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Procurement strategies for lost-sales inventory systems with all-units discounts. (English)

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Summary: Despite the prevalence of all-units discounts in procurement contracts, these discounts pose a technical challenge to analyze procurement strategies due to neither concave nor convex ordering costs. In this paper, we consider the optimal procurement strategies with all-units discounts under the lost-sales setting. By assuming log-concave demands, we find that the optimal procurement strategies have a generalized Q-jump (s, S) structure by introducing a new notion of Q-jump single-crossing. In particular, a sufficient condition is provided for degenerating the optimal procurement strategies from a generalized Q-jump (s, S) structure into a Q-jump (s, S) structure, which is definitely optimal for the single-period problem. Extensive numerical results suggest that the Q-jump (s, S) policy as a heuristic performs considerably well when its optimality sufficient condition is violated. Our results can be extended to systems with multi-break all-units discounts, and systems with all-units discounts on batch ordering.

MSC:

90B05 Inventory, storage, reservoirs

Keywords:

inventory; procurement strategy; all-units discounts; quasi-convexity; Q-jump single-crossing

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