, using either of the capacity levels based on the demand for Stassen's telescopes—master-budget capacity utilization or normal capacity utilization—hides the amount of unused capacity. If Stassen had used master-budget capacity utilization as the capacity level, it would have calculated budgeted fixed manufacturing cost per unit as $135 ($1,080,000 ÷ 8,000 units). This calculation does not use data about practical capacity, so it does not separately identify the cost of unused capacity. Note, however, that the cost of $135 per unit includes a charge for unused capacity: It comprises the $90 fixed manufacturing resource that would be used to produce each unit at practical capacity plus the cost of unused capacity allocated to each unit, $45 per unit ($360,000 ÷ 8,000 units).

From the perspective of long-run product costing, which cost of capacity should Stassen use for pricing purposes or for benchmarking its product cost structure against competitors: $90 per unit based on practical capacity or $135 per unit based on master-budget capacity utilization? Probably the $90 per unit based on practical capacity. Why? Because $90 per unit represents the budgeted cost per unit of only the capacity used to produce the product, and it explicitly excludes the cost of any unused capacity. Stassen's customers will be willing to pay a price that covers the cost of the capacity actually used but will not want to pay for unused capacity that provides no other benefits to them. Customers expect Stassen to manage its unused capacity or to bear the cost of unused capacity, not pass it along to them. Moreover, if Stassen's competitors manage unused capacity more effectively, the cost of capacity in the competitors' cost structures (which guides competitors' pricing decisions) is likely to approach $90. In the next section we show how the use of normal capacity utilization or master-budget capacity utilization can result in setting selling prices that are not competitive.

Pricing Decisions and the Downward Demand Spiral

The **downward demand spiral** for a company is the continuing reduction in the demand for its products that occurs when competitor prices are not met; as demand drops further, higher and higher unit costs result in greater reluctance to meet competitors' prices.

The easiest way to understand the downward demand spiral is via an example. Assume Stassen uses master-budget capacity utilization of 8,000 units for product costing in 2012. The resulting manufacturing cost is $335 per unit ($200 variable manufacturing cost per unit + $135 fixed manufacturing cost per unit). Assume that in December 2011, a competitor offers to supply a major customer of Stassen (a customer who was expected to purchase 2,000 units in 2012) telescopes at $300 per unit. The Stassen manager, not wanting to show a loss on the account and wanting to recoup all costs in the long run, declines to match the competitor's price. The account is lost. The loss means budgeted fixed manufacturing costs of $1,080,000 will be spread over the remaining master-budget volume of 6,000 units at a rate of $180 per unit ($1,080,000 ÷ 6,000 units).

Suppose yet another Stassen customer, who also accounts for 2,000 units of budgeted volume, receives a bid from a competitor at a price of $350 per unit. The Stassen manager compares this bid with his revised unit cost of $380 ($200 + $180), declines to match the competition, and the account is lost. Planned output would shrink further to 4,000 units. Budgeted fixed manufacturing cost per unit for the remaining 4,000 telescopes would now

be $270 ($1,080,000 ÷ 4,000 units). The following table shows the effect of spreading fixed manufacturing costs over a shrinking amount of master-budget capacity utilization:

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	A	B	C	D
1	**Master-Budget**		**Budgeted Fixed**	
2	**Capacity Utilization**	**Budgeted Variable**	**Manufacturing**	**Budgeted Total**
3	**Denominator Level**	**Manufacturing Cost**	**Cost per Unit**	**Manufacturing**
4	**(Units)**	**per Unit**	**[$1,080,000 ÷ (1)]**	**Cost per Unit**
5	**(1)**	**(2)**	**(3)**	**(4) = (2) + (3)**
6	8,000	$200	$135	$335
7	6,000	$200	$180	$380
8	4,000	$200	$270	$470
9	3,000	$200	$360	$560

Practical capacity, by contrast, is a stable measure. The use of practical capacity as the denominator to calculate budgeted fixed manufacturing cost per unit avoids the recalculation of unit costs when expected demand levels change, because the fixed cost rate is calculated based on *capacity available* rather than *capacity used to meet demand*. Managers who use reported unit costs in a mechanical way to set prices are less likely to promote a downward demand spiral when they use practical capacity than when they use normal capacity utilization or master-budget capacity utilization.

Using practical capacity as the denominator level also gives the manager a more accurate idea of the resources needed and used to produce a unit by excluding the cost of unused capacity. As discussed earlier, the cost of manufacturing resources supplied to produce a telescope is $290 ($200 variable manufacturing cost per unit plus $90 fixed manufacturing cost per unit). This cost is lower than the prices offered by Stassen's competitors and would have correctly led the manager to match the prices and retain the accounts (assuming for purposes of this discussion that Stassen has no other costs). If, however, the prices offered by competitors were lower than $290 per unit, the Stassen manager would not recover the cost of resources used to supply telescopes. This would signal to the manager that Stassen was noncompetitive even if it had no unused capacity. The only way then for Stassen to be profitable and retain customers in the long run would be to reduce its manufacturing cost per unit. The Concepts in Action feature on page 319 highlights the downward spiral currently at work in the traditional landline phone industry.

Performance Evaluation

Consider how the choice among normal capacity utilization, master-budget capacity utilization, and practical capacity affects the evaluation of a marketing manager. Normal capacity utilization is often used as a basis for long-run plans. Normal capacity utilization depends on the time span selected and the forecasts made for each year. *However, normal capacity utilization is an average that provides no meaningful feedback to the marketing manager for a particular year.* Using normal capacity utilization as a reference for judging current performance of a marketing manager is an example of misusing a long-run measure for a short-run purpose. Master-budget capacity utilization, rather than normal capacity utilization or practical capacity, should be used to evaluate a marketing manager's performance in the current year, because the master budget is the principal short-run planning and control tool. Managers feel more obligated to reach the levels specified in the master budget, which should have been carefully set in relation to the maximum opportunities for sales in the current year.

When large differences exist between practical capacity and master-budget capacity utilization, several companies (such as Texas Instruments, Polysar, and Sandoz) classify the difference as *planned unused capacity*. One reason for this approach is performance

Concepts in Action

The "Death Spiral" and the End of Landline Telephone Service

Can you imagine a future without traditional landline telephone service? Verizon and AT&T, the two largest telephone service providers in the United States, are already working to make that future a reality. Recently, both companies announced plans to reduce their focus on providing copper-wire telephone service to homes and businesses. According to AT&T, with the rise of mobile phones and Internet communications such as voice over Internet Protocol (VoIP), less than 20% of Americans now rely exclusively on landlines for voice service and another 25% have abandoned them altogether.

But why would telephone companies abandon landlines if 75% of Americans still use them? Continued reduced service demand is leading to higher unit costs, or a downward demand spiral. As AT&T recently told the U.S. Federal Communications Commission, "The business model for legacy phone services is in a death spiral. With an outdated product, falling revenues, and rising costs, the plain-old telephone service business is unsustainable for the long run."

Marketplace statistics support AT&T's claim. From 2000 to 2008, total long-distance access minutes fell by 42%. As a result, revenue from traditional landline phone service decreased by 27% between 2000 and 2007. In 2008 alone, AT&T lost 12% of its landline customers, while Verizon lost 10%. Industry observers estimate that customers are permanently disconnecting 700,000 landline phones every month.

As all these companies lose landline customers and revenue, the costs of maintaining the phone wires strung on poles and dug through trenches is not falling nearly as quickly. It now costs phone companies an average of $52 per year to maintain a copper phone line, up from $43 in 2003, largely because of the declining number of landlines. These costs do not include other expenses required to maintain landline phone service including local support offices, call centers, and garages.

New competitors are taking advantage of this situation. Vonage, the leading Internet phone company, offers its services for as little as $18 per month. Without relying on wires to transmit calls, its direct costs of providing telephone service come to $6.67 a month for each subscriber. And the largest part of that is not true cost, but subsidies to rural phone carriers for connecting long distance calls. As Vonage attracts more customers, its economies of scale will increase while its costs of providing service will decrease for each additional subscriber.

Hamstrung by increasing unit costs, legacy carriers like Verizon and AT&T are unable to compete with Vonage on price. As such, their traditional landline businesses are in permanent decline. So what are these companies doing about it? Verizon is reducing its landline operations by selling large parts of its copper-wire business to smaller companies at a significant discount. AT&T recently petitioned the U.S. government to waive a requirement that it and other carriers maintain their costly landline networks. As the landline phone service "death spiral" continues, the future of telecommunications will include more wireless, fiber optics, and VoIP with less of Alexander Graham Bell's original vision of telephones connected by copper wires.

