INVENTORY MODEL WITH STOCKLEVEL CONSTRAINT USING ARITHMETIC–GEOMETRIC INEQUALITY

M. Jaiganesh[1]M. K. Vediappan[2,*] and M. Ravithammal[3]
1. M. Phil Scholar, Department of Mathematics, VelsInstitute of Science, Technology and Advanced Studies, Chennai – 600117, Tamil Nadu, India.
2. Assistant Professor, Department of Mathematics, VelsInstitute of Science, Technology and Advanced Studies, Chennai – 600117, Tamil Nadu, India.
***Corresponding author mail: mkvediappan@gmail.com**
3. Assistant Professor, Department of Mathematics, TheQuaideMilleth College for Men, Chennai – 600100, Tamil Nadu, India.

ABSTRACT

In this paper, a basic methodology with two essential strategies (basic analytical geometry and algebraic methods) is used to settle the organized vendor - buyer inventory issue. An incorporated vendor - buyer inventory framework with shortage determined logarithmically and mathematically. The proposed strategy approach yields the least of the coordinated absolute expense each year more effectively than the derivatives approach. What's more, for individuals without the foundation of derivatives, it is more valuable to decide the buyer's economic order.

Keywords: Production, Inventory, Order quantity, algebraic method, geometry method.
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1. INTRODUCTION

Practically speaking the things got in a great deal might contain defective things, and the screening system to dispense with the deficient things. Because of the imperfect things and the investigation blunders, deficiencies may in some cases happen. In this paper we present a technique to get the arrangement of the classic economic order quantity to fulfill the stock level limitation by using essential logical calculation and algebraic strategies.

Mari Selvi et al. [4] read Vendor-Buyer model for controllable lead time with screening and facilitated cost. Ravithammal et al. [7] made EOQ stock model using numerical design with stock level target. Vediappan et al. [9] merged stock model with Lagrange Multiplier Technique. Muniappan et al. [5] pulled out a united money related referencing absolute model including stock level and thing house limit obstruction. Ravithammal et al. [6] cultivated an ideal in regards to stock model for confining things with positive basic limitation of immense worth markdown speed of interest. Vediappan et al. [10] developed a central purpose creation absolute model for drug things with floor space and money related course of action objectives. Chun-Jen Chung et al. [1] examining imperfect correspondence and sales implications for evaluation orchestrating and stock association recharging philosophy.Kurdhi et al. [2] isolated a stock model including concede purchase regard discount when the total got is problematic. Lashgari et al. [3] construed generally up-stream settlement early and fragmentary down-stream surrendered segment in a three-level store association. Sarkar et al. [8] made quality improvement and IOU regard markdown under controllable lead time in a stock model.

2. ASSUMPTIONS AND NOTATIONS

The model use the following assumptions and notations

Assumptions

(i) Demand rate is uniform and dependable.

(ii) Shortages are viewed as buyer and vendor has the creation and surveyed the hurt things for resale.

(iii) System cost contains both buyer and vendor cost and besides satisfies the stock restriction. Numerically, the requirement will be composed as $\frac{Q}{2} \leq z$.

Notations

D Demand rate / time

P Production cost for vendor

K_2 Vendor's unit setup cost / order

K_1 Buyer's unit ordering cost / order

h_1 Buyer's unit holding cost / order per unit

h_2 Vendor's unit holding cost / order per unit

B Buyer's backorders level

b Vendor's unit backorder cost / order per unit

Q Economic Order quantity

s Vendor's unit screening cost / order

F Buyer's fixed transportation cost / delivery

U Buyer's unit variable cost for order handling and receiving

n Vendor's multiples of order

TC_s System cost

3. FORMULATION OF THE MODEL

Hence, system cost (buyer cost and vendor cost) can be written as

$$TC_s = \frac{K_1 D}{Q} + \frac{h_1 B^2}{2Q} + \frac{b(Q-B)^2}{2Q} + F + UQ + \frac{K_2 D}{nQ} + \frac{nQh_2\left(\frac{P-D}{P}\right)}{2} + \frac{nQs}{2} + \alpha\left(\frac{Q}{2} - z\right) \quad (1)$$

s.t $\frac{Q}{2} \leq z$

Equation (1) will be written as

$$TC_s = \left(\frac{h_1 + b}{2Q}\right)B^2 - 2bQB + \frac{K_1 D}{Q} + \frac{K_2 D}{nQ} + \frac{nQh_2\left(\frac{P-D}{P}\right)}{2} + \frac{nQs}{2} + F + UQ + \alpha\left(\frac{Q}{2} - z\right)$$

It is of the form $c_1 B^2 + c_2 B + c_3$.

Q_1 will be taken as, $B^* = \frac{-c_2}{2c_1}$

$$B^* = \frac{bQ}{h_1 + b} \quad (2)$$

Equation (1) will be written as

$$TC_s = \left\{\frac{h_1 b + \left[nh_2\left(\frac{P-D}{P}\right) + ns + 2U + \alpha\right](h_1 + b)}{2(h_1 + b)}\right\} Q + \left\{K_1 D + \frac{K_2 D}{n}\right\}\frac{1}{Q} + F - z \quad (3)$$

It is of the form of $c_1 Q + \frac{c_2}{Q} + c_3$.

