PROBABILISTIC INVENTORY MODEL OF CERTAIN DETERIORATING MATERIAL: NEWSPAPER

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by

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CANDIDATE'S DECLARATION

I **Ashika Soni (23/MSCMAT/60)** and **Manjari Pathak (23/MSCMAT/73)**, we hereby certify that the work which is being presented in the thesis entitled **Probabilistic Inventory Model Of Certain Deteriorating Material: Newspaper** in partial fulfillment of the requirements for the award of the Degree of Master of Science, submitted in the Department of **Applied Mathematics**, Delhi Technological University is an authentic record of my own work carried out during the period from **August, 2024** to **May, 2025** under the supervision of **Prof. L.N. Das.**

The matter presented in the thesis has not been submitted by me for the award of any other degree of this or any other Institute.

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This is to certify that the student has incorporated all the corrections suggested by the examiners in the thesis and the statement made by the candidate is correct to the best of our knowledge.

Signature of Supervisor **Signature of External Examiner**

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CERTIFICATE

It is certified that **Ashika Soni** (23/MSCMAT/60) and **Manjari Pathak** (23/MSCMAT/73) has carried out their search work presented in this thesis entitled **"Probabilistic Inventory Model Of Certain Deteriorating Material: Newspaper"** for the award of **Master of Science** from Department of Applied Mathematics, Delhi Technological University, Delhi, under my supervision. The thesis embodies results of original work and studies are carried out by the students themselves and the contents of the thesis do not form the basis for the award of any other degree to the candidate or to anybody else from this or any other University/Institution.

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PROBABILISTIC INVENTORY MODEL OF CERTAIN DETERIORATING MATERIAL: NEWSPAPER

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ABSTRACT

Inventory control needs to be carried out in order to optimize inventory costs while still paying attention to the condition of goods or products in stock. Goods inventory management can place a company in a safe zone from the threat of inventory problems to meet demand.

Many inventory problems are caused by erratic or inconsistent demand. This gives rise to uncertain operational activities so it can be assumed that the inventory model used is probabilistic. One of the probabilistic models that is often used is the model Economic Order Quantity Probabilistic. Economic Order Quantity (EOQ) Probabilistic is an inventory model based on assumptions about demand and lead time. Thus, we will be showing the use of Probabilistic model for newspaper vendor model. The newsvendor model is a supply chain and inventory management concept that can be applied to a newspaper vendor's dilemma. The model helps a vendor to decide how many newspapers to buy each morning before knowing how many they will sell.

Here are some factors that affect the newsvendor's inventory decision: fixed cost, variable cost, initial inventory level, penalty cost, and constant customer demand.

By the Probabilistic EOQ Model we can generate an inventory model for a certain deteriorating material. By using above methodology, we have created a real time example and solve it. By minimizing the expected cost per unit time.

Keywords: Probabilistic model, EOQ model, deterioration, minimum cost

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1. $f(x)$ = pdf of demand, x
2. D = Expected demand
3. h = Holding cost per inventory unit per unit time
4. p = Shortage cost per inventory unit
5. K = Setup cost per order
6. R = Reorder level
7. y = Quantity of order
8. I = Average inventory
9. S = Expected shortage quantity per cycle
10. $E\{x\}$ = Expected inventory

Chapter 1

Introduction

Inventory modeling is the process of figuring out how much of a commodity a company needs to keep on hand in order to run smoothly. An inventory model is a mathematical representation of how a business manages its inventory. It assists organizations in determining when and how much to order in order to reduce the overall cost of inventory. Unpredictable or irregular demand is the root cause of many inventory problems. Demand in real life is typically probabilistic, although in certain situations, the more straightforward deterministic model might be acceptable.

Here is the real-life example use of inventory model:

Kroger Enhances Inventory Management in Pharmacy.

About 2500 pharmacies are run by The Kroger Company in its retail locations across the US. A spreadsheet simulation optimization approach was used to control drug shortages and excess inventory. It was simple to obtain widespread approval from the management and pharmaceutical staff by using the spreadsheet.

Between November 2011 and March 2013, Kroger claims a $80 million rise in revenue and a more than $120 million decrease in inventory.

