

Chapter One: Inventories

Introduction

Inventories are **asset items held for sale** in the ordinary course of business or **goods that will be used or consumed in the production** of goods to be sold.

Classifying and Determining Inventory

How a company classifies its inventory depends on whether the firm is a merchandiser or a manufacturer.

In a **merchandising** company inventory consists of many different items. These items have two common characteristics:

1. they are **owned by the company**, and
2. they are **in a form ready for sale** to customers **in the ordinary course of business**.

Thus, merchandisers need only one inventory classification, **merchandise inventory**, to describe the many different items that make up the total inventory.

In a **manufacturing** company, some inventory may not yet be ready for sale. As a result, manufacturers usually classify inventory into three categories:

1. **Finished goods inventory**: is manufactured items that are completed and ready for sale.
2. **Work in process**: is that portion of manufactured inventory that has been placed into the production process but is not yet complete.
3. **Raw materials**: are the basic goods that will be used in production but have not yet been placed into production.

By observing the levels and changes in the levels of these three inventory types, financial statement users can gain insight into management's production plans. For example, low levels of raw materials and high levels of finished goods suggest that management believes it has enough inventory on hand and production will be slowing down—perhaps in anticipation of a recession. Conversely, high levels of raw materials and low levels of finished goods probably signal that management is planning to step up production.

Many companies have significantly lowered inventory levels and costs using **just-in-time (JIT) inventory methods**. Under a just-in-time method, companies manufacture or purchase goods only when needed for use. For instance, most computer companies are famous for having developed a system for making computers in response to individual customer requests. The success of the JIT system depends on **reliable suppliers**. By integrating their information systems with those of suppliers, most companies have reduced their inventories to nearly zero. This is a huge advantage in an industry where products become obsolete nearly overnight.

Importance of Inventories

Merchandise, being continuously purchased and sold, is one of the most active elements in the operation of wholesale and retail businesses. This is due to the following reasons:

- ☉ The **sale of merchandise is the principal source of revenue** for them.

- ④ When the net income is determined, the **cost of merchandise sold is the largest deductions from sales.**
- ④ A **substantial part of a merchandising firm's resources is invested in inventory**, it is the largest of the current assets of those firms.

Because of the above reasons inventories, **have effects on the current and the following period's financial statements.** If inventories are misstated (understated or overstated), the financial statements will be distorted.

Inventory Systems: Periodic Vs Perpetual

Periodic Inventory System

Under this system there is **no continuous record of merchandise inventory account.** The inventory balance remains the same throughout the accounting period, i.e. the beginning inventory balance. This is because when goods are purchased, they are debited to the ***purchases account*** rather than merchandise inventory account.

The revenue from sales is recorded each time a sale is made. **No entry is made for the cost of goods sold.** Companies do not keep detailed inventory records of the goods on hand throughout the period. Instead, they determine the cost of inventory on hand and cost of goods sold **only at the end of the accounting period**—that is, periodically.

The periodic inventory system is **less costly to maintain** than the perpetual inventory system, but it **gives management less information** about the current status of merchandise. This system is often used by **retail enterprises that sell many kinds of low unit cost merchandise** such as groceries, drugstores, hardware etc.

Perpetual Inventory System

Under this system the **accounting record continuously disclose the amount of inventory.** So, the inventory balance will not remain the same in the accounting period. All increases are debited to merchandise inventory account and all decreases are credited to the same account. There are **no purchases and purchase returns and allowances accounts** in this system. At the time of sale, the **cost of goods sold is recorded in addition to Journal entry for the sale.** So, we can determine the cost of inventory as well as goods sold from the accounting record. **No need of physical counting to determine their costs.**

Companies that sell items of high unit value, such as appliances or automobiles, tended to use the perpetual inventory system.

Management must choose the system or combination of systems that is best for achieving the company's goal.

Determining Inventory Quantities

No matter whether they are using a periodic or perpetual inventory system, all companies **need to determine inventory quantities at the end of the accounting period.**

If using a perpetual system, companies take a physical inventory for the following reasons:

1. To check the accuracy of their perpetual inventory records.
2. To determine the amount of inventory lost due to wasted raw materials, shoplifting, or employee theft.

Companies using a periodic inventory system take a physical inventory for **two different purposes**:

1. to determine the inventory on hand at the balance sheet date
2. to determine the cost of goods sold for the period.

Determining inventory quantities involves two steps:

1. taking a physical inventory of goods on hand
2. determining the ownership of goods.

Taking A Physical Inventory

Companies take a physical inventory at the end of the accounting period. Taking a physical inventory involves actually **counting, weighing, or measuring** each kind of inventory on hand. In many companies, taking an inventory is a formidable task. Large retail companies have thousands of different inventory items. An inventory count is generally more accurate when goods are not being sold or received during the counting. Consequently, companies often “take inventory” when the business is closed or when business is slow. Many retailers close early on a chosen day after the holiday sales and returns, when inventories are at their lowest level to count inventory.

Determining Ownership of Goods

One challenge in computing inventory quantities is determining what inventory a company owns. To determine ownership of goods, two questions must be answered:

1. Do all of the goods included in the count belong to the company?
2. Does the company own any goods that were not included in the count?

Goods in Transit: A complication in determining ownership is **goods in transit** (on board a truck, train, ship, or plane) at the end of the period. The company may have purchased goods that have not yet been received, or it may have sold goods that have not yet been delivered. To arrive at an accurate count, the company must **determine ownership** of these goods.

