|  |  |
| --- | --- |
|  | **Inventory Costing and Capacity Analysis** |
|  |  |

**Transition Notes**

This chapter now has a single comprehensive example that integrates the two parts of the chapter. This helps relate inventory costing to the capacity level issues and should make it easier for the student to relate the two concepts. The section on regulatory requirements is now entitled “Tax Requirements.” Many end-of-chapter problems have been revised and some new ones introduced.

|  |
| --- |
| **Problem Material**  **Correlation Chart** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **15th Edition** | **14th**  **Edition** |  | **15th**  **Edition** | **14th**  **Edition** |
|  | 16 | 16 |  | 30 | 30 Revised |
|  | 17 | 17 |  | 31 | 31 Revised |
|  | 18 | 18 Revised |  | 32 | 32 Revised |
|  | 19 | 19 Revised |  | 33 | 33 Revised |
|  | 20 | 20 |  | 34 | 34 Revised |
|  | 21 | 21 |  | 35 | 35 Revised |
|  | 22 | 22 Revised |  | 36 | 36 Revised |
|  | 23 | 23 Revised |  | 37 | 37 Revised |
|  | 24 | 24 Revised |  | 38 | 38 Revised |
|  | 25 | 25 Revised |  | 39 | 39 Revised |
|  | 26 | 26 Revised |  | 40 | 40 Revised |
|  | 27 | 27 Revised |  | 41 | 41 Revised |
|  | 28 | 28 Revised |  | 42 New |  |
|  | 29 | 29 Revised |  |  |  |

**I. 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.
8. **CHAPTER SYNOPSIS**

This chapter focuses on two related concepts: variable costing, which is introduced and compared with absorption costing; and throughput, or super-variable costing. In the second part of the chapter, capacity concepts that can be used in absorption costing are presented. The use of these capacity concepts—theoretical, practical, normal, and master budget utilization—affect the cost per unit that is calculated for fixed costs.

**III. Points of Emphasis**

1. Students may not have been introduced to the term *absorption costing,* even though they have used it in previous courses. Help them understand how absorption costing and variable costing differ and why variable costing is preferable for decision-making purposes. Observe that a variable costing income statement classifies costs by behavior; an absorption statement classifies costs by character.
2. Emphasize that, although all variable costs are listed on the top portion of the income statement, only variable manufacturing costs are included in variable cost of goods sold.
3. Students may react to the extreme nature of throughput costing. Emphasize that it does not have to be the only costing system employed, and is a useful short-term management tool.
4. Students may have trouble thinking “outside the box” on capacity concepts. The “teaching point” demonstration in the chapter outline will help them realize that capacity may have many definitions and meanings.

**IV. CHAPTER OUTLINE**

|  |  |
| --- | --- |
| **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 | |
|  | |

* 1. **Variable costing** (also known as direct costing) is a method of inventory costing in which all variable manufacturing costs are included as inventoriable costs. All fixed manufacturing costs are excluded from inventoriable costs and are treated as costs of the period in which they are incurred.
  2. **Absorption costing** is a method of inventory costing in which all variable manufacturing costs and all fixed manufacturing costs are included as inventoriable costs. Thus, inventory “absorbs” all manufacturing costs. Absorption costing is the method required for Generally Accepted Accounting Principles for external financial reporting.

Teaching Point. Two observations can be made about variable and absorption costing. First, a variable costing income statement classifies cost based on behavior. An absorption costing income statement classifies cost based on character (manufacturing, selling, administrative).

Second, students frequently do not grasp the concept that not all variable costs are inventoriable—only variable manufacturing costs.

* 1. The main difference between the two is the treatment of fixed manufacturing costs.

Teaching point. At this stage it is helpful to prepare income statements illustrating the two approaches. Before the students can understand why the differences arise between the two, they must have a concept of how an income statement is prepared under both methods. Exercise 9-16 can be used for this purpose, saving the second part to explain why the differences arise.

**Refer to Quiz Question 1 Exercise 9-16 Part 1**

|  |  |
| --- | --- |
| **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 | |
|  | |

(Exhibit 9-2 is an illustration comparing income statements prepared under variable costing and absorption costing for a two-year period.)

* 1. In 2014, production exceeded sales. Because all fixed costs are expensed under variable costing, absorption costing shows a higher operating income. The difference of $270,000 represents fixed costs that are included in ending inventory under absorption costing.
  2. In 2015, sales exceed production, thus reducing inventory. Variable costing shows a higher operating income. The $202,500 difference represents the fixed costs in the change of inventory level ($135 fixed cost per unit × 1,500 unit reduction in inventory).

Teaching point. This concept is best covered through illustration. The more students see these effects, the more likely they are to grasp the concept.

