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AN INVENTORY MODEL WITH TIME-DEPENDENT DEMAND AND LIMITED STORAGE FACILITY UNDER INFLATION

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This assignment will discuss a crucial topic which is the model of inventory along with the demand timely and it has limited storage facility when inflation occurred, this can be explained as a model that achieves into account the felt effect of inflammation on inventory costs. Inflation defines enhance the price of the product gradually. This is basically a measure to enhance the price rate of the products. There are different purposes behind this inflation which are cost-push, demand-pull and expectation of inflation. If the price increases in a faster way the purchasing power of the customer is reduced. In this model, the demand for a particular item is assumed to vary over time and the inventory is assumed to vary over time along with inventory is assumed always limited. For conducting this research paper secondary methodology is used. Here provide a discussion on the topic of the “fixed recorder quantity system” and the “fixed recorder period system” these are very effective for business purposes, and also provide recommendations for an effective model which is used for the business. The recorder quantity system has been updated to provide better accuracy and reliability according to the product demand and the economic crisis during the fixed recorder quantity system.

INTRODUCTION

This model takes into account the cost of inflation on the inventory costs since the costs of buying the item gradually increase as the rate of inflation also enhances. The model also takes into account the storage cost which is associated with the inventory. The costs of storage are related to the inventory. The costs of the storage materials are determined by the cost of renting space, the cost of insurance, and any other associated costs. These costs are then taken into account when calculating the optimal inventory levels. The model also appraises the “Economic Order Quantity (EOQ)” of the item, which is the most effective order quantity of the item that minimizes the total cost of ordering, holding and as well as disposal. This model is used to determine the optimal inventory levels and the most efficient order quantity of the item. This is very effective for business purposes.

REVIEW OF LITERATURE

The author's opinion (KAUSHIK, 2022) about the model which is help to define inventory can be improved by considering the place, and uniform and this is related to the

timely dependent variables. For uniform demand, the inventory models are developed by considering the time-varying demand rate and the time-varying rate of deterioration at each inventory level. The inventory level is determined by minimizing the sum of the cost of ordering and holding. For place and time-dependent demand, the inventory model is developed by considering the demand rate in different locations and times and the rate of detentions and times and the rate of deterioration in each location (KAUSHIK, 2022). The inventory level is determined by minimizing the total cost of ordering and holding in each location. In both cases, this model is developed to evaluate the maximum order size and the potential ordering policy which basically minimizes the rate of the total cost. ***[Referred to appendix 1]***

According to (Das and Islam, 2020) in their literature, they discuss their opinion on the multi-objective fuzzy inventory model along with the dependent on the time frame, price and product demand and this hold the price of the products. In their research paper, they had formulated an inventory model that depends on holding the product's price, and product selling price also according to a time-dependent manner. Here multi-item inventory model is considered according to the limitation of storage space. Hence uncertainty of the cost parameters has been taken as the fuzzy number as a generalized pattern. In their literature, they proposed a multi-objective inventory model that is used to solve for solving these fuzzy programming techniques used that are WFAGP, FAGP method, FNLP, WFNLP etc. In their literature, they describe this model by a numerical example as well as a graphical representation. ***[Referred to appendix 2]***

MATERIALS AND METHODOLOGY

For conducting this research paper data have been collected from different pieces of literature, journals and website which are relevant to this topic. For processing, this research secondary research methodology has been used for collecting the data of the research. Here use qualitative research methods for understanding the data of the research (Jindal, *et al*. 2020). This method is very useful and helps to understand people's behavior, beliefs, attitudes, as well as interaction also. By using this procedure non-numerical data have formed. The integration of qualitative research helps to intervene in the strategy of research that helps to achieve increased attention to the research to maintain the disciplines.

RESULTS AND DISCUSSION

After doing the different literature reviews it has been found 2 inventory models are widely used in the business that are "fixed recorder quantity system" and the "fixed recorder period system".