1.1 The Average Inventory Model

According to the inventory model, orders of specific sizes are periodically placed and received. Two questions are addressed by an inventory policy:
1. What is the order quantity?
2. When should I place my order?

The following generic cost function serves as the foundation for the inventory model:

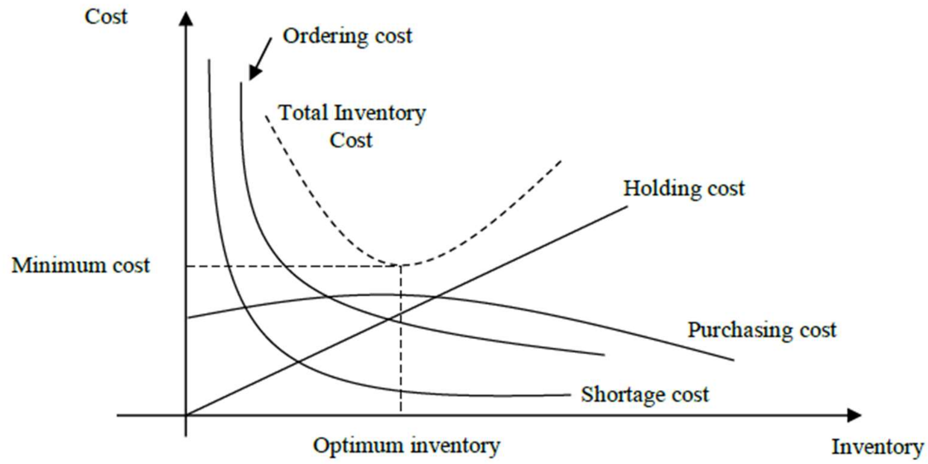

Fig 1.1: Total Inventory Cost

$$\begin{pmatrix}\text{Total}\\ \text{inventory}\\ \text{cost}\end{pmatrix} = \begin{pmatrix}\text{Purchasing}\\ \text{cost}\end{pmatrix} + \begin{pmatrix}\text{Setup}\\ \text{cost}\end{pmatrix} + \begin{pmatrix}\text{Holding}\\ \text{cost}\end{pmatrix} + \begin{pmatrix}\text{Shortage}\\ \text{cost}\end{pmatrix}$$

1. ***Purchasing cost***: The cost per unit of an inventory item is known as the purchasing cost. When choosing how much to order, it's important to keep in mind that sometimes the item is discounted if the order size surpasses a particular limit.

2. ***Setup cost****:* The predetermined fee charged at the time of order placement is known as the setup cost. The price of receiving a shipment may also be included. No matter how big the order is or how big the cargo is, the price is set.

3. ***Holding cost***: The expense of keeping inventory on hand is known as the holding cost. It covers the cost of handling, shrinkage, maintenance, and interest on capital.

4. ***Shortage cost:*** The penalty imposed when stock runs out is known as the shortage cost. Potential revenue loss, manufacturing disruption, the extra expense of arranging emergency supplies (sometimes overnight), and the (difficult to calculate) subjective cost of losing customers are all included.

1.2 Demand's Importance in Inventory Model Development

In general terms, the deterministic or probabilistic nature of the demand determines the analytical complexity of inventory models. The demand may or may not change over time within either category. In real-world scenarios, an inventory model's demand pattern could take one of four forms:

1. Deterministic and constant (static) with time.
2. Deterministic and variable (dynamic) with time.
3. Probabilistic and stationary over time.
4. Probabilistic and nonstationary over time.

1.2.1 Deterministic and constant (static) with time

The demand for an item is assumed to be known with certainty and to be constant in a deterministic inventory model with constant (static) demand across time. When it comes to handling products with steady and predictable demand patterns, this paradigm is helpful. The Economic Order Quantity (EOQ) model is one example.

1.2.2 Deterministic and variable with time

Dynamic (variable) inventory models are more practical in real-world situations because they permit changes over time, whereas deterministic inventory models presuppose certainty in demand and other characteristics. For steady, predictable demand, deterministic models such as the Economic Order Quantity (EOQ) are helpful. Variable replenishment rates, time-dependent demand, and other elements can be included in dynamic models.

