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Inventory Model with Demand Rate Is 3-Variables Weibull Function Constant Deterioration, Constant Holding Cost and Inflation without Shortages

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Abstract: *An inventory model with 3-variable Weibull distribution demand rate and constant deterioration is developed. The holding cost is constant. Shortages are not allowed. The salient feature of this inventory model is for non-perishable products or deteriorating items. A numerical example has been illustrated using MATLAB to describe the model and the sensitivity analysis of various parameters is carried out.*
Keywords - *Constant deterioration; 3-variables Weibull demand; Inflation; Inventory; Constant holding cost*

I. Introduction

The inventory demand always decreases dependent on time or constant so in the mathematical solution the demand taking with negative singe but some inventory models have declining demand without negative singe in the mathematical solution. In this model used a different declining function 3-variables Weibull distribution. **Aggarwal, S. P. (1978)** developed a note on an order-level inventory model for a system with constant rate of deterioration. **Balkhi,Z. T., et al . (2004)** worked **o**n an inventory model for deteriorating items with stock dependent and time-varying demand rates. **Benkherouf, L. (1998)** discussed note on a deterministic lot size inventory model for deteriorating items with shortages and a declining market. **Chakrabarty, T. B., et. al.(1998)** developed an EOQ model for items with weibull distribution deterioration, shortages and trended demand: an extension of philip's. **Covert, R.B., et al (1973**) works on an EOQ model with Weibull distribution deterioration with variable demand. **Ghare, P. et al (1963)** developed a model for an exponentially decaying inventory. **Hariga, M. et al (1994)** discussed optimal and heuristic replenishment models for deteriorating items with exponential time varying demand. **He, Y., Wang, S., et al.(2010)** developed an optimal production-inventory model for deteriorating items with multiple-market demand. **Huang W.L. et al (2007)** discussed an inventory model for items with weibull distribution deterioration rate under stock-dependent demand and again **Huang, Y.F. (2007)** developed economic order quantity under conditionally permissible delay in payments**. Jalan, A., et al. (1996**) worked on the EOQ model for items with weibull distribution deterioration shortages and trended demand. **Khanra S. et al (2003)** developed a note on an order level inventory model for a deteriorating item with time-dependent quadratic demand. **Kun Shan Wu (1998**) discussed an Ordering Policy for Items with Weibull distribution Deterioration under permissible Delay in Payments. **Mandal, B. (2010)** worked on an EOQ inventory model for Weibull distributed deteriorating items under ramp type demand and shortages. **Meher, M. K., et al. (2012)** developed **a**n Inventory Model with Weibull Deterioration Rate under the Delay in Payment in Demand Decling Market. **Philip, G.C. (1974)** worked on a generalized EOQ model for items with Weibull distribution. **Singh, S.R., et al. (2013a**) developed three stage supply chain model with two warehouse, imperfect production, variable demand rate and inflation and again **Singh, S.R., (2013b)** worked on EOQ Model with Volume Agility, Variable Demand Rate, Weibull Deterioration Rate and Inflation International Journal of Computer Applications 72(.23), 0975 – 8887. **Skouri, K., et. al (2009)** discussed Inventory models with ramp type demand rate, partial backlogging and weibull deterioration rate. **Su, C.T., Lin, et al.** (**1999)** developed a deterministic production inventory model for deteriorating items with an exponential declining demand. **Tripathy, C. K., (2010)** developed ordering Policy for Weibull Deteriorating Items for Quadratic Demand with Permissible Delay in Payments. **T. Singh, et al (2012)** Worked on an EOQ Model for A Deteriorating Item with Time Dependent Exponentially Declining Demand Under Permissible Delay In payment **Tripathy P.K, (2011)** developed an Integrated Partial Backlogging Inventory Model having Weibull Demand and Variable Deterioration rate with the Effect of Trade Credit. **Wee, H.M. (1995)** discussed joint pricing and replenishment policy for deteriorating inventory with declining market **Wu, O. et al (2005) d**eveloped an inventory model for deteriorating items with exponential declining demand and partial backlogging. **Yadav, R.K et al (2013**) worked on **v**olume flexibility in production model with cubic demand rate and weibull deterioration with partial backlogging. **Yadav, R. K. et al (2014)** developed a deteriorating inventory model for quadratic demand and constant holding cost with partial backlogging and inflation. In this paper discussed in Section 1, we review the literature on the effects of deterioration and time-dependent demand rate and we position our model in relative to previous work. Section 2 details the model assumptions. In Section 3, we have given notation used in model. In Section 4, we formulate the model as a cost minimization problem. In Section 5, a mathematical solution is given to illustrate the model. Section 6details an algorithm for optimizing the solution In Section 7, we sum with a conclusion of this work and suggest directions for future research. Numerical Solution and analysis of various parameters is taken in Section 8.

