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Adaptive Inventory Optimization for Social Media-Driven Demand Using Heptagonal Fuzzy EOQ and AI Forecasting

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Abstract

This paper presents a hybrid inventory optimization model designed for markets influenced by rapid social-media trends. The approach integrates the fuzzy Economic Order Quantity (EOQ) framework with Heptagonal Fuzzy Numbers (HFNs) to capture uncertainty in demand and costs, while Artificial Intelligence (AI) techniques are employed to forecast demand surges in real time. A case study on Matcha tea, a globally trending product, illustrates the effectiveness of the model. The results show that the fuzzy-AI framework provides more reliable stock recommendations than the classical EOQ model, particularly under volatile conditions. By combining uncertainty modeling with predictive analytics, the proposed method offers a practical decision-support tool for businesses facing unpredictable, trend-driven markets.

Keywords: Fuzzy EOQ, Heptagonal fuzzy number, Artificial intelligence, Inventory optimization, Social media-driven demand

Introduction

The rapid growth of social media has significantly altered consumer behavior, often creating sudden and unpredictable shifts in product demand. Viral posts, influencer endorsements, and trending hashtags can trigger demand surges within hours, leaving

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conventional inventory systems unable to respond effectively. Traditional Economic Order Quantity (EOQ) models, which rely on stable demand assumptions and historical data, are increasingly insufficient for markets shaped by these fast-moving trends.

One example is Matcha tea, which has gained worldwide popularity due to its recognized health benefits such as high antioxidant content, stress reduction, and cognitive support. Beyond wellness, online promotion and lifestyle branding have amplified its appeal, creating global spikes in demand. Such cases highlight the vulnerability of supply chains when unexpected social media-driven demand meets limited production capacity.

To address these challenges, this study proposes an integrated framework that combines fuzzy EOQ modelling with Artificial Intelligence (AI)-based demand forecasting. Heptagonal Fuzzy Numbers (HFNs) are employed to represent uncertain parameters such as demand, ordering cost, and holding cost, while AI tools analyse real-time data streams to detect and predict market fluctuations. By merging uncertainty modelling with predictive analytics, the framework provides a more adaptive and resilient inventory planning approach for trend-sensitive products.

Definitions and Preliminaries

Definition 2.1 (Fuzzy Set): A Fuzzy Set A in a union of disclosure X is characterized by a membership function $\mu_A(x):X\to[0,1]$, which assigns to each element of $x\in X$ a membership grade in the interval [0,1].

- if $\mu_A(x)=1$, x fully belongs to A .
- if $\mu_A(x)=0$,x does not belong to A .
- intermediate values represent partial membership.

Definition2.2 (Fuzzy numbers): A fuzzy set $\tilde{A}$ is a fuzzy number iff (i) For all $\alpha\epsilon(0,1]$ the □ cut sets A_α is a convex set (ii) $\mu_{\tilde{A}}$ is a bounded set in R
(iii) Supp($\tilde{A}$)is a bounded set in R (iv) The height of $\tilde{A}=\max_{x\in x} \mu_{\tilde{A}} =\omega>0$.

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Definition2.3 (Heptagonal Fuzzy number): The parametric form of Heptagonal Fuzzy Number is defined as $\widetilde{H} = (f_1(r)g_1(t), g_2(t), f_2(r))$ for r ∈ [0, k] and t∈ [k,1] where $f_1(r)$ and $g_1(t)$

are bounded left continuous non decreasing functions over [0,ω_1] and [k,ω_2] respectively, f_2 (r) and g_2 (t) are bounded left continuous non increasing functions over [0,ω_1] and [k,ω_2] respectively and 0 ≤ω_1≤k, k≤ω_2≤1.

The membership function for the heptagonal fuzzy number $\widetilde{H} = (h_1, h_2, h_3, h_4, h_5, h_6, h_7; k, \omega)$

$$\mu_{\widetilde{H}}(x) = \begin{cases} 0 & for\ x < h_1 \\ k\left(\frac{x - h_1}{h_2 - h_1}\right) & for\ h_1 \le x \le h_2 \\ k + (\omega - k)\left(\frac{x - h_3}{h_4 - h_3}\right) & for\ h_1 \le x \le h_3 \\ k & for\ h_2 \le x \le h_3 \\ k + (\omega - k)\left(\frac{x - h_3}{h_4 - h_3}\right) & for\ h_3 \le x \le h_4 \\ k + (\omega - k)\left(\frac{h_5 - x}{h_5 - h_4}\right) & for\ h_4 \le x \le h_5 \\ k & for\ h_5 \le x \le h_6 \\ k\left(\frac{h_7 - x}{h_7 - h_6}\right) & for h_6 \le x \le h_7 \\ 0 & for\ x \ge h_7 \end{cases}$$

Remark

(i) The above defined heptagonal fuzzy number becomes normal heptagonal fuzzy number ifω=1

(ii)k=0 then the heptagonal fuzzy number reduces to triangular fuzzy number (h3, h4, h5) if k=1 it reduces to trapezoidal fuzzy number (h1, h2, h6, h7).

