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Economic order quantity model for deteriorating items with planned backorder level

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ABSTRACT

In this study, a deteriorating inventory problem with and without backorders is developed. From the literature search, this study is one of the first attempts by researchers to solve a deteriorating inventory problem with a simplified approach. The optimal solutions are compared with the classical methods for solving deteriorating inventory model. The total cost of the simplified model is almost identical to the original model.

1. Introduction

The classical Economic Order Quantity (EOQ) and Economic Production Quantity (EPQ) have been extended by many researchers for decades. Approaches without using derivative have attracted much attention in recent years. Grubbström and Erdem [1] and Cárdenas-Barrón [2] were among the first researchers to derive EOQ and EPQ with backorders without derivatives, respectively. Later, Yang and Wee [3] and Cárdenas-Barrón et al. [4] developed a method without derivatives to solve an integrated vendor–buyer inventory system. EOQ problem with temporary sale price without derivative was developed by Wee et al. [5]. Chang et al. [6] used algebraic approaches to solve EOQ and Economic Production Quantity (EPQ) model with shortage. Sphicas [7] solved EOQ and EPQ with linear and fixed backorder cost. Cárdenas-Barrón [8] solved the EPQ with rework process using the algebraic method. Minner [9] introduced the cost-difference comparison method for solving the EOQ problem. Wee and Chung [10] extended the research by simplifying the solution procedure. Cárdenas-Barrón [11] applied the nonderivatives method to solve inventory problem in multi-stages multi-customers supply chain. Teng [12] developed arithmetic–geometric-mean-inequality theorem to solve EOQ problem without derivatives. He applied the theorem to EOQ with/without backorder, and EPQ with backorder. The arithmetic–geometric-mean-inequality approach was used by Ouyang et al. [13] and Teng et al. [14]. Ouyang et al. [13] solved an economic order quantity model with partially permissible delay in payments and defective items, and Teng et al. [14] solved an integrated vendor–buyer inventory model considering backorders. Cárdenas-Barrón [15] developed the EOQ/EPQ models using the arithmetic–geometric mean and Cauchy–Bunyakovsky–Schwarz inequality. A complete review of several optimization approaches used in inventory can be found in [16].

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