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A INVENTORY MODEL FOR HEALTH SERVICE FIRMS IN QUADRATIC DEMAND OF PARABOLIC HOLDING COST WITH SHORTAGES

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Abstract:

During olden days, in the inventory models of Health service firms, the demand and cost of holding the things were fixed. Now in the modern world, the above cannot be considered as fixed. It is changing from time to time and place to place. So we have to formulate a model of demand in quadratic with time function. The cost of holding the things are considered as parabolic equations of time where changing of fixed deterioration is taken. The shortage of stocks is allowed. Using this inferences, a mathematical model have developed and find the solution and represented using graph. The scope is time should be optimal, order quantity is more of very least overall average cost. This result has more importance in Health service firms.

Key Words: Deterioration, Health service, Shortages, Time changeable demand and parabolic holding cost.

1. Introduction

As we enter the new globalised world, Health service sectors are facing different challenges , continuously improving their services and giving highest quality at optimal cost. Everyday Health service sectors deal with inventory complications, logistics of materials, and patient quarries regarding their health issues. Controlling the stock is not simple and it varies time to time, based on which the system will change the new domain to service their clients.

Decaying the referred as product decay, evaporation of spoilage and loss of usefulness. The inventories are realistic feature put into discussion. Often we discover Health service products, such as generic medicines, caplets, Ophthalmic, Creams, prescription painkillers, etc., that have a defined life expectancy, due to time it losses.

Vinod Kumar (et al) has proposed a model of Deteriorating inventory dependent demand and holding cost backlogging,[1]. S. K. Karuppasamy.,(et al)have developed a result of Coordination demand and order size dependent trade credit in healthcare industries a model for imperfect thing with time subordinate interest, holding cost and halfway accumulating and give logical arrangement of the model that limit the all out stock expense.[2]. Khanra S, (et al), has proposed a model of An EOQ model item quadratic demand delay in payment.[3]. Uthayakumar,.R (et al) has proposed a model of Pharmaceutical supply chain and Optimization for a pharmaceutical company and a hospital [4]. Khanra, S., (et al) have formulated model of A note on order level inventory model [5]. Pavan Kumar., has presented a paper of deterministic inventory model for parabolic holding cost with no shortages is presented. Salvage value is also incorporated in the model. An expression for average total cost function is derived [6]. Vaithyasubramanian. (et al). A. has proposed a model of Study on User Credentials Using Statistical Analysis [7] Vaithyasubramanian, (et al). have derived a paper of Multifactor authentication a study on user preference, remembering ability, error rate and time consumption [8]. Uthayakumar. R and et al has investigated non-constant deteriorating pharmaceutical things with healthcare Industries inventory model [9]. Pavan Kumar, (et al). has derived a paper of Inventory Control Model with Time-Linked Holding Cost, Salvage Value and Probabilistic Deterioration following Various Distribution it discussed an optimum inventory management issue with time-related cost of holding and salvage value. The decay of items after two distributions is a continuous random number uniform distribution and triangular distribution[10].

To develop a inventory of Health service firms model in quadratic time function, Parabolic holding cost and disintegration rate fixed. The rate of backlogging depends on the length of the next replenishment and allowing shortages. Our target is to find the least overall average cost with least time and largest quantity, leftover paper is constructed to arrange bellow as quoted. In the section (2), Symbols & Inferences **is** listed. Then section (3), we formulated a Math Optimizing model is recommended. In the next section (4), two level numerical problems is carried out and the section (5), Using table values sensitivity test is performed, graphical depictions are showed in section (6). Comments and reviews are submitted in section (7). In the last, completion and provide a few future investigate chance.

2. Symbols and Inferences

2.1. Symbols

S_F	The Health service setup Cost/ordering cost per order;
C_F	The Health service purchase cost per unit;
θ_F	The Health service defective rate;
K_F	Health service Ordering cost
HC	Health service holding Cost/Carrying Cost per unit per time unit;
BC	The Health service back ordered cost.
L_F	The Health service cost of lost sales per unit;
t_{F1}	The Health service time , $t_{F1} \geq 0$
T_{F1}	$\left(= t_{F1} + t_{F2}\right)$ the length of cycle time;
Q_{F1}	The Health service inventory level during $\left[0, T_{F1}\right]$;

Q_{F2}	The Health service inventory level during shortage period;
Q_F	$(=Q_{F1}+Q_{F2})$ the Health service order quantity during a cycle of length T_{F1} ;
$I_{F1}(t)$	The Health service level of positive inventory at time t ;
$I_{F2}(t)$	The Health service level of negative inventory at time t ;
$ATC(t_{F1},t_{F2})$	The Health service Average total cost per time unit.

2.2 Inferences

- Allowing Health service Shortage & partially backlogged
- Health service Holding cost is parabolic of time $h(t)=u+vt^2$, $u \geq 0, v \geq 0$ and the defective rate is constant.