1.2.3 Probabilistic and stationary over time

A stable over time approach makes the assumption that the probability distribution defining this demand is constant over time, whereas a probabilistic inventory model recognises that demand for items is not constant but rather fluctuates based on a probability distribution. Essentially, by adding unpredictability to the demand estimate, a probabilistic inventory model enables more practical inventory management techniques.

This model acknowledges that product demand is not constant and might change. It represents the potential range of demand using probability distributions (such as normal, Poisson, etc.) rather than assuming a single, deterministic demand figure. By taking into consideration changes in lead times and demand, which can result in shortages during lead times, this enables more effective inventory management.

The fundamental statistical characteristics of the data, such as mean, variance, and autocorrelation, are assumed to be constant throughout time by a stationary model. In the context of inventory, this indicates that, in a probabilistic inventory model, the probability distribution that is used to estimate demand stays constant across the planning horizon. Since real-world demand frequently changes over time due to trends, seasonality, and other variables, this is a simplistic assumption.

The assumption of a stable probability distribution in a probabilistic inventory model basically means that the demand pattern is predictable and that demand data from the past may be used to anticipate demand in the future. Although the model is made simpler, it might not adequately capture the changing nature of demand in the real world.

1.2.4 Probabilistic and nonstationary over time

When lead time or demand is unpredictable, a probabilistic inventory model uses a probability distribution to explain the issue. When a time series' statistical characteristics, such as its variance or mean, fluctuate over time, it is said to be non-stationary over time. This implies that the lead time distribution or demand pattern may vary over time in inventories.

Models of probabilistic inventory take lead time and/or demand uncertainty into consideration. Probabilistic models use probability distributions to depict the likelihood of various demand or lead time situations, in contrast to deterministic models where these parameters are known with certainty.

Demand that fluctuates over time (trend), follows a cyclical pattern (seasonality), or both might be examples of non-stationarity in inventory management. Determining ideal inventory levels and reorder points is difficult when demand is non-stationary. More advanced techniques are required to forecast and manage inventory in these circumstances, as traditional inventory models might not be appropriate.

1.3 Static Economic Order Quantity Models

The Economic Order Quantity Probabilistic model is one of the often utilized probabilistic models. The Economic Order Quantity (EOQ) Probabilistic inventory model is predicated on lead time and demand hypotheses.

1.3.1 Classical EOQ Model

The most basic inventory model has no shortage and continuous demand with instantaneous order restocking. In this we define,

y = Order quantity (number of units)
D = Demand rate (units per unit time)
t_0 = Ordering cycle length (time units)

The pattern shown in Figure 1.1 is followed by the inventory level. When the inventory drops to zero, an order of size y units is received instantly. At a steady demand rate, D, the stock is uniformly depleted. For this design, the ordering cycle is

$$t_0 = \frac{y}{D}$$

Two cost parameters are needed for the cost model:

K = Setup cost for placing an order (in dollars per order).

h = Cost of holding (in dollars per unit of inventory per unit of time)

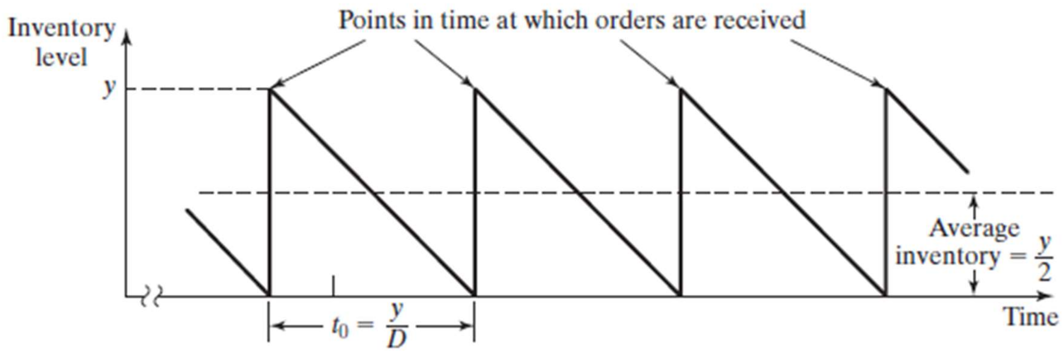

Fig 1.2: Classical EOQ Model

Given that the average inventory level is $\frac{y}{2}$, the total cost *per unit time* (TCU) is

