

# Supply Chain Networks Design for Deteriorating Items under Advance Payment and Backordering

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## Abstract

Advance payment has gained widespread use by businesses as a proactive measure to protect against unforeseen events. This paper designs a supply chain network for deteriorating items under advance payment and partial backordering, as well as for a situation in which shortages are not a factor. In each case, the solution to the mathematical model is presented for minimizing the total network cost. The models are illustrated with numerical examples, and sensitivity analysis is performed by varying the involved parameters. The computational results indicate that the greater the number of equal-sized parts by which we divide the prepayment period, the less the total network cost is.

*Keywords:* Inventory, supply chain network, advance payment, partial backordering, deteriorating items.

## 1. Introduction

In the present competitive market, there are situations in which if a retailer give an extra advance payment (AP) then he may get some price discount at the time of final payment. The use of advance payment by companies in supply chain networks is already extensive and continuing to grow. Besides, deteriorating Items (DIs) and shortage also become more and more common in today business. So that, how does advance payment effect to distribution network design for deteriorating items in case of shortage? There are no previous researches, which answer this question.

In previous research, several studies have presented integrated network design accounted for deteriorating items. Rau et al. [9] developed a multi-echelon inventory model for a deteriorating item to derive an optimal joint total cost from an integrated perspective among the supplier, producer, and buyer. Tang et al. [13] considered a supply chain network's design problem for deteriorating items involving a single supplier, some DCs, and multiple retailers. Liao et al. [7] presented a supply chain coordination's model for deteriorating items. Their lot-sizing coordination model involved one manufacturer and multiple retailers, with the retailers acting as the leader and manufacturer acting as the