Private item inventory control model with and without shortage and quantity discount in deterministic inventory control model

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Abstract : In this paper we discuss about the private item inventory control model with and without shortages and quantity discount in deterministic inventory control model. We calculate the economic order quantity and economic batch quantity and some other formulae in other notations.

IndexTerms **- Demand, Carrying price, ordering price, shortage price, Reorder level Cycle time, lot size, Entire variable price.**

I. INTRODUCTION

The deterministic methods consider a private best estimation of inventory reserves grounded on recognized engineering geological and economic information. Deterministic models of inventory control are used to determine the optimal inventory of private time when demand is mostly largely obscure. Under the model, inventory is building up at a constant rate to meet a determined or accepted, demand.

II. DETERMINISTIC INVENTORY CONTROL MODELS

We calculate only three models in this paper, they are following below:

Fig. 1. Private item inventory control model without stock-out.
Fig. 2. Private item inventory control model with stock-out.
Fig. 3. Private item inventory control model with a quantity discount.

NOTATIONS FOR IN THIS PAPER WE USED:

The brackets indicate to the unit of measurement of each.
P = Purchase (or manufacturing) price of an item (Rs. Per unit)
P_0 = Ordering (or set-up) price per order (Rs per order)
r = price of carrying one rupee's worth of inventory expressed in terms of percent of rupee value of inventory (percent per unit time)
P_h = price of carrying one unit of an item in the inventory for a given length of time (Rs per item per unit time)
P_s = shortage price per unit per time (Rs per unit time)
D = yearly requirement (demand) of an item (units per unit time)
Q = order quantity, i.e. number of units ordered per order (units)
ROL = reorder level (or point) i.e. the level of inventory at which an order is located (units)
LT = replenishment lead time (time period)
n = number of orders per time period (orders per unit time)
t = reorder cycle time i.e. the time interval between successive orders to replenish (time period)
t_c = construction period (time period)
r_c = construction rate i.e. the rate at which quantity Q is added to inventory (quantity per unit time)
EP = entire inventory price
EVP = entire variable inventory price.

PRIVATE ITEM INVENTORY CONTROL MODEL WITHOUT STOCK-OUT

1.1 EOQ model with a constant rate of demand

In this model, demand is assumed to choose an economic order quantity Q^*(EOQ) and ordering frequency (the time when an order must be placed) in such a way that the entire yearly inventory price is minimized. For this model, the following characteristics are assumed.

- The inventory is replenished in private delivery for each order.
- Lead time (LT) is constant and known, i.e. replenishment is instantaneous so that inventory increases by Q units as soon as the order is placed.
- Stock-outs are not allowed. That is, there is always enough inventory on hand to meet the demand.

- Purchase price and reorder prices do not vary with the quantity ordered. That is, the quantity discount is not available.
- Carrying price per year (as a fraction of product price) and ordering price per order are known and constant.
- Each item is independent and money cannot be saved by substituting by other items or grouping price *several items* into a private order.

We should remember two points in this model:

- The main purpose of this simplified model is to derive useful results rather than representing real-life problems. The results so obtained may not provide an optimal answer to real-life problems but they are good approximations and provide useful guidelines.