$$\begin{aligned} \text{TCU}(y) &= \text{Setup cost per unit time} + \text{Holding cost per unit time} \\ &= \frac{\text{Setup cost} + \text{Holding cost per cycle } t_0}{t_0} \\ &= \frac{K + h\left(\frac{y}{2}\right)t_0}{t_0} \\ &= \frac{K}{\left(\frac{y}{D}\right)} + h\left(\frac{y}{2}\right) \end{aligned}$$

The optimum value of the order quantity y is determined by minimizing TCU(y). Assuming y is continuous, a necessary condition for optimality is

$$\frac{d\,\text{TCU}(y)}{dy} = -\frac{KD}{y^2} + \frac{h}{2} = 0$$

The condition is also sufficient because TCU(y) is convex.

The solution of the equation yields the EOQ y^* as

$$y^* = \sqrt{\frac{2KD}{h}}$$

Thus, the optimum inventory policy for the proposed model is

$$\text{Order } y^* = \sqrt{\tfrac{2KD}{h}} \text{ units every } t_0^* = \tfrac{y^*}{D} \text{ time units}$$

Actually, a new order need not be received at the instant it is ordered. Instead, a positive **lead time**, L, may occur between the placement and the receipt of an order, as **reorder point** occurs when the inventory level drops to LD units.

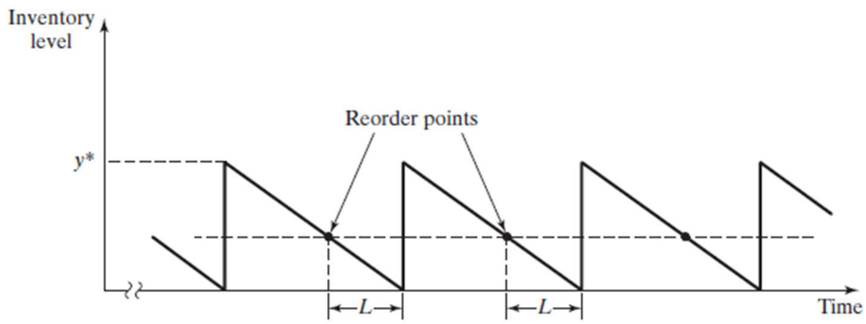

Fig 1.3: Reorder Points

Although this may not always be the case, Figure 1.2 makes the assumption that the lead time, L, is shorter than the cycle length, t0 *. In these situations, the effective lead time is defined as

$$\boldsymbol{L_e = L - nt_0^*}$$

The largest integer number that does not exceed $\frac{L}{t_0^*}$ is the parameter n. The formula acknowledges that the real time between placing and receiving two consecutive orders is Le after n cycles. When the inventory level drops to *LeD* units, the inventory policy can be written as ordering quantity y*, meaning that the reorder point is at *LeD* units.

CHAPTER 2

THE PROBABILISTIC MODEL

Probability studies the random results of experiments. The sample space is the sum of all the results, and each event is a subset of the sample space. If $P\{E\} = 0$, an event E is impossible; if $P\{E\} = 1$, it is certain. As an illustration, in a six-faced
die experiment, it is impossible to roll a seven, but it is certain to roll a number between 1 and 6.

2.1 Random Variables and Probability Distributions

In an experiment, the results can be expressed by a numeric code (e.g., flipping a coin, with the outcome of head/tail taken as 0/1) or they can be naturally numeric (e.g., rolling a die). A **random variable** is defined by the numerical representation of the results.

