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Inventory Model with Number of Orders Constraints for Some stores in Federal University Lokoja using Economic Order Quality

Adamu Wakili
Department of Mathematics, Adamawa State University Mubi, Adamawa State Nigeria.
Contact:adamuwakili23@gmail.com

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Abstract
The paper is focused on determining the economic orders quality (EOQ) inventory model with number of constraints for the University Bookshop and Procurement Store. For any business to be successful and run smoothly, the ordering rate of items should be continuous and at constant rate. In minimizing the inventory cost per unit time, the model of number of orders constraints was developed. The data comprising of dictionary, pen, white board marker, answer booklet, file jacket and A4 paper for model were collected from the study area. This showed that the EOQ model reduced the capital tied up without interrupting business, customers' interest. The model is effect in any business venture and proves efficient.

Keywords: Inventory, order, quantity, demand, trade- off , services and minimization

Introduction

Inventory management is important in effective organization and is vital in the control of items which are in the production or exchange activities in the case of services. The primary goal of inventory management is to avoid holding too many stocks and inventory problems with too small quantities at hand that can cause business failure. The Economic Order Quantity model (EOQ) has proved useful in optimizing resources and thus minimizing associated cost (Buzacott, 1975).The basic goal of inventory management is to maintain a level of current inventory that will provide optimum stock at lowest cost and their availability at all time. The inventory management is to keep the most economical amount of its resources in order to facilitate the increase in the total value of all resources of the organization or business for both human and material resources (Khan, Jabar and Bonny, 2011).

The major objective of inventory management is to control how goods are to be ordered when quantity in store reduces, how frequently orders should be placed and the appropriate measures to be put for minimizing stock outs (Rezaei, 2014).

Generally, there are two types of inventory models, deterministic and probabilistic inventory models, but the work will dwell on deterministic model. In deterministic model is assumed that demand is fixed and known over time. The Economic Order Quality (EOQ) deals with the total cost of ordering, inventory holding cost and storage cost at minimum level and this model that will hand optimal quality control of the inventory over a given period of time (Axsaiter, 2006 and Wild, 2002).

The Economic Order Quantity (EOQ) was developed by Schwarz in 1972 and is used to balance the cost of holding too much inventory as against ordering small quantity too frequently. The economic order quantity model with substitution for two products and then compared the results with those in the case of no substitution was discovered by Drezner et al (1995). Aju (2013) extended the model to multiple products in an inventory system and Nobil, Sedigh and Cardennas-Baron (2018) studied the role economic order quantity in order to reduce the cost of raw material inventory of a dairy farm project and compared the total cost incurred through the project employed method with the total cost of raw material.Sarbit (2011)studied the effectiveness of stock administration in a limited stock and bringing down cost and enhance productivity. Sabastine and Adetunji (2019) discovered that inventory management involves a trade- off between the costs associated as required the primary costs of an

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inventory which is the opportunity cost of the capital used to finance the inventory, ordering costs and storage cost. The inventory management can be carried out effectively by using ABC analysis (A category, B category and C category) and EOQ which deduce that EOQ gives the best results of quantity orders at the right time (Zhaang, Isao and Chen, 2014).

Materials and Methods

The economic order quantity is to minimize the balance of costs between inventory holding cost and re-ordering cost. The following assumptions are to be considered before applying the economic order quantity model:

Demand is uniform, constant and continuous overtime.

The lead time is constant.

There is no limit on order size due to stores capacity.

The cost of holding a unit of stock does not depend on the quantity in stock.

The cost of placing an order is independent of size of the order.

The economic order quantity operations where the demands are relatively constant and the model can be calculated as $EOQ = \sqrt{\frac{2C_a R}{C_h}}$

where C_a = ordering or set up cost per order, C_h = holding cost per unit time and R = demand for items.

The approach with the assumptions is used to find EOQ for each item in a multi-items inventory system with constant on the number of orders to be placed per time. The model can be applied where ordering cost per order and carrying cost per unit time period are not known.

Take the total number of orders per time is $N = \frac{D}{Q}$ for all items to be determined member of orders per time $N\frac{\sqrt{DC}}{\sum\sqrt{DC}}$ where DC= demand in naira, N= specified number of orders.

Formulation Problem

The Federal University Lokoja Bookshop purchased the following items for period and the projected demand with the unit price are as follows:

Table 1: Demand with unit price for bookshop

Item	Demand (unit)	Unit Price(₦)
Dictionary	30	51,000.00
Pen	2	1,800.00
White board Marker	3	2,700.00

If the bookshop wants to restrict the total number of orders to 40 for all the three items, how will the order be placed?