"Fixed recorder quantity system"

This is a model which is used as the inventory level. The main change that is occurring due to the economic crisis is that a digital recorder has been added to the system. A record point is defined that a point which is basically ordered as replenishment. And the quantity of inventory is defined as recorder level. As well as new inventory level is termed as order

quantity. This recorder can store data and accurately record the amount of product in each container. It also allows for better tracking of the product's location and quantity (Kumar, *et al*. 2020). The system also includes an interactive user interface, which allows users to quickly and easily input the number of products being stored in each container. This eliminates the need for manual data entry and ensures that the data is accurate and up to date with the product quantity and location. In addition, the system now includes a variety of sensors that can detect the presence of products in each container. This allows for precise tracking and accurate inventory levels of the products. The sensors can also be used for real-time monitoring of the product's condition and can provide alerts if an issue is detected. Finally, the system includes an automated system for calculating the total quantity of products stored this is very essential. This system can quickly and accurately calculate the total amount of product in each container of the product, ensuring that the correct amount is always available. ***[Referred to Appendix.1]***

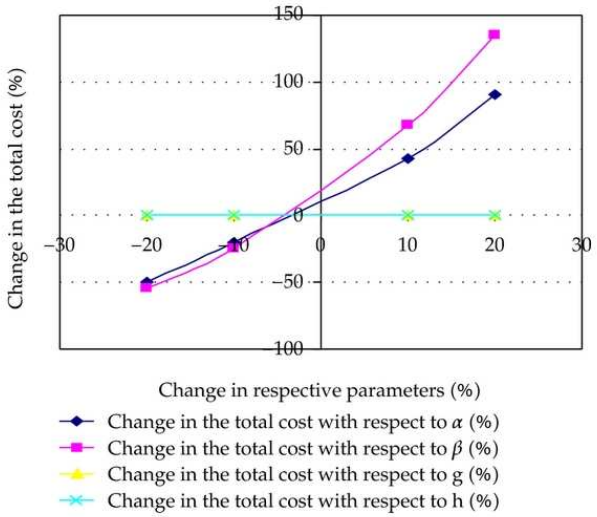


Fig. 1. Inventory model analysis

(Source: https://static-02.hindawi.org)

The data analysis has presented the comparison regarding the change in cost as per the Inventory fluctuation. From the above graph, the level of the inventory parameters is increasing at the level of 150, which is impacted by the ratio of changes in total cost. On the other hand, after a certain period, it has seemed that the curve of total cost parameters is going from the level of – 10 to – 50. This is occurring to the effect of the Fixed Recorder system in the Inventory position.

The above sensitivity analysis shows the valuation level of each parameter. The *w* parameter highest PCI percentage becomes 0.89%, *or* parameter's highest PCI becomes 63.34%, α parameter highest PCI becomes 90.94%, β parameter highest percentage becomes 135.06%, γ parameter highest percentage becomes 0.06%, and the *h* parameter highest percentage also becomes 0.06%.

Parameter	%	T_1	T_2	T_3	*TUC*	PCI (%)
W	20	0.52	4.35	3.38	1015.31	0.89
	10	0.52	4.32	3.40	1010.06	0.37
	−10	0.53	4.30	3.43	1002.82	−0.34
	−20	0.53	4.28	3.44	998.74	−0.72
r	20	0.23	3.67	2.97	384.75	−61.76
	10	0.41	4.01	3.48	658.76	−34.53
	−10	0.73	4.98	5.03	1349.81	34.14
	−20	0.92	5.67	5.98	1643.78	63.34
α	20	0.60	4.04	3.58	1921.46	90.94
	10	0.57	4.21	3.49	1435.53	42.65
	−10	0.48	4.67	3.20	800.69	−20.43
	−20	0.43	5.32	3.18	506.23	−49.69
β	20	0.73	2.46	4.25	2365.46	135.06
	10	0.63	3.21	3.80	1686.47	67.58
	−10	0.38	4.67	3.03	754.87	−24.98
	−20	0.27	5.09	2.68	456.23	−54.66
g	20	0.52	4.31	3.41	1006.96	0.06
	10	0.53	4.31	3.41	1006.75	0.04
	−10	0.53	4.31	3.41	1005.86	−0.04
	−20	0.54	4.31	3.41	1005.68	−0.06
h	20	0.53	4.31	3.41	1006.96	0.06
	10	0.53	4.31	3.41	1006.75	0.04
	−10	0.53	4.31	3.41	1005.86	−0.04
	−20	0.53	4.31	3.41	1005.68	−0.06

