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AN INVENTORY MODEL WITH POWER DEMAND PATTERN UNDER INFLATION

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ABSTRACT
In this paper we discuss the impact of inflation with power demand pattern where two parameters Weibull distribution for deterioration is considered and also a discounted-cash-flow (DCF) approach with progressive trade credit is adopted. We present an analytic formulation of the inventory problem and compare the three cases. The objective function to be optimized is considered as present value of all future cash-out-flows .The motivations, extensions and weaknesses of various previous models have been discussed in brief to bring pertinent information regarding model developments in the past two decades. Numerical example is presented to illustrate the model developed. The result shows that in case 1 and case 2 , we observ that when inflation rate increases, optimum cycle time, optimum procurement quantity and present value of total inventory cost per cycle time decrease and in case 3 when inflation rate increases the present value of total inventory cost per cycle also increases.

KEYWORDS: Weibull Deterioration, Power Demand, Inflation, Discounted Cash Flow

MSC: 90B13

RESUMEN
En este trabajo discutimos el impacto de la inflación; se considera que el patrón de demanda potencial sigue una distribución de Weibull de dos parámetros para el deterioro; el enfoque del flujo de descuento efectivo (discounted-cash-flow, DCF) con comercio de crédito progresivo es adoptado. Presentamos una formulación analítica del problema de inventario y se comparan tres casos. La función objetivo a optimizar es considerada al valor presente y los flujos de efectivo saliente. Las motivaciones, extensiones y debilidades de varios modelos previos son discutidos brevemente para brindar la pertinente información sobre el desarrollo del modelo en las dos última décadas. Un ejemplo numérico es presentado para ilustrar el modelo desarrollado. Los resultados muestran que en los casos 1 y 2 , observamos que cuando la tasa de inflación crece, decrece el ciclo óptimo de tiempo, la cantidad a procurar optima y el presente valor total del costo de inventario por ciclo de tiempo y en el caso 3 cuando la tasa de inflación crece el claro presente del costo total de inventario por ciclo también crece.

1. INTRODUCTION

Most of the researchers have worked on Inventory models with discounted-cash-flow(DCF) approach. Tripathy and Pradhan [11] worked on discounted-cash-flow. A few researchers have discussed the demand of items as power demand pattern. Dutta & Pal [6] have developed an order level inventory system with power demand pattern. Many authors have developed different inventory models incorporating the concept of inflation under different assumptions. Buzacott[5] who discussed EOQ model with inflation subject to different types of pricing policies. Aggarwal and Jaggi [1] determined economic order quantity with inflation under all unit discounts of deteriorating item. Aggarwal et al. [2] investigated the economic ordering policies in the presence of trade credit with inflation for non-deteriorating items. Further Liao [8] proposes an inventory model for deteriorating items under inflation under a situation in which the supplier provides the purchaser a permissible delay of payments. Recently Jaggi and Goel [7] investigated the economic ordering policies of deteriorating items with trade credit under inflationary conditions.
Trade credit is the most effective tool for the supplier to supply more and to attract more retailers. A supplier will allow a certain fixed period for settling the amount owed to him for the items supplied. Usually there is no

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charge, if the outstanding amount is settled within the permitted fixed settlement period. Beyond this period, interest is charged. Secondly, due to high inflation and consequent sharp decline in the purchasing power of money, especially in the developing countries, the financial situation has been changed, so it has been impossible to ignore the effect of inflation. Therefore it is necessary to investigate how inflation influences various inventory policies. So, researchers commonly use a time varying demand pattern to reflect sales in different phases of product life cycle under the consideration of inflation. The effects of Inflation and delay in payments have been discussed. Mathematical models are also derived under different circumstances. The objective is to maximize the profit cost and to determine the length of the cycle as well as quantity. Finally, it is provided with a numerical example for illustration the theoretical results.

The paper is organised as follows: we have developed the mathematical formulation for the solution of the total present value of the cost over the time horizon with regard to different cases. In case 1 and case 2 , we observe that when inflation rate increases, the optimum cycle time, optimum procurement quantity and the present value of total inventory cost per cycle time decrease and in case 3 when inflation rate increases the present value of total inventory cost per cycle also increases.

2. ASSUMPTIONS AND NOTATIONS

(1) The inventory system deals with single item only.

