2.8: Inventory Models for Uncertain Demand

Inventory Models for Uncertain Demand

The previous models are valid on the assumption that the market demand is known and stays unchanged. However, sometimes, the market demand could change unexpectedly. This could lead to an inventory shortage, which would change the reorder point. To keep pace with the market, it would be prudent to consider the oscillation in demand during lead time and add in a safety stock. The demand oscillation is commonly measured in terms of the standard deviation *(δ)* from the average demand during the total time for an order as calculated below:

$$\delta_L=\delta_t\sqrt{L}$$

Knowing the demand variation, the safety stock should be considered to avoid stock out. However, the level of certainty for not facing stock out must also be considered. For example, if we choose to have 95% certainty that stock out and backorder does not happen (also known as Cycle Service Level), then we are reducing the risk of stock out to 5% (100%-95%). Assuming that the demand during lead time is normally distributed, the Z value (Z table) for the selected certainty level would be multiplied to the calculated δ_L to determine the Safety stock as shown below:

$$SS=Z\delta_L$$

The incorporation of safety stock, based on the cycle service level, would move the reordering point to:

$$ROP=d_L+SS$$

Example

A cell phone kiosk has an average demand of 20 phones per week with a variation of 4 phones. The lead time for this kiosk is always 1 week. The Kiosk wishes to maintain a 90% cycle service level. What would be the safety stock and reorder point for this kiosk?

Solution

$\delta_L=\delta_t(\sqrt{L})=4(\sqrt{1})=4$

$SS=Z\delta_L=1.28(4)=5.12$ or 5

Note: *Z value for 90% in Z table is 1.28*

$ROP=\delta_L+SS=4+5=9$

Source