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Definition2.4(Economic Order Quantity): It is the order quantity that minimize the total cost (ordering cost + holding cost) EOQ =$\sqrt{(2DS/H)}$

Where:
D: annual demand
S: order cost per order
H: holding cost per unit year

Here D, S, H are modelled as heptagonal fuzzy numbers in fuzzy environment.

Definition2.5 (Artificial Intelligence (AI) in Inventory forecasting):AI in inventory control refers to the use of machine learning or predictive algorithms to forecast demand, optimize stock levels, and reduce supply chain disruption.AI uses real-time data (social media trends, online sales, sentiment analysis) to identify unexpected rise in demand early.

Model Description

Case Context and Model Justification:

Real world data shows the trending products, especially those are influenced by viral social media, are unpredictable in terms of demand.

Traditional inventory systems lack the adaptability to respond:

- ✓ sudden rise in demand
- ✓ viral influence not visible in past data
- ✓ stockout
- ✓ inaccurate forecasting using crisp historical data alone
- ✓ supply shortages from constrained resources (e.g. pistachios, matcha).

Proposed decision- support inventory model addresses:

- ✓ uses Heptagonal fuzzy number for representing uncertain demand and cost input
- ✓ Artificial Intelligence (AI) for detecting, predicting, and tracking consumer trends
- ✓ Fuzzy EOQ logic for adjusting stock control under uncertainty

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✓ Supports inventory decision during trend-driven rapid changes.

Input Case: Real -world scenarios

Case: Matcha-based products (Global health and wellness trend)
Trend trigger- Health &wellness trend #matchafever
Variability category- Gradual but high-volume

Model Frame work:

Step 1: Trend detection and forecasting (AI layer)

- ✓ Indicates the exact trend-related web data's, hashtags, news, and social mentions.
- ✓ Use AI models (e.g. regression, time-series LSTM) to predict potential demand rise.

Step 2: Demand Representation (Fuzzy Layer)

- o Represent predicted and historical demand values using Heptagonal Fuzzy Numbers (HFNs)
  $\tilde{D}$=(d1, d2, d3, d4, d5, d6, d7)
- o Captures range of low-to-high demand scenarios
- o Makes the model adaptive under uncertainty

Step 3: EOQ and Inventory control (Hybrid layer)

- ✓ Apply modified Fuzzy EOQ formula under fuzzy parameters:
- ✓ Fuzzy Demand
- ✓ Fuzzy holding cost
- ✓ Fuzzy ordering cost
- ✓ Calculate fuzzy optimal order quantity and reorder point

Role of HFNs in the mode:

Heptagonal fuzzy number is used to encode the demand instead of single point forecasting to avoid over ordering and under ordering, especially in the case of unpredictable viral trends.

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For example: D˜=(a1, a2, a3, a4, a5, a6, a7), This model helps various demand levels from minimum (a1) to most plausible(a4) to maximum possible(a4).

Role of AI in the model:

The AI models work as an early detector of trend signals : monitors search engine spikes, social mentions and frequency news. The predicts likely demand surges before the reflect in traditional sales data. It integrates with fuzzy logic layer to adjust inventory decisions.IT ensures the real-time data stream predictions are directly applied to the fuzzy model, allowing dynamic inventory control.

Advantages of this model:

Feature	Advantage
HFN usage	More expressive than triangular or trapezoidal fuzzy numbers, captures fine grained fluctuations.
AI Integration	Allows the system to react to external signals- not just historical data.
Hybrid Architecture	Flexible, scalable and suitable for real-time inventory decision making.

Dual case application tests both trend types 1. impulse- based, 2. Wellness- based

The final output provides:

- ✓ Recommended Order Quantity (fuzzy range)
- ✓ Reorder point (based on trend alert level)
- ✓ Risk-level scoring: High, Medium, or Low based on uncertainty width of HFN

Model overview

Input 1: AI- analyzed data from web trends, social media, sales.
Input 2: Historical sales stored data converted to HFNs to account for uncertainty.

