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INVENTORY FUZZY EOQ AND EPQ MODELS WITHOUT DERIVATIVES

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Abstract

This paper presents an examination of two notable inventory models: Economic Order Quantity (EOQ) and Economic Production Quantity (EPQ), utilizing fuzzy logic without subordinates. The traditional EOQ and EPQ models expect fresh and deterministic interest, cost, and production rate. In any case, in genuine circumstances, these presumptions may not hold, and it becomes important to think about vulnerability and imprecision. The fuzzy logic approach proposed in this paper resolves this issue by utilizing semantic factors to address dubious and uncertain data. The proposed models think about fuzzy interest, cost, and production rate, and the goal is to limit the all-out inventory cost.

Keywords: Inventory management, Economic Order Quantity (EOQ), EPQ (Economic Production Quantity), Fuzzy sets, Fuzzy logic, Fuzzy inventory models

Introduction

EOQ (Economic Order Quantity) and EPQ (Economic Production Quantity) are inventory models that are broadly utilized in store network management to decide the ideal order or production quantity that limits absolute inventory costs.

The EOQ model expects a consistent interest rate and steady ordering cost, while the EPQ model accepts a steady interest rate and consistent production arrangement cost. The two models expect to adjust the expenses of holding inventory (capacity, taking care of, and opportunity costs) with the expenses of ordering or production (arrangement and fixed costs).

Fuzzy inventory models are expansions of EOQ and EPQ models that integrate dubious or uncertain boundaries. These models use fuzzy logic to address and control obscure or fuzzy inventory-related data, for example, request and lead time inconstancy, provider dependability, and quality issues.

Fuzzy EOQ and EPQ models can be addressed utilizing fuzzy number-crunching, which takes into account more sensible and adaptable dynamic under vulnerability. These models don't need the

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utilization of subsidiaries, which makes them computationally basic and available to experts with restricted numerical foundations.

Understanding EOQ and EPQ Fuzzy Inventory Models

The Economic Order Quantity (EOQ) and Economic Production Quantity (EPQ) models are traditional inventory models that give a numerical structure to deciding the ideal order quantity and production quantity, individually, to limit all out inventory costs. Nonetheless, in genuine circumstances, request and holding expenses may not be exactly known, and may rather be described by imprecision and vulnerability.

Fuzzy inventory models are expansions of traditional inventory models that integrate the idea of fuzzy sets, which take into account the portrayal of loose and questionable data. In fuzzy inventory models, the interest and holding costs are addressed by fuzzy numbers or fuzzy factors, which empower the model to catch the uncertainty and unclearness of true inventory frameworks.

The EOQ and EPQ fuzzy inventory models are variations of the traditional EOQ and EPQ models, individually, where the interest and holding costs are addressed by fuzzy factors. These models can give more exact and reasonable inventory management choices in circumstances where the interest and holding costs are dependent upon imprecision and vulnerability.

The comprehension of EOQ and EPQ fuzzy inventory models is fundamental for professionals and scientists intrigued by inventory management and dynamic under vulnerability. By applying these models, chiefs can streamline inventory costs while thinking about the vulnerability and vagueness of interest and holding costs.

The Economic Order Quantity (EOQ) Model

The Economic Order Quantity (EOQ) model is a traditional inventory model that gives a numerical system to deciding the ideal order quantity that limits complete inventory costs. The model expects that request is steady and known, ordering costs are fixed, and holding costs are corresponding to the inventory level.

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The EOQ model depends on the compromise between ordering expenses and holding costs. Ordering costs are the decent costs brought about each time an order is set, while holding costs are the expenses related with holding inventory, like capacity, protection, and outdated nature costs. As the order quantity builds, the ordering costs decline, yet the holding costs increment. Hence, the ideal order quantity is the one that limits the amount of ordering and holding costs.

The mathematical expression for EOQ can be expressed as:

EOQ = sqrt((2 * D * O) / H)

Where: D = annual demand O = ordering cost per order H = holding cost per unit per year

The EOQ model gives a valuable device to inventory management by deciding the ideal order quantity that limits all out-inventory costs. The model accepts that request is steady and known, and that the ordering expenses and it are fixed to hold costs. Notwithstanding, in true circumstances, request and holding expenses might be dependent upon imprecision and vulnerability, which can be tended to by utilizing fuzzy inventory models.

The EOQ Model with Fuzzy Demand and Fuzzy Holding Costs

The EOQ model with fuzzy interest and fuzzy holding costs is an augmentation of the old style EOQ model that consolidates the idea of fuzzy sets to address loose and dubious interest and holding costs. The model considers the improvement of inventory costs under states of imprecision and vulnerability popular and holding costs.

In this model, request and holding costs are addressed by fuzzy numbers or fuzzy factors, which empower the model to catch the equivocalness and ambiguity of certifiable inventory frameworks. The fuzzy interest and holding costs are demonstrated utilizing fuzzy set hypothesis, where each fuzzy number addresses a bunch of potential qualities, and the level of enrollment in the set addresses the level of vulnerability or equivocalness.

