

Safety Stock: Its Importance and Calculation



Table of Contents:

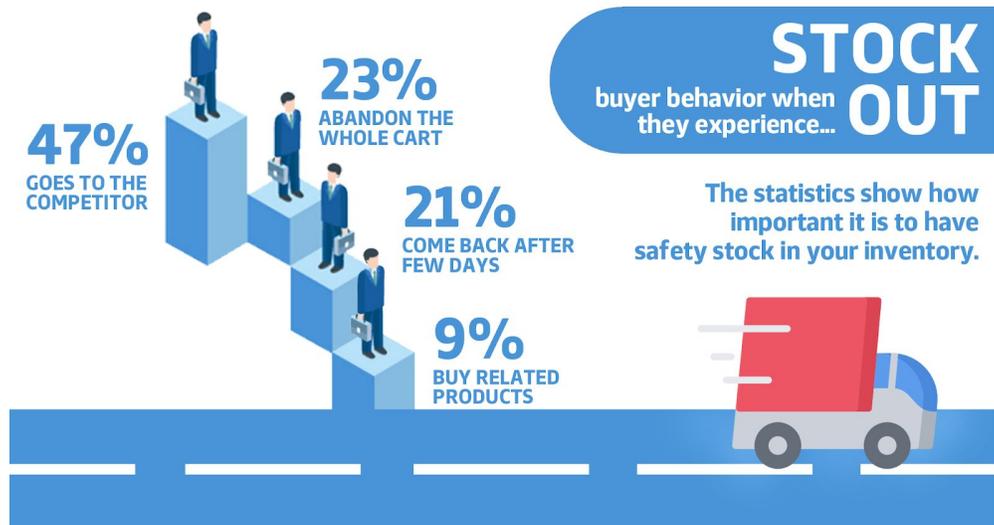
- **Introduction**
- **What is Safety Stock?**
- **3 (Jon-ey) Methods for Calculating Safety Stock**
- **Economic Order Quantity (EOQ)**
- **Reorder Level**
- **Service level and Safety stocks**
- **Example and Case Study**
- **Case Study**
- **Conclusion**

INTRODUCTION

Do you remember the childhood days when we used to keep all our pocket money into piggy banks? So that we can use it to spend on some special occasions.

In this article, we will be talking about Jon (definitely not the King of the North). He is a fictional character for better illustrative purposes and also a mushrooming retailer. He, for long, cherished the state of running OUT-OF-STOCK as a result of persistently good sales on various marketplaces. But he now is in a state of FOMO (fear of missing out) a good number of orders for the same reason.

By researching consumer behavior when they see 'out-of-stock' often, JON found all the more reasons to fear. Here's what he found out through his research



Much for the course correction, Safety Stocks have become a necessity for him.

Jon, smart enough to roll on, researched well on safety stock, and being a blogger himself, shared everything a retailer must know about it. Hence without wasting any time, let's understand what knowledge Jon shares on safety stock, its importance, and calculation.

WHAT IS SAFETY STOCK?

Every retailer stocks inventory according to its customer's average demand. Now, sometimes there can be a rush of sales. Meaning, you are soon going to be out-of-stock faster than you can replenish your inventory. This is for such situations that we need a safety stock.



...an extra inventory beyond consumer's demand. Can also be called a buffer to on-hand inventory during lead time.



Safety stock is basically a buffer to your on-hand inventory or the extra inventory beyond consumers' demand. Sellers and merchants know this term well, and hence it's essential for Jon and all of them to have it, and know exactly what quantity is required to be kept as safety stock.

As stated above, safety stock is a buffer inventory. The question arises, what should be the size of this on hand buffer inventory?

