Development of Inventory Policies Subject to Non-unit sized Demands

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Abstract

In most development of inventory management models, unit demand is assumed, in order to simplify problem complexity. However, in many cases, customers may demand more than one unit of item in one order. With non-unit sized demands, variations in demand increase as demand information moves from downstream to upstream in a supply chain. By neglecting non-unit demand, one may underestimate the magnitude of demand variations and the developed inventory models are less efficient.

This research considers a two-echelon inventory system where demand from end customers is assumed to be non-unit sized. Customer arrival rate is assumed to be Poisson distributed. The work of Matheus and Gelders (2000) is utilized to derive system cost functions under reorder-point, fixed-order-quantity (R, Q) and reorder-point, order-up-to (s, S) inventory policies. Search algorithms are developed to find optimal control parameter values with an objective of minimizing total system costs and constraints on customer service levels.

To explore the effect of non-unit demand, numerical experiment is conducted. Two scenarios with different demand patterns in terms of the batch size of demand are examined. The results show how inventory control policies and system costs are affected by various demand patterns.

Keywords: non-unit sized demands, inventory undershoot, inventory policy