INVENTORY MODEL FOR VENDOR - BUYER WITH BUDGET CONSTRAINT AND TRANSPORTATION COST

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ABSTRACT

In this paper inventory model is developed for vendor – buyer with budget constraint and transportation cost. The model assumes shortage for buyer only and both buyer and vendor having shortage cost also. The system cost is developed for system optimization and it satisfies the budget constraint. At last, numerical model is shown to show the objective utilization of the proposed model.

Keywords: Inventory, Order Quantity, Transportation Cost, Budget Constraint.

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1.INTRODUCTION

In many stock models, the impact of decay is vital. Deterioration is characterized as decay, change or waste that keeps the things from being utilized for its unique reason. Food things, drugs, visual film, electronic parts and synthetic compounds are not many instances of things in which considerable deterioration can happen during the ordinary stockpiling time of the units and subsequently this misfortune should be considered while analyzing the model.

Hemamalini et al. [3] cultivated store model for buyer carrier with screening, worked with cost. Muniappan et al. [7] empowered an intertwined cash related sales aggregate model including stock level and thing house limit. Ravithammal et al. [8] energized an ideal regarding stock model for isolating things with positive astonishing restriction of huge worth discount speed of interest. Saha et al. [9] made a restricted time coordination part with demand subject to cost and arrangements attempts. Sarkar et al. [10] energized an accommodating advancing facilitated exertion system underway organization the chiefs under uncertain circumstances. Babu et al. [1] focused on a lack of EPQ stock model with sum markdown. Babu et al. [2] made bound together creation stock model for Buyer - Vendor with quantity discount for fixed life time products. Kang et al. [4] focused ideal mentioning procedure for a defective single-stage delivering system with prosperity stock and organized postpone buy. Mari Selvi et al. [5] considered a Vendor-Buyer consolidated stock model for controllable lead time with screening and organized cost. Muniappan et al. [6] made an

EPQ inspiration stock model for separating things including fairly collected inadequacies.

2. ASSUMPTIONS AND NOTATIONS

The model use the following assumptions and notations

Assumptions

(i) A predictable demand is considered in this model.
(ii) The shortages having buyer only.
(iii) Both buyer and vendor having transportation cost.

Integrated system cost is made for system optimization and it fulfill the budget level constraint. The constraint will be written as$pQ \leq M$.

Notations

D Demand rate
p Purchase cost
$\mathrm{K_1}$Buyer's ordering cost
$\mathrm{K_2}$ Vendor's setup cost
$\mathrm{h_b}$Buyer's holding cost
$\mathrm{h_v}$Vendor's holding cost
Q Economic Order quantity
$\mathrm{X_1}$Buyer's fixed transportation cost
$\mathrm{Y_1}$Buyer's unit variable cost for order handling and receiving
$\mathrm{X_2}$Vendor's fixed transportation cost
$\mathrm{Y_2}$Vendor's unit variable cost for order handling and receiving
nVendor's multiples of order
d(k) Discount factor
$\mathrm{TC_s}$ Integrated system cost
μLagrange's multiplier
MMaximum inventory level

3. FORMULATION OF THE MODEL

The buyer cost having ordering cost, holding cost, shortage cost and transportation cost.
The total cost for buyer can be written as

$$\mathrm{TC_b} = \frac{\mathrm{K_1 D}}{\mathrm{Q}} + \frac{\mathrm{h_b B^2}}{2\mathrm{Q}} + \frac{\mathrm{s(Q-B)^2}}{2\mathrm{Q}} + \mathrm{X_1} + \mathrm{Y_1 Q} \quad (1)$$

The vendor cost having setup cost, holding cost and transportation cost.
The total cost for vendor can be written as

$$\mathrm{TC_v} = \frac{\mathrm{K_2 D}}{\mathrm{nQ}} + \frac{\mathrm{h_v nQ}}{2} + \mathrm{X_2} + \mathrm{Y_2 Q} \quad (2)$$

