

Inventory management under supply and demand uncertainty using MDP formulation

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To determine the inputs into the production system, we need to manage the inventories for raw materials considering demands of intermediate products. There are two significant issues for the inventory management; first, both supply and demand uncertainty should be considered for long-term operation; second, purchasing raw materials from multiple external vendors is generally a multiple criteria decision making. In these cases, decision cannot be made by intuition or heuristic approaches. Therefore, in this study, we apply a systematic approach to consider diverse criteria for supplier selection and to incorporate possible realizations of uncertainty into the decision-making process at the same time. This problem is formulated as a Markov decision process (MDP) with two exogenous information variables: lead time and demand. Also, Markovian demands are considered to capture the time-correlation in randomly changing condition. An optimal policy is obtained from solving the MDP problem through value iteration, and its usefulness is verified by comparing its performance against those of other heuristic policies for a simple benchmark problem.