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Lower bounding inventory allocations for risk pooling in two-echelon supply chains

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Abstract

This paper addresses the effect of risk-pooling when a single supplier, or a depot, distributes a single commodity to multiple retailers in a two-echelon framework. The demands at the retailers are random and may possibly be correlated. Rather than shipping the full order of inventory from the warehouse at once to the retailer, shipments in two periods within an inventory cycle in a two-echelon format (under observation of real-time demand) yields improved system performance, both in terms of cost and inventory distribution in the system. A lower bounding inventory shipment policy is determined which is utilized to investigate the system performance under two simple heuristics. The allocation policies are based only on marginal distributions of retailer demands, yet, they are quite effective in our computational testing under demand probability distributions such as normal or negative exponential. Our computations also provide evidence that significant improvements in expected unfilled demand during an inventory cycle can be gained due to risk pooling in a two-echelon allocation policy.

key words : *Two-echelon supply chain, risk pooling, lower bounds and heuristics.*

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