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AI forecast layer: predicts upcoming rise in demand using time series or regression models.
Fuzzy Inventory layer: Applies HFNs to EOQ model to compute optimal order quantity under uncertainty

OUTPUT: Order quantity and Reorder point recommendations with low risk of stockouts.

Proposed Inventory model in crisp environment

CASE: MATCHA GREEN TEA

MODEL NAME: ECONOMIC ORDER QUANTITY(EOQ)-crisp environment

Formula:

$$EOQ = \sqrt{\frac{2DS}{H}}$$

Notations:

D- Annual demand(units/year)
S- Ordering cost per order (₹ or $)
H- Holding cost per unit per year (₹ or $)
EOQ- Economic Order Quantity (units

Assumptions:

- ✓ Demand is known &constant
- ✓ Instantaneous replenishment
- ✓ No stockouts
- ✓ Constant holding and ordering cost

Numerical example:

Consider,

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- ✓ Annual demand(D) = 60,000 units
- ✓ Ordering costs(s)=₹ 2,000 per order
- ✓ Cost of One matcha product =₹500
- ✓ Holding cost rate = 15% of item cost

H= 0.15*500=₹75 per unit/year
Now apply the EOQ formula:

$$EOQ=\sqrt{\frac{2*60,000*2000}{75}}=\sqrt{\frac{240,000,000}{75}}=\sqrt{3,200,000}\approx 1788.85$$

Result: To minimize total inventory cost for Matcha tea, the optimal order quantity is 1,789 units per order.Crisp EOQ model applied to the case Matcha tea, EOQ is 1,789

Proposed Inventory model in Fuzzy environment

MODEL NAME: ECONOMIC ORDER QUANTITY(EOQ)-Fuzzy environment

Formula: fuzzy EOQ formula

$E\tilde{O}Q=\sqrt{(2\cdot C_0\cdot \tilde{D})/C_h}$
Where:
$\tilde{D}$: Fuzzy demand represents HFN
Co: Ordering cost
Ch: Holding cost (monthly)

Definition of Heptagonal Fuzzy Number (HFN)

A Heptagonal Fuzzy Number is defined as Ã=(a1, a2, a3, a4, a5, a6,a7)
Where:
a1: lower bound with 0 membership
a2, a3: gradual increase
a4: peak (membership=1)

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a5, a6: gradual decrease
a7: upper bound with 0 membership

Case: Matcha green tea
Let the given data
Ordering cost=₹1,800
Holding cost=₹6 per unit per year → ₹0.5 per month
Fuzzy monthly demand = D̃ =(1400,1600,1800,2000,2200,2400,2600)

For each D_j∈D̃ we compute EOQ:

$$E\tilde{O}Q_i = \sqrt{\frac{2 \cdot 1800 \cdot D_j}{0.5}}$$

Applying the formula

$$E\tilde{O}Q = \left(\sqrt{\frac{2 \cdot 1800 \cdot 1400}{0.5}}, \sqrt{\frac{2 \cdot 1800 \cdot 1600}{0.5}}, \sqrt{\frac{2 \cdot 1800 \cdot 1800}{0.5}}, \sqrt{\frac{2 \cdot 1800 \cdot 2000}{0.5}}, \sqrt{\frac{2 \cdot 1800 \cdot 2200}{0.5}}, \sqrt{\frac{2 \cdot 1800 \cdot 2400}{0.5}}, \sqrt{\frac{2 \cdot 1800 \cdot 2600}{0.5}} \right)$$

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d_j	computation	EOQ(units)
1400	$\sqrt{\dfrac{2 \times 1800 \times 1400}{0 \cdot 5}} = \sqrt{10080000}$	3174.901
1600	$\sqrt{\dfrac{2 \times 1800 \times 1600}{0 \cdot 5}} = \sqrt{11520000}$	3394.112
1800	$\sqrt{\dfrac{2 \times 1800 \times 1800}{0 \cdot 5}} = \sqrt{1296000}$	3600.000
2000	$\sqrt{\dfrac{2 \times 1800 \times 2000}{0 \cdot 5}} = \sqrt{14400000}$	3794.733
2200	$\sqrt{\dfrac{2 \times 1800 \times 2200}{0 \cdot 5}} = \sqrt{15840000}$	3979.949
2400	$\sqrt{\dfrac{2 \times 1800 \times 2400}{0 \cdot 5}} = \sqrt{17280000}$	4156.921
2600	$\sqrt{\dfrac{2 \times 1800 \times 2600}{0 \cdot 5}} = \sqrt{18720000}$	4326.661