Source: *Comments of AT&T Inc. on the Transition from the Legacy Circuit-switched Network to Broadband*. Washington, DC: AT&T Inc., December 21, 2009. http://fjallfoss.fcc.gov/ecfs/document/view?id=7020354032; Hansell, Saul. 2009. Verizon boss hangs up on landline phone business. *New York Times*, September 17; Hansell, Saul. 2009. Will the phone industry need a bailout, too? *New York Times*, May 8.

evaluation. Consider our Stassen telescope example. The managers in charge of capacity planning usually do not make pricing decisions. Top management decided to build a production facility with 12,000 units of practical capacity, focusing on demand over the next five years. But Stassen's marketing managers, who are mid-level managers, make the pricing decisions. These marketing managers believe they should be held accountable only for the manufacturing overhead costs related to their potential customer base in 2012. The master-budget capacity utilization suggests a customer base in 2012 of 8,000 units (2/3 of the 12,000 practical capacity). Using responsibility accounting principles (see Chapter 6, pp. 199–201), only 2/3 of the budgeted total fixed manufacturing costs ($1,080,000 × 2/3 = $720,000) would be attributed to the fixed capacity costs of meeting 2012 demand. The remaining 1/3 of the numerator ($1,080,000 × 1/3 = $360,000) would be separately

shown as the capacity cost of meeting increases in long-run demand expected to occur beyond 2012.[4]

External Reporting

The magnitude of the favorable/unfavorable production-volume variance under absorption costing is affected by the choice of the denominator level used to calculate the budgeted fixed manufacturing cost per unit. Assume the following actual operating information for Stassen in 2012:

	A	B	C
1	Beginning inventory	0	
2	Production	8,000	units
3	Sales	6,000	units
4	Ending inventory	2,000	units
5	Selling price	$ 1,000	per unit
6	Variable manufacturing cost	$ 200	per unit
7	Fixed manufacturing costs	$ 1,080,000	
8	Variable marketing cost	$ 185	per unit sold
9	Fixed marketing costs	$ 1,380,000	

Note that this is the same data used to calculate the income under variable and absorption costing for Stassen in Exhibit 9-1. As before, we assume that there are no price, spending, or efficiency variances in manufacturing costs.

Recall from Chapter 8 the equation used to calculate the production-volume variance:

$$\text{Production-volume variance} = \left(\begin{array}{c}\text{Budgeted fixed}\\ \text{manufacturing overhead}\end{array}\right) - \left(\begin{array}{c}\text{Fixed manufacturing overhead allocated using}\\ \text{budgeted cost per output unit}\\ \text{allowed for actual output produced}\end{array}\right)$$

The four different capacity-level concepts result in four different budgeted fixed manufacturing overhead cost rates per unit. The different rates will result in different amounts of fixed manufacturing overhead costs allocated to the 8,000 units actually produced and different amounts of production-volume variance. Using the budgeted fixed manufacturing costs of $1,080,000 (equal to actual fixed manufacturing costs) and the rates calculated on page 315 for different denominator levels, the production-volume variance computations are as follows:

$$\begin{aligned}
\text{Production-volume variance (theoretical capacity)} &= \$1{,}080{,}000 - (8{,}000 \text{ units} \times \$60 \text{ per unit})\\
&= \$1{,}080{,}000 - 480{,}000\\
&= 600{,}000 \text{ U}\\
\text{Production-volume variance (practical capacity)} &= \$1{,}080{,}000 - (8{,}000 \text{ units} \times \$90 \text{ per unit})\\
&= \$1{,}080{,}000 - 720{,}000\\
&= 360{,}000 \text{ U}\\
\text{Production-volume variance (normal capacity utilization)} &= \$1{,}080{,}000 - (8{,}000 \text{ units} \times \$108 \text{ per unit})\\
&= \$1{,}080{,}000 - 864{,}000\\
&= 216{,}000 \text{ U}
\end{aligned}$$

[4] For further discussion, see T. Klammer, *Capacity Measurement and Improvement* (Chicago: Irwin, 1996). This research was facilitated by CAM-I, an organization promoting innovative cost management practices. CAM-I's research on capacity costs explores ways in which companies can identify types of capacity costs that can be reduced (or eliminated) without affecting the required output to meet customer demand. An example is improving processes to successfully eliminate the costs of capacity held in anticipation of handling difficulties due to imperfect coordination with suppliers and customers.

Production-volume variance (master-budget capacity utilization)	= $1,080,000 − (8,000 units × $135 per unit)
	= $1,080,000 − 1,080,000
	= 0

How Stassen disposes of its production-volume variance at the end of the fiscal year will determine the effect this variance has on the company's operating income. We now discuss the three alternative approaches Stassen can use to dispose of the production-volume variance. These approaches were first discussed in Chapter 4 (pp. 117–122).

1. **Adjusted allocation-rate approach.** This approach restates all amounts in the general and subsidiary ledgers by using actual rather than budgeted cost rates. Given that actual fixed manufacturing costs are $1,080,000 and actual production is 8,000 units, the recalculated fixed manufacturing cost is $135 per unit ($1,080,000 ÷ 8,000 actual units). Under the adjusted allocation-rate approach, the choice of the capacity level used to calculate the budgeted fixed manufacturing cost per unit has no effect on year-end financial statements. In effect, actual costing is adopted at the end of the fiscal year.
2. **Proration approach.** The underallocated or overallocated overhead is spread among ending balances in Work-in-Process Control, Finished Goods Control, and Cost of Goods Sold. The proration restates the ending balances in these accounts to what they would have been if actual cost rates had been used rather than budgeted cost rates. The proration approach also results in the choice of the capacity level used to calculate the budgeted fixed manufacturing cost per unit having no effect on year-end financial statements.
3. **Write-off variances to cost of goods sold approach.** Exhibit 9-7 shows how use of this approach affects Stassen's operating income for 2012. Recall that Stassen had no beginning inventory, and it had production of 8,000 units and sales of 6,000 units. Therefore, the ending inventory on December 31, 2012, is 2,000 units. Using master-budget capacity utilization as the denominator-level results in assigning the highest amount of fixed manufacturing cost per unit to the 2,000 units in ending inventory (see the line item "deduct ending inventory" in Exhibit 9-7). Accordingly, operating income is highest using master-budget capacity utilization. The differences in operating income for the four denominator-level concepts in Exhibit 9-7 are due to different amounts of fixed manufacturing overhead being inventoried at the end of 2012:

	Fixed Manufacturing Overhead In December 31, 2012, Inventory
Theoretical capacity	2,000 units × $60 per unit = $120,000
Practical capacity	2,000 units × $90 per unit = $180,000
Normal capacity utilization	2,000 units × $108 per unit = $216,000
Master-budget capacity utilization	2,000 units × $135 per unit = $270,000

In Exhibit 9-7, for example, the $54,000 difference ($1,500,000 – $1,446,000) in operating income between master-budget capacity utilization and normal capacity utilization is due to the difference in fixed manufacturing overhead inventoried ($270,000 – $216,000).

What is the common reason and explanation for the increasing operating-income numbers in Exhibit 9-4 (p. 310) and Exhibit 9-7? It is the amount of fixed manufacturing costs incurred that is included in ending inventory at the end of the year. As this amount increases, so does operating income. The amount of fixed manufacturing costs inventoried depends on two factors: the number of units in ending inventory and the rate at which fixed manufacturing costs are allocated to each unit. Exhibit 9-4 shows the effect on operating income of increasing the number of units in ending inventory (by increasing production). Exhibit 9-7 shows the effect on operating income of increasing the fixed manufacturing cost allocated per unit (by decreasing the denominator level used to calculate the rate).

Chapter 8 (pp. 275–276) discusses the various issues managers and management accountants must consider when deciding whether to prorate the production-volume

Exhibit 9-7 Income-Statement Effects of Using Alternative Capacity-Level Concepts: Stassen Company for 2012

	A	B	C	D	E	F	G	H	I
1		Theoretical Capacity		Practical Capacity		Normal Capacity Utilization		Master-Budget Capacity Utilization	
2	Denominator level in cases	18,000		12,000		10,000		8,000	
3	Revenues[a]	$6,000,000		$6,000,000		$6,000,000		$6,000,000	
4	Cost of goods sold								
5	Beginning inventory	0		0		0		0	
6	Variable manufacturing costs[b]	1,600,000		1,600,000		1,600,000		1,600,000	
7	Fixed manufacturing costs[c]	480,000		720,000		864,000		1,080,000	
8	Cost of goods available for sale	2,080,000		2,320,000		2,464,000		2,680,000	
9	Deduct ending inventory[d]	(520,000)		(580,000)		(616,000)		(670,000)	
10	Cost of goods sold (at standard cost)	1,560,000		1,740,000		1,848,000		2,010,000	
11	Adjustment for production-volume variance	600,000	U	360,000	U	216,000	U	0	
12	Cost of goods sold	2,160,000		2,100,000		2,064,000		2,010,000	
13	Gross margin	3,840,000		3,900,000		3,936,000		3,990,000	
14	Marketing costs[e]	2,490,000		2,490,000		2,490,000		2,490,000	
15	Operating income	$1,350,000		$1,410,000		$1,446,000		$1,500,000	
16									
17	[a]$1,000 × 6,000 units = $6,000,000			[d]Ending inventory costs:					
18	[b]$200 × 8,000 units = $1,600,000			($200 + $60) × 2,000 units = $520,000					
19	[c]Fixed manufacturing overhead costs:			($200 + $90) × 2,000 units = $580,000					
20	$60 × 8,000 units = $ 480,000			($200 + $108) × 2,000 units = $616,000					
21	$90 × 8,000 units = $ 720,000			($200 + $135) × 2,000 units = $670,000					
22	$108 × 8,000 units = $ 864,000			[e]Marketing costs:					
23	$135 × 8,000 units = $1,080,000			$1,380,000 + $185 × 6,000 units = $2,490,000					

variance among inventories and cost of goods sold or to simply write off the variance to cost of goods sold. The objective is to write off the portion of the production-volume variance that represents the cost of capacity not used to support the production of output during the period. Determining this amount is almost always a matter of judgment.

