An integrated model for lot sizing with supplier selection and quantity discounts

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Abstract

Good inventory management is essential for a firm to be cost competitive and to acquire decent profit in the market, and how to achieve an outstanding inventory management has been a popular topic in both the academic field and in real practice for decades. As the production environment getting increasingly complex, various kinds of mathematical models have been developed, such as linear programming, nonlinear programming, mixed integer programming, geometric programming, gradient-based nonlinear programming and dynamic programming, to name a few. However, when the problem becomes NP-hard, heuristics tools may be necessary to solve the problem. In this paper, a mixed integer programming (MIP) model is constructed first to solve the lot-sizing problem with multiple suppliers, multiple periods and quantity discounts. An efficient Genetic Algorithm (GA) is proposed next to tackle the problem when it becomes too complicated. The objectives are to minimize total costs, where the costs include ordering cost, holding cost, purchase cost and transportation cost, under the requirement that no inventory shortage is allowed in the system, and to determine an appropriate inventory level for each

planning period.
The results demonstrate that the proposed GA model is an effective and accurate tool for
determining the replenishment for a manufacturer for multi-periods.

Keyword：Genetic algorithm; Lot sizing; Supplier selection; All-units quantity discount; Incremental quantity discount