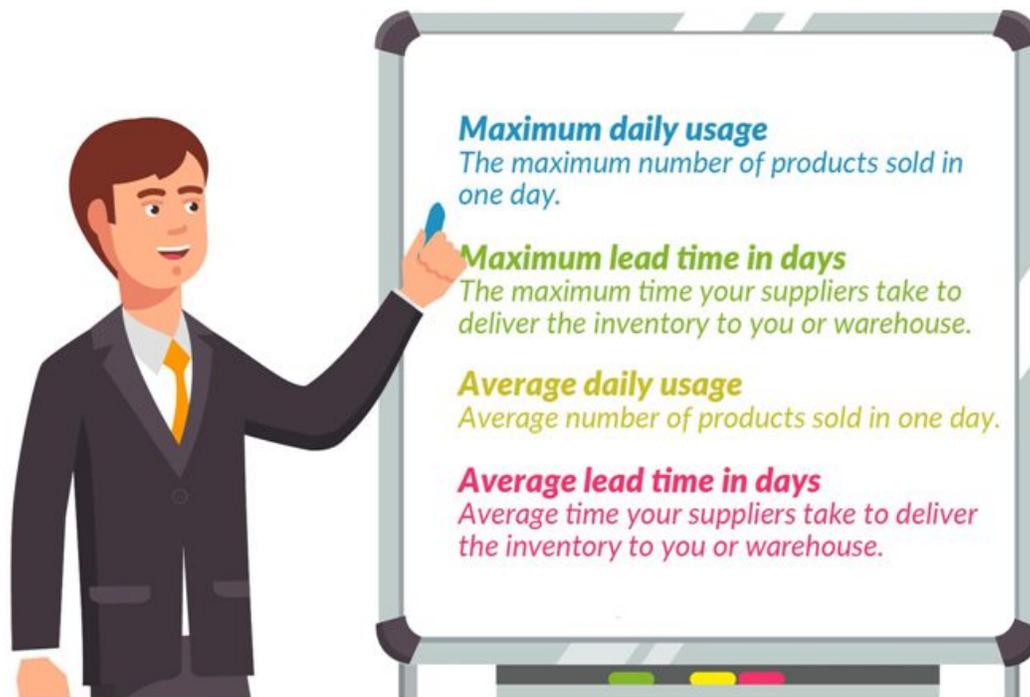
Based on Demand Forecasting



The above graph shows that with the help of demand forecasting, you can determine the estimated amount of safety stock. As the sales of a company rise, the demand also rises. The value difference between the maximum demand and the average demand is used as safety stock. If you can accurately forecast your average and maximum demand based on past data, you can easily calculate the required safety stock size for your organization.

SAFETY STOCK CALCULATION

Let's first understand the terminologies used in the safety stock formula. Our retailer Jon advises retailers of today to know about these terminologies which goes like this:



The formula of safety stock goes as follows:

the SAFETY STOCK formula



3 (Jon-ey) Methods for calculating Safety Stock

Every business has its own methods of calculating safety stock. However, these methods are basically classified into three different styles; statistical-based calculation, time-based calculation, and fixed safety stock.

the SAFETY STOCK calculating methods



STATISCAL based calculation

Uses mathematical theories of probability to calculate the safety stock level.



TIME based calculation

Here, stocks are monitored periodically to ensure accuracy.



FIXED safety stock

Here, companies set a fixed level of safety stock for their goods.

Statistical based calculation

It is a mathematical approach (which Jon hated the most, but fell for it has it filled in his pockets), which uses mathematical theories of probability to calculate the level of safety stock, to prevent stock-out circumstances.

Statistical-based safety stock calculation has its own benefits and drawbacks. “Although this statistical method is purely based on accurate mathematics, predicting business is not always as accurate,” says Jon.

Forecasting is not a foolproof solution. At times, situations can arise that cannot be predicted, even if you have done your homework on analyzing the demands.

For example, statistical methods have no control over market-demand. There are chances that statistics might show you to keep safety stock of items that no longer have a market value.

Time-based calculation

This method of calculating safety stock is time-based. The stocks required for a fixed period of time are calculated based on the time period and are monitored periodically to ensure accuracy and fulfill the need it is intended for.

Jon forecasted that there would be demand for 100 cases of part A to be consumed each day. In that scenario, the safety stocks count for a week for Jon would be 700 cases. That's how a time-based method is used by demand forecasting for a particular material in the coming days.

The main disadvantage of using the time-based calculation for safety stock is that you will lose the liquidity of your finances. This is because a lot of your capital gets tied up in safety stock. If your product is a slow mover, this will be more challenging as now your safety stock will become excess stock and get stuck in your warehouse eating up those valuable shelves.