Tax Requirements

Decision Point

What are the major factors managers consider in choosing the capacity level to compute the budgeted fixed manufacturing cost rate?

For tax reporting purposes in the United States, the Internal Revenue Service (IRS) requires companies to assign inventoriable indirect production costs by a "method of allocation which fairly apportions such costs among the various items produced." Approaches that involve the use of either overhead rates (which the IRS terms the "manufacturing burden rate method") or standard costs are viewed as acceptable. Under either approach, U.S. tax reporting requires end-of-period reconciliation between actual and applied indirect costs using the adjusted allocation-rate method or the proration method.[5] More interestingly, under either approach, the IRS permits the use of practical capacity to calculate budgeted fixed manufacturing cost per unit. Further, the production-volume variance thus generated can be deducted for tax purposes in the year in which the cost is incurred. The tax benefits from this policy are evident from Exhibit 9-7. Note that the operating income when the

[5] For example, Section 1.471-11 of the U.S. Internal Revenue Code states, "The proper use of the standard cost method . . . requires that a taxpayer must reallocate to the goods in ending inventory a pro rata portion of any net negative or net positive overhead variances." Of course, if the variances are not material in amount, they can be expensed (i.e., written off to cost of goods sold), provided the same treatment is carried out in the firm's financial reports.

denominator is set to practical capacity (column D, where the production volume variance of $360,000 is written off to cost of goods sold) is lower than those under normal capacity utilization (column F) or master-budget capacity utilization (column H).

Planning and Control of Capacity Costs

In addition to the issues previously discussed, managers must take a variety of other factors into account when planning capacity levels and in deciding how best to control and assign capacity costs. These include the level of uncertainty regarding both the expected costs and the expected demand for the installed capacity, the presence of capacity-related issues in nonmanufacturing settings, and the potential use of activity-based costing techniques in allocating capacity costs.

Learning Objective 7

Understand other issues that play an important role in capacity planning and control

. . . uncertainty regarding the expected spending on capacity costs and the demand for installed capacity, the role of capacity-related issues in nonmanufacturing areas, and the possible use of activity-based costing techniques in allocating capacity costs

Difficulties in Forecasting Chosen Denominator-Level Concept

Practical capacity measures the available supply of capacity. Managers can usually use engineering studies and human-resource considerations (such as worker safety) to obtain a reliable estimate of this denominator level for the budget period. It is more difficult to obtain reliable estimates of demand-side denominator-level concepts, especially longer-term normal capacity utilization figures. For example, many U.S. steel companies in the 1980s believed they were in the downturn of a demand cycle that would have an upturn within two or three years. After all, steel had been a cyclical business in which upturns followed downturns, making the notion of normal capacity utilization appear reasonable. Unfortunately, the steel cycle in the 1980s did not turn up; some companies and numerous plants closed. More recently, the global economic slowdown has made a mockery of demand projections. Consider that in 2006, the forecast for the Indian automotive market was that annual demand for cars and passenger vehicles would hit 1.92 million in the year 2009–2010. In early 2009, the forecast for the same period was revised downward to 1.37 million vehicles. Even ignoring the vagaries of economic cycles, another problem is that marketing managers of firms are often prone to overestimate their ability to regain lost sales and market share. Their estimate of "normal" demand for their product may consequently reflect an overly optimistic outlook. Master-budget capacity utilization focuses only on the expected demand for the next year. Therefore, master-budget capacity utilization can be more reliably estimated than normal capacity utilization. However, it is still just a forecast, and the true demand realization can be either higher or lower than this estimate.

It is important to understand that costing systems, such as normal costing or standard costing, do not recognize uncertainty the way managers recognize it. A single amount, rather than a range of possible amounts, is used as the denominator level when calculating the budgeted fixed manufacturing cost per unit in absorption costing. Consider Stassen's facility, which has an estimated practical capacity of 12,000 units. The estimated master-budget capacity utilization for 2012 is 8,000 units. However, there is still substantial doubt regarding the actual number of units Stassen will have to manufacture in 2012 and in future years. Managers recognize uncertainty in their capacity-planning decisions. Stassen built its current plant with a 12,000 unit practical capacity in part to provide the capability to meet possible demand surges. Even if such surges do not occur in a given period, do not conclude that capacity unused in a given period is wasted resources. The gains from meeting sudden demand surges may well require having unused capacity in some periods.

Difficulties in Forecasting Fixed Manufacturing Costs

The fixed manufacturing cost rate is based on a numerator (budgeted fixed manufacturing costs) and a denominator (some measure of capacity or capacity utilization). Our discussion so far has emphasized issues concerning the choice of the denominator. Challenging issues also arise in measuring the numerator. For example, deregulation of the U.S. electric utility industry has resulted in many electric utilities becoming unprofitable. This situation has led to write-downs in the values of the utilities' plants and equipment. The

write-downs reduce the numerator because there is less depreciation expense included in the calculation of fixed capacity cost per kilowatt-hour of electricity produced. The difficulty that managers face in this situation is that the amount of write-downs is not clear-cut but, rather, a matter of judgment.

Nonmanufacturing Costs

Capacity costs also arise in nonmanufacturing parts of the value chain. Stassen may acquire a fleet of vehicles capable of distributing the practical capacity of its production facility. When actual production is below practical capacity, there will be unused-capacity cost issues with the distribution function, as well as with the manufacturing function.

As you saw in Chapter 8, capacity cost issues are prominent in many service-sector companies, such as airlines, hospitals, and railroads—even though these companies carry no inventory and so have no inventory costing problems. For example, in calculating the fixed overhead cost per patient-day in its obstetrics and gynecology department, a hospital must decide which denominator level to use: practical capacity, normal capacity utilization, or master-budget capacity utilization. Its decision may have implications for capacity management, as well as pricing and performance evaluation.

Activity-Based Costing

Decision Point

What issues must managers take into account when planning capacity levels and for assigning capacity costs?

To maintain simplicity and the focus on choosing a denominator to calculate a budgeted fixed manufacturing cost rate, our Stassen example assumed that all fixed manufacturing costs had a single cost driver: telescope units produced. As you saw in Chapter 5, activity-based costing systems have multiple overhead cost pools at the output-unit, batch, product-sustaining, and facility-sustaining levels—each with its own cost driver. In calculating activity cost rates (for fixed costs of setups and material handling, say), management must choose a capacity level for the quantity of the cost driver (setup-hours or loads moved). Should management use practical capacity, normal capacity utilization, or master-budget capacity utilization? For all the reasons described in this chapter (such as pricing and capacity management), most proponents of activity-based costing argue that practical capacity should be used as the denominator level to calculate activity cost rates.

Problem for Self-Study

Assume Stassen Company on January 1, 2012, decides to contract with another company to preassemble a large percentage of the components of its telescopes. The revised manufacturing cost structure during the 2012–2014 period is as follows:

Variable manufacturing cost per unit produced	
Direct materials	$ 250
Direct manufacturing labor	20
Manufacturing overhead	5
Total variable manufacturing cost per unit produced	$ 275
Fixed manufacturing costs	$480,000

Under the revised cost structure, a larger percentage of Stassen's manufacturing costs are variable with respect to units produced. The denominator level of production used to calculate budgeted fixed manufacturing cost per unit in 2012, 2013, and 2014 is 8,000 units. Assume no other change from the data underlying Exhibits 9-1 and 9-2. Summary information pertaining to absorption-costing operating income and variable-costing operating income with this revised cost structure is as follows:

	2012	2013	2014
Absorption-costing operating income	$1,500,000	$1,560,000	$2,340,000
Variable-costing operating income	1,380,000	1,650,000	2,190,000
Difference	$ 120,000	$ (90,000)	$ 150,000

Required

1. Compute the budgeted fixed manufacturing cost per unit in 2012, 2013, and 2014.
2. Explain the difference between absorption-costing operating income and variable-costing operating income in 2012, 2013, and 2014, focusing on fixed manufacturing costs in beginning and ending inventory.
3. Why are these differences smaller than the differences in Exhibit 9-2?
4. Assume the same preceding information, except that for 2012, the master-budget capacity utilization is 10,000 units instead of 8,000. How would Stassen's absorption-costing income for 2012 differ from the $1,500,000 shown previously? Show your computations.