**Refer to Quiz Questions 2, 3, and 4 Exercise 9-16 Part 2, 9-18**

|  |  |
| --- | --- |
| **LEARNING**  **OBJECTIVE** | 3 |
| Understand how absorption costing can provide undesirable incentives for mangers to build up inventory  … producing more units for inventory absorbs fixed manufacturing costs and increases operating income | |
|  | |

3.1 As has been observed, absorption costing is the required inventory method for external reporting in the United States and most other countries. Most companies also use absorption costing for internal accounting as well.

3.2 Companies use one method because it is seen as cost effective and less confusing for managers to deal with one common method for inventory reporting.

3.3 Using different inventory costing methods can lead to undesirable behavior on the part of managers seeking to enhance their performance evaluation, even to the detriment of the company.

3.4 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 advantages of both methods.

3.5 One motivation for an undesirable buildup of inventories could be due to the fact that a manager’s bonus is based on absorption-costing operating income (which increases as production increases).

(Exhibit 9-4 illustrates the effect on absorption-costing operating income at different levels of production.)

Teaching point. An extreme example will illustrate how producing in order to build up inventory can result in higher profits under absorption costing and a better performance evaluation for the manager. By over-producing, the manager increases his income, with no increase in the level of sales.

Production Equals Sales

Sales $10/unit × 1000 10,000

Cost of goods sold:

VC (1000 × 4) 4,000

FC 3,000

Mfg costs 7,000

Ending inventory -0-

Cost of goods sold 7,000

Gross profit 3,000

=====

Production Exceeds Sales

Sales $10/ units × 1,000 10,000

Cost of goods sold:

VC (2000 × 4) 8,000

FC 3,000

Mfg cost 11,000

Ending inventory \* 5,500

Cost of goods sold 5,500

Gross profit 5,500

=====

\*1/2 of manufacturing costs

3.6 Top management 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.
* Incorporate a *carrying charge* for inventory in the internal accounting system.
* Change the period to evaluate performance. Instead of quarterly or annual horizon, evaluate the manager over a three-to-five year period.
* Include nonfinancial as well as financial variables in the measures of performance evaluation.

**Refer to Quiz Question 5 Exercises 9-21 and 9-22**

|  |  |
| --- | --- |
| **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 | |
|  | |

4.1 Some managers take the view that only direct materials are truly variable and are the only costs that should be inventoried.

4.2 This approach is known as **throughput costing** or **super-variable costing.** It is an inventory valuation method in which only direct material costs are included in inventoriable costs. All other costs are period costs and expensed in the period incurred.

Teaching point. Students will be slow to accept such a seemingly radical departure from traditional costing methods. Illustrate that, in the very short run, many variable costs do behave as though they were fixed. For example, consider a restaurant. When a server comes on duty, that server will likely work until the end of the shift. Even though business may fluctuate and the server may not stay busy the entire time, the employer is on the hook for 8 hours pay. The employer cannot (from a practical standpoint) tell the employee to take an hour off because business is slow. Thus, the server’s wages for the day are in a very real sense, fixed.

4.3 **Throughput margin** is defined as revenues minus direct material cost of goods sold.

4.4 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 various inventory costing systems.)

Teaching point. This is a good place to revisit the definitions of actual, normal, and standard costing. Although these concepts are not difficult, they need to be brought into the discussion on occasion to reinforce the differences among the three.

4.5 Even though variable costing is not acceptable under GAAP, there are those who feel that it should be acceptable for external reporting purposes. Their argument is that fixed costs are more related to the capacity to produce rather than to actual production of specific units.

4.6 Those, supporting absorption costing maintain that inventories should contain a fixed cost component because both fixed and variable manufacturing costs are necessary to produce goods.

4.7 A key issue in absorption costing is the capacity level used to compute fixed costs per unit produced.

**Refer to Quiz Question 6 Exercises 9-17 and 9-19**

|  |  |
| --- | --- |
| **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 | |
|  | |

5.1 Determining the appropriate level of capacity is one of the most strategic and difficult decisions managers face. Too much capacity means incurring costs of unused capacity. Too little capacity means that demand may go unfilled.

5.2 Four different capacity levels are used to compute the budgeted fixed manufacturing cost rate. They are:

* Theoretical capacity
* Practical capacity
* Normal capacity utilization
* Master-budget capacity utilization

Teaching point. To get students to “think outside the box” about capacity, perform the following demonstration. Get a small glass jar. Ask a student to fill the jar with marbles. When the student has done so, ask if the jar is full. Normally, you will get a “yes” for an answer. Then pull out a box of salt. Ask another student to pour as much salt into the jar with marbles. Then ask “Now is the jar full?” At this point, you will get some weak “yeses” but the students don’t quite trust their answers. Then pull out a glass of water. Have a student pour water into the marbles and salt. Emphasize that capacity is not a hard number, but depends on many factors.