Fig. 2. Sensitivity analysis

(Source: https://pdfs.semanticscholar.org/)

FIXED RECORDER PERIOD SYSTEM

Here is the discussion over the fixed recorder period system this is another inventory model. The recorder period system is a system used to help manage and maintain the accuracy of recordings over long periods of time. This system involves the use of a recorder which is either a mechanical or digital device that records data or events. The recorder period system can be used for a variety of purposes such as recording seismic activity, data of meteorological way of data, or any other type of data that needs to be monitored over a long period of time. The recorder period system consists of three main components (Saha and Sen, 2019). The first component is the recorder of the data itself, which records the data or events that are occurring manually way. The second component is a controller, which is responsible for adjusting the recorder settings and ensuring that the data collected is accurate. Finally, the third component is the software used to store and analyze the data collected. The recorder period system is beneficial because it allows for the collection of accurate data over long periods of time. This system can be used to monitor seismic activity, meteorological data, or any other type of data that needs to be monitored over a long period of time. Additionally, the recorder period system is relatively easy to set up and maintain. Overall, the recorder period system is a useful system for monitoring data or events over long periods of time. This system is relatively easy to set up and maintain and can be used for a variety of purposes. Additionally, the data collected is accurate and reliable, making the recorder period system an

invaluable tool for any organization that needs to monitor data or events over a long period of time.

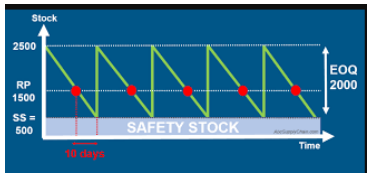


Fig. 3. Safety Stock Level

(Source: https://abcsupplychain.net)

The Inventory Recorder period system demonstrated the safety stock level, where the average stock period has taken 10 days. The estimated order quantity has touched the level of 2000. In this analysis, the RP level stood at 1500 while the rate of SS is 500. By the analysis of the Estimated Inventory level, the average margin of the safety stock level has assumed 2500.

Model	Demand	Warehouse	T_1	T_2	T_3	TUC
I	Exponential increasing demand rate, that is, ae^{bt}	Two warehouses	0.53	4.31	3.41	1006.31
		One warehouse (rented)	0.04	0.11	—	2112.41
		One warehouse (own)	5.52	3.67	—	3378.63
II	Linearly increasing demand rate, that is, $a + bt$	Two warehouses	0.67	6.42	4.11	1786.38
		One warehouse (rented)	0.58	0.12	—	3755.68
		One warehouse (own)	6.27	4.23	—	5302.62
III	Constant demand rate (a)	Two warehouses	0.82	9.49	5.06	2506.38
		One warehouse (rented)	0.09	0.13	—	4912.22
		One warehouse (own)	8.52	5.76	—	6078.92

Fig. 4. Comparison Model

(Source: https://pdfs.semanticscholar.org/)

The above figure shows the comparison model by denoting the comparison index I, II, and III. This three separate model has contains different types of demand with amount of warehouse index. Also this three model has its own several amount that help to understand that which warehouse takes which values and its impact on the market.