  The Health service demand rate is time dependent $f(t)=a_1+b_1t+c_1t^2$,where $a_1>0, b_1>0$
- The Health service lead time is zero , Infinite rate of replenishment is taken.
- $B(t)=\dfrac{1}{1+\delta(T_{F1}-t)}$, δ is backlogging parameter of health service and $(T_{F1}-t)$ is waiting time $(t_{F1} \leq t \leq T_{F1})$ where $T_{F1}=t_{F1}+t_{F2}$.

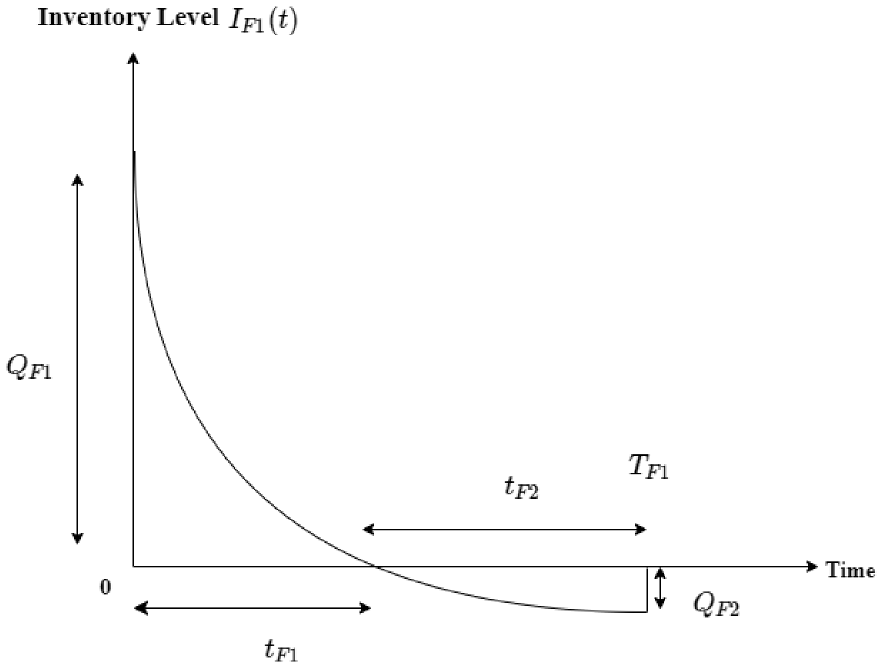

Figure 1: Graph of Inventory System

3. The Mathematical Optimizing model generation

The rate of Health service inventory during positive stock period $\left[0, t_{F1}\right]$ and shortage period $\left[t_{F1}, t_{F1}+t_{F2}\right]$ is formed as follows

$$\frac{dI_{F1}(t)}{dt}+\theta_F I_{F1}(t)=-\left(a_1+b_1 t+c_1 t^2\right),\ 0 \le t \le t_{F1} \tag{1}$$

$$\frac{dI_{F2}(t)}{dt}=-\left(\frac{a_1+b_1 t+c_1 t^2}{1+\delta\left(T_{F1}-t\right)}\right), \quad t_{F1} \le t \le t_{F1}+t_{F2} \tag{2}$$

with the boundary conditions $I_{F1}(t)=I_{F2}(t)=0$ at $t=t_{F1}$, $I_{F1}(t)=Q_{F1}$ at $t=0$ and $Q_{F2}=-I_{F2}(t_{F1}+t_{F2})$ The soln of eqn (1) and applying boundary conditions $I_{F1}\left(t_{F1}\right)=0$ we get

$$I_{F1}(t)=\left[a_1\left(t_{F1}-t\right)+\left(\frac{b_1+a_1\theta_F}{2}\right)\left(t_{F1}^2-t^2\right)+\left(\frac{c_1+b_1\theta_F}{3}\right)\left(t_{F1}^3-t^3\right)+\frac{c_1\theta_F}{4}\left(t_{F1}^4-t^4\right)\right]e^{-\theta_F t},\ 0 \le t \le t_{F1} \tag{3}$$

The solution of equation (2) and using the boundary conditions $I_{F2}\left(t_{F1}\right)=0$ we get

$$\begin{aligned} I_{F2}(t)=&\left[\frac{a_1}{\delta}+\frac{b_1\left(1+\delta(t_{F1}+t_{F2})\right)}{\delta^2}+\frac{c_1\left(1+\delta(t_{F1}+t_{F2})\right)^2}{\delta^3}\right]\log\left[\frac{1+\delta\left(t_{F1}+t_{F2}-t\right)}{1+\delta\left(t_{F2}\right)}\right] \\ &+\left[\frac{b_1}{\delta}+\frac{c_1\left(1+\delta(t_{F1}+t_{F2})\right)}{\delta^2}\right]\left(t-t_{F1}\right)+\frac{c_1}{2\delta}\left(t^2-t_{F1}^2\right), \quad t_{F1} \le t \le t_{F1}+t_{F2} \end{aligned} \tag{4}$$