(2) The demand is given by the power demand pattern for which, demand up to time *t* is assumed to be $d\left(\frac{t}{T}\right)^{\frac{1}{n}}$, where *d* is the demand size during the fixed cycle time $T, n(0<n<\infty)$ is the pattern index and $\left(\frac{dt^{\frac{1-n}{n}}}{nT^{\frac{1}{n}}}\right)$ is the demand rate at time *t*.

(3) Shortages are not allowed

(4) The lead time is zero.

(5) Replenishment rate is infinite and replenishment is instantaneous.

(6) The rate of deterioration at any time $t>0$ follows the two-parameter Weibull distribution $Z(t)=\alpha\beta t^{\beta-1}$, where, $\alpha(0<\alpha<1)$, is the scale parameter and $\beta(>0)$ is the shape parameter.

(7) There is no repair or replacement of deteriorated units in the given cycle and during the cycle time $0 \le z(t) < 1$.

(8) If the retailer pays by *M*, then supplier does not charge retailer. If the retailer pays after *M* and before *N*, he can keep the surplus of the difference in unit selling price and unit cost in an interest bearing account at the rate of I_e/unit/year. During [*M, N*] the supplier charges the retailer an interest rate of I_{C_1} /unit year on the unpaid balance at the end of *N*.

We use the following notations to describe the model of interest:

A = Ordering cost at time t = A_0e^{kt}
where A_0 is the ordering cost at time zero and k is the constant rate of inflation.
C = *U*nit purchase cost at time t =C_0e^{kt}
P,h,r=Selling cost \$/unit, Inventory holding cost excluding interest charges \$/unit/year respectively and Discount rate per time unit.
M, N=First permissible trade credit in settling account without any extra charges and second permissible delay period in settling the account with interest charge of I_{C_1} (*N*>*M*) respectively.
I_{C_1}, I_e=Interest charged per \$/year by the supplier when retailer pays after *M* but before *N* and Interest earned, \$/year
T,Q,I(t)=Length of replenishment cycle, Procurement Quantity, Inventory level at time *t*, $(0 \le t \le T)$.
$PV_1(T)$, $PV_2(T)$, $PV_3(T)$=Present cash-out-flows for $T \le M, M < T < N$ and $T \ge N$ respectively.
PV(T)=Present value of total inventory cost per cycle time which comprises sum of (a) ordering cost; OC, (b) procurement cost; PC (c) inventory holding cost (excluding interest charges), IHC (d) Interest charges; IC for

unsold items after the permissible trade credit *M* or *N*, minus (e) interest earned from the sales revenue during the permissible credit period [*O,M*].

$PV_{\infty}(T)$=Present value of all future cash-out-flows.

3. MATHEMATICAL MODEL

In the interval [0,T], the inventory occurs due to combined effect of the demand and deterioration. The differential equation governing instaneous state of *I(t)* at some instant point of time *t* is given by

$$\frac{dI(t)}{dt}+z(t)I(t)=\frac{-dt^{\frac{1-n}{n}}}{nT^{\frac{1}{n}}},\ 0\le t\le T \qquad [1]$$

with boundary conditions *I(0)=Q* and *I(T)=0* where, $Z(t)=\alpha\beta t^{\beta-1}$.

The solution of (1) is given by

$$I(t)=d\left[1-\left(\frac{t}{T}\right)^{\frac{1}{n}}+\frac{\alpha}{n\beta+1}\left(T^{\beta}-\frac{t^{\beta+\frac{1}{n}}}{T^{\frac{1}{n}}}\right)\right]\left(1-\alpha t^{\beta}\right) \qquad [2]$$

and the order quantity is

$$Q=d\left(1+\frac{\alpha T^{\beta}}{n\beta+1}\right) \qquad [3]$$

The components of the total inventory cost of the system per cycle time are as follows

(a) Ordering cost = OC = A_0e^{kt} [4]

(b) Procurement cost = PC = C_0e^{kt} Q = $C_0e^{kt}d\left(1+\frac{\alpha T^{\beta}}{n\beta+1}\right)$ [5]

(c) Inventory holding cost =

$$\text{IHC} = h\int_0^T I(t)e^{-rt}dt=hdT\left[1+\frac{1}{n+1}\left(\alpha T-n\right)\right] \qquad [6]$$

As charge of the interest and interest earned depends on the length of the cycle time *T*, therefore discussed in detail for the three possible situations.

