

Title

THE RETURN-MAXIMIZING BLEND OF REUSABLE ITEMS/SERVICES WITH STOCHASTIC DEMAND AND PROVIDERS WITH PRICE DIFFERENTIALS

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Abstract

Most companies hold an inventory of reusable items that they need either for production or services. For instance, an organization with expenditures on land-line to mobile-phone calls may consider purchasing a number of reusable bypasses to reduce these expenditures. Bypasses re-route calls to a telephone company that provides a discount for unit of time connection in exchange for a high volume or total time connection. When all bypasses are busy servicing calls, a call to a mobile phone will be routed via a limited number of overflow land-lines. Similarly, a mining service company that operates a delivery service owns trucks to ship from a warehouse to its mining company customers. Such a company may consider purchasing new trucks to reduce operation costs, when operating new trucks is cheaper than operating old ones. That is, a company can save on future operational expenditures at the cost of purchasing new trucks. Telephone lines, bypasses in particular, and trucks are re-usable items because once a call or a delivery has been completed these items become available to service the next request. We call inventory the ensemble of reusable items, bypasses or overflow lines, and trucks, new or old. In this framework, the inventory consists of two sub-inventories: the first is the sub-inventory of items with low operational costs (bypass lines and new trucks), call them type-L items, and the second is the sub-inventory of items with high operational costs (overflow lines and old trucks), call them type-H. It is preferable to operate type-L items than type-H. Hence, type-H items enter service only when all type-L items are busy. For a given time horizon, the cost of the project is a trade-off between the total use of trucks and the number of type-L items to purchase.

This talk presents a novel method to determine the number of type-L items to purchase that maximizes the expected present value of the project. It uses historical information on hour-specific expected intensities of requests and of length of services.