$$Q_{F1}=I_{F1}(0) \Rightarrow Q_{F1}=a_1 t_{F1}+\left(\frac{b_1+a_1\theta_F}{2}\right)t_{F1}^2+\left(\frac{c_1+b_1\theta_F}{3}\right)t_{F1}^3+\frac{c_1\theta_F}{4}t_{F1}^4 \tag{5}$$

$$Q_{F2}=I_{F2}\left(t_{F1}+t_{F2}\right)$$

$$\Rightarrow Q_{F2}=-\left\{\begin{aligned} &\left[\frac{a_1}{\delta}+\frac{b_1\left(1+\delta(t_{F1}+t_{F2})\right)}{\delta^2}+\frac{c_1\left(1+\delta(t_{F1}+t_{F2})\right)^2}{\delta^3}\right]\log\left[\frac{1}{1+\delta\left(t_{F2}\right)}\right] \\ &+\left[\frac{b_1}{\delta}+\frac{c_1\left(1+\delta(t_{F1}+t_{F2})\right)}{\delta^2}\right]t_{F2}+\frac{c_1}{2\delta}\left(t_{F2}^2+2t_{F1}t_{F2}\right) \end{aligned}\right\} \tag{6}$$

$$Q_F=Q_{F1}+Q_{F2}$$

$$Q_F=\left\{\begin{aligned} &a_1 t_{F1}+\left(\frac{b_1+a_1\theta_F}{2}\right)t_{F1}^2+\left(\frac{c_1+b_1\theta_F}{3}\right)t_{F1}^3+\frac{c_1\theta_F}{4}t_{F1}^4 \\ &-\left\{\begin{aligned} &\left[\frac{a_1}{\delta}+\frac{b_1\left(1+\delta(t_{F1}+t_{F2})\right)}{\delta^2}+\frac{c_1\left(1+\delta(t_{F1}+t_{F2})\right)^2}{\delta^3}\right]\log\left[\frac{1}{1+\delta\left(t_{F2}\right)}\right] \\ &+\left[\frac{b_1}{\delta}+\frac{c_1\left(1+\delta(t_{F1}+t_{F2})\right)}{\delta^2}\right]t_{F2}+\frac{c_1}{2\delta}\left(t_{F2}^2+2t_{F1}t_{F2}\right) \end{aligned}\right\} \end{aligned}\right\} \tag{7}$$

The Health service stock holding cost in $\left[0,t_{F1}\right]$ as follows

$$HC=\int_{0}^{t_{F1}} H(t)I_{F1}\left(t\right)dt \Rightarrow HC=\int_{0}^{t_{F1}}\left(u+vt^{2}\right)I_{F1}\left(t\right)dt$$

$$HC=\left\{\begin{array}{l} t_{F1}^{7}\left(\frac{c_1 v\theta_F}{84}\right)+t_{F1}^{6}\left(\frac{b_1 v\theta_F}{72}+\frac{c_1 v}{18}\right)+t_{F1}^{5}\left(\frac{a_1 v\theta_F}{60}+\frac{b_1 v}{15}+\frac{c_1 u\theta_F}{10}\right) \\ +t_{F1}^{4}\left(\frac{a_1 v}{12}+\frac{b_1 u\theta_F}{8}+\frac{c_1 u}{4}\right)+t_{F1}^{3}\left(\frac{a_1 u\theta_F}{6}+\frac{b_1 u}{3}\right)+t_{F1}^{2}\left(\frac{a_1 u}{2}\right)\end{array}\right\} \quad (8)$$

Costs incurred in this period are the stock out cost for items that are back ordered

The stocks out costs are as follows

$$BC=-S_F\int_{t_{F1}}^{t_{F1}+t_{F2}} I_{F2}\left(t\right)dt$$

$$BC=S_F\left\{\begin{array}{l}\left[-\frac{a_1}{\delta^2}-\frac{b_1}{\delta^3}\left(1+\delta(t_{F1}+t_{F2})\right)-\frac{c_1}{\delta^4}\left(1+2\delta(t_{F1}+t_{F2})+\delta^2(t_{F1}+t_{F2})\right)\right]\log\left[1+\delta t_{F2}\right] \\ +\left(\frac{a_1}{\delta}+\frac{b_1}{\delta^2}+\frac{c_1}{\delta^3}\left(1+\delta(t_{F1}+t_{F2})\right)\right)t_{F2}+\frac{1}{2\delta^2}\left(b_1\delta+c_1\right)\left[(t_{F1}+t_{F2})^2-t_{F1}^2\right] \\ +\frac{C_F}{3\delta}\left[(t_{F1}+t_{F2})^3-t_{F1}^3\right]\end{array}\right\} \quad (9)$$