A random variable, x, might be **continuous** (as in the case of equipment failure time) or **discrete** (like in dice rolling). The **probability density function (pdf),** f (x) or p(x), quantifies each continuous or discrete random variable x while meeting the following requirements:

Table 2.1: Random variable

	Random variable, x	
Characteristic	*Discrete*	*Continuous*
Applicability range	$x = a, a + 1, \dots, b$	$a \leq x \leq b$
Conditions for the pdf	$p(x) \geq 0, \sum_{x=a}^{b} p(x) = 1$	$f(x) \geq 0, \int_a^b f(x)dx = 1$

The cumulative distribution function (or CDF), which is defined as

$$P\{x \le X\} = \begin{cases} P(X) = \sum_{x=a}^{X} p(x), & x \text{ discrete} \\ F(X) = \int_a^X f(x)dx, & x \text{ continuous} \end{cases}$$

2.2 Expectation of a Random Variable

The expected value of a random variable x's real function h(x) is calculated as

$$E\{h(x)\} = \begin{cases} \sum_{x=a}^{b} h(x)p(x), & x \text{ discrete} \\ \int_a^b h(x)f(x)dx, & x \text{ continuous} \end{cases}$$

2.3 The Four Probability Distributions

1. Binomial Distribution
2. Poisson Distribution
3. Negative Exponential Distribution
4. Normal Distribution

2.3.1 Binomial Distribution

The pdf of binomial distribution is

$$P\{x = k\} = C_k^n p^k (1-p)^{n-k}, k = 0, 1, 2, \dots, n$$

And mean and variance are

$$E\{x\} = np$$

$$\text{var}\{x\} = np(1-p)$$

2.3.2 Poisson Distribution

The pdf of poisson distribution is

$$P\{x = k\} = \frac{\lambda^k e^{-\lambda}}{k!}, k = 0, 1, 2, \ \ldots$$

And mean and variance are

$$E\{x\} = \lambda$$

$$\text{var}\{x\} = \lambda$$

2.3.3 Negative Exponential Distribution

The pdf of negative exponential distribution

$$f(x) = \lambda e^{-\lambda x}, x > 0$$

And mean and variance are

$$E\{x\} = \frac{1}{\lambda}$$

$$\text{var}\{x\} = \frac{1}{\lambda}$$

2.3.4 Normal Distribution

The pdf of normal distribution is

$$f(x) = \frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2}, \ -\infty < x < \infty$$

And mean and variance are

$$E\{x\} = \mu$$

$$\text{var}\{\mathrm{x}\} = \sigma^2$$

2.4 Probabilistic Inventory Model

A probabilistic inventory model is an inventory management approach that accounts for certainty in demand or lead time. Unlike deterministic models (where demand and lead time are assumed to be known and constant), probabilistic models recognize that real-world variables often fluctuate and cannot be predicted with complete certainty.

The reality of manufacturing and retail, which is that demand will fluctuate from time to time, is closely reflected in the probabilistic inventory model. Variations in demand result in shortages, especially during lead time when a shop has insufficient inventory stock to meet demand while replenishment stock is still pending.

Demand fluctuation and lead time uncertainty based on three possibilities are incorporated into the probabilistic inventory model. The first case has a constant demand but a fluctuating lead time, and the other involves a constant lead time but a fluctuating demand. The third case is when lead time and demand fluctuate simultaneously.

The probabilistic inventory model generates a set of estimated inventory stock quantities and associated probability using existing economic, geological, and production data.

A probabilistic technique has the advantage of being more reliable than deterministic figures since it uses values within a bandwidth that is described by a defined distribution density.

2.5 Probabilistic EOQ Model

One of the probabilistic models that is often used is the model Economic Order Quantity Probabilistic. Economic Order Quantity (EOQ) Probabilistic is an inventory model based on assumptions about demand and lead time which cannot be known with certainty and a probabilistic approach needs to be taken.

The model is based on the following assumptions:

1. The system considers a single item.
2. The lead time is zero.
3. Backlogs result from unmet demand during lead time.
4. There can be only one active order at a time.
5. The demand distribution throughout the lead time stays constant over time.
6. Shortage is allowed.

Figure 2.1 illustrates how inventory levels typically fluctuate over time.