Solution

1. $$\text{Budgeted fixed manufacturing cost per unit} = \frac{\text{Budgeted fixed manufacturing costs}}{\text{Budgeted production units}}$$
$$= \frac{\$480{,}000}{8{,}000 \text{ units}}$$
$$= \$60 \text{ per unit}$$

2. Absorption-costing operating income − Variable-costing operating income = Fixed manufacturing costs in ending inventory under absorption costing − Fixed manufacturing costs in beginning inventory under absorption costing

2012: $1,500,000 − $1,380,000 = ($60 per unit × 2,000 units) − ($600 per unit × 0 units)
$120,000 = $120,000

2013: $1,560,000 − $1,650,000 = ($60 per unit × 500 units) − ($60 per unit × 2,000 units)
−$90,000 = −$90,000

2014: $2,340,000 − $2,190,000 = ($60 per unit × 3,000 units) − ($60 per unit × 500 units)
$150,000 = $150,000

3. Subcontracting a large part of manufacturing has greatly reduced the magnitude of fixed manufacturing costs. This reduction, in turn, means differences between absorption costing and variable costing are much smaller than in Exhibit 9-2.
4. Given the higher master-budget capacity utilization level of 10,000 units, the budgeted fixed manufacturing cost rate for 2012 is now as follows:

$$\frac{\$480{,}000}{10{,}000 \text{ units}} = \$48 \text{ per unit}$$

The manufacturing cost per unit is $323 ($275 + $48). So, the production-volume variance for 2012 is

$$(10{,}000 \text{ units} - 8{,}000 \text{ units}) \times \$48 \text{ per unit} = \$96{,}000 \text{ U}$$

The absorption-costing income statement for 2012 is as follows:

Revenues: $1,000 per unit × 6,000 units	$6,000,000
Cost of goods sold:	
Beginning inventory	0
Variable manufacturing costs: $275 per unit × 8,000 units	2,200,000
Fixed manufacturing costs: $48 per unit × 8,000 units	384,000
Cost of goods available for sale	2,584,000
Deduct ending inventory: $323 per unit × 2,000 units	(646,000)
Cost of goods sold (at standard costs)	1,938,000
Adjustment for production-volume variance	96,000 U
Cost of goods sold	2,034,000
Gross margin	3,966,000
Marketing costs: $1,380,000 fixed + ($185 per unit) × (6,000 units sold)	2,490,000
Operating income	$1,476,000

The higher denominator level used to calculate the budgeted fixed manufacturing cost per unit means that fewer fixed manufacturing costs are inventoried ($48 per unit × 2,000 units = $96,000) than when the master-budget capacity utilization was 8,000 units ($60 per unit × 2,000 units = $120,000). This difference of $24,000 ($120,000 – $96,000) results in operating income being lower by $24,000 relative to the prior calculated income level of $1,500,000.

Decision Points

The following question-and-answer format summarizes the chapter's learning objectives. Each decision presents a key question related to a learning objective. The guidelines are the answer to that question.

Decision	Guidelines
1. How does variable costing differ from absorption costing?	Variable costing and absorption costing differ in only one respect: how to account for fixed manufacturing costs. Under variable costing, fixed manufacturing costs are excluded from inventoriable costs and are a cost of the period in which they are incurred. Under absorption costing, fixed manufacturing costs are inventoriable and become a part of cost of goods sold in the period when sales occur.
2. How does income differ under variable and absorption costing?	The variable-costing income statement is based on the contribution-margin format. Under it, operating income is driven by the unit level of sales. Under absorption costing, the income statement follows the gross-margin format. Operating income is driven by the unit level of production, the unit level of sales, and the denominator level used for assigning fixed costs.
3. Why might managers build up finished goods inventory if they use absorption costing?	When absorption costing is used, managers can increase current operating income by producing more units for inventory. Producing for inventory absorbs more fixed manufacturing costs into inventory and reduces costs expensed in the period. Critics of absorption costing label this manipulation of income as the major negative consequence of treating fixed manufacturing costs as inventoriable costs.
4. How does throughput costing differ from variable costing and absorption costing?	Throughput costing treats all costs except direct materials as costs of the period in which they are incurred. Throughput costing results in a lower amount of manufacturing costs being inventoried than either variable or absorption costing.
5. What are the various capacity levels a company can use to compute the budgeted fixed manufacturing cost rate?	Capacity levels can be measured in terms of capacity supplied—theoretical capacity or practical capacity. Capacity can also be measured in terms of output demanded—normal capacity utilization or master-budget capacity utilization.
6. What are the major factors managers consider in choosing the capacity level to compute the budgeted fixed manufacturing cost rate?	The major factors managers consider in choosing the capacity level to compute the budgeted fixed manufacturing cost rate are (a) effect on product costing and capacity management, (b) effect on pricing decisions, (c) effect on performance evaluation, (d) effect on financial statements, and (e) regulatory requirements.
7. What issues must managers take into account when planning capacity levels and for assigning capacity costs?	Critical factors in this regard include the uncertainty about the expected spending on capacity costs and the demand for the installed capacity, the role of capacity-related issues in nonmanufacturing areas, and the possible use of activity-based costing techniques in allocating capacity costs.

Appendix

Breakeven Points in Variable Costing and Absorption Costing

Chapter 3 introduced cost-volume-profit analysis. If variable costing is used, the breakeven point (that's where operating income is $0) is computed in the usual manner. There is only one breakeven point in this case, and it depends on (1) fixed (manufacturing and operating) costs and (2) contribution margin per unit.

The formula for computing the breakeven point under variable costing is a special case of the more general target operating income formula from Chapter 3 (p. 70):

$$\text{Let } Q = \text{Number of units sold to earn the target operating income}$$

$$\text{Then } Q = \frac{\text{Total fixed costs} + \text{Target operating income}}{\text{Contribution margin per unit}}$$

Breakeven occurs when the target operating income is $0. In our Stassen illustration for 2012 (see Exhibit 9-1, p. 304):

$$Q = \frac{(\$1{,}080{,}000 + \$1{,}380{,}000) + \$0}{(\$1{,}000 - (\$200 + \$185))} = \frac{\$2{,}460{,}000}{\$615}$$
$$= 4{,}000 \text{ units}$$

We now verify that Stassen will achieve breakeven under variable costing by selling 4,000 units:

Revenues, $1,000 × 4,000 units	$4,000,000
Variable costs, $385 × 4,000 units	1,540,000
Contribution margin, $615 × 4,000 units	2,460,000
Fixed costs	2,460,000
Operating income	$ 0

If absorption costing is used, the required number of units to be sold to earn a specific target operating income is not unique because of the number of variables involved. The following formula shows the factors that will affect the target operating income under absorption costing:

$$Q = \frac{\begin{matrix}\text{Total} \\ \text{fixed} \\ \text{costs}\end{matrix} + \begin{matrix}\text{Target} \\ \text{operating} \\ \text{income}\end{matrix} + \left[\begin{matrix}\text{Fixed} \\ \text{manufacturing} \\ \text{cost rate}\end{matrix} \times \left(\begin{matrix}\text{Breakeven} \\ \text{sales} \\ \text{in units}\end{matrix} - \begin{matrix}\text{Units} \\ \text{produced}\end{matrix}\right)\right]}{\text{Contribution margin per unit}}$$

In this formula, the numerator is the sum of three terms (from the perspective of the two "+" signs), compared with two terms in the numerator of the variable-costing formula stated earlier. The additional term in the numerator under absorption costing is as follows:

$$\left[\begin{matrix}\text{Fixed manufacturing} \\ \text{cost rate}\end{matrix} \times \left(\begin{matrix}\text{Breakeven sales} \\ \text{in units}\end{matrix} - \begin{matrix}\text{Units} \\ \text{produced}\end{matrix}\right)\right]$$

This term reduces the fixed costs that need to be recovered when units produced exceed the breakeven sales quantity. When production exceeds the breakeven sales quantity, some of the fixed manufacturing costs that are expensed under variable costing are not expensed under absorption costing; they are instead included in finished goods inventory.[6]

For Stassen Company in 2012, suppose that actual production is 5,280 units. Then, one breakeven point, Q, under absorption costing is as follows:

$$Q = \frac{(\$1{,}080{,}000 + \$1{,}380{,}000) + \$0 + [\$135 \times (Q - 5{,}280)]}{(\$1{,}000 - (\$200 + \$185))}$$
$$= \frac{(\$2{,}460{,}000 + \$135Q - \$712{,}800)}{\$615}$$
$$\$615Q = \$1{,}747{,}200 + \$135Q$$
$$\$480Q = \$1{,}747{,}200$$
$$Q = 3{,}640$$

[6] The reverse situation, where production is lower than the breakeven sales quantity, is not possible unless the firm has opening inventory. In that case, provided the variable manufacturing cost per unit and the fixed manufacturing cost rate are constant over time, the breakeven formula given is still valid.

We next verify that production of 5,280 units and sales of 3,640 units will lead Stassen to breakeven under absorption costing:

Revenues, $1,000 × 3,640 units		$3,640,000
Cost of goods sold:		
Cost of goods sold at standard cost, $335 × 3,640 units	$1,219,400	
Production-volume variance, $135 × (8,000 – 5,280) units	367,200 U	1,586,600
Gross margin		2,053,400
Marketing costs:		
Variable marketing costs, $185 × 3,640 units	673,400	
Fixed marketing costs	1,380,000	2,053,400
Operating income		$ 0

The breakeven point under absorption costing depends on (1) fixed manufacturing costs, (2) fixed operating (marketing) costs, (3) contribution margin per unit, (4) unit level of production, and (5) the capacity level chosen as the denominator to set the fixed manufacturing cost rate. For Stassen in 2012, a combination of 3,640 units sold, fixed manufacturing costs of $1,080,000, fixed marketing costs of $1,380,000, contribution margin per unit of $615, an 8,000-unit denominator level, and production of 5,280 units would result in an operating income of $0. *Note, however, that there are many combinations of these five factors that would give an operating income of $0.* For example, holding all other factors constant, a combination of 6,240 units produced and 3,370 units sold also results in an operating income of $0 under absorption costing. We provide verification of this alternative breakeven point next:

Revenues, $1,000 × 3,370 units		$3,370,000
Cost of goods sold:		
Cost of goods sold at standard cost, $335 × 3,370 units	$1,128,950	
Production-volume variance, $135 × (8,000 – 6,240) units	237,600 U	1,366,550
Gross margin		2,003,450
Marketing costs:		
Variable marketing costs, $185 × 3,370 units	623,450	
Fixed marketing costs	1,380,000	2,003,450
Operating income		$ 0

Suppose actual production in 2012 was equal to the denominator level, 8,000 units, and there were no units sold and no fixed marketing costs. All the units produced would be placed in inventory, so all the fixed manufacturing costs would be included in inventory. There would be no production-volume variance. Under these conditions, the company could break even under absorption costing with no sales whatsoever! In contrast, under variable costing, the operating loss would be equal to the fixed manufacturing costs of $1,080,000.