Lost sales cost per cycle $\left(LS\right)$

$$LS=L_F\int_{t_{F1}}^{t_{F1}+t_{F2}}\left[1-\left(a_1+b_1 t+c_1 t^2\right)\left(\frac{1}{1+\delta\left(t_{F1}+t_{F2}-t\right)}\right)\right]dt$$

$$LS=L_F\left\{\begin{array}{l} a_1 t_{F2}+\frac{b_1 t_{F2}^2}{2}+b_1 t_{F1}t_{F2}+\frac{c_1 t_{F2}^3}{3}+c_1 t_{F1}^2 t_{F2}+c_1 t_{F1}t_{F2}^2-\frac{a_1\log\left(1+\delta t_{F2}\right)}{\delta} \\ +\frac{b_1 t_{F2}}{\delta}-\frac{b_1\left[1+\delta(t_{F1}+t_{F2})\right]\log\left(1+\delta t_{F2}\right))}{\delta^2} \\ +\frac{c_1}{\delta^3}\left(\delta t_{F2}+\frac{3\delta^2 t_{F2}^2}{2}+2\delta^2 t_{F1}t_{F2}-\left[1+\delta(t_{F1}+t_{F2})\right]^2\log\left(1+\delta t_{F2}\right)\right)\end{array}\right\}$$

(10)

Purchase cost per cycles $\left(PC\right)$

$$PC=C_F\times Q_F$$

$$PC = C_F \left\{ \begin{aligned} & a_1 t_{F1} + \frac{b_1 + a_1\theta_F}{2} t_{F1}^2 + \frac{c_1 + b_1\theta_F}{3} t_{F1}^3 + \frac{c_1\theta_F}{4} t_{F1}^4 - \left[\frac{b_1}{\delta} + \frac{c_1\left(1+\delta(t_{F1}+t_{F2})\right)}{\delta^2} \right] t_{F2} \\ & + \left[\frac{a_1}{\delta} + \frac{b_1\left(1+\delta(t_{F1}+t_{F2})\right)}{\delta^2} + \frac{c_1\left[1+\delta(t_{F1}+t_{F2})\right]^2}{\delta^3} \right] \log\left(1+\delta t_{F2}\right) - \frac{c_1}{2\delta}\left[(t_{F1}+t_{F2})^2 - t_{F1}^2 \right] \end{aligned} \right\} \quad (11)$$

Ordering cost $\left(OC\right) = K_F$ fixed cost

Thus the total average pharmaceutical inventory cost in the interval $\left[0, t_{F1}+t_{F2}\right]$ per unit time.

Average total cost = $\dfrac{1}{t_{F1}+t_{F2}}$ [Ordering cost + Purchase price + holding cost + shipping costs + stock out cost]

(ie) $ATC = \dfrac{1}{t_{F1}+t_{F2}}\left[OC + PC + HC + BC + LS\right]$

$$ATC = \frac{1}{t_{F1}+t_{F2}} \left\{ \begin{aligned} & K_F + t_{F1}^7\left(\frac{c_1 v\theta_F}{84}\right) + t_{F1}^6\left(\frac{b_1 v\theta_F}{72} + \frac{c_1 v}{18}\right) + t_{F1}^5\left(\frac{a_1 v\theta_F}{60} + \frac{b_1 v}{15} + \frac{c_1 u\theta_F}{10}\right) \\ & + t_{F1}^4\left(\frac{a_1 v}{12} + \frac{b_1 u\theta_F}{8} + \frac{c_1 u}{4} + \frac{C_F c_1\theta_F}{4}\right) + t_{F1}^3\left(\frac{a_1 u\theta_F}{6} + \frac{b_1 u}{3} + \frac{C_F(c_1 + b_1\theta_F)}{3}\right) \\ & + t_{F1}^2\left(\frac{a_1 u}{2} + \frac{C_F(a_1 + b_1\theta_F)}{2}\right) + C_F a_1 t_{F1} + \left[\frac{c_1 S_F}{\delta} + \frac{c_1 L_F}{3} - \frac{C_F c_1}{2\delta}\right] t_{F2}^3 \\ & + \left[\frac{c_1 S_F}{\delta^2} + \left(\frac{b_1\delta + c_1}{3\delta^2}\right)s + \frac{b_1 L_F}{2} - \frac{c_1 C_F}{\delta} + \frac{3c_1 L_F}{2\delta}\right] t_{F2}^2 \\ & + \left[\left(\frac{a_1}{\delta} + \frac{b_1}{\delta_2} + \frac{c_1}{\delta^3}\right)s + \left(a_1 + \frac{b_1}{\delta}\right)L_F - \left(\frac{b_1}{\delta} + \frac{c_1}{\delta^2}\right)C_F\right] t_{F2} \\ & + \left[\frac{C_F S_F}{\delta^2} + \frac{(b_1\delta + c_1)}{\delta^2} + b_1 L_F + \frac{c_1 C_F}{\delta} + \frac{2c_1 L_F}{\delta}\right] t_{F1} t_{F2} \\ & + \left[\frac{c_1 S_F}{\delta} + c_1 L_F - \frac{3c_1 C_F}{2\delta}\right] t_{F1}^2 t_{F2} + \left[\frac{c_1 S_F}{\delta} + c_1 L_F - \frac{3c_1 C_F}{2\delta}\right] t_{F1} t_{F2}^2 \\ & + \left[\frac{a_1}{\delta} + \frac{b_1\left[1+\delta(t_{F1}+t_{F2})\right]}{\delta^2} + \frac{c_1\left[1+\delta(t_{F1}+t_{F2})\right]^2}{\delta^3}\right] \log\left(1+\delta t_{F2}\right)\left[\frac{S_F}{\delta} - L_F + C_F\right] \end{aligned} \right\} \quad (12)$$