Goods in transit should be included in the inventory of the company that has **legal title** to the goods. Legal title is determined by the terms of the sale.

1. When the terms are **FOB (free on board) shipping point**, ownership of the goods passes to the buyer **when the public carrier accepts the goods from the seller**.
2. When the terms are **FOB destination**, **ownership of the goods remains with the seller until the goods reach the buyer**.

If goods in transit at the statement date are ignored, inventory quantities may be seriously miscounted. Assume, for example, that Fasil Company has 20,000 units of inventory on hand on December 31. It also has the following goods in transit:

1. Sales of 1,500 units shipped December 31 FOB destination.
2. Purchases of 2,500 units shipped FOB shipping point by the seller on December 31.

Fasil has legal title to both the 1,500 units sold and the 2,500 units purchased. If the company ignores the units in transit, it would understate inventory quantities by 4,000 units (1,500 + 2,500).

Inaccurate inventory counts affect not only the inventory amount shown on the balance

sheet but also the cost of goods sold calculation on the income statement.

Consigned Goods: In some lines of business, it is common to hold the **goods of other parties and try to sell the goods for them for a fee**, but without taking ownership of the goods. These are called **consigned goods**.

For example, you might have a used car that you would like to sell. If you take the item to a dealer, the dealer might be willing to put the car on its lot and charge you a commission if it is sold. Under this agreement, the dealer **would not take ownership** of the car, which would still belong to you. Therefore, if an inventory count were taken, the car would not be included in the dealer's inventory because the dealer does not own it.

Many car, boat, and antique dealers sell goods on consignment to keep their inventory costs down and to avoid the risk of purchasing an item that they will not be able to sell. Today, even some manufacturers are making consignment agreements with their suppliers in order to keep their inventory levels low.

Inventory Cost Flow Methods & Their Financial Effects

Inventory is accounted for at cost. Cost includes all expenditures necessary to acquire goods and place them in a condition ready for sale. For example, freight costs incurred to acquire inventory are added to the cost of inventory, but the cost of shipping goods to a customer are a selling expense.

After a company has determined the quantity of units of inventory, it applies unit costs to the quantities to compute the total cost of the inventory and the cost of goods sold. This process can be complicated if a company has purchased inventory items at different times and at different prices.

For example, assume that Walya TV Company purchases three identical 50-inch TVs on different dates at costs of \$720, \$750, and \$800. During the year, Walya sold two sets at \$1,200 each. These facts are summarized in the following illustration.

Purchases	
February 3	1 TV at \$720
March 5	1 TV at \$750
May 22	1 TV at \$800
Sales	
June 1	2 TVs for \$2,400 (\$1,200 x 2)

Cost of goods sold will differ depending on which two TVs the company sold. For example, it might be \$1,470 (\$720 + \$750), or \$1,520 (\$720 + \$800), or \$1,550 (\$750 + \$800). In this section, we discuss alternative costing methods available to Walya.

Specific Identification

If Walya can positively identify which particular units it sold and which are still in ending inventory, it can use the **specific identification method** of inventory costing. For example, if Walya sold the TVs it purchased on February 3 and May 22, then its cost of goods sold is \$1,520 (\$720 + \$800), and its ending inventory is \$750. Using this method,

companies can accurately determine ending inventory and cost of goods sold.

Specific identification requires that companies keep records of the original cost of each individual inventory item. Historically, specific identification was possible only when a company sold a limited variety of high-unit-cost items that could be identified clearly from the time of purchase through the time of sale.

Today, bar coding, electronic product codes, and radio frequency identification make it theoretically possible to do specific identification with nearly any type of product. The reality is, however, that this practice is still relatively rare. Instead, rather than keep track of the cost of each particular item sold, most companies make assumptions, called **cost flow assumptions**, about which units were sold.

Cost Flow Assumptions

Because specific identification is often impractical, other cost flow methods are permitted. These differ from specific identification in that they **assume** flows of costs that may be unrelated to the physical flow of goods. There are three assumed cost flow methods:

1. First-in, first-out (FIFO)
2. Last-in, first-out (LIFO)
3. Average-cost

There is no accounting requirement that the cost flow assumption be consistent with the physical movement of the goods. Company management selects the appropriate cost flow method. To demonstrate the three cost flow methods, we will use a **periodic** inventory system and we will use the data for Houston Electronics' Astro condensers, shown in the following illustration.

Houston Electronics'				
Astro condensers				
Date	Explanation	Units	Unit Cost	Total Cost
Jan. 1	Beginning inventory	100	\$10	\$ 1,000
Apr. 15	Purchase	200	11	2,200
Aug. 24	Purchase	300	12	3,600
Nov. 27	Purchase	<u>400</u>	13	<u>5,200</u>
	Total units available for sale	1,000		<u>\$12,000</u>
	Units in ending inventory	<u>450</u>		
	Units sold	<u>550</u>		

The cost of goods sold formula in a periodic system is:

$$(\text{Beginning Inventory} + \text{Purchases}) - \text{Ending Inventory} = \text{Cost of Goods Sold}$$

Houston Electronics had a total of 1,000 units available to sell during the period

(beginning inventory plus purchases). The total cost of these 1,000 units is \$12,000, referred to as **cost of goods available for sale**.