II. Assumptions

The following assumptions are made in developing the model.

- The inventory system considers a single item only.
- The demand rate is **3**-variable Weibull distribution of time.
- The deterioration rate is constant.
- The inventory system is considered over a finite time horizon.
- Lead time is zero.
- Shortages are not allowed.

III. Notations

The following notations use for inventory model.

A : Setup cost.

$D(t)$: **3**-variable Weibull distribution demand rate in a period [0, T]

$\theta(t)$: Constant Deterioration rate

Qo : Initial ordering quantity

TD : Total demand in a cycle period [0, T]

DU : Deteriorating unit in a cycle period [0, T]

C_d : Deteriorating cost per unit

DC : Deteriorating cost

HC : Holding cost

$TC(T)$: Total inventory cost

T^*: Optimal length size

Q_0^*: Optimal initial order quantity

$TC^*(T)$: Optimal total cost in the period [0, T]

IV. Mathematical Formulation

Consider the inventory model of **3**-variable Weibull distribution demand rate. As the inventory reduces due to demand rate as well as deterioration rate during the interval, the differential representing the inventory status is governed by [0, T]

$$\frac{dI(t)}{dt} + \theta I(t) = -D(t)\,, 0 \le t \le T \tag{1}$$

Where $D(t) = \frac{\alpha}{\beta}\left(\frac{t-\mu}{\beta}\right)^{\alpha-1} e^{-\left(\frac{t-\mu}{\beta}\right)^{\alpha}}, D(t) \ge 0, \alpha, \beta \ge 0$

V. Mathematical Solution

The solution with boundary condition $I(T) = 0$, of the Equation

$$\frac{dI(t)}{dt} + \theta I(t) = -\frac{\alpha}{\beta}\left(\frac{t-\mu}{\beta}\right)^{\alpha-1} e^{-\left(\frac{t-\mu}{\beta}\right)^{\alpha}}, 0 \le t \le T \tag{2}$$

$$I(t) = -\{(1+\theta t)\left[\left(\frac{t-\mu}{\beta}\right)^{\alpha} - \frac{1}{2}\left(\frac{t-\mu}{\beta}\right)^{2\alpha}\right] + \theta\left[\frac{\beta}{\alpha+1}\left(\frac{t-\mu}{\beta}\right)^{\alpha+1} - \frac{\beta}{2(2\alpha+1)}\left(\frac{t-\mu}{\beta}\right)^{2\alpha+1}\right]$$
$$+(1+\theta T)\left[\left(\frac{T-\mu}{\beta}\right)^{\alpha} - \frac{1}{2}\left(\frac{T-\mu}{\beta}\right)^{2\alpha}\right] - \theta\left[\frac{\beta}{\alpha+1}\left(\frac{T-\mu}{\beta}\right)^{\alpha+1} - \frac{\beta}{2(2\alpha+1)}\left(\frac{T-\mu}{\beta}\right)^{2\alpha+1}\right]\}e^{-\theta t} \tag{3}$$

Where use the expansion $e^{-x} \approx 1 - x + \frac{x^2}{2}$ ..., x is small and positive.

So the initial order quantity is obtained by putting the boundary condition in Equation (3) $I(0) = Q_0$. Therefore,

$$Q_0 = -\left[\left(\frac{-\mu}{\beta}\right)^{\alpha} - \frac{1}{2}\left(\frac{-\mu}{\beta}\right)^{2\alpha}\right] + \theta\left[\frac{\beta}{\alpha+1}\left(\frac{-\mu}{\beta}\right)^{\alpha+1} - \frac{\beta}{2(2\alpha+1)}\left(\frac{-\mu}{\beta}\right)^{2\alpha+1}\right]$$
$$+(1+\theta T)\left[\left(\frac{T-\mu}{\beta}\right)^{\alpha} - \frac{1}{2}\left(\frac{T-\mu}{\beta}\right)^{2\alpha}\right] - \theta\left[\frac{\beta}{\alpha+1}\left(\frac{T-\mu}{\beta}\right)^{\alpha+1} - \frac{\beta}{2(2\alpha+1)}\left(\frac{T-\mu}{\beta}\right)^{2\alpha+1}\right] \tag{4}$$

