Summary

EOQ Model with Constant Demand and Variable Order Cycle Time

For this model, the following characteristics (or inputs) are assumed:

- The inventory system involves one type of item or product
- The demand is known and constant and is resupplied instantaneously
- The inventory is replenished in single delivery for each order.
- Lead time (LT) is constant and known, that is replenishment is instantaneous, so that inventory increases by Q units as soon as an order is placed.
- Shortages are not allowed. That is, there is always enough inventory on hand to meet the demand
- Purchase price and reorder costs do not vary with the quantity ordered. That is quantity discount is not available
- Carrying cost per year (as a fraction of product cost) and ordering cost per order are known and constant
- Each item is independent and money cannot be saved by substituting by other items or grouping cost several items into a single order.
- This model is based on the above assumptions, except that the inventory system runs out of stock for a certain period of time, i.e. shortages are allowed. The cost of a shortage in this case is assumed to be directly proportional to the average number of units short. Usually two types of situations occur when an inventory system runs out of stock:
    I. Customers are not likely to purchase inventory items, and therefore, any sale that would have resulted is lost
    II. Customers wait to receive an order from the supplier and such backorder(s) is filled on stock availability. The backorder cost (cost of keeping back log reorders, cost of shipping the items to the customers, loss of goodwill) depends upon how long a customer waits to receive an order. It is expressed in rupees per unit of time

EOQ model with constant demand and fixed reorder cycle time

Let the reorder cycle time, t be fixed, i.e. the inventory is to be supplied after every time period t. also, let Q equal to D into t, where D is the demand rate per unit time, Q is the fixed lot size to meet the demand for the period t

The amount M (<Q) n is planned to meet the demand during time, t_1 is equal to M/D.

Since the reordering (or set-up) cost and time t are constant, therefore the total variable inventory cost (TVC) is given by: TVC (M) is equal to carrying cost plus shortage cost is equal to M square by 2Q into Ch plus 1 by 2Q (Q minus M) whole square into Cs

EOQ model with gradual supply and shortage allowed

This model is based on the assumption as below except that shortages are allowed.

1. Demand is continuous and at a constant rate
2. During the production run, the production of the item is continuous and at a constant rate until production of quantity (Q) is complete
3. The rate of receipt (p) of replenishment of inventory (that is items received per unit time) is greater than the usage rate (d) (that is items consumed per unit time)
4. Production runs in order to replenish inventory are made at regular interval
5. Production set-up cost is fixed (independent of quantity produced)

The aim in this situation is to minimize the total yearly variable inventory cost. Total variable cost (TVC) is equal to set-up cost plus carrying cost plus shortage cost.

Other important formulae:

1. Production cycle time, t* is equal to Q* by D is equal to 1 by D into square root of 2DC0 by Ch (p by p minus d) (Ch plus Cs by Cs)is equal to square root of 2C0 by DCh (p by p minus d) (Ch plus Cs by Cs)
2. Optimal inventory level, Q1* is equal to (p minus d by p) Q* minus Q2* is equal to square root of 2DC0 by Ch (I minus d by p) (Cs by Ch plus Cs).
3. Total minimum variable inventory cost, TVC* is equal to square root of 2DC0 Ch (I minus d by p) (Cs by Ch plus Cs).