Chapter 5
Deteriorating Inventory Model under Permissible Delay in Payments and Fuzzy Environment

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ABSTRACT

This paper deals with the problem of determining the EOQ model for deteriorating items in the fuzzy sense where delay in payments is permissible. The demand rate, ordering cost, selling price per item and deterioration rate are taken as fuzzy numbers. The total variable cost in fuzzy sense is de-fuzzified using the centre of gravity method. The solution procedure has been explained with the help of numerical example.

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1. INTRODUCTION AND RELATED LITERATURE

Inventory models with deteriorating items have been studied by researchers from time to time. Deterioration of an item occurs in the cases such as decay, evaporation, obsolescence, loss of utility or marginal value of a commodity, gasoline, fertilizers, different type of oils, milks, medicines etc.

In global market, supplier uses trade credit as a promotion tool to increase his sale and attract new retailers. So, in practice, the supplier will allow a certain fixed period (credit period) for settling the amount that the supplier owe to retailer for the items supplied. Before the end of the trade credit period, the retailer can sell the goods and accumulate revenue and earn interest. A higher interest is charged if the payment is not settled by the end of the trade credit period.


Chung (1998) presented the DCF (discounted cash flow) approach for the analysis of the optimal inventory policy in the presence of trade credit. Shah and Shah (1998) developed a probabilistic inventory model when delay in payment is permissible. Jamal et al. (2000) and Sarker et al. (2000) computed interest earned on the selling price and concluded that the retailer should settle his account relatively sooner as the unit-selling price increases relative to the unit purchase cost. Chang and Dye (2001) extended the model of Jamal et al. (1997) for time dependent deterioration. They assumed that the backlogging rate is inversely proportional to the waiting time.

Teng (2002) proved that it is beneficial for a well-established retailer to put order of smaller size and take the benefits of the permissible delay more frequently. Shinn and Hwang (2003) determined the retailer’s optimal price and order size simultaneously under the condition of order-size-dependent delay in payment. Huang and Chung (2003) extended Goyal’s (1985) model to discuss the replenishment and payment policies to minimize the annual total average cost under cash discount and payment delay from the retailer’s point of view. Chang et al. (2003) determined an economic order quantity model for deteriorating items in which the supplier offer a trade credit to the retailer if the order quantity is greater than or equal to a pre-specified quantity. Teng et al. (2005) developed the optimal pricing and lot sizing under permissible delay in payments by considering the difference between selling price and purchase quantity and demand to be price sensitive. Yang-Fu Huang’s (2007) developed easy to use procedure to find the optimal ordering policy for the retailer.
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