

A Study On The EOQ Model Of Inventory Management

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Abstract - The Economic Order Quantity (EOQ) model is considered as the oldest classical scheduling production model that is used in accounting the inventory cost in a company. EOQ is one of the techniques of inventory management which minimizes the overall costs of inventory. It is the ideal model for a company to purchase optimum quantity of inventory to keep the overall inventory costs (carrying costs, holding costs) minimum possible.

Keywords: carrying cost, economic order quantity, holding cost.

I. INTRODUCTION

Inventory management is an important aspect of any successful business as inventory is the most important asset for every organization. It gives the overview about the flow of units a business uses in the production or manufacture of goods for sale or distribution. Inventories are generally made up of a combination of goods, raw materials and finished products. The effective management of these items is essential to ensure optimal stock levels and to maximize the earning potential of the company. It also provides business to reduce any inventory-associated losses. Inventory management involves keeping the record of a company's stocked goods. It monitors their weight, dimensions, amounts and location. This helps business owners to know when it's time to replenish products, or buy more materials to manufacture them.

Effective inventory management is essential for ensuring that the business has adequate appropriate stock on hand to meet customer demand. If inventory management is not handled properly then it can result in a business either losing money on potential sales that can't be filled, or wasting money by stocking too much inventory. An effective inventory management system can help to prevent these losses.

One of the technique of inventory management is EOQ. The Economic Order Quantity (EOQ) is the number of units that a company should add to inventory with each order to minimize the total costs of inventory—such as holding costs, order costs, and shortage costs. The EOQ is used as part of a continuous review inventory system in which the level of inventory is monitored at all times and a

fixed quantity is ordered each time when the inventory level reaches a specific reorder point. The EOQ provides a model for calculating the appropriate reorder point and the optimal reorder quantity to ensure the instantaneous replenishment of inventory with no shortages. It can be a valuable tool for small business owners who need to make decisions about how much inventory to keep on hand, how many items to order each time, and how often to reorder to incur the lowest possible costs.

The EOQ model assumes that the demand is constant, and that inventory is depleted at a fixed rate until it reaches zero. At that point, a specific number of items arrive to return the inventory to its beginning level. Since the model assumes instantaneous replenishment, there are no inventory shortages or associated costs. Therefore, the cost of inventory under the EOQ model involves a tradeoff between inventory holding costs (the cost of storage, as well as the cost of tying up of capital in inventory rather than investing it or using it for other purposes) and order costs (any fees associated with placing orders, such as delivery charges). Ordering a large amount at one time will increase a small business's holding costs, while making more frequent orders of fewer items will reduce holding costs but increase order costs. Thus, the EOQ model finds the optimum quantity that minimizes the sum of these costs.

OBJECTIVE:

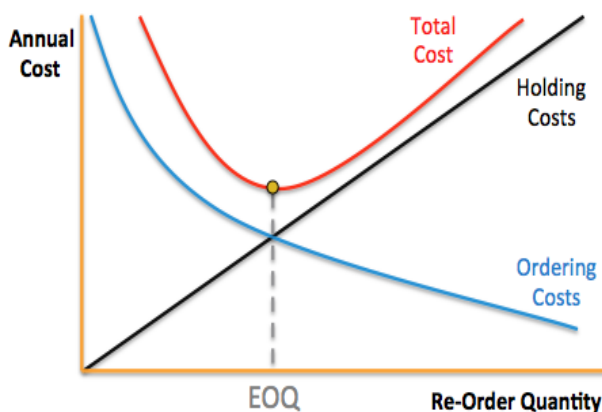
- To understand the concept of EOQ Analysis.

II. REVIEW OF LITERATURE

Inventory Management is a technique for controlling and monitoring the inventory orders, its usage and storage along

with the management of finished goods that are ready for sale. If the inventory is not managed properly, then it can lead to increase in storage cost, working capital issue, wastage of human resources, increase in idle time, disruption of the supply chain, etc. All this leads to a reduction in sales and unsatisfied customers. Therefore, inventory management is an important aspect of the business which should not be ignored and must be managed properly.

Economic Order Quantity technique focuses on taking a decision regarding how much quantity of inventory should the company order at any point of time and when should they place the order. In this model, inventory is reordered when it reaches the minimum level. EOQ model helps to save the ordering cost and carrying costs incurred while placing the order. With EOQ model the organization is able to place the optimum quantity of inventory.



