

RESEARCH PAPER

An inventory model for time dependent deteriorating items with holding cost as a quadratic function of time

ANIL KUMAR SHARMA* AND DIPTI VASDEV

Department of Mathematics, Raj Rishi Govt. Autonomous College, ALWAR (RAJASTHAN) INDIA

ABSTRACT

This paper deals with an inventory model in which shortages are allowed and partially backlogged. It is also assumed that the demand is a function of stock and selling price and the money value is subject to inflation.

Key Words : Inflation, Stock-dependent and selling price dependent demand, Deterioration, Shortages, Partial backlogging.

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In classical inventory models, researchers ignored deterioration in their models and they also assumed the demand rate to be constant. But in realistic situation, deterioration of items is an important factor in inventory that cannot be disregarded. There are many items in which deterioration depends on fluctuations of weather conditions, humidity, temperature, transportation etc. Further, no one can ignore the price sensitive nature of the demand. For example, in the retail industry, organizations may dynamically adjust their prices in order to boost demand and enhance revenues. More extensive reviews on price dependent demand rate were given by Eliashberg and Steinberg (1991), Gallego and Ryzin (1994). Thus, a more general and realistic system is one which considers the demand as a function of selling price. Deb and Chaudhari (1986) derived inventory models with time dependent deterioration rate. Aggarwal and Hashani (1991) developed a model for deteriorating items in decline market without shortages and production rate was known but varied from one period to another. Gupta and Aggarwal (2000) presented an order level inventory model with time dependent deterioration, demand as a linear function of time and

replenishment rate dependent on demand function. Sharma and Kumar (2000) carried out a simple study on deterministic production inventory model for deteriorating items with an exponential declining demand. Yang and Wee (2003) considered a multi-lot-size production inventory system for deteriorating items with constant production and demand rate. Sugapriya and Jeyaraman (2008) discussed an EPQ model for non-instantaneous deteriorating items in which production and demand, both were constant and the holding cost varied with time.

An inventory model is developed for time dependent deteriorating items and the demand is taken to be price dependent. The production runs with constant rate and holding cost varies with quadratic time function. Numerical examples are presented to demonstrate the developed model and to illustrate the procedure.

Assumptions and notations:

- The demand rate $R(t)$ is taken to be selling price dependent and is given by $R(t) = \alpha + \beta s$; α and β are positive constants and 's' is selling price per unit.

* Author for correspondence

Dipti Vasdev, Department of Mathematics, MITRC Engg. College, ALWAR (RAJASTHAN) INDIA