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FUZZY TOTAL DEMAND WITH INTERVAL-VALUED FUZZY SET IN INVENTORY WITHOUT BACKORDER

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Abstract. *For the total demand quantity in an inventory model without backorder, it is very difficult to determine a fixed value r_0. Hence,in this paper we treat total demand as an interval-valued fuzzy set centered around an expected value of r_0. From this we derive a correspondingly fuzzy estimate of total cost and develop some conditions for its minimization.*

Keywords: Without backorder inventory, Fuzzy demand, Interval-valued fuzzy set, Total cost

1. **Introduction.** In the classical inventory model, all the parameters in the total cost are known and have unambiguous fixed values, and all the real variables are constrained to take positive values. But in reality, some quantities will remain uncertain, so we may need to consider some the fuzzy inventory models, of which numerous relevant examples may be cited.

Specifically Vujošević et al. [12], have fuzzified the ordering cost as a trapezoidal fuzzy number in deriving a fuzzy expression for the total cost of managing an inventory model without backorder. In this case they did the defuzzification by using the centroid method. Chen and Wang [2], fuzzified the order cost, inventory cost, and backorder cost as trapezoidal fuzzy numbers and used the functional principle to solve for a fuzzy estimate of total cost. Roy and Maiti [5], rewrote the classic economic order quantity problem into a nonlinear programming problem. It was solved by fuzzifying both nonlinear and geometric programming techniques for linear membership functions. Ishii and Konno [4], fuzzified the shortage cost L in the classical newsboy problem to a fuzzy number, in order to find an optimal ordering quantity in the sense of fuzzy ordering.

In a series of inventory papers ([8,9,13,14]) coauthored by Yao, the authors discussed fuzzy inventory models with or without backorder. In [8], they fuzzified the ordering quantity q as $\widetilde{Q}$ [7] and then obtained the centroid of the fuzzy total cost. They used it as a fuzzy estimate of total cost. With backorder fuzzy inventories, they developed the following two Cases: (1) Solving for ordering quantity q, fuzzified to $\widetilde{Q}$; and with sufficient stock quantity s, assumed to be a crisp real variable [11,12]. (2) Solving for sufficient stock quantity s, fuzzified to $\widetilde{S}$, giving ordering quantity q, assumed to be a crisp real variable [1]. In both (1) and (2) above, they got the centroid of the fuzzy total cost and then used it as a fuzzy estimate of total cost. In [9], they fuzzified the demand quantity r and