The total demand during the cycle period [0, T] is

$$TD = \int_0^T D(t)dt$$
$$= \int_0^T \frac{\alpha}{\beta}\left(\frac{t-\mu}{\beta}\right)^{\alpha-1} e^{-\left(\frac{t-\mu}{\beta}\right)^{\alpha}} dt$$
$$= \left[\left(\frac{T-\mu}{\beta}\right)^{\alpha} - \frac{1}{2}\left(\frac{T-\mu}{\beta}\right)^{2\alpha+1} - \left(\frac{-\mu}{\beta}\right)^{\alpha} - \frac{1}{2}\left(\frac{-\mu}{\beta}\right)^{2\alpha+1}\right] \tag{5}$$

Then the number of deterioration units is

$$DU = Q_0 - TD$$
$$DU = \frac{1}{2}\left(\frac{-\mu}{\beta}\right)^{2\alpha} + \theta\left[\frac{\beta}{\alpha+1}\left(\frac{-\mu}{\beta}\right)^{\alpha+1} - \frac{\beta}{2(2\alpha+1)}\left(\frac{-\mu}{\beta}\right)^{2\alpha+1}\right]$$
$$+(1+\theta T)\left[\left(\frac{T-\mu}{\beta}\right)^{\alpha} - \frac{1}{2}\left(\frac{T-\mu}{\beta}\right)^{2\alpha}\right] - \theta\left[\frac{\beta}{\alpha+1}\left(\frac{T-\mu}{\beta}\right)^{\alpha+1} - \frac{\beta}{2(2\alpha+1)}\left(\frac{T-\mu}{\beta}\right)^{2\alpha+1}\right]$$
$$-\left[\left(\frac{T-\mu}{\beta}\right)^{\alpha} - \frac{1}{2}\left(\frac{T-\mu}{\beta}\right)^{2\alpha+1} - \frac{1}{2}\left(\frac{-\mu}{\beta}\right)^{2\alpha+1}\right] \tag{6}$$

The deterioration cost for the cycle [0, T]

$DC = C_d *$ (Number of deterioration units)

$$DC = C_d * \left\{ \begin{array}{l} \frac{1}{2}\left(\frac{-\mu}{\beta}\right)^{2\alpha} + \theta\left[\frac{\beta}{\alpha+1}\left(\frac{-\mu}{\beta}\right)^{\alpha+1} - \frac{\beta}{2(2\alpha+1)}\left(\frac{-\mu}{\beta}\right)^{2\alpha+1}\right] \\ +(1+\theta T)\left[\left(\frac{T-\mu}{\beta}\right)^{\alpha} - \frac{1}{2}\left(\frac{T-\mu}{\beta}\right)^{2\alpha}\right] - \theta\left[\frac{\beta}{\alpha+1}\left(\frac{T-\mu}{\beta}\right)^{\alpha+1} - \frac{\beta}{2(2\alpha+1)}\left(\frac{T-\mu}{\beta}\right)^{2\alpha+1}\right] \\ -\left[\left(\frac{T-\mu}{\beta}\right)^{\alpha} - \frac{1}{2}\left(\frac{T-\mu}{\beta}\right)^{2\alpha+1} - \frac{1}{2}\left(\frac{-\mu}{\beta}\right)^{2\alpha+1}\right] \end{array} \right\} \quad (7)$$

