

The limitation of crystal balls in inventory management

If you asked most supply chain professionals what super power they would most like, the ability to see the future would probably come fairly high up the list. Uncertainty – of demand, but also of lead times, failure rates, pricing, exchange rates, and many other variables – creates a high percentage of the headaches which supply chain professionals have to deal with on a daily basis.

But how much would 20-20 foresight really help? Ask Oedipus's father! He got 100% forecast accuracy from the Oracle at Delphi, but little good it did him.¹ Amongst the many forecasting methodologies used by modern professionals, consulting high priestesses in Greece doesn't normally feature too highly. But the Oedipus story illustrates an important limitation of forecasts: when you don't have all the details, knowing what the future holds is not as useful as you think. This principle is very important in inventory management.

For the non-specialist, it can be tempting to think that forecasting *is* the challenge with inventory optimization. If only we knew what demand is going to be, goes the thinking, we could always have just enough inventory. There are two major dangers with this argument:

1. Forecasts are almost always wrong due to the inherent unpredictability of the future
2. Too much emphasis on forecasts can blind you to the importance of other factors. Even with a perfect forecast, you can easily get your inventory levels wrong

Let me illustrate this second point.

[illegible][illegible]

In both instances the monthly demand is 60 units, with an average daily demand of 2 units. If your forecast was for monthly demand of 60 units, well done, your forecast accuracy is 100%!

Now think about how much stock you need to fulfil all orders in each case. Daily demand for product A is uniform – you need no safety stock. Each day you ship 2 units and produce 2 units for the next day. On average you hold 2 units. Product B is very different. In order to meet orders, assuming you don't know which day the order(s) might fall, you would need to carry 60 units every day. That's 30 times as much stock as for product A. Quite a difference, considering forecast accuracy was perfect and total demand was identical in both instances.²

It is said that forecasts are always wrong. The further into the future they look and the more detailed they are, the more wrong they are. Knowing this, forecasters normally refresh their forecasts regularly and avoid too much granularity – grouping demand into weekly or monthly “buckets”. But as our example has shown, even a perfect forecast of aggregate demand has limited usefulness without an equally good understanding of what variability to expect.

Rather than focussing too much on forecasting, inventory managers need to give adequate consideration to other factors, such as demand variability, lead time, target service levels, and so on. However, this is not to say that you don't need to give proper attention to demand. It remains one of the most important inputs to inventory calculations and is probably the most likely to change. But to consider demand you don't have to turn to forecasts.

Forecasting is a substantial discipline in its own right and one which we're not going to explore in any detail here. At nVentic, our approach when calculating optimal inventory levels is to start by using actual daily demand instead of any forecast. There are a number of benefits to doing this:

1. You already know your actuals, so you don't need to put effort into generating a forecast
2. Actuals are in their natural form and not aggregated into buckets that hide the actuals
3. You can use actuals to measure variability as well as average demand
4. Actuals are incontrovertible – you don't need to spend time convincing other people how realistic they are
5. Actuals are immutable – as time progresses more actual data become available, but the actual data for any given time period will not change. Forecasts, however, are constantly overwritten and it is easy to lose track of what they were at the time plans were put together, especially since lead times vary by product

There are certainly cases where actuals are inadequate: for instance, with new product launches, where there are no actuals; or sporadic spare parts, where mean time between failures (MTBF) models may well be more useful. And there are events that planners need to be aware of and allow for that may not be visible in the actuals (sales promotions, patent cliffs, seasonality, etc.) as well as longer term product cycles which may be evident in the actuals (sales growth, decline, etc.).

We are not suggesting that using actuals is always better than using forecasts, or that you shouldn't put efforts into improving forecast accuracy. Our approach is to start by using actual demand to calculate optimal inventory levels and then factor in the forecast if (and only if) you are confident it will be more accurate or more beneficial than the actuals.³

Conclusions

In inventory management, it is very important to understand and accept the limitations of any forecast and not to neglect the other key levers. Properly factoring demand variability into the approach is often a largely untapped area of potential. Shortening lead times takes some effort to achieve, but allows organisations to be more responsive and to carry less stock. And developing explicit service level targets and building them into your inventory approach is a very valuable way of balancing the opposing requirements of high service levels and low cost in an objective way.

If you follow this approach, we predict you will be pleasantly surprised by the results.

Notes:

1. King Laius consulted the oracle at Delphi as to whether his wife, Queen Jocasta, would ever have children. He was told that any boy born from their union would end up killing his father. Therefore, when a boy, Oedipus, was born, they left him out on a hillside to die. Oedipus was spared but due to the sequence of events grew up ignorant of who his true parents were. In a classic example of a self-fulfilling prophecy, Oedipus ends up killing Laius precisely because he doesn't know who he is – which one can assume would not have happened had Laius not heard the prophecy in the first place!
2. This example is deliberately simplistic. In reality a majority of items are likely to display more normally distributed demand, but these two extreme examples illustrate the point with a minimum of statistics.
3. How do you determine if the forecast you have been using is better or worse than actuals? In statistical terms, if the Mean Absolute Deviation (MAD) of your forecast vs your actuals is greater than the MAD of your actuals, you would be mad to use the forecast!