Terms to Learn

This chapter and the Glossary at the end of the book contain definitions of the following important terms:

absorption costing (**p. 302**)
direct costing (**p. 302**)
downward demand spiral (**p. 317**)
master-budget capacity utilization (**p. 315**)
normal capacity utilization (**p. 315**)
practical capacity (**p. 315**)
super-variable costing (**p. 312**)
theoretical capacity (**p. 314**)
throughput costing (**p. 312**)
variable costing (**p. 301**)

Assignment Material

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Questions

9-1 Differences in operating income between variable costing and absorption costing are due solely to accounting for fixed costs. Do you agree? Explain.

9-2 Why is the term *direct costing* a misnomer?

9-3 Do companies in either the service sector or the merchandising sector make choices about absorption costing versus variable costing?

9-4 Explain the main conceptual issue under variable costing and absorption costing regarding the timing for the release of fixed manufacturing overhead as expense.

9-5 "Companies that make no variable-cost/fixed-cost distinctions must use absorption costing, and those that do make variable-cost/fixed-cost distinctions must use variable costing." Do you agree? Explain.

9-6 The main trouble with variable costing is that it ignores the increasing importance of fixed costs in manufacturing companies. Do you agree? Why?

9-7 Give an example of how, under absorption costing, operating income could fall even though the unit sales level rises.

9-8 What are the factors that affect the breakeven point under (a) variable costing and (b) absorption costing?

9-9 Critics of absorption costing have increasingly emphasized its potential for leading to undesirable incentives for managers. Give an example.

9-10 What are two ways of reducing the negative aspects associated with using absorption costing to evaluate the performance of a plant manager?

9-11 What denominator-level capacity concepts emphasize the output a plant can supply? What denominator-level capacity concepts emphasize the output customers demand for products produced by a plant?

9-12 Describe the downward demand spiral and its implications for pricing decisions.

9-13 Will the financial statements of a company always differ when different choices at the start of the accounting period are made regarding the denominator-level capacity concept?

9-14 What is the IRS's requirement for tax reporting regarding the choice of a denominator-level capacity concept?

9-15 "The difference between practical capacity and master-budget capacity utilization is the best measure of management's ability to balance the costs of having too much capacity and having too little capacity." Do you agree? Explain.

Exercises

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9-16 **Variable and absorption costing, explaining operating-income differences.** Nascar Motors assembles and sells motor vehicles and uses standard costing. Actual data relating to April and May 2011 are as follows:

	A	B	C	D
1		**April**		**May**
2	Unit data			
3	Beginning inventory	0		150
4	Production	500		400
5	Sales	350		520
6	Variable costs			
7	Manufacturing cost per unit produced	$ 10,000		$ 10,000
8	Operating (marketing) cost per unit sold	3,000		3,000
9	Fixed costs			
10	Manufacturing costs	$2,000,000		$2,000,000
11	Operating (marketing) costs	600,000		600,000

The selling price per vehicle is $24,000. The budgeted level of production used to calculate the budgeted fixed manufacturing cost per unit is 500 units. There are no price, efficiency, or spending variances. Any production-volume variance is written off to cost of goods sold in the month in which it occurs.

Required

1. Prepare April and May 2011 income statements for Nascar Motors under (a) variable costing and (b) absorption costing.
2. Prepare a numerical reconciliation and explanation of the difference between operating income for each month under variable costing and absorption costing.

9-17 **Throughput costing (continuation of 9-16).** The variable manufacturing costs per unit of Nascar Motors are as follows:

	A	B	C
1		**April**	**May**
7	Direct material cost per unit	$6,700	$6,700
8	Direct manufacturing labor cost per unit	1,500	1,500
9	Manufacturing overhead cost per unit	1,800	1,800

Required

1. Prepare income statements for Nascar Motors in April and May of 2011 under throughput costing.
2. Contrast the results in requirement 1 with those in requirement 1 of Exercise 9-16.
3. Give one motivation for Nascar Motors to adopt throughput costing.

9-18 Variable and absorption costing, explaining operating-income differences. BigScreen Corporation manufactures and sells 50-inch television sets and uses standard costing. Actual data relating to January, February, and March of 2012 are as follows:

	January	February	March
Unit data			
Beginning inventory	0	300	300
Production	1,000	800	1,250
Sales	700	800	1,500
Variable costs			
Manufacturing cost per unit produced	$ 900	$ 900	$ 900
Operating (marketing) cost per unit sold	$ 600	$ 600	$ 600
Fixed costs			
Manufacturing costs	$400,000	$400,000	$400,000
Operating (marketing) costs	$140,000	$140,000	$140,000

The selling price per unit is $2,500. The budgeted level of production used to calculate the budgeted fixed manufacturing cost per unit is 1,000 units. There are no price, efficiency, or spending variances. Any production-volume variance is written off to cost of goods sold in the month in which it occurs.

Required

1. Prepare income statements for BigScreen in January, February, and March of 2012 under (a) variable costing and (b) absorption costing.
2. Explain the difference in operating income for January, February, and March under variable costing and absorption costing.

9-19 Throughput costing (continuation of 9-18). The variable manufacturing costs per unit of BigScreen Corporation are as follows:

	January	February	March
Direct material cost per unit	$500	$500	$500
Direct manufacturing labor cost per unit	100	100	100
Manufacturing overhead cost per unit	300	300	300
	$900	$900	$900

Required

1. Prepare income statements for BigScreen in January, February, and March of 2012 under throughput costing.
2. Contrast the results in requirement 1 with those in requirement 1 of Exercise 9-18.
3. Give one motivation for BigScreen to adopt throughput costing.

9-20 Variable versus absorption costing. The Zwatch Company manufactures trendy, high-quality moderately priced watches. As Zwatch's senior financial analyst, you are asked to recommend a method of inventory costing. The CFO will use your recommendation to prepare Zwatch's 2012 income statement. The following data are for the year ended December 31, 2012:

Beginning inventory, January 1, 2012	85,000 units
Ending inventory, December 31, 2012	34,500 units
2012 sales	345,400 units
Selling price (to distributor)	$22.00 per unit
Variable manufacturing cost per unit, including direct materials	$5.10 per unit
Variable operating (marketing) cost per unit sold	$1.10 per unit sold
Fixed manufacturing costs	$1,440,000
Denominator-level machine-hours	6,000
Standard production rate	50 units per machine-hour
Fixed operating (marketing) costs	$1,080,000

Assume standard costs per unit are the same for units in beginning inventory and units produced during the year. Also, assume no price, spending, or efficiency variances. Any production-volume variance is written off to cost of goods sold in the month in which it occurs.

Required

1. Prepare income statements under variable and absorption costing for the year ended December 31, 2012.
2. What is Zwatch's operating income as percentage of revenues under each costing method?
3. Explain the difference in operating income between the two methods.
4. Which costing method would you recommend to the CFO? Why?

9-21 Absorption and variable costing. (CMA) Osawa, Inc., planned and actually manufactured 200,000 units of its single product in 2012, its first year of operation. Variable manufacturing cost was $20 per unit produced. Variable operating (nonmanufacturing) cost was $10 per unit sold. Planned and actual fixed manufacturing costs were $600,000. Planned and actual fixed operating (nonmanufacturing) costs totaled $400,000. Osawa sold 120,000 units of product at $40 per unit.

Required

1. Osawa's 2012 operating income using absorption costing is (a) $440,000, (b) $200,000, (c) $600,000, (d) $840,000, or (e) none of these. Show supporting calculations.
2. Osawa's 2012 operating income using variable costing is (a) $800,000, (b) $440,000, (c) $200,000, (d) $600,000, or (e) none of these. Show supporting calculations.

9-22 Absorption versus variable costing. Grunewald Company manufacturers a professional grade vacuum cleaner and began operations in 2011. For 2011, Grunewald budgeted to produce and sell 20,000 units. The company had no price, spending, or efficiency variances, and writes off production-volume variance to cost of goods sold. Actual data for 2011 are given as follows:

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	A	B
1	Units produced	18,000
2	Units sold	17,500
3	Selling price	$ 425
4	Variable costs:	
5	Manufacturing cost per unit produced	
6	Direct materials	$ 30
7	Direct manufacturing labor	25
8	Manufacturing overhead	60
9	Marketing cost per unit sold	45
10	Fixed costs:	
11	Manufacturing costs	$1,100,000
12	Administrative costs	965,450
13	Marketing	1,366,400

Required

1. Prepare a 2011 income statement for Grunewald Company using variable costing.
2. Prepare a 2011 income statement for Grunewald Company using absorption costing.
3. Explain the differences in operating incomes obtained in requirement 1 and requirement 2.
4. Grunewald's management is considering implementing a bonus for the supervisors based on gross margin under absorption costing. What incentives will this create for the supervisors? What modifications could Grunewald management make to improve such a plan? Explain briefly.