EÕQMatcha≈(3174.901,3394.112,3600.000,3794.733,3979.949,4156.921,4326.661)

Total inventory cost analysis in fuzzy EOQ model

Total inventory cost formula:

$$TC_i = \frac{C_0 \cdot D_i}{Q_i} + \frac{C_h \cdot Q_i}{2}$$

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Where:

TCi : Total inventory cost at the ith EOQ point

Co: Ordering cost per order

Ch : holding cost per unit per month

Di: Monthly demand (from Heptagonal fuzzy Demand $\tilde{D}$)

Qi: Corresponding EOQ value (from fuzzy EOQ set)

NOW

Given:

Ordering cost: ₹1800

Holding cost: ₹0.5

Fuzzy demand (monthly) $\tilde{D}$ =(1400,1600,1800,2000,2200,2400,2600)

EOQvalues $\tilde{Q}$ ≈(3174.9015,3394.112,3600.000,3794.733,3979.949,4156.921,432.661)

Example calculation (first value):

$$Tc_1 = \frac{1800 \cdot 1400}{3174.901} + \frac{0.5 \cdot 3174.901}{2} = 793.90 + 793.73 = 1587.69$$

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Cost table:

D_j	EOQ_j	Ordering cost₹	Holding cost ₹	Total cost₹
1400	3174.901	793.96	793.73	1587.69
1600	3394.112	848.54	848.53	1697.07
1800	3600.000	900.00	900.00	1800.00
2000	3794.733	949.05	948.68	1897.73
2200	3979.949	995.29	994.99	1990.28
2400	4156.921	1039.11	1039.23	2078.34
2600	4326.661	1081.62	1081.67	2163.29

Defuzzification, Ranking and interpretation of Fuzzy inventory model

Defuzzification:

The centroid-simple average method is used to calculate single representation EOQ value from the Fuzzy set, where when every point in the fuzzy number is considered equally relevant.

Defuzzification $EOQ = \frac{a+b+c+d+e+f+g}{7}$

$\tilde{EOQ}_{Matcha=}$(3174.9015,3394.112,3600.000,3794.733,3979.949,4156.921,4326.661)

DefuzzificationEOQ_{Matcha}= $\frac{3174.901+3394.112+3600.000+3794.733+3979.949+4156.921+4326.661}{7}$

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$= \frac{26427.28}{7}$

$= 3775.33\ units/month$

$= 3775.33\ units/month$

Ranking:

$R(E\tilde{O}Q_{\text{Matcha}}) = \frac{3174.901+2(3394.112)+2(3600.000)+2(3794.733)+3979.949+4156.921+4326.661}{10}$

$= \frac{37216.112}{10}$

$= 3721.61\ units/\ month$

Decision-oriented analysis:

The defuzzification EOQ represents the optimal stock-level, which can be maintain the situations where demand fluctuation occurs

The ranked EOQ supports inventory priority under different situations giving more weight to demand points with higher relevance and centrality.

This ensures:

- ✓ Reduce guesswork in inventory planning
- ✓ Avoid under or overstocking
- ✓ Fast response when demand is higher than usual
- ✓ Ordering cycles with most likely market needs
- ✓ These results give the expected order quantity under uncertain demand caused by social-media trends
- ✓ For Matcha tea, a recommended monthly order is ~ 3721 units

