Chapter 6
Artificial Neural Network for Solving the Inventory Control Problem in Fuzzy Environments

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ABSTRACT

In this chapter, different inventory control problems are formulated in fuzzy environment and solved by artificial neural network. Due to present the non-linearity associated with the differential equation in fuzzy environment, the solution procedure may be very complicated. To avoid the situation, artificial neural networks play an important role. In this chapter, different inventory control problems are formulated in fuzzy environment and solved by artificial neural network. Due to present the non-linearity associated with the differential equation in fuzzy environment, the solution procedure may be very complicated. To avoid the situation, artificial neural networks play an important role.

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1. INTRODUCTION

An inventory is a stock of material or the finished goods which remains fixed at a specified time to respond to the demand under control of the optimization. Thus, inventory control is the study and maintenance of the inventory level to be minimized. The ultimate goals of these problems are to determine the optimal time and optimal order quantity subject to certain restrictions.

In practice, the economic production quantity (EPQ) model, is popularly usedfor its simplicity and effectiveness in inventory management. The classical EPQ modelintroduced by *Taft* (Taft, 1918)in 1918 has some drawbacks in it, which has been improved and generalized by several researchers in various direction. Different methodologiesare introduced toformulate and describe the EPQ models generally represented by differential equation. Also, there are several approaches to solve the EPQ model.

Though the classical EPQ model is very easy to describe and establish and also to optimize. But in some real-life problem the whole procedure i.e., mathematical modelling and the optimization of the problem. In this situation, Artificial Neural Network (ANN) is a much promising tool for the optimization of an inventory model. The most interesting matter is that ANN behaves like a model free estimator i.e., without the presence of a mathematical model, it can capture and model the input-output relationships. Till now, several works (Chat & Smith, 2002; Fonseca & Navaresse, 2002; Lotfi & Choueiki, 2000; Ntuen, 1991; Yildirim et al., 2006) such as Network reliability, production scheduling, lot size determination has been done successfully using the ANN. *Ali et al*. (Ali et al., 2011) developed an ANN model to forecast the optimal level of raw materials to feeding and testing data of a pharmaceutical company. *Paul et al*. (Paul & Azeem, 2011) developed an ANN model to determine the optimum inventory level of finished good with feed forward back propagation ANN. Inventory of a ready mixed concrete plants dealing with the fuzzy Neural Network approach management is investigated by Ravanshadnia et al. (Ravanshadnia & Ghanbari, 2014). There are several more papers (Khaldi et al., 2017; Kumar et al., 2014; Slimani et al., 2015) predicting demand using ANNs. The current chapter deals with a different approach of the study of artificial neural network on the inventory problem. Here, the classical EPQ model is revisited with a set of numerical data. The results given by the EPQ model is used to formulate and to test an ANN model. Also, a comparison between these two models is made to justify their relative performance.

The rest of the chapter is presented in the following manner: Section-2 describe briefly a general overview on the artificial neural network. In Section-3, the classical EPQ model is described. An ANN model forecasting the optimum order quantity as a function of demand, production rate, holding cost and the setup cost is developed