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Modeling and analysis for determining optimal suppliers under stochastic lead times.

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Summary: The policy of simultaneously splitting replenishment orders among several suppliers has received considerable attention in the last few years and continues to attract the attention of researchers. In this paper, we develop a mathematical model which considers multiple-supplier single-item inventory systems. The item acquisition lead times of suppliers are random variables. Backorder is allowed and shortage cost is charged based on not only per unit in shortage but also per time unit. Continuous review (s, Q) policy has been assumed. When the inventory level depletes to a reorder level, the total order is split among n suppliers. Since the suppliers have different characteristics, the quantity ordered to different suppliers may be different. The problem is to determine the reorder level and quantity ordered to each supplier so that the expected total cost per time unit, including ordering cost, procurement cost, inventory holding cost, and shortage cost, is minimized. We also conduct extensive numerical experiments to show the advantages of our model compared with the models in the literature. According to our extensive experiments, the model developed in this paper is the best model in the literature which considers order splitting for n-supplier inventory systems since it is the nearest model to the real inventory system.

Keywords: order splitting; inventory; supply chain; multiple sourcing; random lead-time
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