9-23 Comparison of actual-costing methods. The Rehe Company sells its razors at $3 per unit. The company uses a first-in, first-out actual costing system. A fixed manufacturing cost rate is computed at the end of each year by dividing the actual fixed manufacturing costs by the actual production units. The following data are related to its first two years of operation:

	2011	2012
Sales	1,000 units	1,200 units
Production	1,400 units	1,000 units
Costs:		
Variable manufacturing	$ 700	$ 500
Fixed manufacturing	700	700
Variable operating (marketing)	1,000	1,200
Fixed operating (marketing)	400	400

Required

1. Prepare income statements based on variable costing for each of the two years.
2. Prepare income statements based on absorption costing for each of the two years.
3. Prepare a numerical reconciliation and explanation of the difference between operating income for each year under absorption costing and variable costing.
4. Critics have claimed that a widely used accounting system has led to undesirable buildups of inventory levels. (a) Is variable costing or absorption costing more likely to lead to such buildups? Why? (b) What can be done to counteract undesirable inventory buildups?

9-24 Variable and absorption costing, sales, and operating-income changes. Helmetsmart, a three-year-old company, has been producing and selling a single type of bicycle helmet. Helmetsmart uses standard costing. After reviewing the income statements for the first three years, Stuart Weil, president of Helmetsmart, commented, "I was told by our accountants—and in fact, I have memorized—that our breakeven volume is 49,000 units. I was happy that we reached that sales goal in each of our first two years. But, here's the strange thing: In our first year, we sold 49,000 units and indeed we broke even. Then, in our second year we sold the same volume and had a positive operating income. I didn't complain, of course . . . but here's the bad part. In our third year, we *sold 20% more* helmets, but our *operating income fell by more than 80%* relative to the second year! We didn't change our selling price or cost structure over the past three years and have no price, efficiency, or spending variances . . . so what's going on?!"

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	A	B	C	D
1	**Absorption Costing**			
2		**2011**	**2012**	**2013**
3	Sales (units)	49,000	49,000	58,800
4	Revenues	$1,960,000	$1,960,000	$2,352,000
5	Cost of goods sold			
6	Beginning inventory	0	0	352,800
7	Production	1,764,000	2,116,800	1,764,000
8	Available for sale	1,764,000	2,116,800	2,116,800
9	Deduct ending inventory	0	(352,800)	0
10	Adjustment for production-volume variance	0	(215,600)	0
11	Cost of goods sold	1,764,000	1,548,400	2,116,800
12	Gross margin	196,000	411,600	235,200
13	Selling and administrative expenses (all fixed)	196,000	196,000	196,000
14	Operating income	$ 0	$ 215,600	$ 39,200
15				
16	Beginning inventory	0	0	9,800
17	Production (units)	49,000	58,800	49,000
18	Sales (units)	49,000	49,000	58,800
19	Ending inventory	0	9,800	0
20	Variable manufacturing cost per unit	$ 14	$ 14	$ 14
21	Fixed manufacturing overhead costs	$1,078,000	$1,078,000	$1,078,000
22	Fixed manuf. costs allocated per unit produced	$ 22	$ 22	$ 22

Required

1. What denominator level is Helmetsmart using to allocate fixed manufacturing costs to the bicycle helmets? How is Helmetsmart disposing of any favorable or unfavorable production-volume variance at the end of the year? Explain your answer briefly.
2. How did Helmetsmart's accountants arrive at the breakeven volume of 49,000 units?
3. Prepare a variable costing-based income statement for each year. Explain the variation in variable costing operating income for each year based on contribution margin per unit and sales volume.
4. Reconcile the operating incomes under variable costing and absorption costing for each year, and use this information to explain to Stuart Weil the positive operating income in 2012 and the drop in operating income in 2013.

9-25 Capacity management, denominator-level capacity concepts. Match each of the following items with one or more of the denominator-level capacity concepts by putting the appropriate letter(s) by each item:

a. Theoretical capacity
b. Practical capacity
c. Normal capacity utilization
d. Master-budget capacity utilization

1. Measures the denominator level in terms of what a plant can supply
2. Is based on producing at full efficiency all the time
3. Represents the expected level of capacity utilization for the next budget period
4. Measures the denominator level in terms of demand for the output of the plant
5. Takes into account seasonal, cyclical, and trend factors
6. Should be used for performance evaluation in the current year
7. Represents an ideal benchmark
8. Highlights the cost of capacity acquired but not used
9. Should be used for long-term pricing purposes
10. Hides the cost of capacity acquired but not used
11. If used as the denominator-level concept, would avoid the restatement of unit costs when expected demand levels change

9-26 Denominator-level problem. Thunder Bolt, Inc., is a manufacturer of the very popular G36 motorcycles. The management at Thunder Bolt has recently adopted absorption costing and is debating which denominator-level concept to use. The G36 motorcycles sell for an average price of $8,200. Budgeted fixed manufacturing overhead costs for 2012 are estimated at $6,480,000. Thunder Bolt, Inc., uses subassembly operators that provide component parts. The following are the denominator-level options that management has been considering:

a. Theoretical capacity—based on three shifts, completion of five motorcycles per shift, and a 360-day year—$3 \times 5 \times 360 = 5{,}400$.
b. Practical capacity—theoretical capacity adjusted for unavoidable interruptions, breakdowns, and so forth—$3 \times 4 \times 320 = 3{,}840$.
c. Normal capacity utilization—estimated at 3,240 units.
d. Master-budget capacity utilization—the strengthening stock market and the growing popularity of motorcycles have prompted the marketing department to issue an estimate for 2012 of 3,600 units.

Required

1. Calculate the budgeted fixed manufacturing overhead cost rates under the four denominator-level concepts.
2. What are the benefits to Thunder Bolt, Inc., of using either theoretical capacity or practical capacity?
3. Under a cost-based pricing system, what are the negative aspects of a master-budget denominator level? What are the positive aspects?

9-27 Variable and absorption costing and breakeven points. Mega-Air, Inc., manufactures a specialized snowboard made for the advanced snowboarder. Mega-Air began 2011 with an inventory of 240 snowboards. During the year, it produced 900 boards and sold 995 for $750 each. Fixed production costs were $280,000 and variable production costs were $335 per unit. Fixed advertising, marketing, and other general and administrative expenses were $112,000 and variable shipping costs were $15 per board. Assume that the cost of each unit in beginning inventory is equal to 2011 inventory cost.

Required

1. Prepare an income statement assuming Mega-Air uses variable costing.
2. Prepare an income statement assuming Mega-Air uses absorption costing. Mega-Air uses a denominator level of 1,000 units. Production-volume variances are written off to cost of goods sold.
3. Compute the breakeven point in units sold assuming Mega-Air uses the following:
   a. Variable costing
   b. Absorption costing (Production = 900 boards)
4. Provide proof of your preceding breakeven calculations.
5. Assume that $20,000 of fixed administrative costs were reclassified as fixed production costs. Would this change affect breakeven point using variable costing? What if absorption costing were used? Explain.
6. The company that supplies Mega-Air with its specialized impact-resistant material has announced a price increase of $25 for each board. What effect would this have on the breakeven points previously calculated?

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Problems

9-28 Variable costing versus absorption costing. The Mavis Company uses an absorption-costing system based on standard costs. Total variable manufacturing cost, including direct material cost, is $3 per unit; the standard production rate is 10 units per machine-hour. Total budgeted and actual fixed manufacturing overhead costs are $420,000. Fixed manufacturing overhead is allocated at $7 per machine-hour ($420,000 ÷ 60,000 machine-hours of denominator level). Selling price is $5 per unit. Variable operating (nonmanufacturing) cost, which is driven by units sold, is $1 per unit. Fixed operating (nonmanufacturing) costs are $120,000. Beginning inventory in 2012 is 30,000 units; ending inventory is 40,000 units. Sales in 2012 are 540,000 units. The same standard unit costs persisted throughout 2011 and 2012. For simplicity, assume that there are no price, spending, or efficiency variances.

Required

1. Prepare an income statement for 2012 assuming that the production-volume variance is written off at year-end as an adjustment to cost of goods sold.
2. The president has heard about variable costing. She asks you to recast the 2012 statement as it would appear under variable costing.
3. Explain the difference in operating income as calculated in requirements 1 and 2.
4. Graph how fixed manufacturing overhead is accounted for under absorption costing. That is, there will be two lines: one for the budgeted fixed manufacturing overhead (which is equal to the actual fixed manufacturing overhead in this case) and one for the fixed manufacturing overhead allocated. Show how the production-volume variance might be indicated in the graph.
5. Critics have claimed that a widely used accounting system has led to undesirable buildups of inventory levels. (a) Is variable costing or absorption costing more likely to lead to such buildups? Why? (b) What can be done to counteract undesirable inventory buildups?

9-29 Variable costing and absorption costing, the All-Fixed Company. (R. Marple, adapted) It is the end of 2011. The All-Fixed Company began operations in January 2010. The company is so named because it has no variable costs. All its costs are fixed; they do not vary with output.

The All-Fixed Company is located on the bank of a river and has its own hydroelectric plant to supply power, light, and heat. The company manufactures a synthetic fertilizer from air and river water and sells its product at a price that is not expected to change. It has a small staff of employees, all paid fixed annual salaries. The output of the plant can be increased or decreased by adjusting a few dials on a control panel.

