A STOCHASTIC INVENTORY MODEL FOR THE STOCK VERSUS NON-STOCK DECISION

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ABSTRACT

The most fundamental decision in inventory management is whether or not to stock a particular item. Despite its importance, the preponderance of the literature on inventory systems is concerned with how much to order and when to order which assume the stocking decision has been made. In this research we examine an inventory stocking decision model that is based upon an item's demand history. In this model every item must earn its way into the catalogue of stocked items by receiving a given number of demands over a specified time period and will likewise be de-stocked and taken out of the catalogue (or burned) if it receives fewer than a given number of demands over a specified time period. We show the stability of such a policy and discuss implications for its use by firms that compete on product assortment. This research should be of interest to the Department of Defense as well as commercial firms that have large numbers of items in their product catalogues.

INTRODUCTION

The decision of whether or not to keep any particular item in stock is a decision that is simultaneously strategic and tactical. For the military, the stocking decisions has significant implications for determining warehouse size and configuration, personnel required to manage the facility, and the response time for fulfilling orders particularly when the demand for an item is highly uncertain. In the commercial sector, the stocking decision not only defines the business in which the firm operates and how it intends to compete but also drives operational costs beyond those that might be incurred by merely listing an item in the firm's catalogue. Stocking decisions across different firms can be highly idiosyncratic with sales, marketing, product development, finance, manufacturing, and distribution all having some degree of voice in the decision. We explore a velocity-based inventory policy whereby items must earn their way into the catalogue of stocked items by having a specific number of demands occur within a stated time period. Correspondingly, any item that does not have a minimum demand rate over a stated time period will be burned or taken out of the product catalogue. This earn or burn policy has been observed in practice in large industrial distribution operations where the strategic objective is to compete on a high level of service and there are implications for large depot warehouse management as well as the management of inventory in austere environments where space humidity and other controlled space comes at a premium.

MANAGERIAL INSIGHTS AND CONCLUSIONS

We show the steady-state number of items stocked from a given catalogue of stock keeping units (SKUs) as well as determine both the mathematical and managerial stability of an inventory policy that

is based upon the demand rate, or velocity, of multiple items. This policy is in use at a large industrial organization that carries hundreds of thousands of SKUs.

The policy we have discussed is not for new items or items being phased out as part of a product life cycle management process but rather for items that are in a mature, or stable phase, of their life cycle. The stock/nonstock decision is fundamental decision that is both strategic and tactical in nature. The designation of an item as stocked or nonstocked has implications for warehouse size and configuration as well as the number of personnel requirement to manage the inventory and the amount of working capital the firm will hold. The stock/nonstock decision also determines customer response time; whether an item is make-to-stock, assemble-to-order, or make-to-order will all likely have different lead times associated with them.

FUTURE RESEARCH

Future research of the stock/non-stock policy may include determining when the policy is stable or unstable for specific items. Additionally, a cost model may be developed to refine the model to allow management and leadership to identify those items that should be stocked even when their demand volume is low and uncertain.