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Parametric replenishment policies for inventory systems with lost sales and fixed order cost

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In this paper we consider a single-item inventory system with lost sales and fixed order cost. We numerically illustrate the lack of a clear structure in optimal replenishment policies for such systems. However, policies with a simple structure are preferred in practical settings. Examples of replenishment policies with a simple parametric description are the (s, S) policy and the (s, nQ) policy. Besides these known policies in literature, we propose a new type of replenishment policy. In our modified (s, S) policy we restrict the order size of the standard (s, S) policy to a maximum. This policy results in near-optimal costs. Furthermore, we derive heuristic procedures to set the inventory control parameters for this new replenishment policy. In our first approach we formulate closed-form expressions based on power approximations, whereas in our second approach we derive an approximation for the steady-state inventory distribution. As a result, the latter approach could be used for inventory systems with different objectives or service level constraints. The numerical experiments illustrate that the heuristic procedures result on average in 2.4% and 1.8% cost increases, respectively, compared to the optimal replenishment policy. Therefore, we conclude that the heuristic procedures are very effective to set the inventory control parameters.

Keywords: inventory management, lost sales, order cost, replenishment policy

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