Fixed Safety stock

In this method, companies set a fixed level of safety stock for their goods. Your production manager/planner would determine that level or value for the safety stock rather than relying on a quantity by a statistical calculation. This value of safety stock remains constant until the production manager manually changes it.

When it comes to safety stock, retailers need to know two essential things which will increase the efficiency of keeping stock in your inventory are:

- Economic Order Quantity (EOQ)
- Reorder level

Economic order quantity (EOQ)

Economic Order Quantity (EOQ) is a method of calculating the quantity of the stock that needs to be re-ordered by taking into consideration the demand for that particular item/product and your inventory holding costs.

EOQ is the answer to the question; what quantity of stock should you reorder to replenish your inventory?. It's basically an ideal quantity a company should purchase for its inventory.

Determining the economic order quantity, Jon can easily minimize the cost of inventory and safety stock. The economic order quantity formula is as follows:

**Economic
Order
Quantity**

$$Q = \sqrt{\frac{2DS}{H}}$$

where:

Q = EOQ units

D = Demand in units (typically on an annual basis)

S = Order cost (per purchase order)

H = Holding costs (per unit, per year)

Best case use of economic order quantity is to utilize it for calculating a specific re-order level for a specific level of your inventory. Upon reaching this level, it will trigger the need to place an order for more units and hence avoiding stock out circumstances.

For better understanding, let's assume you have a retail shop that carries women's top, and the sales count touches approx 2000 pieces each year. To hold those units of the top in your inventory, it costs you \$5/year, and the fixed cost to place an order is \$2.

The EOQ equation then would be,

$$\sqrt{\frac{(2 * 2,000 \text{ top}) * (\$2 \text{ order cost})}{\$5 \text{ holding cost}}} = 40 \text{ units}$$

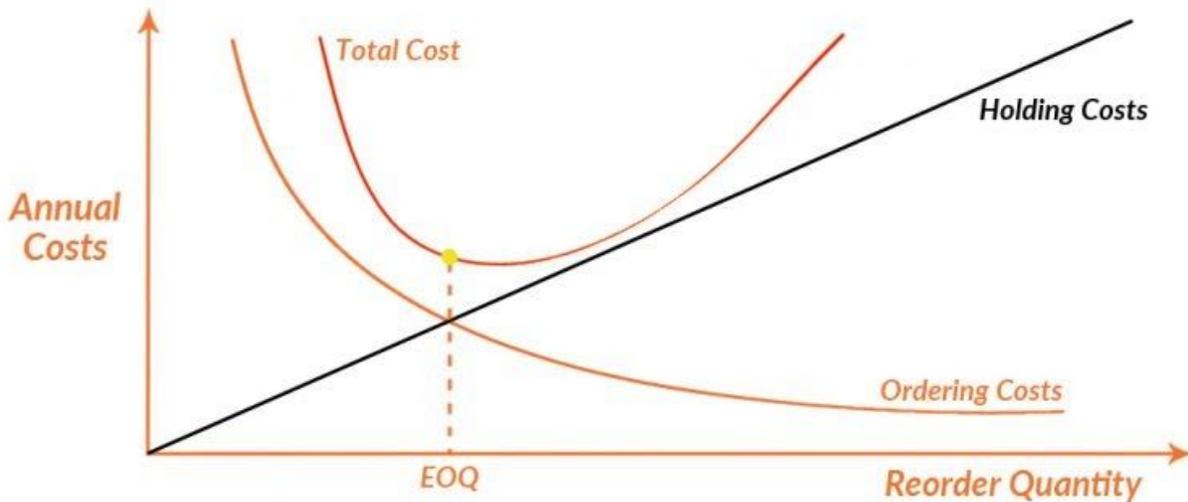
Hence the ideal order quantity to minimize costs and meet customer demand would be 40.

Reorder Level

Reorder level is the point where Jon replenishes his inventory in order to dodge the low inventory level. Below are the graphs, which shows the relation between

i) Annual cost and Reorder quantity.

ii) Max inventory, Reorder point, Safety stock.



