Replenishment Model with Entropic Order Quantity for Deteriorating Items under Inflation

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Abstract

The purpose of the current paper is to determine an optimal order quantity so as to minimize the total cost of the inventory system of a business enterprise. The model is developed for deteriorating items with stock and selling price dependent demand under inflation without permitting shortage. Optimal solution is achieved by cost minimization strategy considering replenishment cost, purchase cost, holding cost and deterioration cost with a special approach to entropy cost for bulk size purchasing units. The effectiveness of the proposed model has been avowed through empirical investigation. Sensitivity analysis has been accomplished to deduce managerial insights. Findings suggest that an increased inflationary effect results in increment in the system total cost. The paper can be extended by allowing shortage. The model can be utilized in the business firms dealing with bulk purchasing units of electric equipments, semiconductor devices, photographic films and many more.

Keywords: Replenishment; decaying goods; inventory; inflation; entropy.

AMS Subject Classification No: 90B05.
1 Introduction

In any business entity, inflation plays a vital role in deciding optimal pricing of goods. Inflation is defined as the monetary depression or low purchasing power of money for goods and services over a period of time. As inflation is a crucial attribute that curbs the purchasing power of money, the increasing rate of inflation erodes the future worth of savings. As a result more spending on luxurious items takes place that influence the demand for certain products. Many countries experience high inflation rate that influence the demand rate for certain products. So it would be unethical if the effect of inflation is ignored while determining the optimal lot size ordering policy.

The products in any business organization impair in quality, character or value due to spoilage, vaporization, dryness or due to changing technical trends. It can no longer be able to meet the future demand of the customer. Thus in inventory management, the effect of deterioration cannot be ignored. During past decade different inventory models are analyzed by various researchers incorporating the phenomenon of deterioration under inflationary effects. The study of the inflationary effect on deteriorating items stipulates to make the inventory policy for the organization. Buzacott [1], Misra [2] and Mishra [3] derived an EOQ model for constant inflation rate. Datta and Pal [4] considered time-dependent demand and analyzed the effect of inflation and time-value of money in their inventory model. Su et al. [5] developed the inventory model considering stock dependent demand with inflationary effects. Several other researchers like Tripathy and Majhi [6], Jaggi and Goel (2005), Moon et al. [7], Jaggi et al. [8], Chern et al. [9], Thangam and Uthayakumar [10], Yang et al. [11], Pradhan et al. [12], Jaggi et al. [13], Tripathi [14] have made significant efforts in developing the inventory models under inflation.

In classical inventory models, the demand rate is assumed to be constant. But in real scenario it is observed that the demand rate for physical goods is undeniably be influenced by internal factors like price and availability. Gupta and Vrat [15] were the pioneer researchers who formulated inventory models considering stock - level dependent demand. Mandal and Phaujdar [16-17] used profit maximization in Gupta and Vrat [15] model and corrected the flaw. Baker and Urban [18] considered stock dependent demand rate in developing the inventory model. Datta and Pal [19] suggested an inventory model for decaying items in which demand depends on inventory-level and shortage is allowed. Sarker et al. [20] introduced a new concept that the decrease in demand is due to the ageing of inventory and it depends on the level of inventory. Tripathy et al. [21] formulated the pricing problem for stock and price sensitive demand with continuous inventory replenishment. Yang, C.T. [22] developed an inventory model for both stock dependent demand rate and stock dependent holding cost rate.

As the retail market becomes more and more competitive, the disorders have become a prevailing characteristic of modern production systems. The entropy approach in bulk size purchasing units is applied by some researchers in management science to account for disorder when modelling the behaviour of production systems. The concept of entropy cost is introduced in inventory problems to account for the hidden management cost that is needed to control the improvement process. Jaber et al. [23] introduced entropy cost in lot sizing with permissible delay in payment. Jaber and Rosen [24] reduced the system entropy in their repair and waste disposal model by applying first and second laws of thermodynamics. Jaber et al. [25] developed Entropic Order Quantity (EnOQ) model for deteriorating items. Tripathy and Pattanaik (2008) worked on Entropic Order Quantity model for fuzzy holding cost and fuzzy disposal cost. Tripathy and Pradhan (2012) formulated a real category inventory management model integrating entropic order quantity and trade credit financing. Ameli et al. [26] formulated an entropic order quantity model with constant rate of deterioration under fuzzy inflationary conditions. Bag et al. [27] worked on entropic order quantity for deteriorating items in consideration with partial backordering. Dash et al. [28] derived a replenishment policy for entropic order quantity model with partial backlogging.