A physical inventory taken at December 31 determined that there were 450 units in ending inventory. Therefore, Houston sold 550 units (1,000 - 450) during the period. To determine the cost of the 550 units that were sold (the cost of goods sold), we assign a cost to the ending inventory and subtract that value from the cost of goods available for sale. The value assigned to the ending inventory **will depend on which cost flow method we use**.

No matter which cost flow assumption we use, though, the sum of cost of goods sold plus the cost of the ending inventory must equal the cost of goods available for sale—in this case, \$12,000.

First-In, First-Out (FIFO)

The first-in, first-out (**FIFO**) method assumes that the **earliest goods** purchased are the first to be sold. FIFO often parallels the actual physical flow of merchandise. That is, it generally is good business practice to sell the oldest units first. Under the FIFO method, therefore, the **costs** of the earliest goods purchased are the first to be recognized in determining cost of goods sold. (This does not necessarily mean that the oldest units **are** sold first, but that the costs of the oldest units are **recognized** first. The following illustration shows the allocation of the cost of goods available for sale at Houston Electronics under FIFO.

Cost of Goods Available for Sale				
Date	Explanation	Units	Unit Cost	Total Cost
Jan. 1	Beginning inventory	100	\$10	\$ 1,000
Apr. 15	Purchase	200	11	2,200
Aug. 24	Purchase	300	12	3,600
Nov. 27	Purchase	<u>400</u>	13	<u>5,200</u>
	Total	<u>1,000</u>		<u>\$12,000</u>

Step 1: Ending Inventory

Date	Units	Unit Cost	Total Cost
Nov. 27	400	\$ 13	\$ 5,200
Aug. 24	<u>50</u>	12	<u>600</u>
Total	<u>450</u>		<u>\$ 5,800</u>

Step 2: Cost of Goods Sold

Cost of goods available for sale	\$12,000
Less: Ending inventory	<u>5,800</u>
Cost of goods sold	<u>\$ 6,200</u>

Under FIFO, since it is assumed that the first goods purchased were the first goods sold, ending inventory is based on the prices of the most recent units purchased. That is, **under FIFO, companies obtain the cost of the ending inventory by taking the unit cost of the most recent purchase and working backward until all units of inventory have been costed.** In this example, Houston Electronics prices the 450 units of ending inventory using the **most recent** prices. The last purchase was 400 units at \$13 on November 27. The remaining 50 units are priced using the unit cost of the second most recent purchase, \$12, on August 24. Next, Houston Electronics calculates cost of goods sold by subtracting the cost of the units **not sold** (ending inventory) from the cost of all goods available for sale.

Companies also can calculate cost of goods sold by pricing the 550 units sold using the prices of the first 550 units acquired. Note that of the 300 units purchased on August 24, only 250 units are assumed sold. This agrees with our calculation of the cost of ending inventory, where 50 of these units were assumed unsold and thus included in ending inventory. The following illustration shows the proof of cost of goods sold:

Date	Units	Unit Cost	Total Cost
Jan. 1	100	\$10	\$ 1,000
Apr. 15	200	11	2,200
Aug. 24	<u>250</u>	12	<u>3,000</u>
Total	<u>550</u>		<u>\$6,200</u>

Last-In, First-Out (LIFO)

The **last-in, first-out (LIFO) method** assumes that the **latest goods** purchased are the first to be sold. LIFO seldom coincides with the actual physical flow of inventory. (Exceptions include goods stored in piles, such as coal or hay, where goods are removed from the top of the pile as they are sold.) Under the LIFO method, the **costs** of the latest goods purchased are the first to be recognized in determining cost of goods sold. The following illustration shows the allocation of the cost of goods available for sale at Houston Electronics under LIFO.

Cost of Goods Available for Sale				
Date	Explanation	Units	Unit Cost	Total Cost
Jan. 1	Beginning inventory	100	\$10	\$ 1,000
Apr. 15	Purchase	200	11	2,200

Aug. 24	Purchase	300	12	3,600
Nov. 27	Purchase	<u>400</u>	13	<u>5,200</u>
	Total	<u>1,000</u>		<u>\$12,000</u>

Step 1: Ending Inventory

Date	Units	Unit Cost	Total Cost
Jan. 1	100	\$ 10	\$ 1,000
Apr. 15	200	11	2,200
Aug. 24	<u>150</u>	12	<u>1,800</u>
Total	<u>450</u>		<u>\$ 5,000</u>

Step 2: Cost of Goods Sold

Cost of goods available for sale	\$12,000
Less: Ending inventory	<u>5,000</u>
Cost of goods sold	<u>\$ 7,000</u>

Under LIFO, since it is assumed that the first goods sold were those that were most recently purchased, ending inventory is based on the prices of the oldest units purchased. That is, **under LIFO, companies obtain the cost of the ending inventory by taking the unit cost of the earliest goods available for sale and working forward until all units of inventory have been costed.** In this example, Houston Electronics prices the 450 units of ending inventory using the **earliest** prices. The first purchase was 100 units at \$10 in the January 1 beginning inventory. Then, 200 units were purchased at \$11. The remaining 150 units needed are priced at \$12 per unit (August 24 purchase). Next, Houston Electronics calculates cost of goods sold by subtracting the cost of the units **not sold** (ending inventory) from the cost of all goods available for sale.