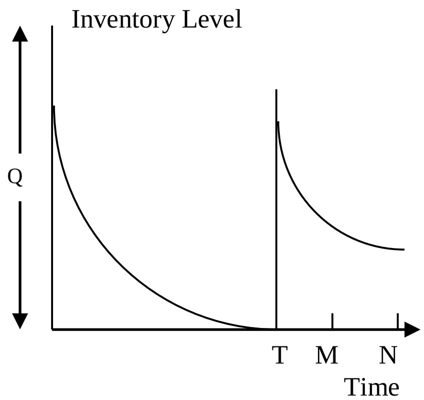
Case 1: $T\le M$
Case 2: $M<T<N$
Case 3: $T\ge N$

Case 1: $T\le M$

Here, retailer sells *Q* units in cycle time *T* and will have to pay *CQ* to the supplier in full at time *M* but $M\ge T$. So interest charges are zero.

i.e. $IC_1 = 0$ [7]

During [*0,T*], the retailer sells products at selling price *p*/unit and deposits the revenue into interest earning account at the rate of I_e/\$/year. In the period [*T,M*], the retailer deposits only the total revenue into an account that earns I_e/\$/year. Hence, interest earned per time unit is



(Figure 1.1)

$$IE_1 \quad = PI_e\left[\int_0^T \frac{dt^{\frac{1}{n}-1}}{nT^{\frac{1}{n}}}.t.e^{-rt}dt + \frac{dt^{\frac{1}{n}-1}}{nT^{\frac{1}{n}-1}}(M-T).e^{-r(M-T)}\right]$$

$$= PI_e d\left[\frac{T}{n+1} + \frac{t^{\frac{1-n}{n}}}{nT^{\frac{1}{n}-1}}(M-T).e^{-r(M-T)}\right] \quad [8]$$

Using equation 4 to 8, the present value of cash-out-flow for one cycle is

$PV_1\ (T)=[OC+PC+IHC+IC_1-IE_1]$ [9]

The present value of all future cash-out-flow is given by

$$PV_{1\infty} = \sum_{n=0}^{\infty} PV_1(T)e^{-nrT} = \frac{PV_1(T)}{1-e^{-rT}}$$

$$\therefore PV_{1\infty}(T) = \left(\frac{1}{rT} + \frac{1}{2} + \frac{rT}{4}\right)PV_1(T) \quad [10]$$

The optimal value of T (say T_1) can be obtained by solving equation

$$\frac{\partial PV_{1\infty}(T)}{\partial T} = S_1\left[A_0ke^{kt} + \frac{\beta C_0 ke^{kt} d\alpha T^{\beta-1}}{n\beta+1} + hd(S_2) - PI_e d\left\{\frac{1}{n+1} + \frac{t^{\frac{1-n}{n}}}{nT^{\frac{1}{n}}}e^{(T-M)r}\left(rMT + \left(1-\frac{1}{n}\right)M - rT^2 - \left(2-\frac{1}{n}\right)T\right)\right\}\right] + S_3PV_1(T) = 0 \quad [11]$$

where

$$S_1 = \frac{1}{rT} + \frac{1}{2} + \frac{rT}{4}, \quad S_2 = 1 + \frac{2\alpha T}{n+1} - \frac{n}{n+1} \quad \text{and} \quad S_3 = \frac{rT}{4} - \frac{1}{rT^2}$$

provided that it satisfies the sufficiency conditions at $T=T_1$.

$$\frac{\partial^2 PV_{1\infty}(T)}{\partial T^2} = S_1\frac{\partial^2 PV_1(T)}{\partial T^2} + 2S_3\frac{\partial PV_1(T)}{\partial T} + \frac{2}{rT^3}PV_1(T) < 0, \forall T = T_1$$