The present study proposes an inventory model for stock and price dependent demand under inflation for deteriorating items with consideration of entropy cost, where the replenishment rate is infinite and the shortage is not allowed. The objective of the study is to find an optimal order quantity with minimization of the total cost function that result in reduction of economic losses.

The rest of the chapter is framed as follows. Section 2 denotes notations and assumptions. Mathematical model has been derived in section 3. Empirical investigation is conducted in section 4. Sensitivity analysis for the
proposed model has been carried out in section 5. Conclusion with future research scope is mentioned in section 6.

Table 1. Major characteristics of inventory models on selected researches

| Authors            | Demand pattern | Demand type       | Deterioration | Replenishment | Effect of Inflation | Entropy |
|--------------------|----------------|-------------------|---------------|---------------|---------------------|---------|
| Dutta & Pal [4]    | Linear         | Time dependent    | Absent        | Absent        | Present             | Absent  |
| Su et al. [5]      | Power pattern  | Stock dependent   | Present       | Present       | Present             | Absent  |
| Jaggi et al. [8]   | Linear         | Inflation dependent| Present       | Present       | Present             | Absent  |
| Tripathy et al. [21]| Linear       | Stock and price dependent| Present | Present       | Absent              | Absent  |
| Ameli et al. [26]  | Constant       | Deterministic     | Present       | Absent        | Absent              | Present |
| Tripathy et al. [29]| Power pattern| Time dependent    | Present       | Present       | Present             | Absent  |
| Jaggi et al. [13]  | Constant       | Deterministic     | Present       | Present       | Absent              | Absent  |
| Dash et al. [28]   | Linear         | Stock dependent   | Present       | Present       | Present             | Present |
| Bag et al. [27]    | Linear         | Selling price dependent| Present | Absent        | Absent              | Present |
| Tripathi, R.P. [14]| Linear        | Stock dependent   | Present       | Absent        | Present             | Absent  |
| Present paper      | Power pattern  | Stock and price dependent| Present | Present       | Present             | Present |

2 Notations and Assumptions

The notations that are used in the present chapter are as follows:

- $H$: The length of planning horizon, $H = mT$ (where $m$ is the frequency of replenishments during the period $H$)
- $T$: Cycle time
- $I(t)$: Inventory level at time $t$
- $Q$: Ordering quantity
- $D$: Rate of demand
- $k$: Constant rate of inflation
- $C_0$: Purchase cost of an item at time zero
- $C(t)$: Purchase cost of an item at time $t$, $C(t) = C_0 e^{kt}$
- $A_0$: Ordering cost at time zero
- $A(t)$: Ordering cost at time $t$, $A(t) = A_0 e^{kt}$
- $h$: Holding cost per unit per unit time
- $v$: Deterioration cost per unit per unit time
- $s$: Selling price per unit
- $\theta$: Deterioration rate per unit time
The assumptions considered in the present chapter are as follows:

1. Demand rate of items is stock and selling price dependent.
   \[ D = s^{-1}(\alpha + \beta Q^r) \]
   \( \alpha, \beta \) and \( r \) are constants
2. Rate of inflation is constant.
3. Rate of replenishment is infinite.
4. There is no backlogging of demand.
5. The lead time is zero.
6. Holding cost and deterioration cost, both are time varying.
7. No repair or replenishment occurs during a cycle time \( T \).

3 Development of the Model

The change in the inventory level at any instant of time \( t \) is represented by a function of the deteriorating rate, demand rate and inventory level.

\[
\frac{dI(t)}{dt} + bI(t) = D(t)
\]  \( (1) \)

The solution of equation (1) with initial condition \( I(0) = 0 \) is

\[
I(t) = \frac{D}{b} [e^{bt} - 1] \quad (0 \leq t \leq T)
\]  \( (2) \)

At \( t = 0 \),

\[
Q = I(0) = \frac{D}{b} [e^{0b} - 1]
\]  \( (3) \)

Replenishment cost in \( (0, H) \) is

\[
R_v = A(0) + A(T) + A(2T) + \ldots + A((m-1)T)
\]

\[
= A_0 + A_0e^{kT} + A_0e^{2kT} + \ldots + A_0e^{(m-1)kT}
\]

\[
= A_0 \left[ 1 + e^{kT} + e^{2kT} + \ldots + e^{(m-1)kT} \right]
\]

\[
= A_0 \left[ \frac{e^{mkT} - 1}{e^{kT} - 1} \right] \quad (As \ H = mT)
\]  \( (4) \)