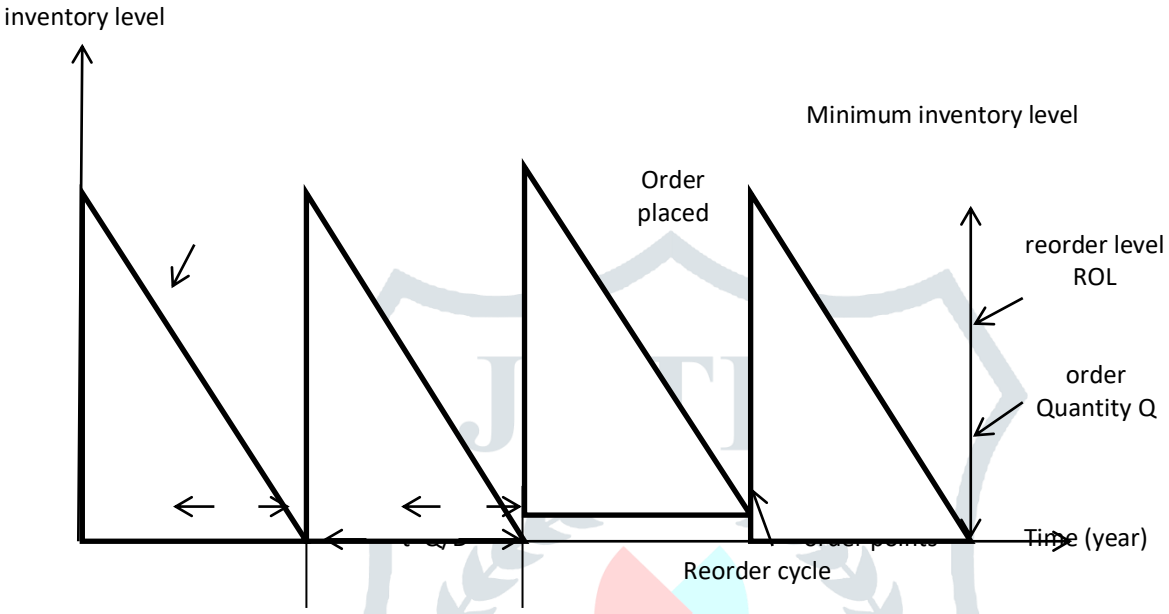

Fig 1.1 Inventory model with constant Demand and instantaneous Supply

- It is the basic model and can be extended in many ways. The few assumptions made in this model will be removed in the subsequent models to bring them close to realistic problems of inventory control. At the beginning of the inventory cycle time, we start with a maximum amount of inventory equal to the order quantity Q. As this amount consumed the level of inventory drops at a constant rate equal to the demand rate D. when it reaches a specific level called *reorder level (ROL)* enough inventory is available to cover expected demand during the lead time LT. At this, an order is placed equal to Q which arrives at the end of lead time, when the inventory level reaches zero. This amount is placed in stock all at once and the inventory level goes up to its maximum value. Obviously, during the reorder cycle the amount of order quantity received and consumed are as equal as the stock at both start and finish of the cycle is zero. That is,

Order quantity replenished in One inventory cycle = Yearly demand consumed in one inventory cycle

$$Q = D.t$$

In order to determine optimal order size (Q), we need to calculate an entire variable inventory price for each order cycle. That is given by,

Entire variable yearly price = Yearly carrying price + Yearly ordering price =}+}EVP = The entire variable inventory price minimum at a value of Q which appears to be at the point where inventory carrying and ordering prices are equal. That is,

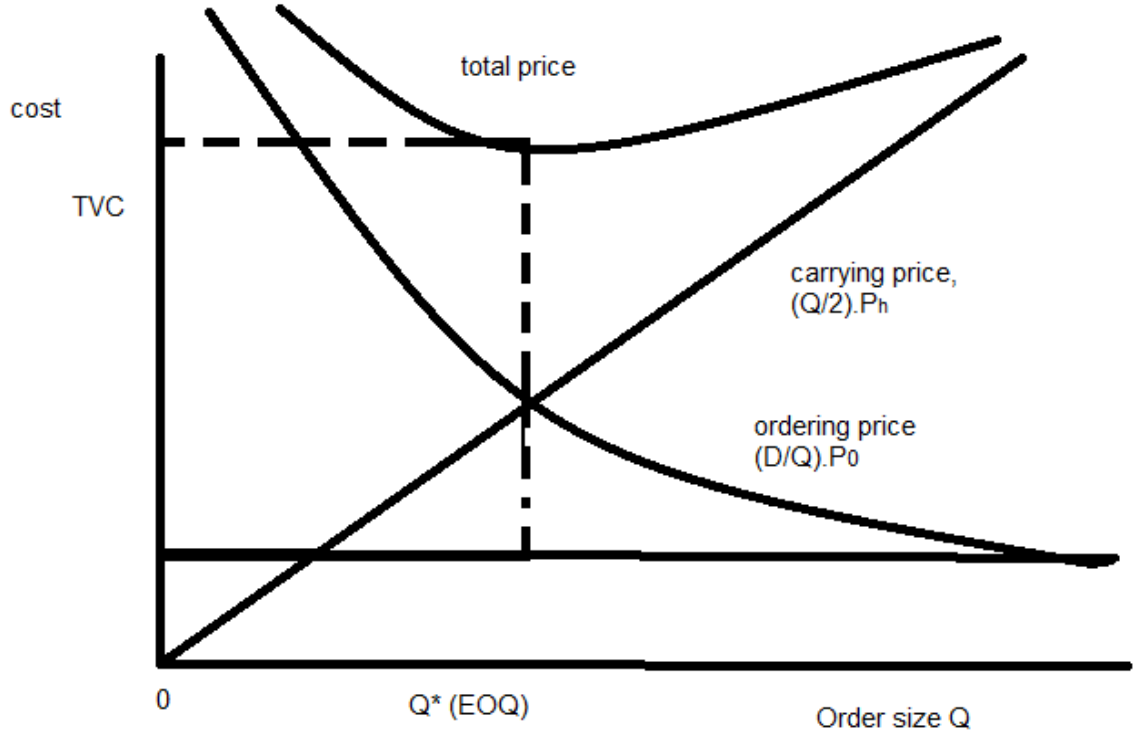

Fig 1.2 Trade-off between EOQ and inventory prices

Other important formulae

II. The optimal length of inventory replenishment cycle time (t*) optimal interval between the successive orders.
III. The optimal number of orders (N*) to be placed in the given time period (assumed as one year)
IV. Optimal (minimum) entire variable inventory price (EVP*)
V. Optimal entire inventory price is the sum of variable price and fixed price so

CONCLUSION:

In this paper, we calculate the value of economic order quantity, economic batch quantity, entire variable price and etc. so many notations are changed in the problem. The formulae do not give the wrong answer because the notations always give the correct answer. It is useful to calculate the value of economic order quantity in the industry.

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