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# Contents

# Solving an Intractable Stochastic Partial Backordering Inventory Problem Using Machine Learning

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**Abstract.** This paper addresses the intractability of order crossover in a partial backordering inventory problem. Here, the Artificial Neural Network (ANN), which is a machine leaning algorithm is used to solve a stochastic inventory problem. The results for examining order crossover with the back-propagation ANN shows notable reduction in inventory cost in comparison to linear regression method. A numerical study is taken to demonstrate the findings. This paper further draws insight on effectiveness of machine learning in comparison to regression.

**Keywords:** ANN · Order crossover · Machine learning

## 1 Introduction

Success and progress of any business organisation depends on the good management of inventories, as there has been a significant amount of money is tied with the inventories. Due to globalization, demanding customers and recent advances in technology, such as machine learning, artificial intelligence, internet of things (IOT), online retail chains; businesses are striving hard to sustain in the market. In recent scenario, customers are remained no more loyal to a particular organisation as they have got numerous options to place their orders. Nowadays, customers prefer to place small orders frequently, in comparison to earlier occasional large orders. With the large businesses mostly using Just-in-time (JIT), leads to an upsurge in small and frequent ordering. This frequent ordering leads to crossover of orders. The scenario when orders receive in different sequence as they were placed is referred as order crossover [1]. There could be numerous reasons for order crossover. Some of the possible reasons include the availability of global suppliers, frequent ordering from retailers (downstream member) to suppliers (upstream members), distant locations of suppliers and retailers and the presence of different modes of transportation. Different delivery times of the suppliers, results in items being stockout and in excess inventory problems. Due to presence of order crossover inventory systems often becomes intractable. Presence of stochastic lead times of suppliers, increases the complexity of inventory systems, that leads to erroneous computation of order quantity and safety factor.

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