

## FA Module 8: Inventories – practice problems

(The attached PDF file has better formatting.)

### Exercise 8.1: Inventory

- A firm's inventory at December 31, 20X0, is 100 units at a cost of 12 per unit.
- The firm buys 400 units in 20X1 at a cost of 15 per unit.
- The firm sells 300 units in 20X1 at 25 per unit.

What is the gross profit margin in 20X1 using

- A. FIFO accounting for inventory
- B. LIFO accounting for inventory
- C. weighted average cost accounting for inventory

*Part A:* With FIFO accounting for inventory, the units sold are the 100 in the starting inventory plus 200 of those bought in 20X1. The gross profit margin in 20X1 is

$$( (300 \times 25) - (100 \times 12 + 200 \times 15) ) / (300 \times 25) = 44.00\%.$$

*Part B:* With LIFO accounting for inventory, the units sold are bought in 20X1. The gross profit margin is

$$( (300 \times 25) - (300 \times 15) ) / (300 \times 25) = 40.00\%$$

*Part C:* For the weighted average cost inventory method, the cost per unit for sales in 20X1 is

$$(100 \times 12 + 400 \times 15) / 500 = 14.40, \text{ and the gross profit margin is } (25 - 14.4) / 25 = 42.40\%$$

## Exercise 8.2: Inventory methods

A firm buys inventory in East Asia and resells it to customers in Europe.

- At year-end 20X0, the firm has 100 units of inventory that cost 6 apiece.
- In 20X1, the firm buys 400 units at 8 apiece and sells 350 units for 15 apiece.
- In 20X2, the firm buys 500 units at 12 apiece and sells 450 units for 18 apiece.

If the firm uses the first-in first-out (FIFO) inventory method:

- A. What is the inventory at year-end 20X1?
- B. What is the inventory at year-end 20X2?
- C. What is the cost of goods sold in 20X1?
- D. What is the cost of goods sold in 20X2?
- E. What is the inventory turnover in 20X1?
- F. What is the inventory turnover in 20X2?
- G. What is the gross profit margin in 20X1?
- H. What is the gross profit margin in 20X2?

*Part A:* At year-end 20X0, the firm has 100 units. In 20X1, the firm buys 50 units more than it sells (400 – 350), so at year-end 20X1, the firm has 150 units of inventory. For FIFO, these are the last 150 units bought, all in 20X1 at 8 apiece, so its inventory is  $8 \times 150 = 1,200$ .

*Part B:* At year-end 20X1, the firm has 150 units of inventory. In 20X2, the firm buys 50 units more than it sells (500 – 450). At year-end 20X2, the firm has 200 units of inventory. For FIFO, these are the last 200 units bought, all in 20X2 at 12 apiece, so its inventory is  $12 \times 200 = 2,400$ .

*Part C:* At year-end 20X1, the firm has 150 units of inventory, all from its 20X1 purchases. It bought 400 units in 20X1 at 8 apiece, so 250 of these units were sold in 20X1. It sold 350 units in total, so another 100 units bought in 20X0 at 6 apiece were sold in 20X1. The cost of goods sold in 20X1 is

$$100 \times 6 + 250 \times 8 = 2,600$$

*Part D:* At year-end 20X2, the firm has 200 units of inventory, all from its 20X2 purchases. It bought 500 units in 20X2 at 12 apiece, so 300 of these units were sold in 20X2. It sold 450 units in total, so another 150 units bought in 20X1 at 8 apiece were sold in 20X2. The cost of goods sold in 20X2 is

$$150 \times 8 + 300 \times 12 = 4,800$$

*Part E:* Inventory turnover is cost of goods sold divided by average inventory. For 20X1, this ratio is

$$2600 / ((600 + 1200) / 2) = 2.88889$$

*Part F:* Inventory turnover is cost of goods sold divided by average inventory. For 20X2, this ratio is

$$4800 / ((1200 + 2400) / 2) = 2.66667$$

*Part G:* For a firm that buys goods and resells them, the gross profit margin is  $1 - \text{cost of goods sold} / \text{net revenue}$ . (If the firm produces the goods in-house or buys raw materials and converts them to finished goods, the cost of goods sold includes production costs.) The 20X1 cost of goods sold is 2,600, and the 20X1 net revenue is  $350 \times 15 = 5,250$ . The gross profit margin is

$$1 - 2,600 / 5,250 = 50.48\%$$

*Part H:* The 20X2 cost of goods sold is 4,800, and the 20X2 net revenue is  $450 \times 18 = 8,100$ . The gross profit margin is

$$1 - 4800 / 8100 = 40.74\%$$

### Exercise 8.3: Inventory methods

A firm buys inventory in East Asia and resells it to customers in Europe.