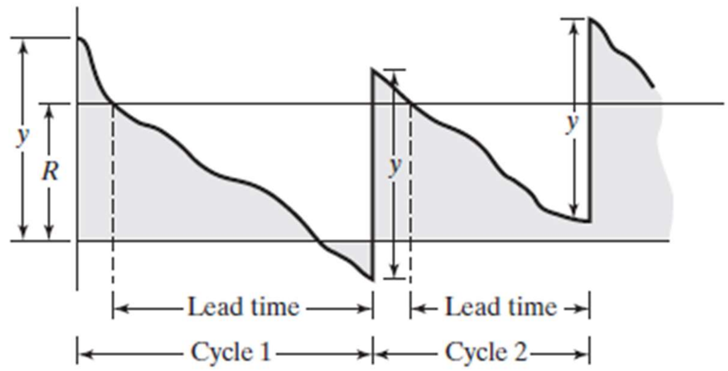

Fig 2.1

The setup cost, projected holding cost, and expected shortage cost must be determined in order to calculate the cost function.

Since the approximate number of orders is $\frac{D}{y}$ per unit time, the setup cost is approximately $\frac{KD}{y}$ per unit time.

Now, the average inventory is

$$I = \frac{(y+E\{R-x\})+E\{R-x\}}{2}$$

$$I = \frac{y}{2} + R - E\{x\}$$

The formula, $y + E\{R - x\}$ and $E\{R - x\}$, is based on the average of a cycle's starting and ending projected inventories, respectively. Approximately, the expression disregards the case where R - $E\{x\}$ may be negative. Thus, hI is equal to the projected holding cost per unit of time.

3. *Expected shortage cost.* Shortage occurs when $x > R$. Its expected value per cycle is computed as

$$S = \int_R^\infty (x - R)f(x)dx$$

Because p is assumed to be proportional to the shortage quantity only, the expected shortage cost per cycle is pS, and, based on $\frac{D}{y}$ cycles per unit time, the shortage cost per unit time is $\frac{pS}{y/D} = \frac{pDS}{y}$.

The resulting total cost function per unit time is

$$\text{TCU}(y, R) = \frac{DK}{y} + h\left(\frac{y}{2} + R - E\{x\}\right) + \frac{pD}{y}\int_R^\infty (x - R)f(x)\,dx$$

The optimal values, y^* and R^*, are determined from

$$\frac{\partial \text{TCU}}{\partial y} = -\left(\frac{DK}{y^2}\right) + \frac{h}{2} - \frac{pDS}{y^2} = 0$$

$$\frac{\partial \text{TCU}}{\partial R} = h - \left(\frac{pD}{y}\right)\int_R^\infty f(x)dx = 0$$

These two equations yield

$$y^* = \sqrt{\frac{2D(K + pS)}{h}} \quad (1)$$

$$\int_{R^*}^\infty f(x)dx = \frac{hy^*}{pD} \quad (2)$$

The optimal values of y^* and R^* cannot be determined in closed forms. An iterative algorithm, developed by Hadley and Whitin (1963, pp. 169–174), is applied to (1) and (2) to find the solution. The algorithm converges in a finite number of iterations, provided a feasible solution exists.

For $R = 0$, equation (1) and (2) yield

$$\hat{y} = \sqrt{\frac{2D(K + pE\{x\})}{2}}$$

$$\tilde{y} = \frac{PD}{h}$$

Unique optimal values of y and R exist when $\tilde{y} \geq \hat{y}$. The smallest value of y^* is $\sqrt{\frac{2KD}{h}}$, which occurs when $S = 0$.

2.5.1 Optimal Solution Algorithm

Following are the steps incorporated:

i. Let $R_0=0$. Set $i=1$ and use the initial solution $y_1 = y^* = \sqrt{\frac{2KD}{h}}$, and move to step *i*.

ii. Use y_i to determine R_i from $\int_{R^*}^{\infty} f(x)dx = \frac{hy^*}{pD}$. If we get $R_i \approx R_{i-1}$, stop;

iii. The optimal solution is $y^*=y_i$, and $R^*=R_i$. Or else, put R_i in equation $y^* = \sqrt{\frac{2D(K+pS)}{h}}$ to calculate y_i. Put $i=i+1$ and repeat set *i*.

