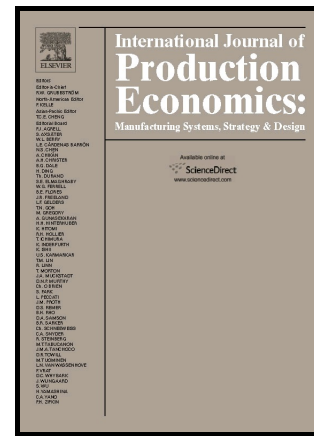


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## Optimal Discounting and Replenishment Policies for Perishable Products

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# Optimal Discounting and Replenishment Policies for Perishable Products

We consider a retailer, selling a perishable product with short shelf-life and uncertain demand, facing these key decisions: (a) whether to discount old(er) items, (b) how much discount to offer, and (c) what should be the replenishment policy. In order to better understand the impact of consumer behavior and shelf-life on these decisions, we consider four models. In Model A, the product has a shelf life of two periods and the retailer decides whether or not to offer a discount. The amount of discount is exogenous and assumed to be large enough so that all the customers prefer the old product to the new one when a discount is offered. Based on several numerical examples, we find that a *threshold* discounting policy, in which a discount is offered if and only if the inventory of old product is below a threshold, is optimal. In Model B, the retailer also decides how much discount to offer. Model C extends Model B and considers a *new pool* of customers who are willing to purchase from the retailer when a discount is offered. In both Models B and C, the product has a shelf-life of two periods while Model D explores what happens with longer shelf-life. We analyze and compare these models to present different managerial insights.

Keywords: retailing, discounting, perishable products, inventory based pricing.

## 1 Introduction

Discounting policies can have important strategic implications for retailers. Recently, JC Penney, a well-known departmental store chain in the US instituted a “no sale” policy by having “everyday low pricing” (EDLP) and getting rid of sales through coupons/discounts. However, they suffered a backlash because consumers were not impressed with the move and had to go back to their old pricing strategy (Mourdoukoutas 2013, Thau 2013, Kapner 2013). There are numerous other instances, e.g., perishable products such as milk and bread, where discounting is prevalent<sup>1</sup>.

The discounting decision, especially in the context of promotional pricing vs. EDLP, has been studied in the past, largely in the marketing literature (e.g., see Ellickson and Misra (2008), Lal and Rao (1997), and the references contained therein). These research works largely analyze the problem at the “macro level” by considering it at the firm/store level with a wide range of products and typically hundreds of stock keeping units (SKUs). They also generally ignore operational aspects such as inventory issues and a limited shelf-life of the product. In this paper, we perform a “micro level” analysis by examining the discounting decision at the product level in which we consider both the replenishment and discounting policies in conjunction. While some research (see

<sup>1</sup>Although apparel products (and also consumer electronics) do not physically decay over time, they do become obsolete quickly, are often discounted, and can be viewed as *perishable* products, especially in *fast fashion* scenarios.

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