The following budgeted and actual data are for the operations of the All-Fixed Company. All-Fixed uses budgeted production as the denominator level and writes off any production-volume variance to cost of goods sold.

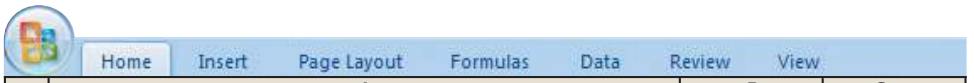
	2010	2011[a]
Sales	20,000 tons	20,000 tons
Production	40,000 tons	0 tons
Selling price	$ 20 per ton	$ 20 per ton
Costs (all fixed):		
Manufacturing	$320,000	$320,000
Operating (nonmanufacturing)	$ 60,000	$ 60,000

[a] Management adopted the policy, effective January 1, 2011, of producing only as much product as needed to fill sales orders. During 2011, sales were the same as for 2010 and were filled entirely from inventory at the start of 2011.

Required

1. Prepare income statements with one column for 2010, one column for 2011, and one column for the two years together, using (a) variable costing and (b) absorption costing.
2. What is the breakeven point under (a) variable costing and (b) absorption costing?
3. What inventory costs would be carried in the balance sheet on December 31, 2010 and 2011, under each method?
4. Assume that the performance of the top manager of the company is evaluated and rewarded largely on the basis of reported operating income. Which costing method would the manager prefer? Why?

9-30 Comparison of variable costing and absorption costing. Hinkle Company uses standard costing. Tim Bartina, the new president of Hinkle Company, is presented with the following data for 2012:



	A	B	C
1	**Hinkle Company**		
2	**Income Statements for the Year Ended December 31, 2012**		
3		**Variable**	**Absorption**
4		**Costing**	**Costing**
5	Revenues	$9,000,000	$9,000,000
6	Cost of goods sold (at standard costs)	4,680,000	5,860,000
7	Fixed manufacturing overhead (budgeted)	1,200,000	-
8	Fixed manufacturing overhead variances (all unfavorable):		
9	Spending	100,000	100,000
10	Production volume	-	400,000
11	Total marketing and administrative costs (all fixed)	1,500,000	1,500,000
12	Total costs	7,480,000	7,860,000
13	Operating income	$1,520,000	$1,140,000
14			
15	Inventories (at standard costs)		
16	December 31, 2011	$1,200,000	$1,720,000
17	December 31, 2012	66,000	206,000

Required

1. At what percentage of denominator level was the plant operating during 2012?
2. How much fixed manufacturing overhead was included in the 2011 and the 2012 ending inventory under absorption costing?
3. Reconcile and explain the difference in 2012 operating incomes under variable and absorption costing.
4. Tim Bartina is concerned: He notes that despite an increase in sales over 2011, 2012 operating income has actually declined under absorption costing. Explain how this occurred.

9-31 Effects of differing production levels on absorption costing income: Metrics to minimize inventory buildups. University Press produces textbooks for college courses. The company recently hired a new editor, Leslie White, to handle production and sales of books for an introduction to accounting course. Leslie's compensation depends on the gross margin associated with sales of this book. Leslie needs to decide how many copies of the book to produce. The following information is available for the fall semester 2011:

Estimated sales	20,000 books
Beginning inventory	0 books
Average selling price	$80 per book
Variable production costs	$50 per book
Fixed production costs	$400,000 per semester

The fixed cost allocation rate is based on expected sales and is therefore equal to $400,000/20,000 books = $20 per book

Leslie has decided to produce either 20,000, 24,000, or 30,000 books.

Required

1. Calculate expected gross margin if Leslie produces 20,000, 24,000, or 30,000 books. (Make sure you include the production-volume variance as part of cost of goods sold.)
2. Calculate ending inventory in units and in dollars for each production level.

3. Managers who are paid a bonus that is a function of gross margin may be inspired to produce a product in excess of demand to maximize their own bonus. The chapter suggested metrics to discourage managers from producing products in excess of demand. Do you think the following metrics will accomplish this objective? Show your work.
   a. Incorporate a charge of 10% of the cost of the ending inventory as an expense for evaluating the manager.
   b. Include nonfinancial measures (such as the ones recommended on p. 311) when evaluating management and rewarding performance.

9-32 Alternative denominator-level capacity concepts, effect on operating income. Lucky Lager has just purchased the Austin Brewery. The brewery is two years old and uses absorption costing. It will "sell" its product to Lucky Lager at $45 per barrel. Paul Brandon, Lucky Lager's controller, obtains the following information about Austin Brewery's capacity and budgeted fixed manufacturing costs for 2012:

Home Insert Page Layout Formulas Data Review View

	A	B	C	D	E
1		Budgeted Fixed	Days of	Hours of	
2	Denominator-Level	Manufacturing	Production	Production	Barrels
3	Capacity Concept	Overhead per Period	per Period	per Day	per Hour
4	Theoretical capacity	$28,000,000	360	24	540
5	Practical capacity	$28,000,000	350	20	500
6	Normal capacity utilization	$28,000,000	350	20	400
7	Master-budget capacity for each half year				
8	(a) January–June 2012	$14,000,000	175	20	320
9	(b) July–December 2012	$14,000,000	175	20	480

Required

1. Compute the budgeted fixed manufacturing overhead rate per barrel for each of the denominator-level capacity concepts. Explain why they are different.
2. In 2012, the Austin Brewery reported these production results:

Home Insert Page Layout Formulas Data

	A	B
12	Beginning inventory in barrels, 1-1-2012	0
13	Production in barrels	2,600,000
14	Ending inventory in barrels, 12-31-2012	200,000
15	Actual variable manufacturing costs	$78,520,000
16	Actual fixed manufacturing overhead costs	$27,088,000

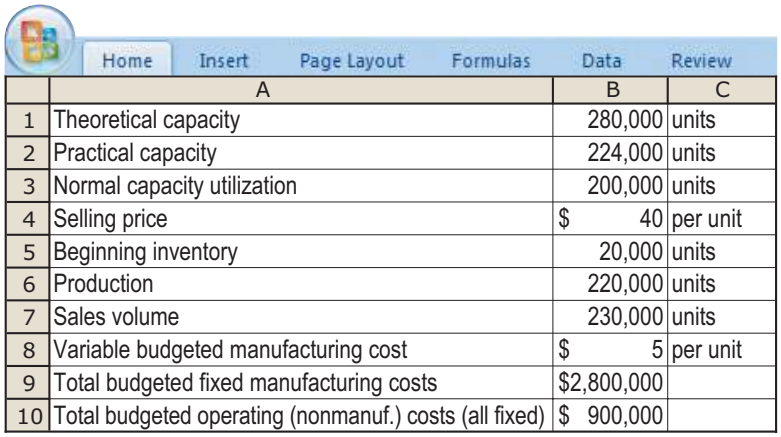
There are no variable cost variances. Fixed manufacturing overhead cost variances are written off to cost of goods sold in the period in which they occur. Compute the Austin Brewery's operating income when the denominator-level capacity is (a) theoretical capacity, (b) practical capacity, and (c) normal capacity utilization.

9-33 Motivational considerations in denominator-level capacity selection (continuation of 9-32).

Required

1. If the plant manager of the Austin Brewery gets a bonus based on operating income, which denominator-level capacity concept would he prefer to use? Explain.
2. What denominator-level capacity concept would Lucky Lager prefer to use for U.S. income-tax reporting? Explain.
3. How might the IRS limit the flexibility of an absorption-costing company like Lucky Lager attempting to minimize its taxable income?

9-34 Denominator-level choices, changes in inventory levels, effect on operating income. Koshu Corporation is a manufacturer of computer accessories. It uses absorption costing based on standard costs and reports the following data for 2011:



	A	B	C
1	Theoretical capacity	280,000	units
2	Practical capacity	224,000	units
3	Normal capacity utilization	200,000	units
4	Selling price	$ 40	per unit
5	Beginning inventory	20,000	units
6	Production	220,000	units
7	Sales volume	230,000	units
8	Variable budgeted manufacturing cost	$ 5	per unit
9	Total budgeted fixed manufacturing costs	$2,800,000	
10	Total budgeted operating (nonmanuf.) costs (all fixed)	$ 900,000	

There are no price, spending, or efficiency variances. Actual operating costs equal budgeted operating costs. The production-volume variance is written off to cost of goods sold. For each choice of denominator level, the budgeted production cost per unit is also the cost per unit of beginning inventory.

Required

1. What is the production-volume variance in 2011 when the denominator level is (a) theoretical capacity, (b) practical capacity, and (c) normal capacity utilization?
2. Prepare absorption costing–based income statements for Koshu Corporation using theoretical capacity, practical capacity, and normal capacity utilization as the denominator levels.
3. Why is the operating income under normal capacity utilization lower than the other two scenarios?
4. Reconcile the difference in operating income based on theoretical capacity and practical capacity with the difference in fixed manufacturing overhead included in inventory.

