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Optimal pricing and ordering policies for perishable commodities

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Abstract

In the pricing problem considered, a seller must determine the price for several units of a perishable or seasonal product to be sold for a limited period of time. The list price should be posted in advance of the sale and is not negotiable with potential buyers. Any product not sold by the end of the sales period will be disposed at a lower price. Assuming that the customer's demand is represented as a negative binomial distribution, we determine the optimal product price based on the demand rate, buyers' preferences, and length of the sales period. Because the seller's average revenue decreases as the number of items for sale increases, we also consider the optimal-order quantity that maximizes the seller's total expected profit. For the case where the seller can divide the sales period into several short periods, we finally propose a multi-period pricing model.

Keywords: Product pricing; Price posting; Optimal-order quantity; Perishable inventory

1. Introduction

Many industries, retailers, and service providers have the opportunity to enhance their revenues through the optimal pricing of their perishable products that must be sold within a fixed period of time. This is a fairly common situation, in practice, with seasonal products such as fashion apparel, which perishes at the end of the season. Among several reasons for this behavior are rapid changes in fashion and high inventory costs. The concept can be expanded to several other areas, including food products that perish when the expiration date is passed.

In all of these cases, the retailer can further improve its revenues by *dynamically* adjusting the sales price of a perishable product as the expiration date approaches and the inventory of the product diminishes. This situation arises, for example, in airline or hotel yield management. Travel agents also provide customers with current prices obtained from updated computer databases. However, it is not uncommon for the

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