

## The strategic management of inventory

or

### How much does inventory really cost to hold?

#### Introduction

Inventory holding cost may not seem like a strategic lever. In fact, it is one of the key ways in which Finance departments can help improve working capital.

In 2019, a commonly encountered belief is that holding cost is low because interest rates are low. This is partly true, but misleading. In this white paper we will examine why, and why it matters.

One reason why organisations may hold too much inventory is that they underestimate the true cost of holding inventory. In this white paper we will also examine why this is an issue, what a realistic holding cost is and how it should be used.

#### What is inventory holding cost?

Holding cost is the cost of holding inventory and is expressed as a percentage of unit costs. If an item costs €100,000 to produce or buy, and it costs €20,000 a year to hold, its holding cost is said to be 20%.

Holding cost is made up of the cost of capital tied up in inventory, plus the operational cost of holding the inventory: warehouse space, material handling, obsolescence, insurance, and so on.

Importantly, **holding cost is related to but not the same as the P&L (EBIT) impact of increasing or decreasing inventory**. Holding cost is the **total** cost of holding inventory and is used in inventory management for calculating batch sizes and deciding on advance or discount purchases. **It is greater than the P&L impact of changes in inventory** for a number of reasons. Firstly, EBIT does not include the cost of capital, but secondly, holding cost includes a number of costs which cannot be switched on and off at will: warehouses, employment, loans, etc. Holding cost includes P&L items, but also balance sheet effects.

It is a mistake to ignore these “fixed” costs. If you believe inventory to be expensive to hold, you will try to hold very little. If you believe inventory to be cheap to hold, you will tend to hold a great deal. But smart organisations should avoid this. Why fill up a building with inventory when you might have better uses for the space, such as adding a production line, or subletting part of the building? And once the building is more or less full, a perception that all that inventory is needed can lead to sub-optimal longer-term decisions, such as adding a warehouse.

Remember there is no such thing as fixed costs, just variable costs with longer or shorter time horizons.

## How much is holding cost?

Each organisation will have its own unique holding cost depending on its cost of capital and its operational cost structure. Holding cost can be difficult to estimate with any degree of accuracy, but it is worth putting some effort into generating an approximate figure for your own organisation.<sup>1</sup>

The operational cost can typically be broken down into the following categories:

1. Storage costs. Both external and internal warehouses, including, for instance
  - a. (notional) rental costs
  - b. Maintenance
  - c. Temperature control
  - d. Security
  - e. Insurance
2. Obsolescence. This can be further broken down into sub-categories such as:
  - a. Scrap (the total value of the inventory written off)
  - b. Rework costs
  - c. Discount costs (selling items at below cost)
3. Internal transfer costs. Moving inventory around between sites
4. Handling costs, including, in particular stock counting/stock control and especially those causing production stoppages
5. Management costs. The time spent by planning teams controlling existing inventory, dealing with obsolescence etc.
6. Overheads. All of the above requires IT, HR, Finance and other corporate time and expense

While building up an estimate, it is important to keep in mind the difference between total inventory holding cost and P&L impact. You may (rightly) feel that you need a storage warehouse, but this does not mean holding inventory in it has no cost. You will also need to make some estimates. If, for instance, you own a facility where half the space is filled with production lines and half the space is storage for inventory, then half the relevant costs for the facility should be included in inventory holding cost. Or if you have a team who are responsible for ordering, planning and controlling inventory, only their time spent controlling existing inventory should be included in holding cost. And so on.

Then consider the cost of capital. This should be the Weighted Average Cost of Capital (WACC). It is true that, writing in 2019, the global cost of debt is at historically low levels<sup>2</sup> and this in turn has led to relatively low WACC for asset-intensive companies, but this can be misleading. For a highly indebted company, the fact that WACC is low does not mean it can easily issue more debt. For such a company it would be undesirable for decisions to be made on the assumption of a low holding cost since it will lead to more capital being tied up in inventory. The opposite should be the case – these companies should do all they can to free cash from inventory and reduce their dependence on debt.

In fact, there is a compelling argument to ignore the calculated holding cost altogether and consider the opportunity cost instead. Look at the Internal Rate of Return (IRR) threshold for internal business cases to be approved. What is the highest IRR project that was rejected in the last 12-24 months? This can be considered the opportunity cost of the cash you have tied up in inventory and is a useful sense check that you are using a reasonable holding cost rate. The opportunity cost can easily be lower than your inventory holding cost, but if it is higher there is a strong strategic case to be made for using it as your holding cost.