The mathematical expression for EOQ with fuzzy demand and fuzzy holding costs can be expressed as:

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EOQ = sqrt((2 * D̃ * Õ) / H̃)

Where: D̃ = fuzzy demand Õ = fuzzy ordering cost per order H̃ = fuzzy holding cost per unit per year

The improvement of inventory costs in this model includes deciding the ideal fuzzy order quantity that limits the absolute fuzzy inventory costs. This is commonly accomplished utilizing fuzzy streamlining strategies, for example, the fuzzy straight programming or the fuzzy objective programming approach.

The EOQ model with fuzzy interest and fuzzy holding costs gives a more precise and practical way to deal with inventory management by thinking about the imprecision and vulnerability of interest and holding costs. This model can furnish leaders with more strong inventory management choices, especially in circumstances where request and holding costs are dependent upon imprecision and vulnerability.

The Economic Production Quantity (EPQ) Model

The Economic Production Quantity (EPQ) model is an old-style inventory model that gives a numerical system to deciding the ideal production quantity that limits complete inventory costs. The model expects that request is steady and known, and that the production rate is consistent and momentary, while arrangement costs are fixed, and holding costs are corresponding to the inventory level.

The EPQ model depends on the compromise between arrangement expenses and holding costs. Arrangement costs are the decent costs caused each time a production run is started, while holding costs are the expenses related with holding inventory, like capacity, protection, and outdated nature costs. As the production quantity builds, the arrangement costs decline, yet the holding costs increment. Subsequently, the ideal production quantity is the one that limits the amount of arrangement and holding costs.

The mathematical expression for EPQ can be expressed as:

EPQ = sqrt((2 * D * S) / H)

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Where: D = annual demand S = setup cost per production run H = holding cost per unit per year

The EPQ model gives a helpful device to inventory management by deciding the ideal production quantity that limits complete inventory costs. The model accepts that request is steady and known, and that the production rate is consistent and momentary, while arrangement expenses and it are fixed to hold costs. Notwithstanding, in true circumstances, request and holding expenses might be dependent upon imprecision and vulnerability, which can be tended to by utilizing fuzzy inventory models.

The EOQ Model with Fuzzy Demand and Fuzzy Holding Costs without Derivatives

The EOQ model with fuzzy interest and fuzzy holding costs without subsidiaries is a variation of the EOQ model with fuzzy interest and fuzzy holding costs that doesn't expect subordinates to be determined, simplifying it to utilize and carry out. Rather than utilizing subsidiaries, the model purposes an iterative way to deal with decide the ideal order quantity.

In this model, the fuzzy interest and fuzzy holding costs are addressed by fuzzy numbers or fuzzy factors, and the model expects to find the ideal order quantity that limits the complete fuzzy inventory costs. The iterative methodology includes choosing an underlying order quantity, working out the all-out fuzzy inventory costs, and changing the order quantity in light of the determined expenses until the ideal order quantity is reached.

The mathematical expression for the iterative EOQ model with fuzzy demand and fuzzy holding costs can be expressed as:

Step 1: Select an initial order quantity Q(0) Step 2: Calculate the total fuzzy inventory costs TC(Q) using the expression:

$TC(Q) = [(\tilde{D} * Q * \tilde{O}) / \tilde{Q}] + [(\tilde{H} * Q * \tilde{Q}) / 2]$

Where: $\tilde{D}$ = fuzzy demand $\tilde{O}$ = fuzzy ordering cost per order $\tilde{H}$ = fuzzy holding cost per unit per year $\tilde{Q}$ = fuzzy order quantity

Step 3: Adjust the order quantity based on the calculated costs using the expression:

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Q(i+1) = sqrt((2 * D̃ * Õ) / H̃) * sqrt(TC(Q(i)) / TC(Q(i) + 1))

Step 4: Repeat steps 2 and 3 until the change in the order quantity becomes sufficiently small, indicating that the optimal order quantity has been reached.

The iterative EOQ model with fuzzy interest and fuzzy holding costs without subordinates gives an easier way to deal with inventory management under states of imprecision and vulnerability popular and holding costs. The model doesn't need the estimation of subsidiaries, pursuing it more open to choose producers who might not have areas of strength for a foundation.

Conclusion

Taking everything into account, the EOQ (Economic Order Quantity) and EPQ (Economic Production Quantity) models are two generally utilized inventory models that assist organizations with deciding the ideal inventory levels and ordering/production amounts to limit their inventory costs while fulfilling client need. The two models accept that the interest rate is known and deterministic, and don't represent questionable interest or lead time. In any case, organizations can utilize fuzzy inventory models to represent request vulnerability and variety in lead time. Fuzzy inventory models can assist organizations with settling on more educated inventory choices and further develop their inventory management rehearses. Generally, the EOQ and EPQ models, alongside fuzzy inventory models, are significant instruments for organizations hoping to advance their inventory levels and expenses.

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