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Joint optimal dynamic pricing and replenishment policies for items with simultaneous quality and physical quantity deterioration. (English) Zbl 1410.90018

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Summary: This paper discusses optimal dynamic pricing and replenishment policies for items with simultaneous deterioration of quality and physical quantity. Qualitative deterioration is assumed to be instantaneous, while physical deterioration follows non-instantaneous pattern. In order to tackle dynamic essence of the problem, selling price is defined as a time-dependent function of the initial price and discount rate. The product is sold at the initial price value in the time period with no physical quantity deterioration; subsequently it is exponentially discounted to boost customer's demand. In addition to price, the demand rate is dependent on the quality of inventory and changes in price over time. This consideration has enhanced dynamic characteristic of the proposed model. The model seeks to maximize total profit of the system by determining the optimal replenishment cycle, initial price and discount rate. In order to characterize the optimal solution several theoretical results are derived which demonstrate existence and uniqueness of the optimal solution. Then, an iterative solution algorithm is developed based on these theoretical results. Finally, in order to analyze the behavior of model and illustrate the solution procedure numerical results accompanied by sensitivity analyses of key parameters of the model are provided.

MSC:

90B05 Inventory, storage, reservoirs

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Keywords:

dynamic pricing; replenishment policies; quality deterioration; physical quantity deterioration; non-instantaneous deterioration

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