Companies also can calculate cost of goods sold by pricing the 550 units sold using the prices of the last 550 units acquired. Note that of the 300 units purchased on August 24, only 150 units are assumed sold. This agrees with our calculation of the cost of ending inventory, where 150 of these units were assumed unsold and thus included in ending inventory. The following illustration shows the proof of cost of goods sold:

Date	Units	Unit Cost	Total Cost
Nov. 27	400	\$13	\$ 5,200
Aug. 24	<u>150</u>	12	<u>1,800</u>
Total	<u>550</u>		<u>\$7,000</u>

Under a periodic inventory system, which we are using here, all goods purchased during the period are assumed to be available for the first sale, regardless of the date of purchase.

Average-Cost

The average-cost method allocates the cost of goods available for sale on the basis of the **weighted-average unit cost** incurred. The average-cost method assumes that goods are similar in nature. The following illustration presents the formula and a sample computation of the weighted-average unit cost.

$$\text{Cost of Goods Available for Sale} \div \text{Total Units Available for Sale} = \text{Weighted-Average Unit Cost}$$

$$\$12,000 \div 1,000 = \$12$$

The company then applies the weighted-average unit cost to the units on hand to determine the cost of the ending inventory. The following illustration shows the allocation of the cost of goods available for sale at Houston Electronics using average-cost.

Cost of Goods Available for Sale				
Date	Explanation	Units	Unit Cost	Total Cost
Jan. 1	Beginning inventory	100	\$10	\$ 1,000
Apr. 15	Purchase	200	11	2,200
Aug. 24	Purchase	300	12	3,600
Nov. 27	Purchase	<u>400</u>	13	<u>5,200</u>
	Total	<u>1,000</u>		<u>\$12,000</u>

Step 1: Ending Inventory

$$\$12,000 \div 1,000 = \$12$$

<u>Units</u>	<u>Unit Cost</u>	<u>Total Cost</u>
450	\$12	\$5,400

Step 2: Cost of Goods Sold

Cost of goods available for sale	\$12,000
Less: Ending inventory	<u>5,400</u>
Cost of goods sold	<u>\$ 6,600</u>

We can verify the cost of goods sold under this method by multiplying the units sold times the weighted-average unit cost ($550 \times \$12 = \$6,600$). Note that this method does

not use the average of the unit costs. That average is \$11.50 ($\$10 + \$11 + \$12 + \$13 = \$46$; $\$46 \div 4$). The average-cost method instead uses the average **weighted by** the quantities purchased at each unit cost.

Financial Statement & Tax Effects of Cost Flow Methods

Each of the three assumed cost flow methods is acceptable for use. Some companies use the FIFO method of inventory costing. Some companies use LIFO for part or all of their inventory. And others use the average-cost method. In fact, a company may also use more than one cost flow method at the same time. The reasons companies adopt different inventory cost flow methods are varied, but they usually involve one of three factors:

- (1) income statement effects
- (2) balance sheet effects
- (3) tax effects

Income Statement Effects

To understand why companies might choose a particular cost flow method, let's examine the effects of the different cost flow assumptions on the financial statements of Houston Electronics. The condensed income statements in the following illustration assume that Houston sold its 550 units for \$18,500, had operating expenses of \$9,000, and is subject to an income tax rate of 30%.

Houston Electronics			
Condensed Income Statements			
	<u>FIFO</u>	<u>LIFO</u>	<u>AVERAGE-COST</u>
Sales revenue	<u>\$18,500</u>	<u>\$18,500</u>	<u>\$18,500</u>
Beginning inventory	1,000	1,000	1,000
Purchases	<u>11,000</u>	<u>11,000</u>	<u>11,000</u>
Cost of goods available for sale	12,000	12,000	12,000
Ending inventory	<u>5,800</u>	<u>5,000</u>	<u>5,400</u>
Cost of goods sold	<u>6,200</u>	<u>7,000</u>	<u>6,600</u>
Gross profit	12,300	11,500	11,900
Operating expenses	<u>9,000</u>	<u>9,000</u>	<u>9,000</u>
Income before income taxes	3,300	2,500	2,900
Income tax expense (30%)	<u>990</u>	<u>750</u>	<u>870</u>
Net income	<u>\$ 2,310</u>	<u>\$ 1,750</u>	<u>\$ 2,030</u>

Note the cost of goods available for sale (\$12,000) is the same under each of the three inventory cost flow methods. However, the ending inventories and the costs of goods sold are different. This difference is due to the unit costs that the company allocated to cost of goods sold and to ending inventory. Each birr of difference in ending inventory results in a corresponding birr difference in income before income taxes. For Houston, an \$800 difference exists between FIFO and LIFO cost of goods sold.

In *periods of changing prices*, the cost flow assumption can have significant impacts both on income and on evaluations of income, such as the following.

1. In a period of inflation, FIFO produces a higher net income because lower unit costs of the first units purchased are matched against revenue.
2. In a period of inflation, LIFO produces a lower net income because higher unit costs of the last goods purchased are matched against revenue.
3. If prices are falling, the results from the use of FIFO and LIFO are reversed. FIFO will report the lowest net income and LIFO the highest.
4. Regardless of whether prices are rising or falling, average-cost produces net income between FIFO and LIFO.

As shown in the Houston example, in the above illustration, in a period of rising prices FIFO reports the highest net income (\$2,310) and LIFO the lowest (\$1,750); average-cost falls between these two amounts (\$2,030).