- At year-end 20X0, the firm has 100 units of inventory costing 6 apiece.
- In 20X1, the firm buys 400 units at 8 apiece and sells 350 units for 15 apiece.
- In 20X2, the firm buys 500 units at 12 apiece and sells 450 units for 18 apiece.

If the firm uses the last-in first-out (LIFO) inventory method:

- A. What is the inventory at year-end 20X1?
- B. What is the inventory at year-end 20X2?
- C. What is the cost of goods sold in 20X1?
- D. What is the cost of goods sold in 20X2?
- E. What is the inventory turnover in 20X1?
- F. What is the inventory turnover in 20X2?
- G. What is the gross profit margin in 20X1?
- H. What is the gross profit margin in 20X2?

*Part A:* At year-end 20X0, the firm has 100 units. In 20X1, the firm buys 50 units more than it sells ( $400 - 350$ ), so at year-end 20X1, the firm has 150 units of inventory. For LIFO, these are the first 150 units bought: 100 in 20X0 at 6 apiece and 50 in 20X1 at 8 apiece, so its inventory is  $6 \times 100 + 8 \times 50 = 1,000$ .

*Part B:* The firm sells 450 units in 20X2, all of which are bought in 20X2. 500 units were bought in 20X2, so 50 of these units remain in inventory. The inventory at year-end 20X2 is

$$100 \times 6 + 50 \times 8 + 50 \times 12 = 1,600$$

*Part C:* The cost of goods sold during the year = beginning inventory + purchases during the year – ending inventory =  $100 \times 6 + 400 \times 8 - 1,000 = 2,800$

*Question:* Why is the cost of goods sold in 20X1 higher in this LIFO problem than in the previous FIFO problem?

*Answer:* In the previous FIFO problem, the 100 units of beginning inventory were retained (not sold); in this LIFO problem, they are sold in 20X1 and 100 units of newly bought inventory are retained in the inventory. The difference is  $100 \times (8 - 6) = 200$ .

*Part D:* The cost of goods sold during the year = beginning inventory + purchases during the year – ending inventory =  $1,000 + 500 \times 12 - 1,600 = 5,400$

*Part E:* Inventory turnover is cost of goods sold divided by average inventory. For 20X1, this ratio is

$$2800 / ((600 + 1000) / 2) = 3.50000$$

*Part F:* Inventory turnover is cost of goods sold divided by average inventory. For 20X2, this ratio is

$$5400 / ((1000 + 1600) / 2) = 4.15385$$

*Part G:* For a firm that buys goods and resells them, the gross profit margin is  $1 - \text{cost of goods sold} / \text{net revenue}$ . (If the firm produces the goods in-house or buys raw materials and converts them to finished goods, the cost of goods sold includes production costs.) The 20X1 cost of goods sold is 2,800, and the 20X1 net revenue is  $350 \times 15 = 5,250$ . The gross profit margin is

$$1 - 2,800 / 5,250 = 46.67\%$$

*Part H:* The 20X2 cost of goods sold is 5,400, and the 20X2 net revenue is  $450 \times 18 = 8,100$ . The gross profit margin is

$$1 - 5400 / 8100 = 33.33\%$$

*Question:* Do firms prefer showing lower or higher inventory costs?

*Answer:* Higher inventory costs generally means lower cost of goods sold and higher accounting profits; lower inventory costs generally means higher cost of goods sold and lower accounting profits.

The textbook mentions that:

- For taxable income, firms wish to show lower profits. In the United States, the same inventory costing method must be used for taxable income as for financial statements, so many industrial firms choose LIFO methods when inflation was high. Tax laws differ by country. In some countries, the tax authorities specify the inventory costing method.
- Some publicly traded firms wish to show profits each year (or at least to meet analysts' projections).