5.3 **Theoretical capacity** is the level of capacity based on producing at full efficiency all the time. This measure of capacity does not allow for plant maintenance, shutdowns, interruptions, or any other factors. Theoretical capacity may be achieved for short periods of time, but it cannot be sustained. Theoretical capacity represents an ideal goal of capacity utilization.

5.4 **Practical capacity** is the level of capacity that reduces theoretical capacity by considering unavoidable operating interruptions—scheduled maintenance or holidays, for example.

5.5 **Normal capacity** is the level of capacity utilization that satisfies average customer demand over a period of time—often two to three years (and includes seasonal, cyclical, and trend factors).

5.6 **Master-budget capacity utilization** is the level of capacity that managers expect for the current time period, typically one year.

5.7 Theoretical and practical capacity measure capacity in terms of what a plant can supply. Normal capacity and master-budget utilization measure capacity in terms of demand.

5.8 The capacity level chosen will affect the budgeted fixed overhead cost rate. As a lower capacity level is chosen, the fixed cost per unit increases.

The Stassen Company illustration demonstrates the effect of different capacity level choices on the fixed overhead rate.

**Refer to Quiz Question 7 Exercise 9-25**

|  |  |
| --- | --- |
| **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 | |
|  | |

6.1 One of the principles of cost accounting covered in an earlier chapter was “different costs for different purposes.” That principle applies as we seek to choose a capacity level for different purposes, including:

* Product costing and capacity management
* Pricing
* Performance evaluation
* External reporting
* Tax requirements

6.2 Theoretical capacity is rarely used to calculate budgeted fixed manufacturing cost per unit because it is significantly different from the “real” capacity available to a company.

6.3 Practical capacity is frequently used to calculate budgeted fixed manufacturing cost per unit. This approach sets the cost of capacity at the cost of supplying the capacity regardless of demand. Practical capacity, then, highlights the cost of capacity acquired but not used and may serve to direct managers’ attention toward more effective capacity management.

6.4 The **downward demand spiral** is the continuing reduction in demand that occurs when competitor prices are not met. As demand drops, unit costs become increasingly higher resulting in an increased reluctance to meet competitors’ prices.

Teaching point. The downward demand spiral and its effect on profits is best illustrated through an example such as is included in the text.

6.5 As the company increases prices to cover fixed costs, demand drops due to the higher price, resulting in another price increase to cover still higher per-unit costs.

6.6 Note that capacity costs also arise in nonmanufacturing parts of the value chain and must be appropriately dealt with by management. Failure to consider these may create unexpected losses.

6.7 In *performance evaluation,* managers must guard against using a long-run measure such as normal capacity usage for a short-run purpose such as annual bonuses. Master-budget utilization would be more effective in this situation.

6.8 For*external reporting* purposes, the choice of capacity measure will affect the magnitude of the production-volume variance. How this variance is disposed of at the end of the year will impact the company’s operating income.

* The **adjusted allocation-rate approach** restates all amounts in the ledgers using actual rather than budgeted cost rates. This has the effect of switching to actual costing at the end of the year.
* The **proration approach** spreads the variance among the accounts containing overhead—Work-in-Process, Finished Goods, and Cost of Goods Sold—in proportion to the balances in these accounts.
* The **write-off to cost-of-goods-sold approach** simply writes the balance of the variance off to cost of goods sold. This can be utilized when the balance is immaterial. This method also is the simplest to utilize.

Teaching point. A number of cost accountants use the write-off to cost-of-goods-sold approach with the belief that the balance to be written off must be very large before it becomes material. In a normal operating situation, a very large percentage of the balance will go to cost of goods sold, so it would take a huge balance to make a material difference between methods.

6.9 For tax reporting in the United States, the IRS requires companies to assign inventoriable indirect production costs by a method that fairly allocates costs among items produced. Practical capacity is permitted by the IRS as a method of calculating budgeted fixed manufacturing cost per month.

**Refer to Quiz Questions 8, 9, and 10 Exercise 9-24**

|  |  |
| --- | --- |
| **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 demand for installed capacity, the role of capacity-related issues in nonmanufacturing areas, and the possible use of ABC techniques in allocating capacity costs | |
|  | |

* 1. Per-unit costs are based on a single level of output. The uncertainty attached to estimating demand and therefore production affects the cost per unit, and may negatively affect other decisions.
  2. Fixed manufacturing costs, such as utilities, may be difficult to predict. This can also affect the determination of per-unit fixed cost amounts.
  3. If capacity isn’t attained in the manufacturing process, there may be excess capacity later in the value chain, such as with distribution.
  4. ABC uses multiple numerators and denominators to allocate costs. Most proponents suggest that managers base activity rate denominators on practical capacity.