The necessary condition for least value of $ATC(t_{F1}, t_{F2})$ are $\dfrac{\partial(ATC(t_{F1}, t_{F2}))}{\partial t_{F1}} = 0$ & $\dfrac{\partial(ATC(t_{F1}, t_{F2}))}{\partial t_{F2}} = 0$. The sufficient condition for least of $ATC(t_{F1}, t_{F2})$, $t_{F1} > 0$, $t_{F2} > 0$.

$$\begin{vmatrix} \frac{\partial^2(ATC)}{\partial t_{F1}^2} & \frac{\partial^2(ATC)}{\partial t_{F1}t_{F2}} \\ \frac{\partial^2(ATC)}{\partial t_{F2}t_{F1}} & \frac{\partial^2(ATC)}{\partial t_{F2}^2} \end{vmatrix} > 0$$

To solve using the any technique of computer based software and obtain optimal order cycle time (t_{F1}, t_{F2}) is (t_{F1}^*, t_{F2}^*), The II order derivative of $ATC(t_{F1}, t_{F2})$, is very complicated. That is also using computer based software verified and with the help of a graph the progress can be identified and tabulated.

4. Numerical problems

Example 1: The Health service input data are
$a_1 = 25$ units, $b_1 = 40$ units, $c_1 = 50$ units, $\theta_F = 0.005$ units,
$u = 0.05$ units, $v = 0.001$ units, $\delta = 4.2$ units, $S_F = Rs.12, L_F = Rs.15, C_F = Rs.50, K_F = Rs.5000.$
We have the optimum solution as $t_{F1}^* = 1.125, t_{F2}^* = 0.1702, ATC = 7943.745$ and quantity $Q_F = 59.0405.$

Example 2: The Health service input data are
$a_1 = 50$ units, $b_1 = 80$ units, $c_1 = 70$ units, $\theta_F = 0.05$ units,
$u = 5$ units, $v = 2$ units, $\delta = 5$ units, $S_F = Rs.20, L_F = Rs.20, C_F = Rs.90, K_F = Rs.6000.$
We have the optimum solution as $t_1^* = 0.7882, t_2^* = 0.0823, ATC = 16786.668$ and quantity $Q_F = 111.3272.$

5. Sensitivity analysis and representations using graphs

5.1. To demonstrate the modifications in the parameters are shown in Table

Parameter	Variation	t_{F1}	t_{F2}	Q_F	$ATC(t_{F1}, t_{F2})$
a_1	23	1.1227	0.1732	56.492	7844.4165
	24	1.1239	0.1717	57.7673	7894.0747
	25	1.125	0.1702	59.0405	7943.745
	26	1.1261	0.1687	60.3116	7993.4272
	27	1.1271	0.1673	61.5809	8043.1208
b_1	38	1.1343	0.1679	59.338	7876.2591
	39	1.1296	0.169	59.191	7910.0439
	40	1.125	0.1702	59.0405	7943.745
	41	1.1203	0.1713	58.8866	7977.3633
	42	1.1157	0.1724	58.7293	8010.8994
c_1	48	1.1414	0.1658	60.6945	7883.4789
	49	1.1331	0.168	59.8635	7913.7311
	50	1.125	0.1702	59.0405	7943.745
	51	1.1169	0.1724	58.2253	7973.5281
	52	1.109	0.1746	57.4177	8003.087