Purchase cost in \( (0, H) \) is

\[
P_v = Q \left[ C(0) + C(T) + C(2T) + \ldots + C((M-1)T) \right]
\]

\[
= QC_0 \left[ \frac{e^{kH} - 1}{e^{kT} - 1} \right]
\]  \( (5) \)
Holding cost in (0, \( H \)) is

\[
H_c = h \sum_{n=0}^{\infty} C(nT) \int_0^T t l(t) dt
\]

\[
= hC_0 \left[ \frac{e^{\theta T} - 1}{e^{\theta T} - 1} \right] \int_0^T c_0 \left[ e^{\theta (T-t)} - 1 \right] dt
\]

\[
= hC_0 \left[ \frac{e^{\theta T} - 1}{e^{\theta T} - 1} \right] \frac{D}{\theta} \left[ \frac{e^{\theta T} - \theta T^2}{2} - \frac{1}{\theta} - T \right]
\]  \( (6) \)

Deterioration cost in (0, \( H \)) is

\[
B_c = v\theta \sum_{n=0}^{\infty} C(nT) \int_0^T I(t) dt
\]

\[
= v\theta C_0 \left[ \frac{e^{\theta T} - 1}{e^{\theta T} - 1} \right] \frac{D}{\theta} \left[ \frac{e^{\theta T} - \theta T^2}{2} - \frac{1}{\theta} - T \right]
\]  \( (7) \)

Entropy cost in (0, \( H \)) is

\[
E_c = \frac{Q \delta}{D T} \sum_{n=0}^{\infty} C(nT)
\]  \( (8) \)

Total cost of the inventory system in (0,\( H \)) is

\[
\phi = \text{Replenishment cost} + \text{Purchase cost} + \text{Carrying cost} + \text{Deterioration cost} + \text{Entropy cost}
\]

\[
= \left[ A_0 + QC_0 + \left( h + v\theta \right) C_0 \left( \frac{e^{\theta T} - \theta T^2}{2} - \frac{1}{\theta} - T \right) + \frac{Q \delta C_0}{D T} \left( \frac{e^{\theta T} - 1}{e^{\theta T} - 1} \right) \right]
\]  \( (9) \)

The optimal solution for \( Q \) that will minimize the total cost can be obtained by solving the equation

\[
\frac{\partial \phi}{\partial Q} = 0
\]  \( (10) \)

i.e.

\[
\left( \frac{e^{\theta T} - 1}{e^{\theta T} - 1} \right) C_0 + \left( h + v\theta \right) C_0 \left( \frac{e^{\theta T} - \theta T^2}{2} - \frac{1}{\theta} - T \right) + \frac{Q \delta C_0}{D T} \left( \frac{e^{\theta T} - 1}{e^{\theta T} - 1} \right) = 0
\]  \( (11) \)

For convexity of the total cost function the necessary and sufficient condition is

\[
\frac{\partial^2 \phi}{\partial Q^2} > 0
\]  \( (12) \)

Using mathematical software MATHEMATICA-5.1, the optimal solution for \( Q \) is worked out by the following procedure and the convexity nature is checked.
The solution procedure is described as follows.

Step 1: The inventory parameters are assigned with values.

Step 2: With the assigned values of the inventory parameters, equation (11) is solved using MATHEMATICA-5.1 to find the value of $Q$.

Step 3: The total cost is found out by using equation (9).

Step 4: The sufficiency condition (convexity test) is performed using equation (12).

4 Empirical Investigation

The following numerical illustrations show the effectiveness of the proposed model.

Numerical illustration-1:

The following inventory system is considered with the assigned parametric values,

$\alpha = 1000, \beta = 10, h = Rs0.007/unit/year, m = 3, C_0 = Rs15/unit, A_0 = Rs3500, \tau = 0.9, k = 0.1, v = Rs0.007/unit/year, \theta = 0.001/units/year, S = Rs28/unit, T = 1.6\ years.$

The Optimal solution for the purchase quantity $Q = 499623$

The total inventory cost $TC = Rs.26624700$

Further the second order derivative of the cost function with respect to $Q$ is found positive which confirms the convexity of the total cost function.