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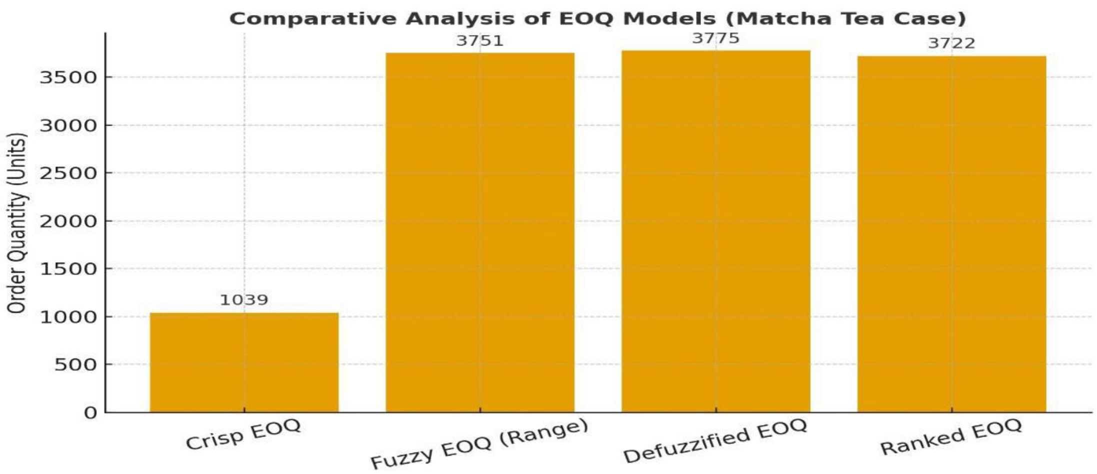
Comparative analysis and AI forecasting integration

Comparison table:



Case	Crisp EOQ (units)	Fuzzy EOQ range (HFN)	Defuzzified EOQ	Ranked EOQ
Matcha tea	1039.23	3174.901-4326.661	3775.33	3721.61

- Fuzzy EOQ is more realistic for unpredictable markets.
- Crisp EOQ severely underestimates required stock during demand fluctuation
- Defuzzified values guide better monthly procurement decisions.

Role of AI in inventory planning

Artificial intelligence can process the live market signals like social media sentiment, influencer campaigns, consumer purchase spikes, news and media trends. Using the data AI can predict sudden demand shifts, suggest order interval, optimize storage and reorder alert,

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prevent under or over stockage.AI fits into EOQ by providing real-time inputs like updated demand estimates which connect into EOQ model, making the system responsive and adaptive.

Smart inventory decision flow of combing AI and Fuzzy logic:

AI forecast the spike, fuzzy EOQ expands its demand bounds and defuzzifies EOQ increases order quantity automatically preventing future shortage or customer loss.

1. Trend Data Capture – AI collects real-time social media + web signals
2. Pattern prediction-AI forecast short-term demand fluctuation
3. Fuzzy EOQ model input- forecast feed into fuzzy demand model
4. Defuzzification & Ranking-EOQ recommendations adjusted to optimal level
5. Order recommendation issued-App or dashboard notifies stock team with EOQ and timing.

Conclusion:

This study demonstrates that conventional inventory models are inadequate for markets influenced by sudden, trend-driven demand surges. Using Matcha tea as a case example, we developed a hybrid EOQ framework that integrates Heptagonal Fuzzy Numbers (HFNs) for uncertainty representation with Artificial Intelligence (AI) for real-time forecasting. The proposed approach not only accommodates volatile demand patterns but also translates fuzzy estimates into actionable order quantities through defuzzification and ranking techniques. Comparative analysis confirms that the fuzzy-AI model outperforms the classical EOQ method by reducing the risks of both stockouts and excess inventory.

By combining predictive analytics with fuzzy optimization, the model provides inventory managers with a practical decision-support tool for highly dynamic markets. Beyond wellness products, the framework is adaptable to other consumer goods influenced by viral social media trends. Future work may extend this approach to multi-echelon supply chains, dynamic pricing, and integration with automated decision systems, further enhancing resilience and profitability in uncertain market environments.

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INDEXED IN INDEX COPERNICUS - ICI Journals Master List 2022 - IJCRAR--ICV 2022: 81.15

Reference

1.Hemalatha,S.,and Annadurai,K.(2023).Optimization of a fuzzy inventory model with pentagonal Fuzzy numbers. International journal of mathematics and computer research,11(3),3277-3287.DOI:10.47191/ijmcr/v11i3.01.

2.Inshort App,Matcha tra supply struggles to meet global demand amid social trend#matchafever . https://www.inshorts.com

3.Rajalakshmi,R.M.,and Michael Rosario,G.(2017).A fuzzy inventory model with allowable shortage using different fuzzy numbers. International journal of computational and applied mathematics.12(1),http://www.ripublication.com.

4.Rathi,k.,Balamohan,s.(2014). Reprentation and Ranking of fuzzy numbers with heptagonal membership function using value and ambiguity index. Applied mathematics science,8(87),4309-4321,http://dx.doi.org/10.12900/ams.2014.45363.

5.Times of India. (2015, April 22). Viral trends cause global pistachio and matcha shortage.

6.Zadeh, L.A(1965). Fuzzy sets. information and control,8(3),338-358.