#### Exercise 8.4: Inventory methods

A firm buys inventory in East Asia and resells it to customers in Europe.

- At year-end 20X0, the firm has 100 units of inventory costing 6 apiece.
- In 20X1, the firm buys 400 units at 8 apiece and sells 350 units for 15 apiece.
- In 20X2, the firm buys 500 units at 12 apiece and sells 450 units for 18 apiece.

If the firm uses the weighted average inventory method:

- A. What is the inventory at year-end 20X1?
- B. What is the inventory at year-end 20X2?
- C. What is the cost of goods sold in 20X1?
- D. What is the cost of goods sold in 20X2?
- E. What is the inventory turnover in 20X1?
- F. What is the inventory turnover in 20X2?
- G. What is the gross profit margin in 20X1?
- H. What is the gross profit margin in 20X2?

*Part A:* At year-end 20X0, the firm has 100 units of inventory that it bought for 6 apiece. In 20X1, the firm buys 400 more units at 8, so the average cost of a unit is

$$(100 * 6 + 400 * 8) / 500 = 7.6$$

The firm sells 350 units, so at year-end 20X1, the firm has 150 units of inventory with a cost of

$$150 * 7.6 = 1,140$$

*Part B:* The firm buys 500 units in 20X2 at 12 apiece. The average cost of its units is

$$(150 * 7.6 + 500 * 12) / (150 + 500) = 10.98462$$

200 of these units remain in inventory at year-end 20X2, with a carrying value of

$$200 * (150 * 7.6 + 500 * 12) / (150 + 500) = 2,197$$

*Part C:* The cost of goods sold = purchases – increase in inventory. For 20X1, this is

$$400 * 8 - (1140 - 600) = 2,660$$

The firm began 20X1 with inventory of 600, it bought  $400 * 8 = 3,200$  of inventory, and it ends the year with 1,140 of inventory, so the cost of goods sold is  $600 + 3,200 - 1,140 = 2,660$ .

*Part D:* The cost of goods sold = purchases – increase in inventory. For 20X2, this is

$$500 * 12 - (2197 - 1140) = 4,943$$

The firm began 20X2 with inventory of 1,140, it bought  $500 * 12 = 6,000$  of inventory, and it ends the year with 2,197 of inventory, so the cost of goods sold is  $1,140 + 6,000 - 2,197 = 4,943$ .

*Part E:* Inventory turnover is cost of goods sold divided by average inventory. For 20X1, this ratio is

$$2660 / ((600 + 1140) / 2) = 3.05747$$

*Part F:* Inventory turnover is cost of goods sold divided by average inventory. For 20X2, this ratio is

$$4943 / ( (1140 + 2197) / 2 ) = 2.96254$$

*Part G:* For a firm that buys goods and resells them, the gross profit margin is  $1 - \text{cost of goods sold} / \text{net revenue}$ . The 20X1 cost of goods sold is 2,660, and the 20X1 net revenue is  $350 \times 15 = 5,250$ .

$$\text{The gross profit margin is } 1 - 2,660 / 5,250 = 49.33\%.$$

*Part H:* For a firm that buys goods and resells them, the gross profit margin is  $1 - \text{cost of goods sold} / \text{net revenue}$ . The 20X2 cost of goods sold is 4,943, and the 20X2 net revenue is  $450 \times 18 = 8,100$ . The gross profit margin is

$$1 - 4943 / 8100 = 38.98\%$$

The textbook emphasizes the relations among the inventory costing method. Fifty years ago, most inventory was raw materials and parts, whose prices rose steadily with inflation. Firms expanded as the economy grew or produced similar amounts each year.

- FIFO causes the higher priced recent goods to remain in inventory, and the lower priced older goods to be included in cost of goods sold.
- LIFO causes the lower priced recent goods to remain in inventory, and the higher priced older goods to be included in cost of goods sold.

The inventory asset is higher each year with FIFO, and the cost of goods sold is higher each year with LIFO.

For many high-tech firms now, the cost of inventory declines from year to year. Inflation is low, and prices of computing equipment decrease. The relations in the two bullet points above are reversed.