θ_F	0.001	1.1246	0.1739	57.994	7935.2905
	0.003	1.1248	0.172	58.5186	7939.514
	0.005	1.125	0.1702	59.0405	7943.745
	0.007	1.1251	0.1683	59.5596	7947.9834
	0.009	1.1253	0.1665	60.0762	7952.229
u	0.03	1.1249	0.1705	58.9269	7942.8968
	0.04	1.125	0.1704	58.9838	7943.3209
	0.05	1.125	0.1702	59.0405	7943.745
	0.06	1.125	0.17	59.0972	7944.1693
	0.07	1.125	0.1698	59.1539	7944.5936
v	0.08	1.1249	0.1696	59.1689	7944.5862
	0.09	1.1249	0.1695	59.1852	7944.6927
	0.001	1.125	0.1702	59.0405	7943.745
	0.002	1.125	0.1702	59.0421	7943.7557
	0.003	1.125	0.1702	59.0437	7943.7663
S_F	10	1.1412	0.1504	62.8768	7923.3502
	11	1.1333	0.1601	60.9838	7933.273
	12	1.125	0.1702	59.0405	7943.745
	13	1.1163	0.1808	57.0427	7954.7839
	14	1.1071	0.1919	54.9859	7966.4089
δ	4	1.1049	0.1968	54.0281	7967.6125
	4.1	1.1155	0.1828	56.6523	7954.9796
	4.2	1.125	0.1702	59.0405	7943.745
	4.3	1.1335	0.1589	61.221	7933.7202
	4.4	1.1412	0.1487	63.218	7924.746
L_F	13	1.1371	0.1553	61.9181	7935.1736
	14	1.1313	0.1624	60.535	7939.3024
	15	1.125	0.1702	59.0405	7943.745
	16	1.1179	0.1787	57.419	7948.5396
	17	1.1101	0.1882	55.6524	7953.7309
C_F	48	1.1396	0.1757	60.1283	7787.3512
	49	1.1322	0.1728	59.5902	7865.8079
	50	1.125	0.1702	59.0405	7943.745
	51	1.1178	0.1677	58.4826	8021.1749
	52	1.1106	0.1655	57.9196	8098.1093
K_F	4000	1.0019	0.1977	44.1179	7142.3894
	4500	1.0662	0.1828	51.5914	7550.7279
	5000	1.125	0.1702	59.0405	7943.745
	5500	1.1792	0.1593	66.4416	8323.4295
	6000	1.2296	0.1497	73.7861	8691.3554