## Why does it matter – what is holding cost used for?

Holding cost is an important factor in the inventory levels organisations target and ultimately hold. This is because of the decisions which are made on the basis of assumed holding cost. To take the two most important instances:

- Optimal Procurement order sizes can be calculated by offsetting re-order costs and volume discounts against holding cost. This directly affects raw materials inventory levels
- Optimal Production batch sizes can be calculated by offsetting set up costs against holding cost. This directly affects finished goods inventory levels

Note in these two examples we say “can”. In many cases organizations make these decisions with no explicit holding cost. Instead, they might produce “lot for lot”. Or they might simply choose the batch/order sizes that minimize production/acquisition costs within the constraints of what is possible in terms of capacity and reasonable in terms of expected demand. If you find a year’s worth of a particular raw material in your warehouse because Procurement found a great deal on it, this effect is in evidence.

The importance of holding cost for working capital should not be underestimated. In inventory optimization initiatives a lot of focus is put on safety stock levels, but order/batch size is another key lever. Let me illustrate this with a simplified example:

Demand for a product is 100 units per month. It is produced in 400 unit batches every 4 months. This means on average (net of safety stock), 200 units are on stock over the course of a year.

Now halve the batch size to 200 units produced every 2 months. Average stock holding (again, net of safety stock) over the year is now only 100 units.

## So what should you do?

Holding cost remains difficult to quantify precisely. Some approximations are necessary and diminishing returns are had from putting too much effort into it. But the final point to consider is the behavioural aspect. Operations departments have a constant focus on EBIT and only an occasional focus on cash. EBIT focus is a good thing, but can lead to an unconscious prioritisation of EBIT over cash. A key way to counter this is to ensure that a realistic measure of holding cost is used in calculations of batch sizes and factored into TCO calculations for procurement.<sup>3</sup>

We recommend you start by looking at how holding cost is used today and ensure that the holding cost used is not too low. 20% is normally a good starting point, or WACC plus 10% as an absolute minimum. We would then recommend trying to calculate your actual holding cost bottom up until you are confident you are in the range. Avoid having individual plants or business units do this themselves, since it leads to divergent results and much duplication of effort. Instead, Finance should establish a standard holding cost centrally and then ensure it is used globally. Multi-national corporations should find that holding cost varies from country to country in line with interest rates and there is a case to be made for high inflation countries to use a higher holding cost than the global standard.

From a behavioural perspective, if Operations has no working capital targets on their dashboard, there will be a strong tendency to hold too much inventory for the reasons we have set out in this paper. Fixing this is also important. But setting holding cost centrally is a strong lever that Finance can exert to free up working capital. Are you getting the most you could out of it?

If you would like to discuss how to take your inventory optimization capabilities to the next level, contact us: [information@nventic.com](mailto:information@nventic.com)

## Notes

1. An internet search for inventory holding cost can quickly generate an approximate percentage for rule of thumb calculations. For instance, Investopedia (<https://www.investopedia.com/terms/c/carryingcostofinventory.asp>) suggests 20-30% although it does not cite a source for this statistic.  
A textbook from 1993 reviews estimates of holding costs in academic studies between 1951 and 1990 (Lambert, D.M. and Stock, J.R., *Strategic Logistics Management* (third edition), Irwin (1993), page 366). All but one is within the range of 20-29% and while that one exception goes as low as 12%, that is only as part of a range from 12-34%. Interest rates are indeed very low in 2019, even within the perspective of the last 100 years, although when Harris (1913) first derived the EOQ model he took holding costs to be 20% at a time when interest rates (in the USA) were at 4.5%, so only 2% more than 2019.  
The CSCMP (Council of Supply Chain Management Professionals) commissions a yearly state of logistics report which includes a benchmark of inventory holding rates over the past 10 years in the US. The most recent figure, for 2018, was 18%. (<https://www.atkearney.com/transportation-travel/state-of-logistics-report>)
2. The European Central Bank (ECB) at the time of writing in 2019 is actually offering negative interest rates on deposits (and 0% on loans). Of course, most companies cannot borrow at ECB base rates, but costs of borrowing are historically low, as is WACC, which factors in the cost of equity. Some very big companies, based on what they report in their annual reports, have WACC in the low single digits.  
A benchmark of US firms from the start of 2019 found the average WACC for 6000 US non-financial firms was 8.22% ([http://people.stern.nyu.edu/adamodar/New\\_Home\\_Page/datafile/wacc.htm](http://people.stern.nyu.edu/adamodar/New_Home_Page/datafile/wacc.htm)). A KPMG study from 2018 focusing just on 276 firms in the DACH region, including 26 of the DAX30, is more or less identical (7% average WACC when including financial firms) (<https://assets.kpmg/content/dam/kpmg/ch/pdf/cost-of-capital-study-2018.pdf>). Note that operational costs can easily add another 10-20% on top of WACC.
3. This often adds additional impetus to reducing EBIT effects too. An organisation that complacently uses large batch sizes with an assumption of low holding cost (or no sight of holding cost), when confronted with a requirement to factor in a holding cost of 20% or more, will often urgently have to address topics like SMED to avoid productivity measures being negatively impacted.