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A Fuzzy Inventory Model with Hazy Pricing, Marketing and Service Planning

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Abstract

In real-world markets, demand is influenced by various parameters. Many researchers have recently been interested in integrated production and marketing planning strategies in inventory models where demand is dependent on a variety of parameters, such as price and/or marketing expenditure. Quite possibly of the main element that impacts request in genuine business sectors is the nature of administrations gave to clients of an item, however stock models have not considered this. Conversely, genuine stock frameworks' expense boundaries and different boundaries, like value, promoting, and administration flexibility to request, are dubious and questionable. Consequently, the idea of fuzziness can be used to control this uncertainty. This paper proposes a novel fuzzy inventory model for profit maximization in the face of shortages. When calculating demand as a power function, all factors like price, marketing, and service costs are taken into consideration. Unit cost is also calculated using order quantity as a power function. Due to the fuzziness of the proposed model's operating environment and expected outcomes, a fuzzy decision must be made to satisfy the decision criteria. Geometric programming and fuzzy optimization are used to formulate and solve the proposed model in order to approximate the results' membership functions. Following the presentation of a numerical example of the model, a case study is provided to evaluate and verify the results of the model.

Keywords: Parameters • Geometric programming • Fuzziness

Introduction

However, the aforementioned studies do not include marketing or service planning because they only offer lot-sizing models. In addition, there is an important reason why these traditional fuzzy lot-sizing models can be criticized for not providing clear solutions in a fuzzy environment. When the parameters are fuzzy, the value of the objective and the decision variables that are dependent on them ought to be intuitively fuzzy as well. To put it another way, the criteria for the decision should be satisfied by making a decision that is unclear. However, fuzzy inventory models with fuzzy solutions have only been the subject of a few studies. A geometric programming solution for determining the optimal fuzzy profit of the model and a fuzzy pricing and lot-sizing inventory model with price-dependent demand and order quantity-dependent unit costs were developed. Service planning is not included in any of the aforementioned inventory models. In real-world markets, demand is influenced by various parameters. Many researchers have recently been interested in integrated production and marketing planning strategies in inventory models where demand is dependent on a variety of parameters, such as price and/or marketing expenditure. The quality of a product's customer service is one of the most important factors that affect demand in real markets, but inventory models have not taken this into account. Cost parameters and other parameters, such as price, marketing, and service elasticity to demand, in real inventory systems, on the other hand, are hazy and uncertain. Thus, the idea of fluffiness can be used to deal with this vulnerability.

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Discussion

This paper proposes a novel fuzzy inventory model for profit maximization in the face of shortages. When calculating demand as a power function, all factors like price, marketing, and service costs are taken into consideration. Unit cost is also calculated using order quantity as a power function. Due to the fuzziness of the proposed model's operating environment and expected outcomes, a fuzzy decision must be made to satisfy the decision criteria. Geometric programming and fuzzy optimization are used to formulate and solve the proposed model in order to approximate the results' membership functions. Following the presentation of a numerical example of the model, a case study is provided to evaluate and verify the results of the model.

As a result, modern industries place a high value on combining marketing and production strategies to maximize profits. A company's primary objective is to maximize profit over the planning horizon. In inventory management models where multiple parameters affect demand and unit cost, integrated production and marketing strategies have piqued the interest of numerous researchers in recent years. In the majority of traditional inventory models, researchers make the assumption that demand and unit cost are deterministic and constant. These presumptions are erroneous in the real world. Normally, the amount of requests decides the unit cost. When order quantities rise to meet high demand, discounts are offered. Consequently, higher orders result in lower unit costs, and the reverse is also true. In addition, demand in actual markets is influenced by a number of parameters, including selling price, marketing expenditure, and service quality. Promoting and statistical surveying are instances of showcasing exercises. The act of promoting and selling products or services is known as marketing. Service refers to the activities, benefits, and satisfactions that are offered to customers. Timely delivery, repurchase intent, customer support, and appropriate sale and after-sale services can all have an impact on the product's demand rate. In point of fact, the quality of a product's services can entice customers, thereby increasing demand. However, service quality's effect on demand is not yet taken into account by inventory models.

For the purpose of defining the order quantity-dependent unit cost, think of unit cost as a decreasing power function of lot size. Price, marketing costs, and other variables can all be used to determine the demand rate. Using terms in power functional form, these two assumptions transform the model into a profit maximization nonlinear programming problem. In the literature, the geometric programming method is frequently used to solve inventory issues because it works well for these kinds of nonlinear problems.

Combining lot-sizing, marketing, and service strategies are typically more realistic optimal production strategies. Lee and Kim were the first to incorporate pricing and marketing into the conventional problem of sizing inventory lots. Demand influenced production costs, and they determined demand through price and marketing costs. The model was formulated and solved as a profit maximization problem in the form of a geometric programming problem. Lee formulated the problem in a different way, considering unit cost as a function of lot size, and used geometric programming to determine the selling price and order quantity. Lee developed and solved the same inventory model within a few constraints using geometric programming. It is presumed in the aforementioned studies that the parameters governing inventory costs are clear and precise; However, they are uncertain in real-world problems because they depend on a variety of factors. For dealing with the aforementioned uncertainty in inventory model parameters and imprecise information during decision-making, fuzziness is an appropriate strategy. Nonetheless, conventional econometrics techniques can't generally be utilized to gauge boundaries in the interest and cost capabilities. When dealing with a new product for which there is no historical data available to estimate the parameters, the concept of fuzzy logic is the best approach. When we are confronted with uncertainty or insufficient information, nonlinear and geometric programming can be utilized to solve a fuzzy EOQ model with demand-dependent unit cost and limited storage capacity. Through slope-based nonlinear programming and mathematical programming, settled a multi-thing stock model with amount subordinate to stock expenses and request subordinate to unit cost under uncertain goals and imperatives. A multi-item EOQ model with fuzzy/hybrid cost parameters under two types of resources was used to derive the solution after transforming the problem into its equivalent deterministic form by using a surprise function for the constraints. Methods for solving a multi-objective fuzzy inventory model with three constraints and demand-dependent unit costs and shortages. They also took into account the constraint and the objective function's coefficients, as well as the fuzziness of the goals and coefficients of the objective function [1-5].

Conclusion

However, the aforementioned studies do not include marketing or service planning because they only offer lot-sizing models. In addition, there is an important reason why these traditional fuzzy lot-sizing models can be criticized for not providing clear solutions in a fuzzy environment. When the parameters are fuzzy, the value of the objective and the decision variables that are dependent on them ought to be intuitively fuzzy as well. To put it another way, the criteria for the decision should be satisfied by making a decision that is unclear. However, fuzzy inventory models with fuzzy solutions have only been the subject of a few studies. A geometric programming solution for determining the optimal fuzzy profit of the model and a fuzzy pricing and lot-sizing inventory model with price-dependent demand and order quantity-dependent unit costs were developed. Service planning is not included in any of the aforementioned inventory models.

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Conflict of Interest

No potential conflict of interest was reported by the authors.

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