Holding Cost for the cycle [0, T] is

$$HC = \int_0^T h e^{-rt} I(t)\,dt$$

$$HC = h * \left\{ \begin{array}{l} (1+\theta T)\left[\frac{\beta}{\alpha+1}\left(\frac{T-\mu}{\beta}\right)^{\alpha+1} - \frac{\beta}{2(2\alpha+1)}\left(\frac{T-\mu}{\beta}\right)^{2\alpha+1}\right] - \theta\left[\begin{array}{l}\frac{2\beta^2}{(\alpha+1)(\alpha+2)}\left(\frac{T-\mu}{\beta}\right)^{\alpha+2} \\ -\frac{\beta^2}{2(2\alpha+1)(\alpha+1)}\left(\frac{T-\mu}{\beta}\right)^{2\alpha+2}\end{array}\right] \\ +T(1+\theta T)\left[\left(\frac{T-\mu}{\beta}\right)^{\alpha} - \frac{1}{2}\left(\frac{T-\mu}{\beta}\right)^{2\alpha}\right] - \theta T\left[\frac{\beta}{\alpha+1}\left(\frac{T-\mu}{\beta}\right)^{\alpha+1} - \frac{\beta}{2(2\alpha+1)}\left(\frac{T-\mu}{\beta}\right)^{2\alpha+1}\right] \\ +(rT+\theta T+r\theta T+\theta^2T^2)\left[\frac{\beta}{\alpha+1}\left(\frac{T-\mu}{\beta}\right)^{\alpha+1} - \frac{\beta}{(2\alpha+1)}\left(\frac{T-\mu}{\beta}\right)^{2\alpha+1}\right] \\ -(r+\theta+r\theta+2\theta^2T)\left[\frac{\beta^2}{(\alpha+1)(\alpha+2)}\left(\frac{T-\mu}{\beta}\right)^{\alpha+2} - \frac{\beta^2}{2(2\alpha+1)(\alpha+1)}\left(\frac{T-\mu}{\beta}\right)^{2\alpha+2}\right] \\ -2\theta^2\left[\frac{\beta^3}{(\alpha+1)(\alpha+2)(\alpha+3)}\left(\frac{T-\mu}{\beta}\right)^{\alpha+3} - \frac{\beta^3}{2(2\alpha+1)(\alpha+1)(2\alpha+3)}\left(\frac{T-\mu}{\beta}\right)^{2\alpha+3}\right] \\ -\theta(r+\theta)T\left[\frac{\beta^2}{(\alpha+1)(\alpha+2)}\left(\frac{T-\mu}{\beta}\right)^{\alpha+2} - \frac{\beta^2}{2(2\alpha+1)(\alpha+1)}\left(\frac{T-\mu}{\beta}\right)^{2\alpha+2}\right] \\ +\theta(r+\theta)\left[\frac{\beta^3}{(\alpha+1)(\alpha+2)(\alpha+3)}\left(\frac{T-\mu}{\beta}\right)^{\alpha+3} - \frac{\beta^3}{2(2\alpha+1)(\alpha+1)(2\alpha+3)}\left(\frac{T-\mu}{\beta}\right)^{2\alpha+3}\right] \\ +(T-(r+\theta)\frac{T^2}{2})(1+\theta T)\left[\left(\frac{T-\mu}{\beta}\right)^{\alpha} - \frac{1}{2}\left(\frac{T-\mu}{\beta}\right)^{2\alpha}\right] - \theta\left[\frac{\beta}{\alpha+1}\left(\frac{T-\mu}{\beta}\right)^{\alpha+1} - \frac{\beta}{2(2\alpha+1)}\left(\frac{T-\mu}{\beta}\right)^{2\alpha+1}\right] \\ -\left[\frac{\beta}{\alpha+1}\left(\frac{-\mu}{\beta}\right)^{\alpha+1} - \frac{\beta}{2(2\alpha+1)}\left(\frac{-\mu}{\beta}\right)^{2\alpha+1}\right] + \theta\left[\begin{array}{l}\frac{2\beta^2}{(\alpha+1)(\alpha+2)}\left(\frac{-\mu}{\beta}\right)^{\alpha+2} \\ -\frac{\beta^2}{2(2\alpha+1)(\alpha+1)}\left(\frac{-\mu}{\beta}\right)^{2\alpha+2}\end{array}\right] \\ +(r+\theta+r\theta)\left[\frac{\beta^2}{(\alpha+1)(\alpha+2)}\left(\frac{-\mu}{\beta}\right)^{\alpha+2} - \frac{\beta^2}{2(2\alpha+1)(\alpha+1)}\left(\frac{-\mu}{\beta}\right)^{2\alpha+2}\right] \\ +2\theta^2\left[\frac{\beta^3}{(\alpha+1)(\alpha+2)(\alpha+3)}\left(\frac{-\mu}{\beta}\right)^{\alpha+3} - \frac{\beta^3}{2(2\alpha+1)(\alpha+1)(2\alpha+3)}\left(\frac{-\mu}{\beta}\right)^{2\alpha+3}\right] \\ -\theta(r+\theta)\left[\frac{\beta^3}{(\alpha+1)(\alpha+2)(\alpha+3)}\left(\frac{-\mu}{\beta}\right)^{\alpha+3} - \frac{\beta^3}{2(2\alpha+1)(\alpha+1)(2\alpha+3)}\left(\frac{-\mu}{\beta}\right)^{2\alpha+3}\right] \end{array} \right\} \quad (8)$$

