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Calculating Warehouse Inventory Turnover

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Inventory turnover is best thought of as the number of times that an inventory "turns over" or cycles through the warehouse in a year. Inventory turnover of 12 means the average inventory moves through the warehouse once per month; turns of 6 times means the average inventory cycles through the facility every two months. Inventory turnover can be improved by either moving the same amount of product through the warehouse with a lower average inventory or moving more product through the warehouse with the same average inventory.

The inventory turnover measure is a ratio of flow to average inventory. As such, it is somewhat of an abstract concept. *Days of supply* is another, more straightforward, way of viewing inventory turnover. Inventory turnover and days of supply are related: if the inventory turns 4 times per year, or once every 3 months, then 4 turns equates to a three-month or 90-day supply of sales. Twelve turns equates to an inventory of 30 days of supply.

Correct Calculations Are Critical

Because inventories represent a sizable investment of company funds and larger inventories mean higher carrying costs (space, insurance, taxes, capital costs, etc), a common inventory management goal focuses on improving inventory turnover.

EXAMPLE: A firm's inventory currently turns over 6 times per year, and the firm's annual unit flow through the warehouse is 180,000 units. The firm's average inventory is $180,000/6$ or 30,000 units. Assume the carrying cost of inventory is 25% and the cost of a unit is \$10. The inventory investment is $30,000 \times \$10 = \$300,000$. The annual inventory carrying cost is $\$300,000 \times .25 = \$75,000$.

If the firm increases inventory turnover from 6 to 9 turns per year and maintains the same level of product flow, the average inventory would be $180,000/9 = 20,000$ units or \$200,000. There are two important influences at work here. The firm will:

1. Experience a \$100,000 reduction in the cash invested in inventory.
2. Have operating savings based on a reduction in carrying costs. Carrying costs will now be $\$200,000 \times .25 = \$50,000$ per year, which equates to an annual savings of \$25,000 ($\$75,000 - \$50,000$).

As the example demonstrates, inventory turnover is a critical performance metric to assess the effectiveness of inventory management. Because it is so extensively used as a diagnostic tool, it is imperative that inventory turnover be calculated using appropriate and valid techniques.

Calculating Turnover

Calculating inventory turnover does not appear to be complex. Take product flow for the year and divide by the average inventory—that's all there is to it.

The key is that *both* product flow (dollar volumes, physical flow of units, accounting measures of sales) and average inventory must be accurately measured.

Product Flow. There are many ways to derive the sales volume numbers used to calculate inventory turnover. In today's environment, bar codes and POS (point-of-sale data) make it pretty easy to accurately measure the flow of volume through a facility or logistics system. Often times this information is readily available from software in the warehouse (WMS or ERP systems).

However, if firms use periodic financial summaries to determine sales for a period, it is important to assess whether the sales data, if not reported in units, is based on cost or retail value. The numbers must be reported with *consistency*. If inventory is valued at cost, then sales (product flow) need to be valued at cost; if inventory is measured at retail values, then sales (flow) should be measured at retail value.

Warehouses typically work with unit volumes, as opposed to dollar values. Working with sales, product flow and inventory values in units eliminates any problem with consistency in valuation.

Average Inventory. Average inventory represents the typical amount of product found in the facility at any given point in time. *What is the most accurate way to determine the average inventory?* The answer depends on the nature of the product flow through the warehouse. If there is little variability in product flow from day- to-day, month-to-month and quarter-to-quarter, and there is no increasing or decreasing trend in sales over the year, then calculating average inventory is uncomplicated. Measuring inventory at any one time would produce about the same results as it would at any other time. In this situation, it would probably be safe to take the beginning inventory at the start of the year, add the ending inventory at year's end, and divide by two.

When product flow varies throughout the year, and inventories expand and contract during different periods, more frequent measures of the inventory level need to be taken to generate an accurate measure of the average inventory. The most accurate measure would be recording daily inventories for the year, adding them, and then dividing by 365. This would guarantee that all the highs and lows have been adequately accounted for.

If it is not possible to use daily inventories, an average of weekly inventories is the next best alternative, followed by the average of monthly inventories and so on. The worst measure of inventory is the record of inventory at year's end or at any single point in time.

Monthly Inventories

If monthly inventories are used, consider the time of the month that inventory is taken. Many companies have formal or informal policies that dictate that inventories be kept at a minimum at the close of the month in order to financially report the lowest inventory levels on the balance sheet. This could result in much higher levels at the beginning of the month. In this case, end-of-month inventories will not provide sound comparative data. Daily inventories using high, low, and average levels will provide management with the proper tools to make inventory decisions. To see the impact of these effects, assume the following product flow situation:

1st Month, 500 units, 2nd Month, 750 units, 3rd Month 200 units

- Method 1: The average inventory is $500+750+200/3 = 1450/3 = 483$ units. Assuming total annual volume of 7200 units, inventory turnover would be $7200/483 = \mathbf{14.90}$
- Method 2: Calculate average inventory using only the first and last month, then average inventory would be $500+200 = 700/2 = 350$ units. Assuming total annual volume of 7200 units, inventory turnover would be $7200/350 = \mathbf{20.60}$

By using only the beginning and ending inventory figures, turnover is calculated to be over **5 turns higher** than it actually is—an increase of 38%.

Dollars versus units. It is usually more precise to work with inventory turnover statistics using units rather than dollars because dollar measures are subject to different interpretations, and costs and prices may change during the course of a year. If dollar measures are used, make sure that the product flow measured in dollars is the same as the inventory values measured in dollars.

In addition, if inventories are valued at cost, and the data is provided from accounting and financial statements, you also need to know the **inventory valuation method** (LIFO or FIFO), because the method will affect the dollar value associated with the inventory.

Inventory-related sales. It is important to compare inventory to the velocity of related sales from the warehouse. For example, in distributor and wholesaling operations, product can be shipped directly from vendor to customer, which means it would not move through the warehouse and should not be counted against that inventory. *Direct sales and direct shipments do not require inventory stored in the warehouse and should not be used in calculating inventory turns.* As another example, a manufacturing company may decide to ship product or customer orders from a plant or distribution center outside the existing service region. Such sales must be deducted before calculating inventory turns.

Excerpted from *Inventory Turnover*, by Dr. Tom Speh