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Chapter 5

Dynamic Pricing, Advertisement Investment and Replenishment Model for Deteriorating Items



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Abstract In practice, it is commonly observed that the quality and price of items are two important factors for customers to choose a product. The profit of a firm is greatly affected by these two factors, especially when their inventory has deteriorating items. Also, it is commonly observed that the product demand increases due to promotional efforts like advertisement through digital media, newspaper, etc. Thus, the spending on commercial promotion is a very crucial decision. This paper considers a replenishment model for perishable items with investment on promotion and retail price-dependent demand with a budget constraint. The deterioration rate is considered constant. An optimization problem is formulated in order to provide a pricing, promotional spending and replenishment policy, which maximize the total profit. Using Pontryagin's maximum principle, the optimal advertisement investment is obtained for a given retail price and cycle time. The closed form of the inventory level is obtained by solving the respective differential equation of inventory. The model is validated by a numerical example with hypothetical parameters in result section. The results show that the model is pretty stable and the concavity is proven graphically. The sensitivity analysis is performed in discussion section. The sensitivity analysis about key inventory parameters reveals some important managerial insights. Also, the future scope is given in conclusion section, which gives a brief idea about possible extensions of this model.

Keywords Inventory · Deteriorating items · Price-dependent demand · Advertisement investment · Budget constraint

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