Numerical illustration-2:

The following inventory system is considered with the assigned parametric values,

$\alpha = 1100, \beta = 8, h = Rs0.006/unit/year, m = 3, C_0 = Rs14/unit, A_0 = Rs3500, \tau = 0.9, k = 0.1, v = Rs0.008/unit/year, \theta = 0.001/units/year, S = Rs25/unit, T = 1.8\ years.$

The Optimal solution for the purchase quantity $Q = 745832$

The total inventory cost $TC = Rs.37925600$

Further the second order derivative of the cost function with respect to $Q$ is found positive.

Numerical illustration-3:

The following inventory system is considered with the assigned parametric values,

$\alpha = 1500, \beta = 15, h = Rs0.008/unit/year, m = 3, C_0 = Rs20/unit, A_0 = Rs4000, \tau = 0.85, k = 0.1, v = Rs0.008/unit/year, \theta = 0.001/units/year, S = Rs30/unit, T = 1.6\ years.$

The Optimal solution for the purchase quantity $Q = 1118150$

The total inventory cost $TC = Rs.79423100$
Further the second order derivative of the cost function with respect to $Q$ is found positive.

**Numerical illustration-4:**

The following inventory system is considered with the assigned parametric values, $\alpha = 1200, \beta = 12, h = Rs0.008/unit/year, m = 4, C_0 = Rs20/unit, A_0 = Rs3000, \tau = 0.85, k = 0.1, v = Rs0.008/unit/year, \theta = 0.001 units/year, S = Rs30/unit, T = 1.6 years.

The Optimal solution for the purchase quantity $Q = 1844770$

The total inventory cost $TC = Rs.115580000$

Further the second order derivative of the cost function with respect to $Q$ is found positive.

**Numerical illustration-5:**

The following inventory system is considered with the assigned parametric values,

$\alpha = 800, \beta = 110, h = Rs0.002/unit/year, m = 5, C_0 = Rs12/unit, A_0 = Rs200, \tau = 0.8, k = 0.2, v = Rs0.001/unit/year, \theta = 0.007 units/year, S = Rs25/unit, T = 0.6 years.$

The Optimal solution for the purchase quantity $Q = 3883380$

The total inventory cost $TC = Rs.300507000$

Further the second order derivative of the cost function with respect to $Q$ is found positive.

### 5 Sensitivity Analysis

There may be change in the parameter values due to the uncertainties in the decision making situation. The sensitivity analysis of empirical investigation has been carried out to analyze the effect of change in the parametric values on purchase quantity as well as on total cost.

**Numerical illustration-1:**

| Parameter | % change | $Q$   | Total cost(TC) |
|-----------|----------|-------|----------------|
| $a$       | -10      | 499622| 26624700       |
|           | -5       | 499622| 26624700       |
|           | 5        | 499623| 26624700       |
|           | 10       | 499623| 26624700       |
| $\beta$   | -10      | 691786| 36859200       |
|           | -5       | 691786| 36858200       |
|           | 5        | 499622| 26623900       |
|           | 10       | 403540| 21507000       |
| $h$       | -10      | 538656| 28703900       |
|           | -5       | 509381| 27144700       |
|           | 5        | 499622| 26624300       |
|           | 10       | 499621| 26623900       |
| $m$       | -10      | 499623| 23351500       |
|           | -5       | 499623| 24968500       |
|           | 5        | 499623| 28321200       |

**Table 2. Effect on $Q$ and $TC$ by changing one parameter keeping others unchanged**
The followings results are found from sensitivity analysis:

- Increment in the values of $\beta$ and $h$ results in decreasing values of order quantity $Q$ and total cost $TC$.
- The values of total cost $TC$ increase with forwarding movement of the values of $m$, $C_0$, $A_0$, and $k$ but the values of order quantity $Q$ remain unaffected.
- The increased values of $\theta$, $s$ and $T$ sensitize the values of order quantity $Q$ and total cost $TC$ to increase.

