Chapter 10
Pricing and Replenishment Policies for Imperfect Quality Deteriorating Items under Inflation and Permissible Delay in Payments

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ABSTRACT
Usually it is assumed that all items in a lot are of good quality, but in reality this assumption may not always be pertinent. Thus, the inspection of lots becomes essential in almost all organizations. Moreover, its role becomes more vital when the items are deteriorating in nature. Owing to this fact, this paper investigates the impact of initial inspection on retailer’s pricing and ordering policy for deteriorating items under inflation and permissible delay in payments using discounted cash flow approach over a finite planning horizon. Demand rate is assumed to be a function of selling price. The proposed model jointly optimizes the number of replenishments and price by maximizing the retailer’s total profit. Results have been demonstrated with the help of a numerical example, and sensitivity analyses are also presented to provide managerial insights into practice.

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1. INTRODUCTION

It is generally experienced that imperfect quality of goods has got direct implication on inventory management. This aspect has been recognized well but has not received the due attention of the researchers. The quantity received should be subject to 100% inspection in almost all types of concern and its role becomes more prominent when items are deteriorating in nature. Deterioration is a well established fact in literature, due to which utility of an item does not remain same over the period of time. Ghare and Schrader (1963) were first who presented an economic order quantity model for exponentially decaying inventory. Covert and Phillip (1973) extended the model with the assumption of weibull distribution deterioration. Thereafter, several interesting papers for controlling the deteriorating items have appeared in different journals (Dave & Patel, 1981; Sachan, 1984; Chung & Ting, 1994; Hargia & Benkherouf, 1994; Hargia, 1995; Chakrabarti & Chaudhuri, 1997, Wu et al., 2006).

Further, price is an obvious strategy to influence demand, therefore, inventory models for deteriorating items with price-dependent demand has received a significant attention in the literature. Specifically Lau and Lau (1988) designed a model in which demand can be increased by decreasing selling price. Polatoglu (1991) proposed a model in which the pricing and procurement decisions are determined simultaneously. Moreover, Khouja and Mehrez (1996) investigated a multi-product multi-discount constrained newsboy problem and provided an algorithm for solving the problem. Their model contains discount prices but not decision parameters. Chen and Chu (2001) considered a related production planning problem in which demand can be controlled via pricing strategies during the selling period. Wee (1997) studied an inventory model in which demand is price-dependent and inventory deteriorates at a varying rate, and proposed an algorithm for determining the maximum net profit. You and Chen (2007) developed an EOQ model of seasonal goods with spot and forward purchase demands. Additionally, Chen and Chen (2007) investigated periodic pricing and replenishment policy for continuously decaying inventory with multivariate demand. Since then many articles had appeared under different realistic situations (Arcelus et al., 2002; Jaggi et al., 2007; Mondal et al., 2003; You, 2006). Later, Jiangtao et al. (2009) explore the inventory replenishment policy for the kind of items in which the demand is sensitive to stock and selling price.

Most of the above inventory models work under the assumption that the payment will be made to the supplier for the goods immediately after receiving the consignment. But this assumption may not be true in the day-to-day dealing, as most of the supplier offer certain fixed period for settling the account in order to stimulate their demand. During this period, the supplier charges no interest, but beyond this period interest is being charged by the supplier under the terms and conditions agreed upon. Owing to this fact, during the past few years, a lot of research work has been conducted on inventory models with permissible delay in payment. Goyal (1985) presented the model by introducing permissible delay in payments for fixed time period. Aggarwal and Jaggi (1995) extended his work for deteriorating items.

The review article by Chang et al. (2008) gives a complete and up-to-date survey of published inventory literature under trade credits.

All the above articles are based on the assumption that the cost involved in inventory system remains constant over the planning horizon. This assumption may not be true in the real life, as many countries experience high annual inflation rate. As a result, while developing the inventory model, the effect of inflation cannot be ignored. Buzacott (1975) has developed an EOQ model with inflation subject to different types of pricing policies. Several other interesting and relevant papers exist in this direction (Datta & Pal, 1991;