5.2. Graph of parameters with average total cost

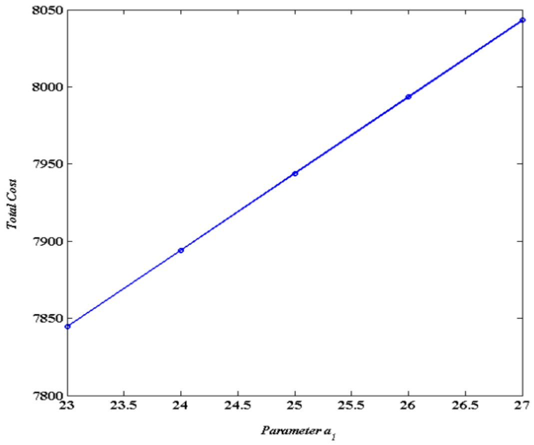

Fig:2 Changing in the parameter value a_1

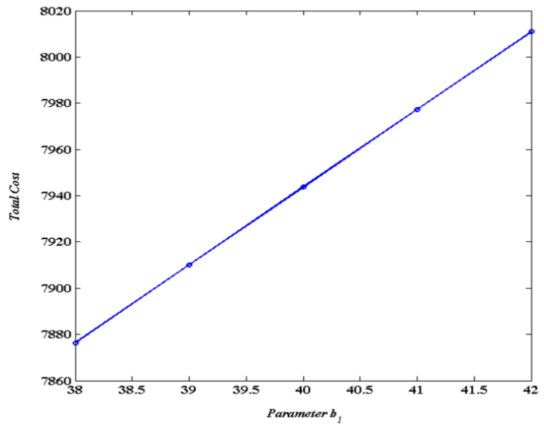

Fig:3 Changing in the parameter value b_1

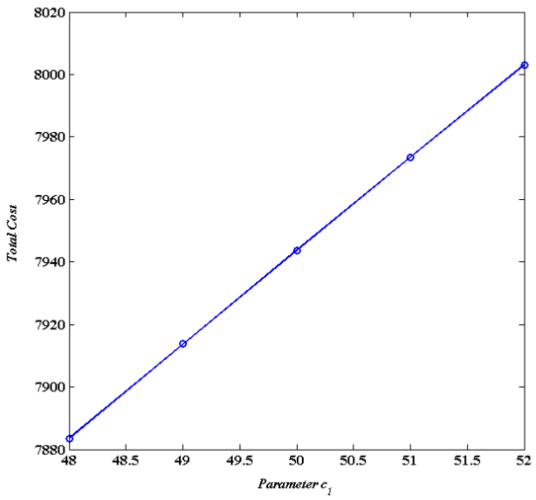

Fig:4 Changing in the parameter value c_1

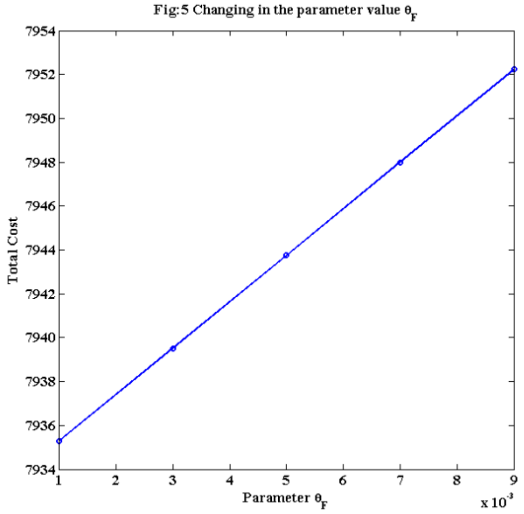

Fig:5 Changing in the parameter value θ_F

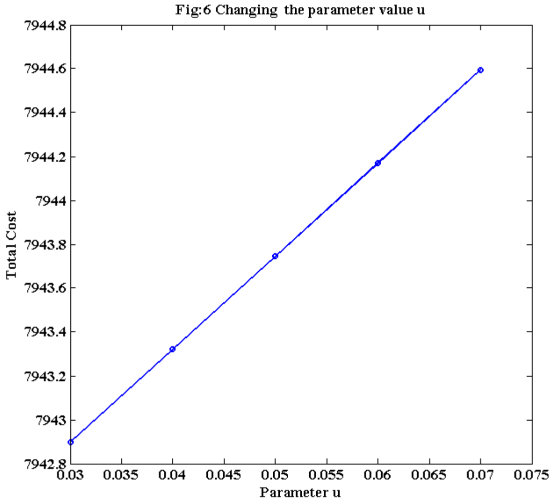

Fig:6 Changing the parameter value u

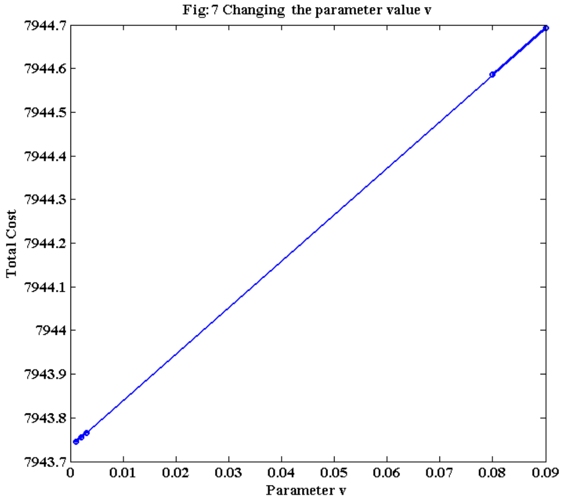

Fig:7 Changing the parameter value v

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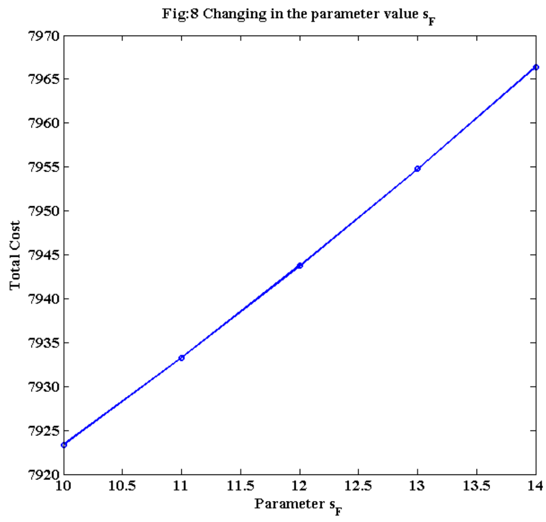