Table 2: The Computation for Demand to be placed on the order items

Item	Demand	Units price	$\sqrt{DC}$	$N\frac{\sqrt{DC}}{\sum\sqrt{DC}}$
Dictionary	30	51,000.00	123.93	362
Pen	2	1,800.00	60	2
White board Marker	3	2,700.00	90	2
			1386.58	40

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The economic order quantity with number of orders constraint for Federal University Lokoja Procurement Store purchased three items: answer booklets, file jacket and A4 paper. For the next year, the project demands and the unit price are as follows:

Table 3: Procurement of three items

Item	Demand (Unit)	Unit Price(₦)
Answer booklet	7,250.00	725,000.00
File Jacket	2,600.00	208,000.00
A4 paper	200	130,000.00

The procurement store wants to restrict the total number of order to 10,060 for all the three items. How many orders should be placed for each item?

Table 4: Computation for demand placed on items

Item	$\sqrt{DC}$	$\frac{\sqrt{DC}}{\sum\sqrt{DC}}$	Number of orders
Answer booklet	22026.51	0.3679	3,701
File jackets	23255.11	0.3732	3754
A4 paper	16124.51	0.2588	2604

Results and Discussion

The computation for the total number of orders per period to be placed for each items are shown in the tables below:

Table 5: Computation for total number of order items

Item	Unit price in naira (₦)	$\frac{\sqrt{DC}}{\sum\sqrt{DC}}$	Number placed on order
Dictionary	51,000.00	0.892	36
Pen	1,800.00	0.043	2
White board marker	2,700.00	0.065	2
Total			40

Table 6: Computation of three items for bookshop

Item	Unit price in naira (₦)		Number placed on order
Answer booklet	725,000.00	0.3679	3,701
Students' file	208,000.00	0.3732	3754
A4 paper	1,300,000.000	0.2588	2604
			10,000

The results from the computation showed that for dictionary the demand per unit price is ₦51,000, for pen the demand per unit price is ₦1800 and for white board marker the demand per unit price is ₦2700. Table VI also showed that for answer booklet the demand per unit price is ₦725,000, for students file the demand per unit price is ₦208,000 and for A4 paper the demand per unit price is ₦1,3000,000.

Conclusion

After the analysis on the data obtained from the stores and based on economic order quantity model with number of order constraint, showed the prediction of the demand over time for the items. The model of the inventory control can be successfully used in a general dynamic model for analyzing inventory over time in affixed order quantity. This model distinguishes the law of dynamic and control domain which is very useful when one analyses the business decision environment. First is to establish the law of dynamic, secondly, determine the control domain and thirdly, define an objective function which will be incorporated into the performance criterion.

Reference

Aju. M (2013): Demand Forecasting for Economic Order Quantity to Inventory Management, *International Journal of Scientific and Research Publication*,2, 12-20.

Axsaiter. S (2006): Inventory Control in Management (International series in Operations Research and Management Science) *Sprinter Science and Business Media*, 51-60.

Buzacott. J.A. (1975): Economic Order Quantity with Inflation.`*Operational Research Quarterly*, 26, 553-558.

Drezner. Z, Gurnani. H and Pasternack. B. A (1995): An Economic Order Quantity Model with Subtitution between Products. *Journal of the Operational Research Society*. 46(7), 23-35.

Khan. M, Jabar. M. Y and Bonny. M (2011) : An Economic Order Quantity for items with imperfect quantity and inspection errors. *International Journal of Production Economics*. 33, 113-118.

Nobil .A, Sedigh .A and Cardenas-Baron.L (2018): A Generalized Economic Order Quantity Inventory Model with Shortage. *Arab Journal of Science and Engineering.*10, 1007.

Rezaei.J (2014): Economic Order Quantity for Growing items. *International Journal of Production Economica, Elsever.* 155, 109-113.

Sabastine. M and Adetunji.O (2018) : Economic Order Quantity for Growing items with imperfect quanlity. *Science Direct (Operations Research Perspectives).* 10, 10-16.

Sarbit.S (2011): An Economic Order Quantity Model for items having linear demand inflation and permissible delay, *International Journal of Computer Application.* 33(9), 22-29.

10.Schwarz.L.B (1972) : Economic Order Quantity for Products with finite demand Horizon .*AIIE Transaction*. 4, 234-237.

Wild. T (2002): Best Practice in Inventory Mangement. *Elsevier Science*, 112-148.

Zhang .Q and Isao.Y and Chen. T (2014): Economic Order Quantity under Advanced Paysment. *Applied Journal of Mathematical Model.* 38, 5810-5921;