### Table 3. Effect on $Q$ and $TC$ with simultaneous change in all parameter values

| Parameter | -10% | -5% | 5%  | 10% |
|-----------|------|-----|-----|-----|
| $C_0$     | 900  | 950 | 1050| 1100|
| $A_0$     | 3150 | 3325| 3675| 3850|
| $k$       | 0.09 | 0.095| 0.105| 0.11|
| $\theta$  | 2.7  | 2.85| 3.15| 3.33|
| $s$       | 25.20| 26.6| 29.40| 30.80|
| $T$       | 1.44 | 1.52| 1.68| 1.76|
| $Q$       | 13068900 | 18859300 | 42244100 | 87084300|
| $TC$      | 13068900 | 18859300 | 42244100 | 87084300|

- The simultaneous increase in the above parameter values sensitize the values of order quantity $Q$ and total cost $TC$ to increase.
Similarly the simultaneous decrease in the above parameter values sensitizes the values of order quantity ‘Q’ and total cost ‘TC’ to decrease.

**Numerical illustration-2:**

| Parameter | % change | Q      | Total cost( TC ) |
|-----------|----------|--------|------------------|
| a         | -10      | 732992 | 37273000         |
|           | -5       | 733480 | 37297800         |
|           | 5        | 745832 | 37925600         |
|           | 10       | 745832 | 37925600         |
|           | -10      | 1076110| 54713000         |
|           | -5       | 803833 | 40874100         |
|           | 5        | 691786 | 35178200         |
|           | 10       | 691786 | 35177600         |
| β         | -10      | 799878 | 40672900         |
|           | -5       | 756793 | 38482900         |
|           | 5        | 712403 | 36226400         |
|           | 10       | 691918 | 35185100         |
| h         | -10      | 745832 | 33147500         |
|           | -5       | 745832 | 35504300         |
|           | 5        | 745832 | 40413100         |
|           | 10       | 745832 | 42968800         |
| m         | -10      | 745832 | 34134300         |
|           | -5       | 745832 | 36029900         |
|           | 5        | 745832 | 39821200         |
|           | 10       | 745832 | 41716900         |
| C₀        | -10      | 745832 | 37924300         |
|           | -5       | 745832 | 37924900         |
|           | 5        | 745832 | 37926200         |
|           | 10       | 745832 | 37926800         |
| A₀        | -10      | 419304 | 21327100         |
|           | -5       | 549176 | 27929000         |
|           | 5        | 1037680| 52761100         |
|           | 10       | 1441120| 73269500         |
| k         | -10      | 538656 | 27394200         |
|           | -5       | 691786 | 35177700         |
|           | 5        | 847356 | 43086500         |
|           | 10       | 1076110| 54713800         |
| θ         | -10      | 1243160| 64499800         |
|           | -5       | 1243160| 64499800         |
| s         | -10      | 1243160| 64499800         |
|           | -5       | 1243160| 64499800         |
| T         | -10      | 1243160| 64499800         |
|           | -5       | 1243160| 64499800         |

The sensitivity analysis results the followings

- The increased values of β and h sensitizes the values of order quantity ‘Q’ and total cost ‘TC’ to decrease.
- The forwarding values of m, C₀, A₀ and k sensitizes the values of total cost ‘TC’ to move forward but do not sensitizes the values of ordering cost ‘Q’.
• The increased values of $\theta, s$ and $T$ sensitize the values of order quantity ‘$Q$’ and total cost ‘$TC$’ to increase.

**Table 5. Effect on $Q$ and $TC$ with simultaneous change in all parameter values**

| Parameter | -10% | -5%  | 5%  | 10% |
|-----------|------|------|-----|-----|
| $\alpha$ | 990  | 1045 | 1155| 1210|
| $\beta$  | 9    | 9.5  | 10.5| 11  |
| $h$      | 0.0054 | 0.0057 | 0.0063 | 0.0066 |
| $m$      | 2.7  | 2.85 | 3.15| 3.3 |
| $C_0$    | 12.6 | 13.3 | 14.7| 15.4|
| $A_0$    | 3150 | 3325 | 3675| 3850|
| $k$      | 0.09 | 0.095| 0.105|0.11|
| $\theta$ | 0.0009 | 0.00095 | 0.00105 | 0.00110 |
| $s$      | 22.50| 23.75| 26.25| 27.50|
| $T$      | 1.62 | 1.71 | 1.89 | 1.98|
| $Q$      | 403540 | 499623 | 1435290 | 7539970 |
| $TC$     | 15637400 | 22281600 | 83498100 | 501989000 |

• The simultaneous increase in the above parameter values sensitize the values of order quantity ($Q$) and total cost ($TC$) to increase.
• Similarly the simultaneous decrease in the above parameter values sensitize the values of order quantity ($Q$) and total cost ($TC$) to decrease.