**V. OTHER RESOURCES**

To download these and other resources, visit the Instructor’s Resource Center [*www.pearsonhighered.com*](http://www.pearsonhighered.com/).

The following exhibits were mentioned in this chapter of the Instructor’s Manual, and have been included in the **PowerPoint Lecture presentation** created specifically for this chapter. You may use the PowerPoint Lecture presentations “as is”, or modify them to suit your individual needs.

Exhibit 9-2 is an illustration comparing income statements prepared under variable costing and absorption costing for a two-year period.

Exhibit 9-4 illustrates the effect on absorption-costing operating income at different levels of production.

Exhibit 9-6 compares product costing under various inventory costing systems.

**CHAPTER 9 QUIZ**

1. The main difference between variable costing and absorption costing is
2. the treatment of nonmanufacturing costs.
3. the accounting for variable manufacturing costs.
4. the accounting for fixed manufacturing costs.
5. their value for decision makers.

**The following data apply to questions 2 and 3.**

Alvin Inc. planned and actually manufactured 200,000 units of its single product in 2008, its first year of operations. Variable manufacturing costs were $30 per unit of product. Planned and actual fixed manufacturing costs were $600,000, and marketing and administrative costs totaled $400,000 in 2004. Alvin sold 120,000 units of product in 2008 at a selling price of $40 per unit.

1. [CMA Adapted] Alvin’s 2008 operating income using variable costing is

a. $800,000.

b. $600,000.

c. $440,000.

d. $200,000.

1. [CMA Adapted] Alvin’s 2008 operating income using absorption costing is

a. $840,000.

b. $800,000.

c. $440,000.

d. $200,000.

1. [CPA Adapted] Operating income using variable costing as compared to absorption costing would be higher
2. when the quantity of beginning inventory equals the quantity of ending inventory.
3. when the quantity of beginning inventory is more than the quantity of ending inventory.
4. when the quantity of beginning inventory is less than the quantity of ending inventory.
5. under no circumstances.
6. Absorption costing enables managers to increase operating income in the short run by changing production schedules. Which statement is *true* regarding such action?
7. The reason for increased operating income is the deferral of fixed manufacturing overhead contained in unsold inventory.
8. A desirable effect of these changes in production is “cherry picking” the production line.
9. This is done through decreases in the production schedule as customer demand for product falls.
10. None of the above statements are true regarding the manager’s action to increase operating income through changes in the production schedule.
11. The proponents of throughput costing
12. maintain that variable costing undervalues inventories.
13. maintain that it provides more incentive to produce for inventory than do either variable or absorption costing.
14. argue that only direct materials and direct labor are “truly variable” and all indirect manufacturing costs be written off in the period in which they are incurred.
15. treat all costs except those related to variable direct materials as costs of the period in which they are incurred.
16. The absolute minimum absorption-inventory cost that would be reported under the best conceivable operating conditions is a description of which type of denominator-level concept cost?
17. Master-budget utilization
18. Practical capacity
19. Theoretical capacity
20. Normal utilization
21. Use of capacity levels based on demand
22. hides the amount of unused capacity.
23. highlights the cost of capacity acquired but not used.
24. yields a cost rate that does not include a charge for unused capacity.
25. results in a price that covers the cost of capacity customers expect to pay.
26. A company may experience the downward demand spiral when
27. the use of theoretical capacity as a denominator level has contributed to budgets that project sales to be higher than actually attainable.
28. spreading capacity costs over a small number of units and setting selling prices even higher to recover those costs.
29. engaged in a cyclical business and after experiencing an upturn.
30. the production-volume variance is unfavorable each time period during a year.
31. The manner in which a company deals with end-of-period variances will determine the effect production-volume variances have on the company’s end-of-period operating income. When the chosen capacity level exceeds the actual production level, which approach to end-of-period variances results in an unfavorable production-volume variance affect on that period’s operating income?
32. Proration approach
33. Adjusted allocation-rate approach
34. Theoretical approach
35. Write-off to cost-of-goods-sold approach

**CHAPTER 9 QUIZ SOLUTIONS**

# 1. c

# 2. d

# 3. c

# 4. b

# 5. a

# 6. d

# 7. c

# 8. a

# 9. b

# 10. d

**Quiz Question Calculations**

2. Sales 120,000 × $40/unit $4,800,000

VC 120,000 × $30/unit 3,600,000

Contribution margin $1,200,000

Fixed costs ($600,000 + $400,000) 1,000,000

Operating income 200,000

========

3. Sales 120,000 × $40 $4,800,000

COGS

Variable 3,600,000

Fixed 360,000\*

3,960,000

Gross profit 840,000

Fixed costs 400,000

Operating income 440,000

=======

Fixed manufacturing cost $600,000 / 200,000 units = $3 unit

$3/unit × 120,000 units sold = $360,000