Now the integrated system cost will bewritten as

$$\mathrm{TC_s} = \mathrm{TC_b} + \mathrm{TC_v}$$

Subject to the constraints, $pQ \leq M$

$$TC_s = TC_b + TC_v + \mu(pQ - M)$$

$$\mathrm{TC_s} = \frac{\mathrm{K_1 D}}{\mathrm{Q}} + \frac{\mathrm{h_b B^2}}{2\mathrm{Q}} + \frac{\mathrm{s(Q-B)^2}}{2\mathrm{Q}} + \mathrm{X_1} + \mathrm{Y_1 Q} + \frac{\mathrm{K_2 D}}{\mathrm{nQ}} + \frac{\mathrm{h_v nQ}}{2} + \mathrm{X_2} + \mathrm{Y_2 nQ} + \mu(pQ - M) \quad (3)$$

Now equation (3) will be written as

$$\mathrm{TC_s} = \left\{\frac{\mathrm{h_b + s}}{2\mathrm{Q}}\right\}\mathrm{B^2} - \mathrm{sB} + \left\{\mathrm{K_1 D} + \frac{\mathrm{K_2 D}}{\mathrm{n}}\right\}\frac{1}{\mathrm{Q}} + \frac{\mathrm{sQ}}{2} + \frac{\mathrm{h_v nQ}}{2} + \mathrm{X_1} + \mathrm{Y_1 Q} + \mathrm{X_2} + \mathrm{Y_2 nQ} + \mu(pQ - M) \quad (4)$$

It is in the type of $x_1\mathrm{B}^2 + x_2 B + x_3$.

Bwill be taken as, $B = -\frac{x_2}{2x_1}$

$$\mathrm{B^*} = \frac{\mathrm{sQ}}{\mathrm{h_b + s}} \quad (5)$$

Now equation (3) will be written as

$$\mathrm{TC_s} = \left\{\frac{\mathrm{h_b s + n h_v + 2Y_1 + 2n Y_2 + 2\mu p}}{2}\right\}\mathrm{Q} + \left\{\mathrm{K_1 D} + \frac{\mathrm{K_2 D}}{\mathrm{n}}\right\}\frac{1}{\mathrm{Q}} + \mathrm{X_1} + \mathrm{X_2} - \mu M \quad (6)$$

It is in the typeof $x_1 Q + \frac{x_2}{Q} + x_3$.

Qwill be taken as, $Q = \sqrt{\frac{x_2}{x_1}}$

$$\mathrm{Q^*} = \sqrt{\frac{2\left(\mathrm{K_1 D} + \frac{\mathrm{K_2 D}}{\mathrm{n}}\right)(\mathrm{h_b + s})}{\mathrm{h_b s} + (\mathrm{h_b + s})(\mathrm{n h_v} + 2(\mathrm{Y_1} + \mathrm{n Y_2} + \mu p))}} \quad (7)$$

Where $\mu = \frac{2p^2\left(\mathrm{K_1 D} + \frac{\mathrm{K_2 D}}{\mathrm{n}}\right)(\mathrm{h_b + s}) - M^2(\mathrm{h_b s} + (\mathrm{h_b + s})(\mathrm{n h_v} + 2(\mathrm{Y_1} + \mathrm{n Y_2})))}{2pM^2(\mathrm{h_b + s})}$

4. NUMERICAL EXAMPLE

Let K_1=200$ /order; K_2=200$ /order; D=1000 units; h_b=2$; h_v=3$; M=300; s=0.2;
p=2; n=6; F=2; V=5; X_1=0.1; X_2=0.2; Y_1=0.2; Y_2=0.3;
The optimal solution is
Q = 112.6136, μ= 0.0101, B = 10.2376, TC_b = 1.8088 x 10^3, TC_v = 1.4915 x 10^3,
TC_s = 3.2996 x 10^3

5.CONCLUSION

In this paper, inventory model for vendor buyer with budget constraint and transportation cost is assessed for deteriorating products. The model allows transportation cost for buyer and vendor and shortage for buyer. System cost is made for comparable benefits for buyer and vendor. It is then depicted with the help of numerical models. The objectives of this paper can in like manner be contacted various settings including different qualities of demand, price discount, once rebate and so on.,

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