

Analysis and management of periodic review, order-up-to level inventory systems with order crossover

ABSTRACT

In this paper we investigate the (R, S) periodic review, order-up-to level inventory control system with stochastic demand and variable leadtimes. Variable leadtimes can lead to order crossover, in which some orders arrive out of sequence. Most theoretical studies of order-up-to inventory systems under variable leadtimes assume that crossovers do not occur and, in so doing, overestimate the standard deviation of the realized leadtime distribution and prescribe policies that can inflate inventory costs. We develop a new analytic model of the expected costs associated with this system, making use of a novel approximation of the realized (reduced) leadtime standard deviation resulting from order crossovers. Extensive experimentation through simulation shows that our model closely approximates the true expected cost and can be used to find values of R and S that provide an expected cost close to the minimum cost. Taking account of, as opposed to ignoring, crossovers leads, on average, to substantial improvements in accuracy and significant cost reductions. Our results are particularly useful for managers seeking to reduce inventory costs in supply chains with variable leadtimes.

Keywords: Periodic Review Inventory Models, Leadtime Variability, Order Crossover