

# Simulation Analysis of VMI Policies for the Multi-Period IRP with Stochastic Demands

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## Abstract

The supply-chain-to-supply-chain business competition model creates the Vendor Managed Inventory (VMI) management model for the retailers. The previous studies show that most of the conventional inventory management strategies apply fixed-quantity or order-up-to-level supplement methods, rarely mentioning the impact of supplement quantity cutting or non-order-up-to-level strategy on the total cost of the inventory routing of VMI management model. This study proposes the inventory management strategy with supplement threshold and upper limit, builds an inventory management model by the systematic analogical method and analyzes the effects of the inventory management strategy with combinations of different supplement thresholds and upper limits on the total cost of the inventory routing as well as the relatively changing situation of the inventories and transportation costs of the suppliers and retailers in a two-phase supply chain system of one supplier and multiple retailers under the condition that the demand time point and demand quantity of the retailers' customers are fixed and undetermined. When the system simulates the supplier to execute the inventory management, it firstly applies the supplement threshold after each supplement cycle to update the minimum inventory level, thus determining the collection of the supplement objects for the next supplement cycle and secondly determines the supplement quantity based on the upper limit of supplement. After that, it works out the optimal routine for supplement delivery and calculates the total cost of the inventory routing for the supplement cycle by linear programming method based on the analogue results. The study results indicate that the inventory management strategy combining the supplement-quantity-cut upper limit of supplement with the slightly-raised supplement threshold can effectively reduce the total cost, improve the vehicle utilization rate

and maintain a certain service performance; moreover, it can delivery the supplement to more retailers during the supplement cycle to offer a new inventory routing management strategy for reference by the practitioner when making decisions.

Keyword : VMI, Multi-Period IRP, Replenishment, Stochastic