To management, higher net income is an advantage. It causes external users to view the company more favorably. In addition, management bonuses, if based on net income, will be higher. Therefore, when prices are rising (which is usually the case), companies tend to prefer FIFO because it results in higher net income.

Others believe that LIFO presents a more realistic net income number. That is, LIFO matches the more recent costs against current revenues to provide a better measure of net income. During periods of inflation, many challenge the quality of non-LIFO earnings, noting that failing to match current costs against current revenues leads to an understatement of cost of goods sold and an overstatement of net income.

Balance Sheet Effects

A major advantage of the FIFO method is that in a period of inflation, the costs allocated to ending inventory will approximate their current cost. For example, for Houston Electronics, 400 of the 450 units in the ending inventory are costed under FIFO at the higher November 27 unit cost of \$13.

Conversely, a major shortcoming of the LIFO method is that in a period of inflation, the costs allocated to ending inventory may be significantly understated in terms of current cost. The understatement becomes greater over prolonged periods of inflation if the inventory includes goods purchased in one or more prior accounting periods.

Tax Effects

We have seen that both inventory on the balance sheet and net income on the income statement are higher when companies use FIFO in a period of inflation. Yet, many companies have selected LIFO. Why? The reason is that LIFO results in the lowest income taxes (because of lower net income) during times of rising prices. For example,

at Houston Electronics, income taxes are \$750 under LIFO, compared to \$990 under FIFO. The tax savings of \$240 makes more cash available for use in the business.

Applying the Inventory Cost Flow Methods to Perpetual Inventory Records

What inventory cost flow methods can companies employ if they use a perpetual inventory system? Simple—they can use any of the inventory cost flow methods described earlier. To illustrate the application of the three assumed cost flow methods (FIFO, LIFO, and average-cost), we will use the data shown in the following illustration for Houston Electronics' Astro condensers.

Houston Electronics'					
Astro condensers					
Date	Explanation	Units	Unit Cost	Total Cost	Balance in Units
1/1	Beg. inventory	100	\$10	\$ 1,000	100
4/15	Purchases	200	11	2,200	300
8/24	Purchases	300	12	3,600	600
9/10	Sale	550			50
11/27	Purchases	400	13	<u>5,200</u>	450
				<u>\$12,000</u>	

First-In, First-Out (FIFO)

Under perpetual FIFO, the company charges to cost of goods sold the cost of the earliest goods on hand **prior to each sale**. Therefore, the cost of goods sold on September 10 consists of the units on hand January 1 and the units purchased April 15 and August 24. The following illustration shows the inventory under a FIFO method perpetual system.

<u>Date</u>	<u>Purchases</u>	<u>Cost of Goods Sold</u>	Balance (in units and cost)
Jan.1			(100 @ \$10) \$1,000
Apr. 15	(200 @ \$11) \$2,200		(100 @ \$10) (200 @ \$11) \$ 3,200
Aug.24	(300 @ \$12) \$3,600		(100 @ \$10) (200 @ \$11) \$ 6,800 (300 @ \$12)
Sept.10		(100 @ \$10) (200 @ \$11)	

	(250 @ \$12)	(50 @ \$12)	\$ 600
Cost of goods sold	\$6,200		
Nov.27	(400 @ \$13) \$5,200	(50 @ \$12)	
		(400 @ \$13)	
Ending inventory			\$5,800

The ending inventory in this situation is \$5,800, and the cost of goods sold is \$6,200 [(100 @ \$10) + (200 @ \$11) + (250 @ \$12)]. Compare this result to the periodic system illustration. You can see that the results under FIFO in a perpetual system are the **same as in a periodic system**. In both cases, the ending inventory is \$5,800 and cost of goods sold is \$6,200. Regardless of the system, the first costs in are the costs assigned to cost of goods sold.

Last-In, First-Out (LIFO)

Under the LIFO method using a perpetual system, the company charges to cost of goods sold the cost of the **most recent purchase prior to sale**. Therefore, the cost of the goods sold on September 10 consists of all the units from the August 24 and April 15 purchases plus 50 of the units in beginning inventory. The following illustration shows the computation of the ending inventory under the LIFO method.

<u>Date</u>	<u>Purchases</u>	<u>Cost of Goods Sold</u>	<u>Balance</u> <u>(in units and cost)</u>
Jan.1			(100 @ \$10) \$1,000
Apr. 15	(200 @ \$11) \$2,200		(100 @ \$10) (200 @ \$11) \$ 3,200
Aug.24	(300 @ \$12) \$3,600		(100 @ \$10) (200 @ \$11) \$ 6,800 (300 @ \$12)
Sept.10		(300 @ \$12) (200 @ \$11) (50 @ \$10)	(50 @ \$10) \$ 500
Cost of goods sold		\$6,300	
Nov.27	(400 @ \$13) \$5,200		(50 @ \$10) (400 @ \$13)
Ending inventory			

\$5,700

The use of LIFO in a perpetual system will usually produce cost allocations that differ from those using LIFO in a periodic system. In a perpetual system, the company allocates the latest units purchased **prior to each sale** to cost of goods sold. In contrast, in a periodic system, the latest units purchased **during the period** are allocated to cost of goods sold. Thus, when a purchase is made after the last sale, the LIFO periodic system will apply this purchase to the previous sale.