Case 2: *M<T<N*

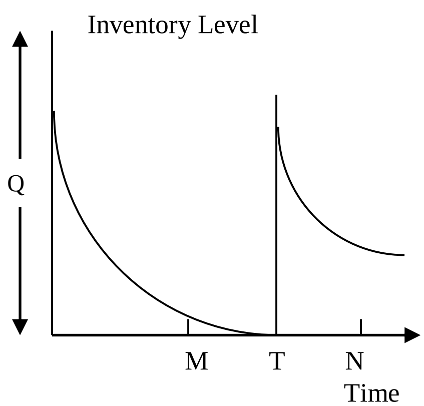
Here, interest earned, IE_2 during [$0,M$] is

$$IE_2 = PI_2 \int_0^M \frac{dt^{\frac{1-n}{n}}}{nT^{\frac{1}{n}}} .t.e^{-rt} dt .$$

So,

$$IE_2 = \frac{PI_e dM^{\frac{1}{n}+1}}{(n+1)T^{\frac{1}{n}}} .$$

Buyer has to pay the procurement cost $C_0 e^{kt} Q$ of Q units at time $T=M$ to the supplier up to time M, the retailer sells $\frac{dt^{\frac{1-n}{n}}}{nT^{\frac{1}{n}}} .Me^{-rM}$ plus interest earned IE_2 to pay the supplier. Depending on the difference between the total procurement cost $C_0 e^{kt} Q$ and the total revenue $\frac{Pdt^{\frac{1-n}{n}}}{nT^{\frac{1}{n}}} .Me^{-rM} + IE_2$, two sub-cases are possible.



(Figure 1.2)

Case 2.1 : $\frac{Pdt^{\frac{1-n}{n}}}{nT^{\frac{1}{n}}} Me^{-rM} + IE_2 \geq C_0 e^{kt} Q$

Case 2.2 : $\frac{Pdt^{\frac{1-n}{n}}}{nT^{\frac{1}{n}}} Me^{-rM} + IE_2 < C_0 e^{kt} Q$

Case 2.1 : $\frac{Pdt^{\frac{1-n}{n}}}{nT^{\frac{1}{n}}} Me^{-rM} + IE_2 \geq C_0 e^{kt} Q$

Here the retailer has enough availability of money to pay off the total purchase cost at M. Therefore, interest charge

$$IC_{2.1} = 0 \qquad [12]$$

The present value of cash-out-flow for one cycle for this sub-case is

$$PV_{2.1}(T)=[OC+PC+IHC+IC_{2.1}-IE_2] \qquad [13]$$

The present value of all future cash-out-flows is given by

$$PV_{2.1\infty}(T) = \left(\frac{1}{rT} + \frac{1}{2} + \frac{rT}{4} \right) PV_{2.1}(T) \qquad [14]$$

$$\frac{\partial PV_{2.1\infty}(T)}{\partial T}=S_1\left[A_0ke^{kt}\frac{\beta C_0ke^{kt}d\alpha T^{\beta-1}}{n\beta+1}+hd(S_2)+\frac{PI_edM^{\frac{1}{n}+1}}{n(n+1)}T^{-\frac{1}{n}-1}\right]+S_3PV_{2.1}(T) \qquad [15]$$

provided that it satisfies the sufficient condition

$\frac{\partial^2 PV_{2.1\infty}(T)}{\partial T^2}<0$ at $T=T_{2.1}$

Case 2.2 : $\frac{Pdt^{\frac{1-n}{n}}}{nT^{\frac{1}{n}}}Me^{-rM}+IE_2<C_0e^{kt}Q$

In this sub-case, the retailer does not have sufficient money in his account to make the payment at permissible credit time M. Then, supplier charges retailer in the unpaid balance U_1 at the interest rate I_{C1} after time M. where

$$U_1=C_0e^{kt}Q-\left[\frac{Pdt^{\frac{1-n}{n}}}{nT^{\frac{1}{n}}}Me^{-rM}+IE_2\right]$$

Therefore, interest charges payable $IC_{2.2}$ is

$$IC_{2.2}=\frac{U_1^2}{P}I_{c_1}\int_M^T\frac{I(t)e^{-rt}\,nT^{\frac{1}{n}}}{dt^{\frac{1-n}{n}}}dt$$

$$=\frac{U_1^2I_{c_1}nT^{\frac{1}{n}}}{pd}\int_M^T I(t)e^{-rt}\,t^{1-\frac{1}{n}}dt$$

$$=S_4S_5S_6-S_4S_6S_7-\frac{S_4S_8}{nT^{\frac{1}{n}}}-\frac{\alpha S_4}{nT^{\frac{1}{n}}}.S_9\left(\frac{1}{n\beta+1}-1\right)$$

$$-\alpha S_4S_6S_{10}+\alpha S_4S_6S_{11}+\frac{\alpha^2S_4S_{12}}{nT^{\frac{1}{n}}(n\beta+1)} \qquad [16]$$