Q will be taken as, $Q = \sqrt{\frac{c_2}{c_1}}$

$$Q^* = \sqrt{\frac{2\left(K_1 D + \frac{K_2 D}{n}\right)(h_1 + b)}{h_1 b + \left[nh_2\left(\frac{P-D}{P}\right) + ns + 2U + \alpha\right](h_1 + b)}} \quad (4)$$

Where $\alpha = \frac{\left(K_1 D + \frac{K_2 D}{n}\right)(h_1 + b) - 2z^2\left\{h_1 b + \left[nh_2\left(\frac{P-D}{P}\right) + ns + 2U\right](h_1 + b)\right\}}{2z^2}$ (5)

4. NUMERICAL EXAMPLE

In this section numerical example is presented to illustrate the developed model.

Example 1. Let K_1 = 100 per order, K_2 = 400 per order, h_1 = 0:02\$, h_2 = 0:03\$, *s* = 0:1\$, *D* = 1500 units/ year, *P* = 2000 units/ year, *U* = 0:2, *F* = 0:2, *n* = 2, *b* = 0:3, *z* = 1000, α = 0.1.

The optimal solutions are Q^* = 1107.509, *B* = 1038.29, *TCs* = 803.1706.

Example 2. Let K_1 = 200 per order, K_2 = 300 per order, h_1 = 3$, h_2 = 4$,*s* = 2$, *D* = 2000 units/ year, *P* = 3000 units/ year, *U* = 0*:*1, *F* = 0*:*3, *n* = 2,*b* = 4, *Z* = 500, α = 0*:*2.

The optimal solutions are Q^*= 399*.*2944, *B* = 228*.*1682,*TCs* = 3892*.*157.

5. CONCLUSION

In this paper, we cultivate a financial solicitation sum model with imperfect quality things, inadequacies and stock level necessity. Lagrange's multiplier strategy is utilized to manage this kind of issue. The ideal game plan is gotten by using fundamental analytical geometry and arithmetical systems. In the vast majority of the stock models there are two or three techniques to ideal characteristics. To separate and other update method this technique is amazingly easy to comprehend for people who have nonappearance of information in differential math.

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Ravithammal et al. [6] developed an ideal valuing stock model for breaking down things with positive remarkable capacity of value rebate pace of interest. Vediappan et al. [11] made an impetus creation amount model for drug items with floor space and budget constraints.Chun-Jen Chung et al. [1] investigating imperfect process and demand effects on inspection scheduling and supply chain replenishment policy.Kurdhi et al. [2]isolated an inventory model involving back-order pricediscount when the amount received is uncertain.Lashgari et al. [3] derived partial up-stream advanced payment andpartial down-stream delayed payment in a three-level supply chain.Sarkar et al. [9] developedquality improvement and backorder price discount undercontrollable lead time in an inventory model.

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Abstract
The effects of lead time uncertainty on optimal inventory policies in a two-echelon supply chain operating under continuous review inventory assumptions are examined. In this system, the buyer selects an inventory order quantity and reorder point to maximise its profits, while the seller selects an order quantity from its external supplier that is an integer multiple of the buyer's order quantity; unsatisfied demand is accounted for as lost sales and may also incur a penalty cost representing lost customer goodwill. Normally distributed demand per unit time is assumed and lead time can follow any discrete probability distribution, resulting in a mixture of Gaussians distribution for lead time demand. Examples where lead time is discrete and not well-approximated by a continuous distribution are examined, and use of the mixture of Gaussians approach versus a single normal distribution for lead time demand in these cases reduces supply chain costs by between 12% and 13%.

Keywords
continuous review, supply chain coordination, discounting, inventory management, lead time uncertainty, supply chain management, SCM, lost sales, inventory modelling, mixture of Gaussians, order quantity, reorder point, lead times, optimal inventory policies, two-echelon supply chains

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In practice, when a supplier is confronted with extreme completion in markets, unanticipated surplus in inventory, or change in the production run of a product, he/she may offer a special price discount to motivate buyers to order a special quantity.The purpose of the present paper is to investigate coordination and non coordination circumstance under a quantity discount.

In practice, when a provider is faced with outrageous finish in business sectors, unexpected excess in stock, or change in the creation run of an item, he/she might offer an exceptional value discount to spur purchasers to arrange an extraordinary amount. The reason for the current paper is to research coordination and non coordination situation under an amount rebate.

All things considered, when a supplier is gone facing with ludicrous realization in business areas, unforeseen abundance in stock, or change in the creation run of a thing, he/she may offer an uncommon worth markdown to prod buyers to organize a remarkable sum. The inspiration driving the current paper is to analyze coordination and non coordination circumstance under a sum discount.

Taking everything into account, when a provider is gone looking with incredible acknowledgment in business regions, surprising excess in stock, or change in the creation run of a thing, he/she might offer an exceptional worth markdown to nudge purchasers to sort out a momentous aggregate. The motivation driving the current paper is to investigate coordination and non coordination situation under an aggregate discount.