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Abstract

In this paper, we consider three–stage inventory production system in three–layer supply chain with equal–sized shipments and incorporating raw material procurement. The vendor converts raw material, which is ordered from supplier, to finished product and delivers it to the buyer. We assume that the demand in buyer's side is stochastic and shortage is allowed. The objective is to minimise the expected total cost incurred by the vendor and the buyer. We derive expected total joint cost function and propose solution procedure to determine the optimal policy. Finally, we present numerical examples to illustrate the significance of cost reduction of the integrated model in comparison with independent model.

Keywords

inventory modelling, three–layer supply chains, stochastic, raw materials procurement, integrated models, supply chain management, SCM, expected total cost, cost reduction

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Integrated inventory model for three-layer supply chains with stochastic demand

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Abstract: In this paper, we consider three-stage inventory production system in three-layer supply chain with equal-sized shipments and incorporating raw material procurement. The vendor converts raw material, which is ordered from supplier, to finished product and delivers it to the buyer. We assume that the demand in buyer's side is stochastic and shortage is allowed. The objective is to minimise the expected total cost incurred by the vendor and the buyer. We derive expected total joint cost function and propose solution procedure to determine the optimal policy. Finally, we present numerical examples to illustrate the significance of cost reduction of the integrated model in comparison with independent model.

Keywords: inventory; three-layer supply chain; stochastic; raw material procurement; integrated model.

1 Introduction

The remarkable interest in integrated inventory model-related research in recent years has been due to its significant benefit to improve supply chain system collaboration and coordination, especially in reducing total system cost. If there exists no coordination, then each party will act individually to make decisions that minimise their own cost; this may not be optimal for the system. Parties in any stage of supply chain systems are realising that integrating inventory decisions through determining production and delivery decisions jointly is one of the best strategies to improve supply chain performance. The determination of lot sizing decisions that considers all parties' interest in supply chain system is known as joint economic lot size (JELS).