EOQ is the most appropriate technique used to address inventory management problem. When using this technique, there are some cost affecting the calculation. The costs are annual material cost, annual holding cost, annual ordering cost, and annual total cost. EOQ aims at balancing annual order cost and annual holding cost, thus minimizing total cost. Below are the equations related to economic order quantity:

Q^* : optimal order quantity (unit/order)

D : annual demand of product (unit/period)

S : setup cost (price/order)

h : holding cost as a fraction of product cost (price/unit period)

C : product cost (price/unit)

Q : lot size (unit/order)

In EOQ technique, product cost is not depending on the size of an order, so the material cost is formulated:

Equations

$$(1): \text{Annual Material Cost} = C \cdot D$$

Given annual demand (D) and lot size (Q), we can calculate number of orders that must be put by company in one year that formulated using Equation 2.

$$(2): \text{Number of Orders per Year} = D/Q$$

In EOQ technique, setup cost is incurred whenever company put an order, so the annual ordering cost is formulated by Equation 3.

$$(3): \text{Annual Ordering Cost} = (D/Q) \cdot S$$

Because lot size is denoted as Q , so the average inventory level that hold by pharmacy is $Q/2$ unit. While, the annual holding cost is the cost of keeping the inventory in the warehouse for one year. The keeping cost is usually stated as portion of unit cost, so the annual holding cost is formulated:

$$(4): \text{Annual Holding Cost} = Q/2 \cdot h \cdot C$$

Then, annual total cost is the sum of annual material cost, annual ordering cost, and annual holding cost. The formula is shown below:

$$(5): \text{Annual Total Cost} = CD + D/Q \cdot S + (Q/2)hC$$

Optimal lot size is found when annual setup cost equals with annual holding cost:

$$(6): \text{EOQ Equation } (D/Q) \cdot S = (Q/2)hC$$

By solving the above equation, thus we get Q^* as the optimal lot size:

$$(7): \text{Optimal Order Quantity} =$$

$$Q^* = \sqrt{\frac{2DS}{hC}}$$

(8): Re-order level=Buffer stock or Safety stock + (Maximum daily usage rate*lead time), this gives the information about when to place an order for the inventory.

III. DATA ANALYSIS & INTERPRETATION

A firm requires 50 items everyday for a machine . A fixed cost of Rs. 50 per order is incurred for placing an order.

The inventory carrying cost per item amounts to be Rs. 0.02 per day. The lead period is 32 days and the level of safety stock is 400 units. Compute 1) Economic order quantity and 2) Re-order level.

Solution:

Given consumption per day=50

Annual requirement=50*365

$$=18250 \text{ units.}$$

Ordering cost per order=Rs.50 per order

Carrying cost per day=Rs.0.02

Carrying cost per annum=Rs.0.02*365

$$=Rs.7.3$$

Economic Order Quantity=SQRT(2*A*O/C)

$$=SQRT(2*18250*50/7.3)$$

Economic Order Quantity=500 units per order

Total number of orders(in a year)=Annual requirement/EOQ

$$=18250/500$$

$$=36.5 \text{ orders}$$

Time gap between the orders= No of days in a year/total number of orders

$$=365/36.5$$

$$=10 \text{ days}$$

Total Ordering Cost=Total number of orders*Ordering cost per order

$$= 36.5*50$$

$$= Rs.1825$$

Total Carrying Cost= (EOQ/2)*Carrying cost per unit per annum

$$= (500/2)*7.3$$

$$= 250*7.3$$

$$= Rs.1825$$

Total Carrying And Carrying Cost=1825+1825

$$=Rs.3650$$

Given Safety stock level=400 units

Lead time = 32 days

Re-order level = Safety stock+(Maximum daily usage rate*Lead time)

$$=400+(50*32)$$

$$=400+1600$$

Re-order level =2000 units.

Interpretation:

The economic order quantity is 500 units per order, this is the optimal quantity the company should order to minimize the cost i.e. the level at which the total carrying cost (Rs.1825) is equal to the total ordering cost(Rs.1825).If the firm orders more than this quantity then it increases the carrying cost increases and if the firm orders less than this then it increases the ordering cost. The total number of orders in a year is 36.5 orders. The time gap between the orders is 10 days . the re-order level is 2000 units that means when the inventory level reaches 2000 units in the firm then it should place the order.

IV. CONCLUSION

The Economic Order Quantity model is one of the most crucial tool for effective inventory management as it reflects the accurate measure of inventory quantity. It provides the break even between the two extremes i.e. if the quantity is massive then the frequency of placing the orders would decrease which leads to reducing order costs but has larger holding costs and if the quantity is small then greater order frequency leading to higher order costs but due to unavailability of appropriate quantity it may hurdle the business process. Hence, it is the regarded as the most desirable quantity for the successful running of business.

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