The reorder point formula goes this way;

$$\text{Reorder Point} = \text{Lead Time Demand} + \text{Safety Stock}$$

Service level and Safety stocks

In inventory management, the service level is the probability of not going out-of-stock during the next stock replenishment cycle, eventually helping Jon to reduce the count of lost sales.

The service level is determined in business by the level of stocks or orders they receive. This is the only reason why Jon stocks in a quantity that is enough to cover the supplier's delivery times and is adequate enough to cover the customer's demand.

Overstocking can be a burden that Jon needs to avoid. Otherwise, it will cost his company to lose all the invested capital because of high maintenance and carrying costs.

Jon maintains a high level of service when it comes to retailing, and so are most of the retailing companies, by setting their goals at 97% as this is the only key towards assuring the client loyalty.

For measuring the safety level and readiness to deliver according to the number of units sold, the formula goes this way:

Service level = Number of quantities delivered / Total quantity of demand (by consumers)

Different Criteria for calculating service level

Different Criteria for calculating service level	Formula of Service level
Stock Out	number of quantities delivered / the total quantity of the demand
Frequency of Stock outs	number of order item delivered / the total quantity of order items
Loss of Sale	value of quantities delivered on time / the value of the total quantity of the demand
Stock out period	number of days with stockout / the total number of days



“ SAFETY STOCK optimization

helps a consumer goods company reduce the inventory cost by 27% while maintaining service levels. Stock levels dropped **€18.5 million** across the different classes and lead to bottom line savings of **€2.1 million.**

Now let's dip our toes into understanding the safety stock calculation and what are the scenarios where safety stocks play a vital role in having your business running smoothly.

Example and Case Study

Let's say your business is selling notebooks. On average, the daily selling of those notebooks is around 35. It takes approximately 7 days to replenish the stock again.

Now let's say exam season has arrived and the demand for notebooks has risen. You observed that on a particular day, the number of notebooks sold went up to 60 in a day. Also, due to bad weather, your supplier wasn't able to supply the notebook stock to your warehouse in the estimated time, and you received it after 12 days.

So for the notebooks, the safety stock level would be:

$$\text{Safety Stocks} = (60 * 12) - (35 * 7)$$

$$= 475$$

This means you need to have about 475 units of safety stocks on hand at any time (particularly when the exam seasons are going, or your city's weather condition changes frequently). With 475 safety stock, you'll be able to sell at least 35 notebooks per day for more than 12 days (i.e. max lead time).

Well, this was just one scenario where safety stock can be used. Let's dive deeper and understand different scenarios where safety stock can be your guardian angel.



1 When prices of the raw materials rise



2 When the supplier is not able to supply



3 When the demand exceeds expectations



Prices of raw material increases

Safety stocks prevent stock outs when there is a high variation in demand and supply. But what if the prices of the raw material whose product you sell sharply increases?

So if this type of situation arises and in that instance, if your inventory has got safety stock, then you've no idea how much money will be saved. Still wondering how this would work? This example would solve all your confusions:

Suppose you are a 'Handmade-Bag' seller, and because of the government's new policy, the prices of cotton, leather, and other fabrics (raw material), which are required to make a bag have increased. Eventually, it has made a great impact on the prices of the bags you sell.

If the cost of a bag is \$10, due to inflation, it becomes \$15. Imagine if you have a safety stock of 100 units, which were bought at \$10 (before inflation).

Your total purchasing amount would be $100 * 10 = \$1000$. And if you didn't have safety stock in the inventory, then you had to purchase the bags at \$15.

The total purchasing amount would be $100 * 15 = \$1500$.

Net loss = \$500

The supplier is unable to supply

There are multiple reasons that your supplier may fail to deliver the product on time, some of which are even reasonable and contractually acceptable.

It is possible that some natural disasters prevented sellers from being able to deliver the product. Say, for instance, a natural calamity like an earthquake or tsunami has seriously damaged your seller's factory and the finished goods prior to shipment.

For such cases having a safety stock with you on hand tends to be a business-saving gem.

Demand goes beyond expectation



A lovely situation for sellers at the beginning, but eventually becomes unlovely as time progresses.