The present value of cash-out-flow for one cycle for this sub-case is

$PV_{2.2}(T)=[OC+PC+IHC+IC_{2.2}-IE_2]$ [17]

The present value of all future cash-out-flows is given by

$$PV_{2.2\infty}(T)=\left(\frac{1}{rT}+\frac{1}{2}+\frac{rT}{4}\right)PV_{2.2}(T) \qquad [18]$$

where,

$$PV_{2.2}(T)=A_0e^{kt}+C_0e^{kt}dS_6+hdT\left(1+\frac{\alpha T}{n+1}\right)-\frac{nhdT}{n+1}-IC_{2.2}-\frac{PI_edM^{\frac{1}{n}+1}}{(n+1)T^{\frac{1}{n}}}$$

The optimum value of $T=T_{2.2}$ is the solution of non-linear equation.

$$\frac{\partial PV_{2.2\infty}(T)}{\partial T}=\frac{\partial PV_{2.2}(T)}{\partial T}+S_3PV_{2.2}(T)=0 \qquad [19]$$

where,

$$\frac{\partial PV_{2.2}(T)}{\partial T}=S_1\Bigg[A_0ke^{kt}+\frac{\beta C_0ke^{kt}d\alpha T^{\beta-1}}{n\beta+1}+hdS_2+\frac{PI_edM^{\frac{1}{n}+1}}{n(n+1)T^{\frac{1}{n}+1}}+\frac{T^{1-\frac{1}{n}}}{n}\left(1-\frac{2n}{2n-1}\right)S_4$$

$$+\frac{S_4S_7}{nT}\left(1+T^{\beta}\right)+\frac{P\alpha T^{\beta+\frac{1}{n}-1}}{n(n\beta+1)}\left(1-\frac{n(2+\beta)}{P(2n-1)}+\frac{n(\beta+2)}{P(n\beta+2n-1)}\right)S_4$$

$$-\frac{\alpha S_4S_{11}}{nT}\left[\frac{1}{n^2}-\alpha T^{\beta}\right]+2S_4S_6S_7\frac{\partial U_1}{\partial T}-\frac{2\alpha S_4S_{11}}{U_1n^2}\left(1+\frac{\alpha n^2T^{\beta}}{n\beta+1}\right)\left(\frac{\partial U_1}{\partial T}\right)$$

$$+\frac{2\alpha}{U_1nT^{\frac{1}{n}}}S_4S_{13}\left[\frac{1}{n\beta+1}-1\right]\frac{\partial U_1}{\partial T}+\frac{2S_1S_4}{U_1nT^{\frac{1}{n}}}\left(S_{14}-\frac{\alpha^2S_{15}}{n\beta+1}\right)\frac{\partial U_1}{\partial T}\Bigg]$$

where,

$$\frac{\partial U_1}{\partial T}=\frac{C_0ke^{kt}d\alpha\beta T}{n\beta+1}+\frac{Pdt^{\frac{1-n}{n}}Me^{-rM}}{n^2T^{-\frac{1}{n}+1}}+\frac{PI_edM^{\frac{1}{n}+1}T^{-\frac{1}{n}-1}}{n(n+1)},\quad S_4=\frac{U_1^2I_{c_1}n^2T^{\frac{1}{n}}}{P},$$

$$S_5=\frac{T^{2-\frac{1}{n}}}{2n-1}-\frac{rT^{3-\frac{1}{n}}}{3n-1},\quad S_6=1+\frac{\alpha T^{\beta}}{n\beta+1},\quad S_7=\frac{M^{2-\frac{1}{n}}}{2n-1}-\frac{rM^{3-\frac{1}{n}}}{3n-1},$$

$$S_8=\frac{T^2}{2}-\frac{rT^3}{3}-\frac{M^2}{2}+\frac{rM^3}{3},\quad S_9=\frac{T^{\beta+2}}{\beta+2}-\frac{rT^{\beta+3}}{\beta+3}-\frac{M^{\beta+2}}{\beta+2}+\frac{rM^{\beta+3}}{\beta+3}$$

$$S_{10}=\frac{T^{\beta+2-\frac{1}{n}}}{n\beta+2n-1}-\frac{rT^{\beta+3-\frac{1}{n}}}{n\beta+3n-1},\quad S_{11}=\frac{M^{\beta+2-\frac{1}{n}}}{n\beta+2n-1}-\frac{rM^{\beta+3-\frac{1}{n}}}{n\beta+3n-1}$$