Average-Cost

The average-cost method in a perpetual inventory system is called the **moving average method**. Under this method, the company computes a new average **after each purchase**, by dividing the cost of goods available for sale by the units on hand. The average cost is then applied to:

- (1) the units sold, to determine the cost of goods sold
- (2) the remaining units on hand, to determine the ending inventory amount.

The following illustration shows the application of the moving-average cost method by Houston Electronics (computations of the moving-average unit cost are shown after the illustration)

<u>Date</u>	<u>Purchases</u>	<u>Cost of Goods Sold</u>	<u>Balance</u> <u>(in units and cost)</u>
Jan.1			(100 @ \$10) \$ 1,000
April 15	(200 @ \$11) \$2,200		(300 @ \$10.667) \$ 3,200
Aug.24	(300 @ \$12) \$3,600		(600 @ \$11.333) \$ 6,800
Sept.10		(550 @ \$11.333)	(50 @ \$11.333) \$ 567
Cost of goods sold		\$6,233	
Nov.27	(400 @ \$13) \$5,200		(450 @ \$12.816)
Ending inventory			\$5,767

Houston Electronics computes **a new average each time it makes a purchase**:

1. On April 15, after Houston buys 200 units for \$2,200, a total of 300 units costing \$3,200 ($\$1,000 + \$2,200$) are on hand. The average unit cost is \$10.667 ($\$3,200 \div 300$).
2. On August 24, after Houston buys 300 units for \$3,600, a total of 600 units costing \$6,800 ($\$1,000 + \$2,200 + \$3,600$) are on hand. The average cost per unit is \$11.333 ($\$6,800 \div 600$).
3. On September 10, to compute cost of goods sold, Houston uses this unit cost of

\$11.333 until it makes another purchase, when the company computes a new unit cost. Accordingly, the unit cost of the 550 units sold on September 10 is \$11.333, and the total cost of goods sold is \$6,233.

4. On November 27, following the purchase of 400 units for \$5,200, there are 450 units on hand costing \$5,767 (\$567 + \$5,200) with a new average cost of \$12.816 ($\$5,767 \div 450$).

Using Inventory Cost Flow Methods Consistently

Whatever cost flow method a company chooses, it should use that method consistently from one accounting period to another. This approach is often referred to as the **consistency concept**, which means that a company uses the same accounting principles and methods from year to year. Consistent application enhances the comparability of financial statements over successive time periods. In contrast, using the FIFO method one year and the LIFO method the next year would make it difficult to compare the net incomes of the two years.

Although consistent application is preferred, it does not mean that a company may never change its inventory costing method. When a company adopts a different method, it should **disclose** in the financial statements the change and its effects on net income.

Effects of Inventory Errors on the Financial Statements

Unfortunately, errors occasionally occur in accounting for inventory. In some cases, errors are caused by failure to count or price the inventory correctly. In other cases, errors occur because companies do not properly recognize the transfer of legal title to goods that are in transit. When errors occur, they affect both the income statement and the balance sheet.

Income Statement Effects

Under a periodic inventory system, both the beginning and ending inventories appear in the income statement. The ending inventory of one period automatically becomes the beginning inventory of the next period. Thus, inventory errors affect the computation of cost of goods sold and net income in two periods.

The effects on cost of goods sold can be computed by first entering incorrect data in the formula for cost of goods sold in the following illustration and then substituting the correct data.

$$\text{Beginning Inventory} + \text{Cost of Goods Purchased} - \text{Ending Inventory} = \text{Cost of Goods Sold}$$

If the error understates **beginning** inventory, cost of goods sold will be understated. If the error understates **ending** inventory, cost of goods sold will be overstated. The following illustration shows the effects of inventory errors on the current year's income statement.

<u>When Inventory Error:</u>	<u>Cost of Goods Sold Is:</u>	<u>Net Income Is:</u>
Understates beginning inventory	Understated	Overstated
Overstates beginning inventory	Overstated	Understated

Understates ending inventory	Overstated	Understated
Overstates ending inventory	Understated	Overstated

So far, the effects of inventory errors are fairly straightforward. Now, though, comes the surprising part: An error in the ending inventory of the current period will have a **reverse effect on net income of the next accounting period**. The following sample company illustration shows this effect.

Sample Company								
Condensed Income Statements								
	<u>2016</u>				<u>2017</u>			
	<u>Incorrect</u>		<u>Correct</u>		<u>Incorrect</u>		<u>Correct</u>	
Sales revenue		\$80,000		\$80,000		\$90,000		\$90,000
Beg. inventory	\$20,000		\$20,000		\$12,000		\$15,000	
Cost of goods purchased	<u>40,000</u>		<u>40,000</u>		<u>68,000</u>		<u>68,000</u>	
Cost of goods available for sale	60,000		60,000		80,000		83,000	
Ending inventory	<u>12,000</u>		<u>15,000</u>		<u>23,000</u>		<u>23,000</u>	
Cost of goods sold		<u>48,000</u>		<u>45,000</u>		<u>57,000</u>		<u>60,000</u>
Gross profit		32,000		35,000		33,000		30,000
Operating expenses		<u>10,000</u>		<u>10,000</u>		<u>20,000</u>		<u>20,000</u>
Net income		<u>\$22,000</u>		<u>\$25,000</u>		<u>\$13,000</u>		<u>\$10,000</u>
	Net Income understated = (\$3,000) (\$22,000 – 25,000)				Net income overstated = \$3,000 (\$13,000 – 10,000)			
	The errors cancel. Thus, the combined total income for the 2-year period is correct.							