The total inventory cost TC (T) = Ordering cost (A) + Deterioration cost (DC)
+ Holding cost (HC)

Therefore the total variable cost per unit time

$$TC(T) = \frac{1}{T}\left[A + DC + HC\right]$$

$$
\begin{aligned}
TC(T) = \frac{1}{T}\{ & A + C_d * \{ \frac{1}{2}\left(\frac{-\mu}{\beta}\right)^{2\alpha} + \theta\left[\frac{\beta}{\alpha+1}\left(\frac{-\mu}{\beta}\right)^{\alpha+1} - \frac{\beta}{2(2\alpha+1)}\left(\frac{-\mu}{\beta}\right)^{2\alpha+1}\right] \\
& + (1+\theta T)\left[\left(\frac{T-\mu}{\beta}\right)^{\alpha} - \frac{1}{2}\left(\frac{T-\mu}{\beta}\right)^{2\alpha}\right] - \theta\left[\frac{\beta}{\alpha+1}\left(\frac{T-\mu}{\beta}\right)^{\alpha+1} - \frac{\beta}{2(2\alpha+1)}\left(\frac{T-\mu}{\beta}\right)^{2\alpha+1}\right] \\
& - \left[\left(\frac{T-\mu}{\beta}\right)^{\alpha} - \frac{1}{2}\left(\frac{T-\mu}{\beta}\right)^{2\alpha+1} - \frac{1}{2}\left(\frac{-\mu}{\beta}\right)^{2\alpha+1}\right]\} \\
& + h * \{ (1+\theta T)\left[\frac{\beta}{\alpha+1}\left(\frac{T-\mu}{\beta}\right)^{\alpha+1} - \frac{\beta}{2(2\alpha+1)}\left(\frac{T-\mu}{\beta}\right)^{2\alpha+1}\right] - \theta\left[\begin{array}{l}\frac{2\beta^2}{(\alpha+1)(\alpha+2)}\left(\frac{T-\mu}{\beta}\right)^{\alpha+2} \\ -\frac{\beta^2}{2(2\alpha+1)(\alpha+1)}\left(\frac{T-\mu}{\beta}\right)^{2\alpha+2}\end{array}\right] \\
& + T(1+\theta T)\left[\left(\frac{T-\mu}{\beta}\right)^{\alpha} - \frac{1}{2}\left(\frac{T-\mu}{\beta}\right)^{2\alpha}\right] - \theta T\left[\frac{\beta}{\alpha+1}\left(\frac{T-\mu}{\beta}\right)^{\alpha+1} - \frac{\beta}{2(2\alpha+1)}\left(\frac{T-\mu}{\beta}\right)^{2\alpha+1}\right] \\
& + (rT + \theta T + r\theta T + \theta^2 T^2)\left[\frac{\beta}{\alpha+1}\left(\frac{T-\mu}{\beta}\right)^{\alpha+1} - \frac{\beta}{(2\alpha+1)}\left(\frac{T-\mu}{\beta}\right)^{2\alpha+1}\right] \\
& - (r + \theta + r\theta + 2\theta^2 T)\left[\frac{\beta^2}{(\alpha+1)(\alpha+2)}\left(\frac{T-\mu}{\beta}\right)^{\alpha+2} - \frac{\beta^2}{2(2\alpha+1)(\alpha+1)}\left(\frac{T-\mu}{\beta}\right)^{2\alpha+2}\right] \\
& - 2\theta^2\left[\frac{\beta^3}{(\alpha+1)(\alpha+2)(\alpha+3)}\left(\frac{T-\mu}{\beta}\right)^{\alpha+3} - \frac{\beta^3}{2(2\alpha+1)(\alpha+1)(2\alpha+3)}\left(\frac{T-\mu}{\beta}\right)^{2\alpha+3}\right] \\
& - \theta(r+\theta)T\left[\frac{\beta^2}{(\alpha+1)(\alpha+2)}\left(\frac{T-\mu}{\beta}\right)^{\alpha+2} - \frac{\beta^2}{2(2\alpha+1)(\alpha+1)}\left(\frac{T-\mu}{\beta}\right)^{2\alpha+2}\right] \\
& + \theta(r+\theta)\left[\frac{\beta^3}{(\alpha+1)(\alpha+2)(\alpha+3)}\left(\frac{T-\mu}{\beta}\right)^{\alpha+3} - \frac{\beta^3}{2(2\alpha+1)(\alpha+1)(2\alpha+3)}\left(\frac{T-\mu}{\beta}\right)^{2\alpha+3}\right] \\
& + (T - (r+\theta)\frac{T^2}{2})(1+\theta T)\left[\left(\frac{T-\mu}{\beta}\right)^{\alpha} - \frac{1}{2}\left(\frac{T-\mu}{\beta}\right)^{2\alpha}\right] - \theta\left[\frac{\beta}{\alpha+1}\left(\frac{T-\mu}{\beta}\right)^{\alpha+1} - \frac{\beta}{2(2\alpha+1)}\left(\frac{T-\mu}{\beta}\right)^{2\alpha+1}\right] \\
& - \left[\frac{\beta}{\alpha+1}\left(\frac{-\mu}{\beta}\right)^{\alpha+1} - \frac{\beta}{2(2\alpha+1)}\left(\frac{-\mu}{\beta}\right)^{2\alpha+1}\right] + \theta\left[\begin{array}{l}\frac{2\beta^2}{(\alpha+1)(\alpha+2)}\left(\frac{-\mu}{\beta}\right)^{\alpha+2} \\ -\frac{\beta^2}{2(2\alpha+1)(\alpha+1)}\left(\frac{-\mu}{\beta}\right)^{2\alpha+2}\end{array}\right] \\
& + (r + \theta + r\theta)\left[\frac{\beta^2}{(\alpha+1)(\alpha+2)}\left(\frac{-\mu}{\beta}\right)^{\alpha+2} - \frac{\beta^2}{2(2\alpha+1)(\alpha+1)}\left(\frac{-\mu}{\beta}\right)^{2\alpha+2}\right] \\
& + 2\theta^2\left[\frac{\beta^3}{(\alpha+1)(\alpha+2)(\alpha+3)}\left(\frac{-\mu}{\beta}\right)^{\alpha+3} - \frac{\beta^3}{2(2\alpha+1)(\alpha+1)(2\alpha+3)}\left(\frac{-\mu}{\beta}\right)^{2\alpha+3}\right] \\
& - \theta(r+\theta)\left[\frac{\beta^3}{(\alpha+1)(\alpha+2)(\alpha+3)}\left(\frac{-\mu}{\beta}\right)^{\alpha+3} - \frac{\beta^3}{2(2\alpha+1)(\alpha+1)(2\alpha+3)}\left(\frac{-\mu}{\beta}\right)^{2\alpha+3}\right]\}
\end{aligned}
\tag{9}
$$