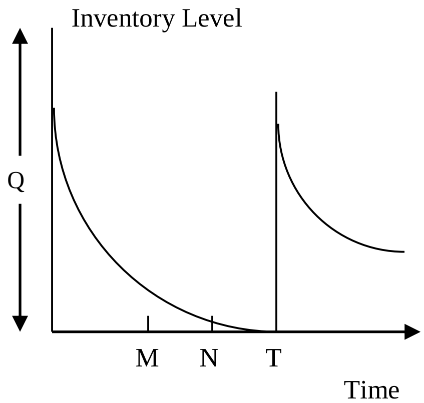
$$S_{12}=\frac{T^{2\beta+2}}{2\beta+2}-\frac{rT^{2\beta+3}}{2\beta+3}-\frac{M^{2\beta+2}}{2\beta+2}+\frac{rM^{2\beta+3}}{2\beta+3},$$

$$S_{13}=\frac{rM^{\beta+3}}{\beta+3}-\frac{M^{\beta+2}}{\beta+2},\quad S_{14}=\frac{rM^3}{3}-\frac{M^2}{2},\quad S_{15}=\frac{rM^{2\beta+3}}{2\beta+3}-\frac{M^{2\beta+2}}{2\beta+2}$$

provided that it satisfies the sufficient condition.

$$\frac{\partial^2PV_{2.2\infty}(T)}{\partial T^2}<0 \text{ at } T=T_{2.2}$$

Case 3: Depending the procurement cost C_0e^{kt} Q, total amount available to retailer at M is $\frac{Pdt^{\frac{1-n}{n}}Me^{-rM}}{nT^{\frac{1}{n}}}+IE_2$ available to the retailer at N is $\frac{Pdt^{\frac{1-n}{n}}Ne^{-rM}}{nT^{\frac{1}{n}}}+IE_2$; following sub-cases are possible.



(Figure 1.3)

Case 3.1: $\dfrac{Pdt^{\frac{1-n}{n}}}{nT^{\frac{1}{n}}} Me^{-rM} + IE_2 \geq C_0 e^{kt} Q$

This sub-case is same as sub-case 2.1. The present value of all future cash-out-flows is given by

$$PV_{3.1\infty}(T) = \left(\frac{1}{rT} + \frac{1}{2} + \frac{rT}{4} \right) PV_{2.1}(T) \qquad [20]$$

The non-linear solution to the management problem lies in the optimum value of $T=T_{3.1}$.

$$\frac{\partial PV_{3.1\,\infty}(T)}{\partial T} = 0 \qquad [21]$$

provided that it satisfies the sufficient condition

$$\frac{\partial^2 PV_{3.1\infty}(T)}{\partial T^2} < 0 \text{ at } T=T_{3.1}$$

Case 3.2: $\dfrac{Pdt^{\frac{1-n}{n}}}{nT^{\frac{1}{n}}} Me^{-rM} + IE_2 < C_0 e^{kt} Q$ but

$$\left[\frac{Pdt^{\frac{1-n}{n}}}{nT^{\frac{1}{n}}} (N-M) e^{-r(N-M)} + PI_2 \int_M^N \frac{dt^{\frac{1-n}{n}}}{nT^{\frac{1}{n}}} te^{-rt} dt \right] \geq$$

$$C_0 e^{kt} Q - \left(\frac{Pdt^{\frac{1-n}{n}}}{nT^{\frac{1}{n}}} Me^{-rM} + IE_2 \right)$$

In this case, the retailer balance causes the stock-out balance to be lower than M to settle the account of supplier completely but he can pay the balance on or before N. Hence, the retailer makes the payment of $\dfrac{Pdt^{\frac{1-n}{n}}}{nT^{\frac{1}{n}}} Me^{-rM} + IE_2$ at M and will pay the interest charges at the rate of I_{C_1} on the unpaid balance

$$U_1 = C_0 e^{kt} Q - \left[\frac{Pdt^{\frac{1-n}{n}}}{nT^{\frac{1}{n}}} Me^{-rM} + IE_2 \right] \text{ at } M.$$