As you study the illustration, you will see that the reverse effect comes from the fact that understating ending inventory in 2016 results in understating beginning inventory in 2017 and overstating net income in 2017.

Over the two years, though, total net income is correct because the errors **offset each other**. Notice that total income using incorrect data is \$35,000 (\$22,000 + \$13,000), which is the same as the total income of \$35,000 (\$25,000 + \$10,000) using correct data. Also note in this example that an error in the beginning inventory does not result in a corresponding error in the ending inventory for that period. The correctness of the ending inventory depends entirely on the accuracy of taking and costing the inventory at the balance sheet date under the periodic inventory system.

Balance Sheet Effects

Companies can determine the effect of ending inventory errors on the balance sheet by using the basic accounting equation: $\text{Assets} = \text{Liabilities} + \text{Owner's Equity}$. Errors in the ending inventory have the effects shown in the following illustration.

Ending Inventory Error	Assets	Liabilities	Owner's Equity
Overstated	Overstated	No effect	Overstated
Understated	Understated	No effect	Understated

The effect of an error in ending inventory on the subsequent period was shown in the previous illustration. Recall that if the error is not corrected, the combined total net income for the two periods would be correct. Thus, total owner's equity reported on the balance sheet at the end of 2017 will also be correct.

Statement Presentation and Analysis of Inventory Presentation

Inventory is classified in the balance sheet as a current asset immediately below receivables. In a multiple-step income statement, cost of goods sold is subtracted from net sales. There also should be disclosure of:

- (1) the major inventory classifications
- (2) the basis of accounting (cost, or lower-of-cost or-market)
- (3) the cost method (FIFO, LIFO, or average-cost)

Lower-of-Cost-or-Market

The value of inventory for companies selling high-technology or fashion goods can drop very quickly due to continual changes in technology or fashions. These circumstances sometimes call for inventory valuation methods other than those presented so far. For instance, company managers make large purchases of some inventories when they fear a future shortage. And sometimes the shortage may not materialize, and by the end of the year the price of the particular inventory may dropped. Inventories will then worth less than its original cost. Do you think the inventories will be stated at cost, in accordance with the historical cost principle, or at its lower replacement cost?

As you probably reasoned, this situation requires a departure from the cost basis of accounting. This is done by valuing the inventory at the **lower-of-cost-or-market (LCM)** in the period in which the price decline occurs. LCM is a basis whereby inventory is stated at the lower of either its cost or market value as determined by current replacement cost. LCM is an example of the accounting convention of **conservatism**. Conservatism means that the approach adopted among accounting alternatives is the method that is least likely to overstate assets and net income.

Companies apply LCM to the items in inventory after they have used one of the cost flow methods (specific identification, FIFO, LIFO, or average-cost) to determine cost. Under the LCM basis, market is defined as **current replacement cost**, not selling price. For a merchandising company, current replacement cost is the cost of purchasing the same goods at the present time from the usual suppliers in the usual quantities. Current

replacement cost is used because a decline in the replacement cost of an item usually leads to a decline in the selling price of the item.

To illustrate the application of LCM, assume that Maraki TV has the following lines of merchandise with costs and market values as indicated. LCM produces the results shown in the following illustration. Note that the amounts shown in the final column are the lower-of-cost-or-market amounts for each item.

	Units	Cost per Unit	Market per Unit	Lower-of-Cost-or-Market
Flat-screen TVs	100	\$600	\$550	\$55,000 (\$550 x 100)
Satellite radios	500	90	104	45,000 (\$90 x 500)
Blu-ray players	850	50	48	40,800 (\$48 x 850)
CDs	3,000	5	6	<u>15,000</u> (\$5 x 3,000)
Total inventory				<u>\$155,800</u>

Analysis

The amount of inventory carried by a company has significant economic consequences. And inventory management is a double-edged sword that requires constant attention. On the one hand, management wants to have a great variety and quantity available so that customers have a wide selection and items are always in stock. But, such a policy may incur high carrying costs (e.g., investment, storage, insurance, obsolescence, and damage). On the other hand, low inventory levels lead to stock-outs and lost sales. Common ratios used to manage and evaluate inventory levels are inventory turnover and a related measure, days in inventory.

Inventory turnover measures the number of times on average the inventory is sold during the period. Its purpose is to measure the liquidity of the inventory. The inventory turnover is computed by dividing cost of goods sold by the average inventory during the period. Unless seasonal factors are significant, average inventory can be computed from the beginning and ending inventory balances. For example, Addis Supermarket reported in its 2017 annual report a beginning inventory of \$43,803, an ending inventory of \$44,858, and cost of goods sold for the year ended January 31, 2017, of \$358,069. The inventory turnover formula and computation for Addis Supermarket are shown below.

$$\text{Cost of Goods Sold} \div \text{Average Inventory} = \text{Inventory Turnover}$$

$$\$358,069 \div \frac{\$44,858 + \$43,803}{2} = 8.1 \text{ times}$$

A variant of the inventory turnover is **days in inventory**. This measures the average number of days inventory is held. It is calculated as 365 divided by the inventory turnover. For example, Addis Supermarket's inventory turnover of 8.1 times divided into 365 is approximately 45.1 days. This is the approximate time that it takes a company to sell the inventory once it arrives at the store. There are typical levels of inventory in every industry. Companies that are able to keep their inventory at lower levels and higher turnovers and still satisfy customer needs are the most successful.