There could be several reasons for such a situation, namely:

- Product's craze has suddenly grown
- The price of that product falls down
- The need for a product rises
- Cost of the product is going to increase in future

In such cases, your calculation of keeping a particular stock in inventory may get altered, and the risk of low-level in the inventory for that selective product arises.

Having safety-stocks on hand, in these types of an unexpected rise in demand, earns you more profit by achieving your consumer's needs.

Now let's look at the real like example with a case study, where safety stock was proven to be an asset – defining better logistics, improving inventory holding cost, reducing lead-time, and much more.

CASE STUDY

Internal Scenario of Company

Jon and his company, nowadays, have shown a great interest in becoming leaner and being competitive in the market. There certainly are different areas within the company wherein improvement is necessary to make the entire chain lean, leveraging from its benefits.

Of all the areas, the most important is “inventory” that the company has, which must always be efficient according to the lean inventory principles. Here, safety stock is one of the main drivers.

The company mentioned in this case-study has always tried really hard to manage its inventory efficiently across the supply chain. On the journey towards efficiency and being lean, safety stocks of this particular company have stolen the spotlight.

Cost minimization is the biggest target to be achieved for this company by having a safety stock efficient model in place.

The company about which we are talking about is owned by our expert Jon.

Jon's company is a manufacturer and a global leader in the aerospace industry. The main highlight in this company is the high demand variability and long lead time compared to the other competitors.

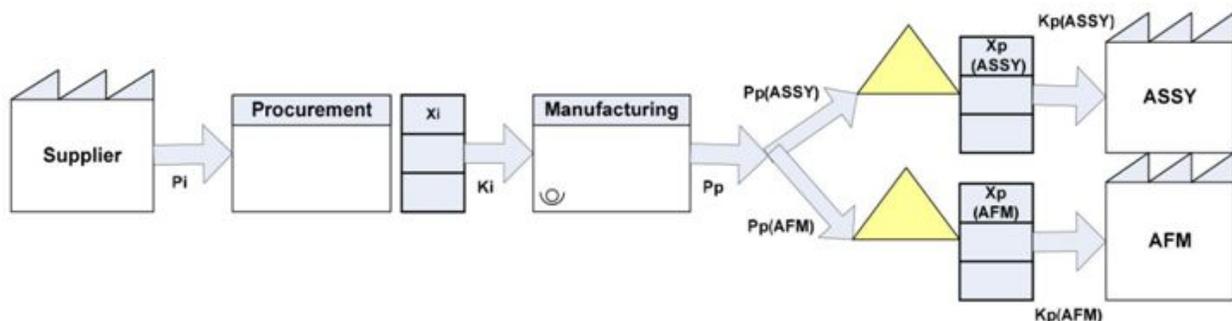
As said, Jon's company is a multi-stage manufacturer. There are different stages involved in the process, such as:

- Tiers of suppliers
- Procurement
- Manufacturing
- Assembling
- And most importantly, customers.

There are two manufacturing plants (MFs) that Jon's company has. Based on their tasks, the procurement department is responsible for getting the raw materials or unfinished parts through various other suppliers to the manufacturing plant or the production line.

Here, Jon's supplier can definitely be a representative of an external or internal manufacturing entity. To be noted – the procurement's location is basically different than that of the manufacturing unit.

The manufacturing unit mainly has two important customers – the Assembly (ASSY) and Aftermarket (AFM) before the final product goes out to the end-customer. The ASSY and AFM can either be from the internal chain or from the external supply chain, depends.



If at all the availability of the parts (right ones at the right time) is assured for the internal customers, there are 90% chance that the end-customers will get an on-time-delivery as well.

How can this availability be guaranteed? The best way is to have optimum safety stock levels maintained, which can also minimize the logistics costs.

For Jon's company, to apply the safety stock model in place, it was difficult to obtain appropriate input data that can achieve desired results.

However, they found many results of the databases which had all the data related to inventory and stock. That assisted the company with past data, documentation & reports. With the help of operational and strategic support personnel in Jon's company. All the integrated logistics departmental personnel passed in the required information for getting in the safety stock model to action.