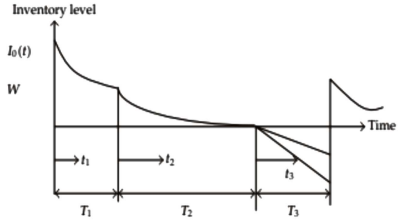


Fig. 5. Graphical representation of the *OW* inventory system

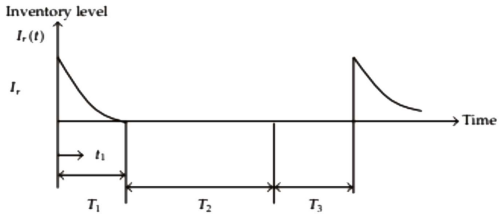


Fig. 6. Graphical representation of the *RW* inventory system

(Source: https://pdfs.semanticscholar.org/)

Through these two graphical representations, here we understand about the *OW* and *RW* inventory system. This will mainly represented by the time and inventory data.

CONCLUSION AND FUTURE SCOPE

The inventory model with time-dependent demand and limited storage facility under inflation is a complex problem that requires careful analysis. In this model, the demand for the products is time-dependent, and the storage capacity is limited. Such models can provide important insights into the effects of inflation on inventory levels and can be used to inform inventory management decisions. Additionally, the model can be used to identify the best inventory management practices to ensure optimal inventory levels (Kumar, *et al*, 2022). Moreover, the model can be adapted to account for other factors such as seasonality, market conditions, and supplier constraints.

In conclusion, this model with time-dependent demand and limited storage facility under inflation provides an effective tool for the management of inventory. It can be used to identify optimal inventory levels and identify strategies to offset the effects of inflation. By using this model, businesses can ensure that they maintain optimal inventory levels while also reducing their costs.

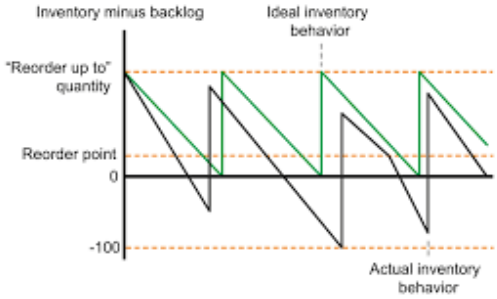
RECOMMENDATIONS

This model is essential for business purpose along with a limited type of storage facility and dependent on the time demand under inflation should be based on the "economic order quantity (EOQ) model". The EOQ model takes into account both the cost of ordering and the cost of holding inventory items.

- When considering the EOQ model, it is important to factor in inflation. Inflation affects the cost of ordering and the cost of holding inventory items. The cost of ordering increases due to the increasing cost of raw materials and labor. The cost of holding inventory also increases due to the increasing cost of storage, insurance, and taxes.
- In order to manage this model in a timely manner, businesses should use time-series forecasting techniques. Time-series forecasting techniques help to predict the future demand for products by analyzing past demand. This helps to identify trends in demand and allows businesses to adjust their inventory levels accordingly.
- In order to manage a limited storage facility, businesses should employ the ABC inventory control system. This system assigns a classification level to each inventory item based on its importance.
- Businesses should use the EOQ model, time-series forecasting techniques, the ABC inventory control system, safety stock, and an inventory management system in order to manage this model with limited storage and timely manner. These tools help businesses to ensure that they maintain optimal inventory levels while minimizing their costs.

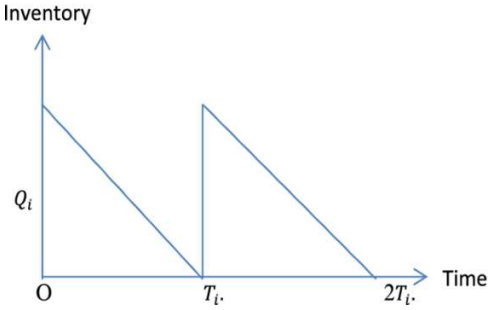
APPENDICES

Appendix 1: Rate of the Inventory



(Source: www.data:image.net)

Appendix 2: Fuzzy multi-objective inventory model



(Source: https://media.springernature.org)

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