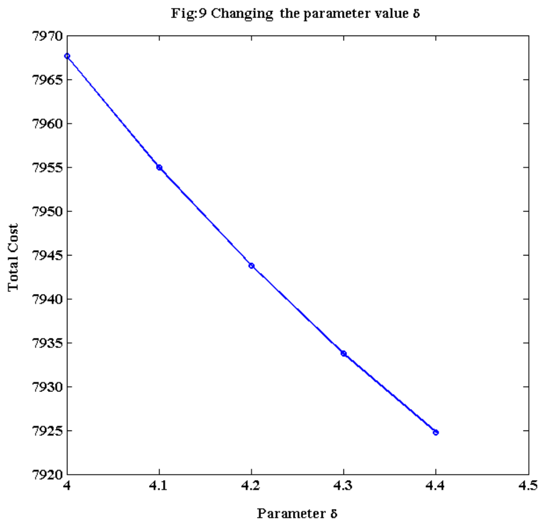

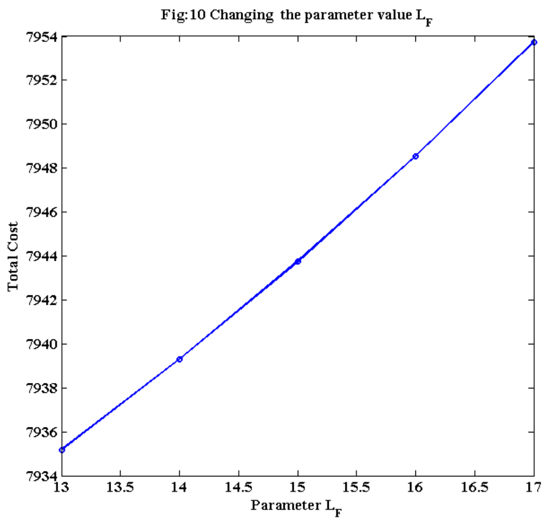

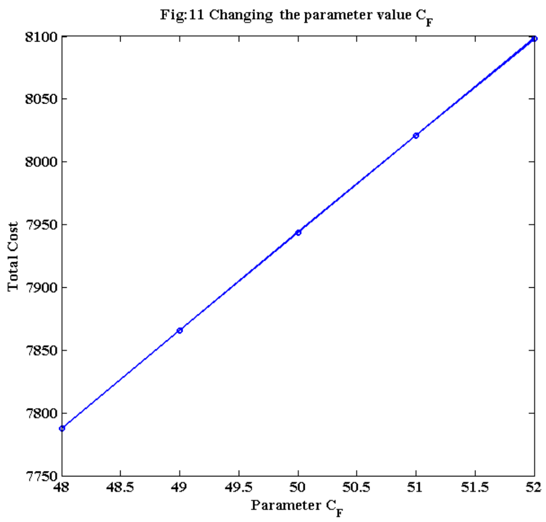

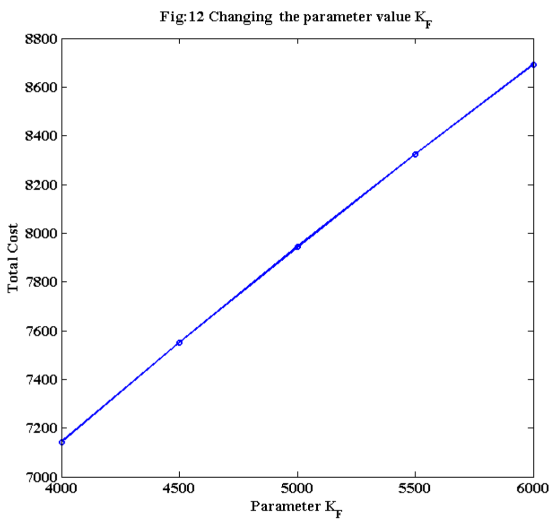

6. Observations using table value

Here the investigation are using tabular values we can observe the following progress

(1). The raising in a results in time t_{F1} raising and Time t_{F2} also decline ,there by the order amount Q_F has also raising and Average tot cost ATC has also been raising.

(2). The raising in b results in time t_{F1} decline and Time t_{F2} also raising , there by the order amount Q_F has also decline and Average tot cost ATC has also been raising.

(3). The raising in c results in time t_{F1} decline and Time t_{F2} raising ,there by the order

(4). Amount Q_F has also raising and Average tot cost ATC has also been raising.

(5). The raising in θ_F results in time t_{F1} raising and Time t_{F2} also decline, there by the order amount Q_F has also raising and Average tot cost ATC has also been raising.

(6). The raising holding cost coefficient u in a results in time t_{F1} raising and Time t_{F2} also decline ,there by the order amount Q_F has also raising and Average tot cost ATC has also been raising.

(7). The raising holding cost coefficient v in a results in time t_{F1} raising and Time t_{F2} also raising ,there by the order amount Q_F has also raising and Average tot cost ATC has also been raising.

(8). The raising in setup cost s a results in time t_{F1} decline and Time t_{F2} raising ,there by the order amount Q_F has also raising and Average tot cost ATC has also been decline.

(9). The raising in δ a results in time t_{F1} raising and Time t_{F2} also decline ,there by the order amount Q_F has also raising and Average tot cost ATC has also been raising.

(10). The raising in lost sales L_F results in time t_{F1} decline and Time t_{F2} also raising , there by the order amount Q_F decline and Average tot cost ATC has also been raising.

(11). The raising in purchase cost C_F results in time t_{F1} decline and Time t_{F2} also decline ,there by the order amount Q_F has also decline and Average tot cost ATC has also been raising.

(12). The raising in ordering cost K_F results in time t_{F1} raising and Time t_{F2} also decline ,there by the order amount Q_F has also raising and Average tot cost ATC has also been raising.

7. Conclusions

In this work the inventory model of Health service firms formulated using the demand in quadratic with time function, cost of holding the things as considered as parabolic equations of time changing of fixed deterioration is found. This established using shortages, by using this ideas a mathematical model framed and solved with the help of computation table & Graph ,The impact of parameters vs optimal time and quantity and average overall cost showing see the progress , from the table , found greatest time period more quantity of very least overall average cost. This result has more application in Health service firms. This model can be further developed using Parabolistic demand and deterioration, the inflation, quadratic time function of holding cost etc.

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