An Optimal Algorithm for Finding (R, Q) Policy in a Price-Dependent Order Quantity Inventory System with Soft Budget Constraint

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Abstract : This paper is concerned with the single-item continuous review inventory system in which demand is stochastic and discrete. The budget consumed for purchasing the ordered items is not restricted but it incurs extra cost when exceeding specific value. The unit purchasing price depends on the quantity ordered under the all-units discounts cost structure. In many actual systems, the budget as a resource which is occupied by the purchased items is limited and the system is able to confront the resource shortage by charging more costs. Thus, considering the resource shortage costs as a part of system costs, especially when the amount of resource occupied by the purchased item is influenced by quantity discounts, is well motivated by practical concerns. In this paper, an optimization problem is formulated for finding the optimal (R, Q) policy, when the system is influenced by the budget limitation and a discount pricing simultaneously. Properties of the cost function are investigated and then an algorithm based on a one-dimensional search procedure is proposed for finding an optimal (R, Q) policy which minimizes the expected system costs .