This case is similar to expression developed in 2.2.
The present value of all future cash-out-flows is given by

$$PV_{3.2\infty}(T)=\left(\frac{1}{rT}+\frac{1}{2}+\frac{rT}{4}\right)PV_{2.2}(T) \qquad [22]$$

To determine optimum value of $T=T_{3.2}$ which is the solution of non-linear equation

$$\frac{\partial PV_{3.2\,\infty}(T)}{\partial T}=0 \qquad [23]$$

provided that it is satisfies the sufficient condition.

$$\frac{\partial^2 PV_{3.2\,\infty}(T)}{\partial T^2}<0 \text{ at } T=T_{3.2}$$

4. NUMERICAL RESULT

The following parametric values in appropriate units are considered.

$A=100, h=2, d=50, \alpha=0.001, \beta=0.02,$

$n=0.6, c=2, P=30, I_e=8\%,$

$t=\frac{1}{2}, M=\frac{2}{365}, I_{C_1}=10\%, A_0=10, C_0=2, k=0.1$

Table 1 . Case 1

R	T	PV	Q
0.01	0.45608524	27.33184086	50.04863741
0.02	0.455739	27.32789277	50.04863667
0.03	0.455445	27.31631939	50.02250222
0.04	0.4552	27.312612	50.02249012
0.05	0.454995	27.312549	50.02247999
0.06	0.454831	27.312251	50.02247189
0.07	0.45469911	27.312142	50.02246537
0.08	0.45461	27.302124	50.02246097
0.09	0.454547	27.30282928	50.02245786
0.5	0.469845	27.56952185	50.02321369

Table 2 . Case 2.1 and 3.1

R	T	PV	Q
0.01	0.452117	27.24793036	50.04862891
0.11	0.452125	27.27493367	50.04862892
0.21	0.452205	27.27605916	50.0486291
0.31	0.452243	27.27732146	50.04862918
0.32	0.452426	27.29254709	50.04862957
0.33	0.452497	27.2864207	50.04862972
0.34	0.452763	27.29735626	50.0486303
0.35	0.452820	27.28498383	50.04863042
0.36	0.452979	27.28705753	50.04863076
0.41	0.452480	27.27994397	50.04862969
0.5	0.452478	27.27991562	50.04862968

Table 3 . Case 2.2 and 3.2

R	T	PV	Q
0.01	0.53211	27.521167	50.02629002
0.11	0.53137	27.5211653	50.02625346
0.21	0.531355	27.5210561	50.02625272
0.22	0.531349	27.519678	50.02625242
0.23	0.531493	27.5187713	50.02625954
0.25	0.531477	27.50955301	50.02625875
0.26	0.531761	27.50955211	50.02627278
0.31	0.531528	27.50855489	50.02626126

0.41	0.531612	27.49763209	50.02626542
0.91	0.531711	27.49631109	50.02626614
0.5	0.5318299	27.49831171	50.0262718

5. SENSITIVITY ANALYSIS

To find the changes of inflation rate on optimum cycle time, optimum procurement quantity and the present value, we give a set of numerical calculations for incremental inflation rate.

Tables 1, 2 and 3 show part of calculation results.

The calculation results show that:

(1) From Tables 1 and 2 , we can conclude that when Inflation rate increases , the optimum cycle time, procurement quantity and the present value of total inventory cost per cycle time decrease.

(2) From Table 3, we can conclude that when inflation rate increases the present value of total inventory cost per cycle also increases.

6. CONCLUSIONS

In this paper, we have proposed an inventory model for power demand pattern under inflation in discounted cash flow approach (DCF). The effects of inflation, power demand and discounted cash-flow are discussed. Numerical example is presented to examine the effects of inflation, Weibull deterioration and optimal order quantity.

It is observed from case 1 and case 2 that for deterioration rate of inflation , as discount rate increases, optimum cycle time, optimum procurement quantity and the present value of total inventory cost per cycle time decrease but in case 3 when increasing rate of infiation, the present value of total inventory cost per cycle is also increased.

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