CHAPTER 3

THE NEWSPAPER VENDOR

3.1 The statement of Problem

The number of newspapers to purchase each day is up to the newspaper vendor. Newspaper demand is not definite and follows a known probability distribution. The goal is to **maximize expected profit** or **minimize expected cost/loss**. He distributes around 500 newspapers in area A and his brother 500 in nearby area B. Also, they have a small stall which is operated by their dad. So roughly they sell 1300 newspaper a day. The commission they earn is 0.75 paise per newspaper, so for 1300 newspaper they earn around 1000 per day. Determine the optimal ordering policy.

3.1.1 Solution

D = 39000 papers per month

K = ₹ 390 per order

h = ₹ 5 per paper per month

p = ₹0.75 per paper

$f(x) = \frac{1}{30}$, $0 \leq x \leq 30$

E{x} = 1000 papers

Starting, we will find if the problem has a feasible solution. Using the explained equations, we find,

$$\hat{y} = \sqrt{\frac{2(39000)(390 + 0.75 * 1000)}{5}} = 4217.11$$

$$\tilde{y} = \frac{(0.75)(39000)}{5} = 5850$$

Since, $\tilde{y} \geq \hat{y}$, a unique solution exists for y^* and R.

The expression for S is computed as

$$S = \int_R^{30} (x - R) \frac{1}{30} dx = 15 + \frac{R^2}{60} - R$$

$$y_i = \sqrt{\frac{2(39000)(390 + 0.75S)}{h}}$$

To find R_i,

$$\int_R^{30} \frac{1}{30} dx = \frac{5y_i}{3900 * 0.75}$$

$$R_i = 30 - \frac{y_i}{195}$$

We now use above result to determine the solution:

Iteration 1:

$$y_1 = 780$$

$$R_1 = 26$$

Iteration 2:

$$S = 0.27$$

$$y_2 = 780.2$$

$$R_2 = 25.99$$

Iteration 3:

$$S = 0.272$$

$$y_3 = 780.203$$

$$R_3 = 25.99$$

Because $y_3 \approx y_2$ and $R_3 \approx R_2$, so the optimum $R^* = 26$ and $y^* = 780$ papers. Hence, he should approximately order 780 papers whenever the inventory level drops to 26 papers.

CHAPTER 4

ANALYSIS AND OBSERVATION

The model's sensitivity to variations in four crucial parameters is examined in the following paper:

1. Holding Cost (h)
2. Setup Cost (K)
3. Shortage Cost (p)
4. Demand (D)

Each parameter is varied by ±20%, and the corresponding values of optimal order quantity y* and reorder point R* are observed.

Table 4.1 Effect of Holding Cost h

Change in %	h(₹/unit/month)	y*(approx.)	R*(approx.)
-20	4	850	24
0	5	780	26
+20	6	720	28

Observations

- **When holding cost decreases (e.g., from ₹5 to ₹4)**, the vendor can afford to hold more stock, so the optimal order quantity increases (from 780 to 850).
- **When holding cost increases (e.g., from ₹5 to ₹6)**, holding inventory becomes expensive, so the order quantity is reduced (from 780 to 720) to save on carrying costs.
- Interestingly, the **reorder level (R*) increases with higher h**, which might seem counterintuitive but reflects a more conservative restocking strategy due to the cost sensitivity of excess inventory.

Table 4.2 Effect of Setup Cost K

Change in %	K(₹)	y*(approx.)	R*(approx.)
-20%	300	720	25.999
0%	390	780	26
+20%	450	830	26.001

Observations

- **Higher setup cost (e.g., ₹450)** means each order is more expensive to place, so the vendor compensates by placing **fewer, larger orders** (y* increases to 830).
- **Lower setup cost** makes frequent smaller orders more viable (y* drops to 720).
- The **reorder level stays nearly constant**, indicating it's more influenced by demand and shortage costs than setup costs.

Table 4.3 Effect of Shortage Cost p

Change in %	p(₹)	y*(approx.)	R*(approx.)
-20	0.5	700	23
0	0.75	780	26
+20	1.0	860	28.5

Observation

- **Shortage cost reflects the penalty for unmet demand (stockouts)**.
- When **p increases**, the cost of running out of stock becomes more significant. So the vendor orders more (y* increases to 860) and raises the reorder level to reduce the risk.
- Conversely, when **p is lower**, the vendor can risk stocking out a bit more, reducing y* and R*.