Methods of Estimating Inventories

In our previous discussions, we assumed that a company would be able to physically count its inventory. What if it cannot? What if the inventory were destroyed by fire or flood, for example? In that case, the company would use an estimate.

Two circumstances explain why companies sometimes estimate inventories. First, a casualty such as fire, flood, or earthquake may make it impossible to take a physical inventory. Second, managers may want monthly or quarterly financial statements, but a physical inventory is taken only annually. The need for estimating inventories occurs primarily with a periodic inventory system because of the absence of perpetual inventory records.

There are two widely used methods of estimating inventories:

- (1) the gross profit method
- (2) the retail inventory method

Gross Profit Method

The **gross profit method** estimates the cost of ending inventory by applying a gross profit rate to net sales. This method is relatively simple but effective. Accountants, auditors, and managers frequently use the gross profit method to test the reasonableness of the ending inventory amount. It will detect large errors.

To use this method, a company needs to know its net sales, cost of goods available for sale, and gross profit rate. The company then can estimate its gross profit for the period. The following illustration shows the formulas for using the gross profit method.

Step 1:	Net Sales	-	Estimated Gross Profit	=	Estimated Cost of Goods Sold
Step 2:	Cost of Goods Available for Sale	-	Estimated Cost of Goods Sold	=	Estimated cost of Ending Inventory

To illustrate, assume that Maraki Company wishes to prepare an income statement for the month of January. Its records show net sales of \$200,000, beginning inventory \$40,000, and cost of goods purchased \$120,000. In the preceding year, the company realized a 30% gross profit rate. It expects to earn the same rate this year. Given these facts and assumptions, Maraki can compute the estimated cost of the ending inventory at January 31 under the gross profit method as follows.

Step 1:	
Net sales	\$ 200,000
Less: Estimated gross profit (30% x \$200,000)	<u>60,000</u>
Estimated cost of goods sold	<u>\$140,000</u>
Step 2:	
Beginning inventory	\$ 40,000

Cost of goods purchased	<u>120,000</u>
Cost of goods available for sale	160,000
Less: Estimated cost of goods sold	<u>140,000</u>
Estimated cost of ending inventory	<u>\$ 20,000</u>

The gross profit method is based on the assumption that the gross profit rate will remain constant. But, it may not remain constant, due to a change in merchandising policies or in market conditions. In such cases, the company should adjust the rate to reflect current operating conditions. In some cases, companies can obtain a more accurate estimate by applying this method on a department or product-line basis.

Note that companies should not use the gross profit method to prepare financial statements at the end of the year. These statements should be based on a physical inventory count.

Retail Inventory Method

A retail store has thousands of different types of merchandise at low unit costs. In such cases, it is difficult and time-consuming to apply unit costs to inventory quantities. An alternative is to use the **retail inventory method** to estimate the cost of inventory. Most retail companies can establish a relationship between **cost and sales price**. The company then applies the **cost-to-retail percentage to the ending inventory at retail prices to determine inventory at cost**. Under the retail inventory method, a company's records must show both the cost and retail value of the goods available for sale.

We can demonstrate the logic of the retail method by using unit-cost data. Assume that Ortiz Inc. has marked 10 units purchased at \$7 to sell for \$10 per unit. Thus, the cost-to-retail ratio is 70% (\$70 ÷ \$100). If four units remain unsold, their retail value is \$40 (4 x \$10), and their cost is \$28 (\$40 x 70%). This amount agrees with the total cost of goods on hand on a per unit basis (4 x \$7). The following illustration presents the formulas for using the retail inventory method.

Step 1:	Goods Available for Sale at Retail	-	Net Sales	=	Ending Inventory at Retail
Step 2:	Goods Available for Sale at Cost	÷	Goods Available for Sale at Retail	=	Cost-to-Retail Ratio
Step 3:	Ending Inventory at Retail	x	Cost-to-Retail Ratio	=	Estimated cost of Ending Inventory

The following illustration shows application of the retail method for Valley West. Note that it is not necessary to take a physical inventory to determine the estimated cost of goods on hand at any given time.

	At Cost	At Retail
Beginning inventory	\$14,000	\$ 21,500

Goods purchased	<u>61,000</u>	<u>78,500</u>
Goods available for sale	<u>\$75,000</u>	100,000
Less: Net sales		<u>70,000</u>
Step (1) Ending inventory at retail =	<u>\$ 30,000</u>	

Step (2) Cost-to-retail ratio = $\$75,000 \div \$100,000 = 75\%$

The Step (3) Estimated cost of ending inventory = $\$30,000 \times 75\% = \underline{\underline{\$22,500}}$

retail inventory method also facilitates taking a physical inventory at the end of the year. Valley West can value the goods on hand at the prices marked on the merchandise, and then apply the cost-to-retail ratio to the goods on hand at retail to determine the ending inventory at cost.

The major disadvantage of the retail method is that it is an averaging technique. Thus, it may produce an incorrect inventory valuation if the mix of the ending inventory is not representative of the mix in the goods available for sale. Assume, for example, that the cost-to-retail ratio of 75% for Valley West consists of equal proportions of inventory items that have cost-to-retail ratios of 70%, 75%, and 80%. If the ending inventory contains only items with a 70% ratio, an incorrect inventory cost will result. Companies can minimize this problem by applying the retail method on a department or product-line basis.