**Numerical illustration 3:**

**Table 6. Effect on $Q$ and $TC$ by changing one parameter keeping others unchanged**

| Parameter | % change | $Q$ | Total cost($TC$) |
|-----------|----------|----|------------------|
| $\alpha$ | -10      | 1118150 | 79423100 |
|          | -5       | 1118150 | 79423100 |
|          | 5        | 1118150 | 79423100 |
|          | 10       | 1118150 | 79423100 |
| $\beta$  | -10      | 1844770 | 131021000 |
|          | -5       | 1844770 | 131018000 |
|          | 5        | 1076110 | 76436500 |
|          | 10       | 1076110 | 76436600 |
| $h$      | -10      | 1844770 | 131018000 |
|          | -5       | 1844770 | 131017000 |
|          | 5        | 1076110 | 76437300 |
|          | 10       | 1076110 | 76436600 |
| $m$      | -10      | 1118150 | 69658900 |
|          | -5       | 1118150 | 74482400 |
|          | 5        | 1118150 | 84483700 |
|          | 10       | 1118150 | 89667300 |
| $C_0$    | -10      | 1118150 | 71482200 |
|          | -5       | 1118150 | 75452600 |
|          | 5        | 1118150 | 83393500 |
|          | 10       | 1118150 | 87363900 |
| $A_0$    | -10      | 1118150 | 79421600 |
|          | -5       | 1118150 | 79422300 |
The sensitivity analysis results the followings:

- The increased values of $\beta$ and $h$ sensitize the values of order quantity ‘$Q$’ and total cost ‘$TC$’ to decrease.
- The forwarding values of $m$, $C_0$, $A_0$ and $k$ sensitize the values of total cost ‘$TC$’ to move forward but do not sensitize the values of ordering quantity ‘$Q$’.
- The increased values of $\theta$, $s$ and $T$ sensitize the values of order quantity ‘$Q$’ and total cost ‘$TC$’ to increase.
- The corresponding values of order quantity ‘$Q$’ and total cost ‘$TC$’ are not sensitized with a variation in the values of $\alpha$ within a range of 10% back warding and forwarding.

Table 7. Effect on $Q$ and $TC$ with simultaneous change in all parameter values

| Parameter | % change | $Q$       | Total cost ($TC$) |
|-----------|----------|-----------|-------------------|
| $\alpha$  | -10%     | 1350      | 1425              | 1575 | 1650 |
|           | -5%      | 13.50     | 14.25             | 15.75 | 16.50 |
| $\beta$   |          | 0.0072    | 0.0076            | 0.0084 | 0.0088 |
|           |          | 2.7       | 2.85              | 3.15 | 3.3  |
| $h$       |          | 18        | 19                | 21  | 22   |
| $m$       |          | 3600      | 3800              | 4200 | 4400 |
| $C_0$     |          | 0.09      | 0.095             | 0.105 | 0.11 |
| $A_0$     |          | 0.0009    | 0.00095           | 0.00105 | 0.00110 |
| $k$       |          | 27        | 28.5              | 31.5 | 33   |
| $\theta$  |          | 1.44      | 1.52              | 1.68 | 1.76 |
| $s$       |          | -        | 1076110           | 1844770 | 3199520 |
| $T$       |          | -        | 67024900          | 149249000 | 294752000 |

- The simultaneous increase in the above parameter values sensitizes the values of $Q$ and $TC$ to increase.
- Similarly the simultaneous decrease in the above parameter values sensitizes the values of $Q$ and $TC$ to decrease.
6 Conclusion

The present study proposes an inventory model for stock and price dependent demand under inflation for deteriorating items with consideration of entropy cost, where the replenishment rate is infinite and the shortage is not allowed. The model provides a significant direction to obtain replenishment policy under the existing conditions. The present model can assist the inventory manager to determine the order size so as to minimize the system total cost under inflationary condition. Sensitivity analysis of the numerical illustrations reveals that the increment in the inflation value will result more inventory cost. The increased deterioration rate, selling price and cycle time increase the optimal ordering quantity. However the increased values of holding cost sensitize the ordering quantity to decrease. The proposed model can be used in case of bulk purchasing units of electric equipments, semiconductor devices, photographic films and many other stock dependent consumption products. In future the model can be extended by allowing shortage. Moreover backlogging can be permitted in the proposed model to get more realistic result.

Competing Interests

Authors have declared that no competing interests exist.

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https://www.sdiarticle4.com/review-history/73354