Table 4.4 Effect of Demand D

Change in %	D(unit/month)	y*(approx.)	R*(approx.)
-20	35000	730	24
0	39000	780	26
+20	43000	820	28

Observations

- **Higher demand means more frequent depletion of inventory**, so the vendor increases both the **order quantity (y*)** and **reorder level (R*)** to stay prepared.
- Conversely, **lower demand** reduces both values — fewer units are ordered, and replenishment is triggered at a lower threshold.

Summary of Observations

Table 4.5 Summary

Parameter	**↑ Value Effect**	**↓ Value Effect**
Demand (D)	↑ y*, ↑ R* (to meet more frequent sales)	↓ y*, ↓ R* (less need for stock)
Setup Cost (K)	↑ y* (to reduce frequency of orders)	↓ y* (can order more frequently)
Holding Cost (h)	↓ y* (avoid carrying costs)	↑ y* (carrying is cheaper)
Shortage Cost (p)	↑ y*, ↑ R* (avoid stockouts)	↓ y*, ↓ R* (stockouts are tolerable)

CHAPTER 5

CONCLUSION

By the above explained Probabilistic EOQ Model we can generate an inventory model for the certain deteriorating material such as Newspaper. By using above methodology, we created a real time example and solved it. By minimizing the expected price per unit of time. Sensitivity analysis has been used to illustrate how the best ordering policy behaves. The outcomes thus far demonstrate the model's realism. Since newspapers have short shelf lives and high perishability thus enhanced probabilistic models help minimize overproduction and waste, supporting environmental goals.

The future scope of probabilistic inventory models for newspapers (also known as the n*ewsvendor problem* in operations research) is evolving, especially as traditional print media adapts to digital disruption and logistical complexity. Its future lies in smart forecasting, data integration, sustainability goals, and expansion to similar high-uncertainty, short-lifecycle products.

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PAPER ACCEPTANCE MAIL

Acceptance of Abstract for 3rd International Conference on Recent Trends in Mathematical Sciences (ICRTMS-2025)

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ICRTMS2025
to me

Sun, Apr 27, 7:30 PM

Dear Manjari Pathak
I hope you are doing well.

We are pleased to inform you that the Conference Committee reviewed your abstract titled **"Probabilistic Inventory Model of Newspaper Vendor"** and has approved for presentation at "**3rd International Conference on Recent Trends in Mathematical Sciences (ICRTMS-2025)"** scheduled to be held on **10th – 11th May, 2025** at **Himachal Pradesh University, Shimla**, H. P., India in Hybrid mode.

We believe that your presentation will make a valuable contribution to the conference. Your Paper ID is **ICRTMS_205**

We request you to **fill the registration form,** if not done already, and mail your **full length paper in PDF format** latest by **25th April, 2025.**
Please feel free to contact us for any queries.
To register, please fill out the Google Form available at the link:
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The participants who will not register, will not be allowed to present their paper in the conference.

Lodging Arrangement
The organizing committee of ICRTMS-2025 makes arrangements for the stay of participants in nearby guest houses and hotels. The participants are free to exercise their choice about their stay for which they have to immediately contact the concerned guest house or hotel. **The participants are requested to book their accommodation by the end of March, 2025 as in the months of May and June there is tourist season in Shimla.**

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3rd INTERNATIONAL CONFERENCE ON RECENT TRENDS IN MATHEMATICAL SCIENCES (ICRTMS-2025)

10th-11th May, 2025

CERTIFICATE OF APPRECIATION

This is to certify that **Ms. Ashika Soni, UG/PG Student, Delhi Technological University** has presented a research paper entitled **Probabilistic Inventory Model of Newspaper Vendor** in **3rd International Conference on Recent Trends in Mathematical Sciences (ICRTMS-2025)** organized by the **Himachal Ganita Parishad (HGP) at Himachal Pradesh University, Shimla** on **10th-11th May, 2025**.

Dr. Kamalendra Kumar	Dr. Neetu Dhiman	Dr. Shalini Gupta
Co-Convener	**Convener**	**President (HGP)**

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