

Optimal Decision Making in Operations Research and Statistics

Methodologies and Applications

Editors

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CHAPTER 14

Co-ordinated Selling Price and Replenishment Policies for Duopoly Retailers under Quadratic Demand and Deteriorating Nature of Items

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1. Introduction

As such, deterioration is a process of becoming gradually worse, to a state of damage, decay, spoilage, and loss of utility resulting in a declination of the usefulness of the original one. Deterioration reduces the quality and physical quantity of inventory. The product's selling price is one of the key factors in uplifting a customer's demand for a product which is directly influenced by the customer's satisfaction level. Recent studies include selling price-based rate of market demand and much weightage on deterioration is drawn to highlight the shorter life cycles of goods. Therefore, appropriate inventory control of deterioration of items is considered to be a crucial matter to elaborate.

Moreover, the retailer's influence has been raised intensely by development of huge supermarkets and chain-stores. In the retailer's sell-list, a product diversity has been observed including the branded items. The comparable products with diverse brands sold by various other retailers are compatible items for customers. For example, the two big online retailers, Grofers and bigbasket, selling perishable items such as vegetables and fruits. The main factor in dominating the share market is the selling price of these two competing retailers. As such selling price strategies are one of the main components influencing inventory management. So, a pricing and inventory policy is needed for consideration of these retailers. This article provides us a better approach to reduce the wastage occurred by the spoilage of deteriorating items by analysing and considering the problem of pricing and inventory decisions in a duopoly setting.

As such the key subject to this work is related to pricing-inventory decisions, and among them mostly the research is about a duopoly environment. Cohen (1977) initially introduced the strategy of joint pricing and inventory decisions for deteriorating items with an assumption of exponential decay and in cases of no shortages and complete backordering by analysing the optimal pricing and ordering policy. Thereafter, a generalized study of Cohen (1977) was considered by Rajan et al. (1992) where the concept of dynamic pricing was encountered. Then, Rajan et al.'s (1992) model was extended by Abad (1996) including partial backlogging by estimating the optimal policy for joint pricing.

There are few papers in which the study of a joint pricing-inventory problem in a duopoly environment is done. Zhu and Thonemann (2009) considered joint pricing and inventory control problem for a retailer who sells two non-deteriorating products with cross-price effects on demand and concluded that the retailer can significantly improve its profit by managing the two products jointly as opposed to independently, especially when the cross-price demand elasticity is high. An analysis of the joint dynamic pricing and inventory control problem of non-deteriorating items in a duopoly setting was done by Adida and Perakis (2010) and showed the existence of a Nash equilibrium in continuous time.

Two competing retailers with different cost structures selling non-deteriorating products, and addressing the problem of dynamic quantity competition was considered by Transchel and Minner (2011). An analysis is done by Chen et al. (2014) on the joint pricing and inventory control problem for perishable products with a fixed lifetime under an assumption that the inventories can be intentionally disposed of before they reach their maximum shelf life. A joint pricing, delivery study was proposed by Chen and Shi (2017) where in an inventory problem the customers can strategize their purchasing times.

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