Chapter 13

Fuzzy Economic Production Quantity Model for Weibull Deteriorating Items with Ramp Type of Demand

M. Valliathal
Chikkaiah Naicker College, India

R. Uthayakumar
Gandhigram Rural University, India

ABSTRACT

This paper discusses an Economic Production Quantity model for Weibull deteriorating items over an infinite time horizon under fuzzy environment. Fuzziness is introduced by allowing the cost components such as setup cost, production cost, holding cost, shortage cost and opportunity cost due to lost sales to certain extent. Triangular fuzzy numbers are used to represent the mentioned costs. Optimum policies of the described models under fuzzy costs are derived. The proposed model can be extended in several ways. For instance, the deterministic demand function to stochastic fluctuating demand patterns could be considered. The model could also be generalized to allow for quantity discounts, as well as permissible delay in payments.

DOI: 10.4018/978-1-4666-2473-3.ch013
1. INTRODUCTION

For high tech products and fashionable commodities with short product life cycle, the willingness of the customer to wait for backlogging during a shortage period diminishes with the length of the waiting time. It has been assumed that the shortages in the inventory system are either completely backlogged or totally lost. However, it is reasonable to characterize that the longer the waiting for the next replenishment, the smaller the backlogging rate would be for many products with growing sales. The backlogging rate can be modelled on taking into account customer’s behaviour. Recent researches in this field include San José et al. (2006), Wu et al. (2006), Ouyang et al. (2006a, 2006b), Manna et al. (2007), Chern et al. (2008), Halim et al. (2008), Chung (2009), Skouri et al. (2009), and Manna et al. (2009).

Demand is the most important component of an inventory system. Inventories are kept so that demands may be met, orders filled, requirements satisfied. Inventory problems exist because there are demands; otherwise, we have no inventory problems. For long, inventory models have dealt with the case that demand is constant. Constant demands take place in the fully developed stage of the item. In practical life it is not possible. Demand of goods may vary with time or price or even with the instantaneous level of inventory displayed in a supermarket.

In reality, there are many situations where the demand rate depends on time. In the marketplace it is observed that the demand for inventory items increases with time in the growth phase, and decreases in the decline phase. The demand of some items, especially seasonable products like seasonable garments, shoes, etc. is low at the beginning of the season and increases as the season progresses, i.e. it changes with time. Hence, researchers commonly use a time-varying demand pattern to reflect sales in different phases of product life cycle. Silver and Meal (1973) published a lot-size model taking time-varying demand. Since then, several researchers have studied deteriorating inventory models with time varying demand under variety of modelling assumptions. After that Donaldson (1977), Bhunia and Maiti (1998), Chang and Dye (1999), Wee and Wang (1999), Zhao et al. (2001), Skouri and Papachristos (2003) and others developed their inventory models with dynamic demand.

We know that the items stored in the inventory are generally subject to deterioration. Commonly, inventory models deal with non-deteriorating items (i.e., items which never deteriorate) and instantaneous deteriorating items (i.e., as soon as they enter the inventory they are subject to deterioration). Some items gain more quality during their storage period known as ameliorating items.

Existing inventory models have dealt with the case that demand is either a constant or a monotonic function. Constant demands take place in the fully developed stage of the item and monotonic in the beginning or last stage of the cycle of life. In practical life it is not possible. The demands of fashionable goods increase up to a certain level and after that the demand becomes steady. Such type of demand functions are known as ramp type of demand. We know that demand is not always a monotonic function (i.e., items like fashionable goods) over a planning period and after a particular time it becomes steady. Researchers related to this field are Manna and Chaudhuri (2006), Panda et al. (2008), Mahata and Goswami (2009a), etc.

Here, it is considered that a manufacturer who produces and sells a single product over an infinite (or finite) time horizon faces a ramp-type of demand. Shortages are allowed and partially backlogged. The objective is to obtain the optimal policies that minimize the total cost. Comparative analysis between the models with partial backlogging rate and the models with completely backlogging rate through numerical results are made.

In the crisp inventory models, all the parameters in the total cost are known and have definite values. But in the practical situation it is not possible. Hence fuzzy inventory models fulfill that gap. Different fuzzy inventory models occur due to fuzzy various cost parameters in the total cost.
35 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the product's webpage:

www.igi-global.com/chapter/fuzzy-economic-production-quantity-model/70960?camid=4v1

This title is available in InfoSci-Books, InfoSci-Knowledge Management, Business, Administration, and Management, InfoSci-Business and Management, InfoSci-Select, InfoSci-Select, InfoSci-Select. Recommend this product to your librarian:

www.igi-global.com/e-resources/library-recommendation/?id=1

Related Content

Implementing a Cloud-Based Decision Support System in a Private Cloud: The Infrastructure and the Deployment Process
www.igi-global.com/article/implementing-a-cloud-based-decision-support-system-in-a-private-cloud/148625?camid=4v1a

Asset Management for Buildings within the Framework of Building Information Modeling Development
www.igi-global.com/chapter/asset-management-for-buildings-within-the-framework-of-building-information-modeling-development/176754?camid=4v1a

A Support System for the Strategic Scenario Process
www.igi-global.com/chapter/support-system-strategic-scenario-process/11326?camid=4v1a

Configuring Systems of Massively Distributed, Autonomous and Interdependent Decision Makers
www.igi-global.com/article/configuring-systems-massively-distributed-autonomous/69515?camid=4v1a