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Calculation of the on-hand stock levels with fuzzy techniques

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Keywords: On-hand levels; fuzzy set; inventory; lost sales; periodic review

1 Introduction

One challenge in inventory control models is to know the available stock at the beginning of the cycle to satisfy future demands. For inventory managers, this information is necessary both to determine service levels and to establish the control parameters of the inventory policy. In the literature, we find an exact expression proposed by (Cardós et al., 2006) for the lost sales case. However, this method requires huge computational efforts for large S values, which hinder its implementation in practical environments or information systems.

2 Objectives

The main goal of this work is to propose a new approach of the on-hand stock levels when unfilled demand is lost. To this aim, we apply fuzzy set techniques

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(Zadeh, 1965), based on the uncertainty that real demand introduces. We focus on the traditional periodic review system (*R, S*).

3 Methods

We propose a new approach of the on-hand stock vector modeling it as an imprecise Markov chain using possibility functions. We adapt the expression of (Cardós et al., 2006), where $\overline{\overline{M_R}} = \overline{\overline{M_{R-L}}} \times \overline{\overline{M_L}}$ is the transition matrix between two consecutive replenishment cycles. When $\overline{\overline{M_R}}$ converges, the eigenvector represents the on-hand stock vector. We apply fuzzy logic to eliminate the computational effort required to achieve the convergence. To each iteration, we calculate the difference between the highest and the smallest element of each column (t_j). We define the error as the largest value of t_j, i.e. $t = \max\{t_1, ..., t_{S+1}\}$ and we stop when t arrives to a predefined value.

4 Results

In order to analyse the performance of the proposed fuzzy vector, we calculate the exact and the fuzzy vector, which are used to compute the fill rate following the expression proposed by (Guijarro et al., 2012). The results of this work show a very good performance of the proposed approach, even when the fill rate level is lower than 90%.

5 Conclusion

We develop a new fuzzy method to calculate the on-hand stock levels just after an order delivery, which is needed both to calculate the inventory costs and to analyse the performance of the inventory policy. In (Cardós et al., 2006) we find an exact expression to calculate the on-hand vector, however this method requires huge computational efforts for large *S* values. The proposed fuzzy method presents a good performance and reduces significantly the computational costs, been easily implementable in practical environments.

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