The impact of forecasting methods on the performance of inventory control policies with joint replenishment

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Abstract

Most of the research on inventory control is focused on the replenishment of single items. However, considerable savings can be achieved in many practical multi-item inventory systems by the coordination of replenishment orders for groups of items. Coordinated or joint replenishment inventory models are used whenever a number of items are involved in a replenishment and it is possible to share the fixed cost associated with the replenishment. Ordering items jointly reduces the ordering cost and may enable utilization of the same transportation facility and/or group quantity discounts.

Both deterministic and stochastic models for joint replenishment exist. In deterministic joint replenishment inventory systems the problem is to determine the frequency of replenishing individual items. In stochastic models, demand behaviour is the basic source of uncertainty. The joint replenishment inventory control policy with stochastic features can be stated as follows: For a group of items, when the inventory position of an item reaches the must-order point, a replenishment is triggered to raise the item's inventory position to its order-up-to level. Meanwhile, any other item in the group with an inventory position at or below its can-order point is included in the replenishment as to raise the inventory position to the order-up-to level.

This research investigates the effects of joint replenishment on total costs and performance of inventory systems. Several inventory systems that use different forecasting methods and inventory management policies are considered. A simulation model is built in order to investigate these effects. The experimental design includes two forecasting methods: simple exponential smoothing and moving average. The inventory management policies make use of fixed review-time periods. Two alternative policies are studied: reorder point method with a fixed order quantity policy, and reorder point method with an order-up-to-level policy. The output of the simulation model will also be used to serve as a guide for parameter settings of both the forecasting methods and the inventory management policies.

Keywords: forecasting, inventory management, simulation, joint replenishment