Safety stock in action

The inventory strategy at the company for the manufacturing parts with the high cost and low volume is the MRP system. Based on this, a safety stock strategy is necessary for this particular category of parts. Suppliers' support cannot always be reliable, and hence safety stock comes into action for backing up this variability.

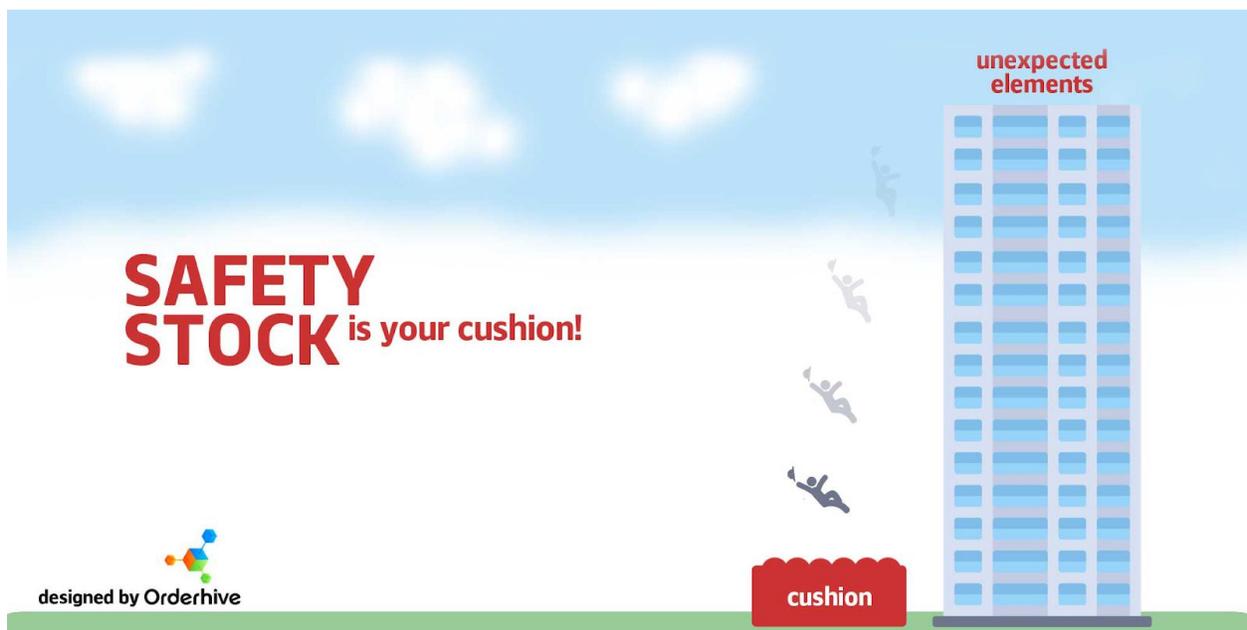
As per company rules, whenever there are changes in the supply chain – such as demand or entrance of new competitors, the introduction of a new product or the retirement of an older one, the safety stock's count should always be re-evaluated. Jon has decided to run the checks every quarter.

Jon's company has also designed its safety model in a way that whenever the safety stock is in the upstream stage, there will be tons of savings in the carrying or holding costs. On the other hand, if the safety stocks are kept in the downstream stages, a lot of lead time will be saved.

Conclusion

Jon says, "Safety stock acts as a cushion when you fall from the high-rise building of unexpected elements in the market." Thus having that cushion in your inventory, especially when there is a high fluctuation rate, could help a seller to bypass many or any unwanted circumstances.

Jon says, there is a thin line between safety stocks and excess-stock. Hence to determine the perfect quantity, efficient calculation of the safety stocks is a necessity, which is only possible if there is a good analytical & report generating tool available for demand forecasting.



But always remember, the more the safety stock, the higher would be the carrying and maintaining cost. Therefore, if you master the art of determining what level of safety stocks should be kept in your inventory, good sales are just numbers that would keep on increasing.

Related Articles:

<https://www.skuvault.com/blog/safety-stock-formula/>

<https://www.tradegecko.com/inventory-management/determining-our-safety-stock-level>

<https://www.eazystock.com/blog/4-reasons-for-carrying-safety-stock-inventory/>