Inventory Simulation Models Theory

1. Economic Order Quantity (EOQ)

The EOQ model determines the optimal order quantity that minimizes the total cost of inventory.

Assumptions:

- Constant demand rate (D)
- Constant lead time
- Fixed ordering cost (S)
- Constant holding cost per unit per year (H)

Formula: EOQ = sqrt((2 * D * S) / H)

Total annual cost = (D/Q)*S + (Q/2)*H

2. Reorder Point (ROP) System

In continuous review systems, the reorder point is the inventory level at which a new order is placed.

ROP = (Demand rate * Lead time) + Safety stock

Safety stock is added to cover demand variability during lead time.

3. Stochastic Demand Inventory Simulation

When demand is random, simulation can be used to estimate stock-out risk.

Monte Carlo simulation can generate random daily demand and track inventory over time.

This helps determine optimal safety stock and reorder levels for desired service levels.

4. Service Level & Safety Stock

Service level is the probability of not stocking out during lead time.

Safety stock is calculated using demand variability and desired service level.

Formula: Safety stock = Z * sigma_L

Where Z is the z-score for the desired service level and sigma_L is the standard deviation of demand during lead time.