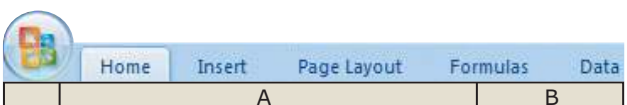
9-35 Effects of denominator-level choice. Carlisle Company is a manufacturer of precision surgical tools. It initiated standard costing and a flexible budget on January 1, 2011. The company president, Monica Carlisle, has been pondering how fixed manufacturing overhead should be allocated to products. Machine-hours have been chosen as the allocation base. Her remaining uncertainty is the denominator level for machine-hours. She decides to wait for the first month's results before making a final choice of what denominator level should be used from that day forward.

During January 2011, the actual units of output had a standard of 37,680 machine-hours allowed. The fixed manufacturing overhead spending variance was $6,000, favorable. If the company used practical capacity as the denominator level, the production-volume variance would be $12,200, unfavorable. If the company used normal capacity utilization as the denominator level, the production-volume variance would be $2,400, unfavorable. Budgeted fixed manufacturing overhead was $96,600 for the month.

Required

1. Compute the denominator level, assuming that the normal-capacity-utilization concept is chosen.
2. Compute the denominator level, assuming that the practical-capacity concept is chosen.
3. Suppose you are the executive vice president. You want to maximize your 2011 bonus, which depends on 2011 operating income. Assume that the production-volume variance is written off to cost of goods sold at year-end, and assume that the company expects inventories to increase during the year. Which denominator level would you favor? Why?

9-36 Downward demand spiral. Spirelli Company is about to enter the highly competitive personal electronics market with a new optical reader. In anticipation of future growth, the company has leased a large manufacturing facility, and has purchased several expensive pieces of equipment. In 2011, the company's first year, Spirelli budgets for production and sales of 25,000 units, compared with its practical capacity of 50,000. The company's cost data follow:



	A	B
1	Variable manufacturing costs per unit:	
2	Direct materials	$ 24
3	Direct manufacturing labor	36
4	Manufacturing overhead	12
5	Fixed manufacturing overhead	$700,000

Required

1. Assume that Spirelli uses absorption costing, and uses budgeted units produced as the denominator for calculating its fixed manufacturing overhead rate. Selling price is set at 120% of manufacturing cost. Compute Spirelli's selling price.
2. Spirelli enters the market with the selling price computed previously. However, despite growth in the overall market, sales are not as robust as had been expected, and a competitor has priced its product $15 lower than Spirelli's. Enrico Spirelli, the company's president, insists that the competitor must be pricing its product at a loss, and that the competitor will be unable to sustain that. In response, Spirelli makes no price adjustments, but budgets production and sales for 2012 at 22,000 units. Variable and fixed costs are not expected to change. Compute Spirelli's new selling price. Comment on how Spirelli's choice of budgeted production affected its selling price and competitive position.
3. Recompute the selling price using practical capacity as the denominator level of activity. How would this choice have affected Spirelli's position in the marketplace? Generally, how would this choice affect the production-volume variance?

9-37 Absorption costing and production-volume variance—alternative capacity bases. Earth's Best Light (EBL), a producer of energy-efficient light bulbs, expects that demand will increase markedly over the next decade. Due to the high fixed costs involved in the business, EBL has decided to evaluate its financial performance using absorption costing income. The production-volume variance is written off to cost of goods sold. The variable cost of production is $2.70 per bulb. Fixed manufacturing costs are $1,015,000 per year. Variable and fixed selling and administrative expenses are $0.40 per bulb sold and $200,000, respectively. Because its light bulbs are currently popular with environmentally-conscious customers, EBL can sell the bulbs for $9.60 each.

EBL is deciding among various concepts of capacity for calculating the cost of each unit produced. Its choices are as follows:

Theoretical capacity	725,000 bulbs
Practical capacity	406,000 bulbs
Normal capacity	290,000 bulbs (average expected output for the next three years)
Master budget capacity	175,000 bulbs expected production this year

Required

1. Calculate the inventoriable cost per unit using each level of capacity to compute fixed manufacturing cost per unit.
2. Suppose EBL actually produces 250,000 bulbs. Calculate the production-volume variance using each level of capacity to compute the fixed manufacturing overhead allocation rate.
3. Assume EBL has no beginning inventory. If this year's actual sales are 175,000 bulbs, calculate operating income for EBL using each type of capacity to compute fixed manufacturing cost per unit.

9-38 Operating income effects of denominator-level choice and disposal of production-volume variance (continuation of 9-37).

Required

1. If EBL sells all 250,000 bulbs produced, what would be the effect on operating income of using each type of capacity as a basis for calculating manufacturing cost per unit?
2. Compare the results of operating income at different capacity levels when 175,000 bulbs are sold and when 250,000 bulbs are sold. What conclusion can you draw from the comparison?
3. Using the original data (that is, 250,000 units produced and 175,000 units sold) if EBL had used the proration approach to allocate the production-volume variance, what would operating income have been under each level of capacity? (Assume that there is no ending work in process.)

9-39 Cost allocation, downward demand spiral. Cayzer Associates operates a chain of 10 hospitals in the Los Angeles area. Its central food-catering facility, Mealman, prepares and delivers meals to the hospitals. It has the capacity to deliver up to 1,300,000 meals a year. In 2012, based on estimates from each hospital controller, Mealman budgeted for 975,000 meals a year. Budgeted fixed costs in 2012 were $1,521,000. Each hospital was charged $6.46 per meal—$4.90 variable costs plus $1.56 allocated budgeted fixed cost.

Recently, the hospitals have been complaining about the quality of Mealman's meals and their rising costs. In mid-2012, Cayzer's president announces that all Cayzer hospitals and support facilities will be run as profit centers. Hospitals will be free to purchase quality-certified services from outside the system. Ron Smith, Mealman's controller, is preparing the 2013 budget. He hears that three hospitals have decided to use outside suppliers for their meals; this will reduce the 2013 estimated demand to 780,000 meals. No change in variable cost per meal or total fixed costs is expected in 2013.

Required

1. How did Smith calculate the budgeted fixed cost per meal of $1.56 in 2012?
2. Using the same approach to calculating budgeted fixed cost per meal and pricing as in 2012, how much would hospitals be charged for each Mealman meal in 2013? What would their reaction be?
3. Suggest an alternative cost-based price per meal that Smith might propose and that might be more acceptable to the hospitals. What can Mealman and Smith do to make this price profitable in the long run?

9-40 Cost allocation, responsibility accounting, ethics (continuation of 9-39). In 2013, only 760,500 Mealman meals were produced and sold to the hospitals. Smith suspects that hospital controllers had systematically inflated their 2013 meal estimates.

Required

1. Recall that Mealman uses the master-budget capacity utilization to allocate fixed costs and to price meals. What was the effect of production-volume variance on Mealman's operating income in 2013?
2. Why might hospital controllers deliberately overestimate their future meal counts?
3. What other evidence should Cayzer's president seek to investigate Smith's concerns?
4. Suggest two specific steps that Smith might take to reduce hospital controllers' incentives to inflate their estimated meal counts.

Collaborative Learning Problem

9-41 Absorption, variable, and throughput costing; performance evaluation. Mile-High Foods, Inc., was formed in March 2011 to provide prepackaged snack boxes for a new low cost regional airline beginning on April 1. The company has just leased warehouse space central to the two airports to store materials.

To move packaged materials from the warehouses to the airports, where final assembly will take place, Mile-High must choose whether to lease a delivery truck and pay a full-time driver at a fixed cost of $5,000 per month, or pay a delivery service a rate equivalent to $0.40 per box. This cost will be included in either fixed manufacturing overhead or variable manufacturing overhead, depending on which option is chosen. The company is hoping for rapid growth, as sales forecasts for the new airline are promising. However, it is essential that Mile-High managers carefully control costs in order to be compliant with their sales contract and remain profitable.

Ron Spencer, the company's president, is trying to determine whether to use absorption, variable, or throughput costing to evaluate the performance of company managers. For absorption costing, he intends to use the practical-capacity level of the facility, which is 20,000 boxes per month. Production-volume variances will be written off to cost of goods sold.

Costs for the three months are expected to remain unchanged. The costs and revenues for April, May, and June are expected to be as follows:

Sales revenue	$6.00 per box
Direct material cost	$1.20 per box
Direct manufacturing labor cost	$0.35 per box
Variable manufacturing overhead cost	$0.15 per box
Variable delivery cost (if this option is chosen)	$0.40 per box
Fixed delivery cost (if this option is chosen)	$5,000 per month
Fixed manufacturing overhead costs	$15,000 per month
Fixed administrative costs	$28,000 per month

Projected production and sales for each month follow. High production in May is the result of an anticipated surge in June employee vacations.

	Sales (in units)	Production
April	12,000	12,200
May	12,500	18,000
June	13,000	9,000
Total	37,500	39,200

Required

1. Compute operating income for April, May, and June under absorption costing, assuming that Mile-High opts to use
   a. the leased truck and salaried driver.
   b. the variable delivery service.
2. Compute operating income for April, May, and June under variable costing, assuming that Mile-High opts to use
   a. the leased truck and salaried driver.
   b. the variable delivery service.
3. Compute operating income for April, May, and June under throughput costing, assuming that Mile-High opts to use
   a. the leased truck and salaried driver.
   b. the variable delivery service.
4. Should Mile-High choose absorption, variable, or throughput costing for evaluating the performance of managers? Why? What advantages and disadvantages might there be in adopting throughput costing?
5. Should Mile-High opt for the leased truck and salaried driver or the variable delivery service? Explain briefly.