The necessary and sufficient conditions for minimize cost a given value *T* are

$\frac{dTC(T)}{dT}=0$ And $\frac{d^2TC(T)}{dT^2}>0$ then differentiation with respect to T of (9), we get

VI. Algorithm

To find out the solution following algorithm used

Step1: Find derivative $\frac{dTC(T)}{dT}$ and put $\frac{dTC(T)}{dT}=0$

Step2: Solve equation for T

Step3: Find the derivative $\frac{d^2TC(T)}{dT^2}$ and check $\frac{d^2TC(T)}{dT^2}>0$ for T^* optimal length

Step4: Find optimal total cost and initial order quantity

VII. Conclusion

In the present paper, we developed an inventory model for variable deteriorating item with inflation and the model with 3-variable Weibull distribution demand rate is developed. The deterioration cost is constant. Shortages are not allowed. The model is very practical for the industries in which the demand rate is depending upon the time and holding cost is constant with inflation. This model can further be extended by taking more realistic assumptions such as finite replenishment rate, variable deterioration rate, variable holding etc.

VIII. Numerical Solution

Consider an inventory system with the following parameter in proper units $A=800$, $\alpha=8$, $\mu=0.6$, $\beta=3$, $\theta=0.02$, $r=0.04$, $h=10$ and $C_d=12$ The computer output of the program by using Mat lab software is T^* = 4.2013, Q_o * = 182.95 and TC^* = 343.708. The effect of changes in the parameter of the inventory model also can be study by using Mat lab. If $\alpha<\beta$ the total cost decreases and if $\mu<\beta$ the total cost is also decreases. If α increases the total cost also decreases but if r increases then total cost increases.

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