

Public Procurement of Multiple Health Products: The Dynamic Inventory Budget Allocation Problem

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The goal of this paper is to provide guidelines to grant recipients on how to allocate disease-specific procurement budgets between different health products. We use field data from the Global Fund to Fight Aids, Tuberculosis and Malaria to build a data-driven inventory model and study the dynamic inventory budget allocation problem. Motivated by their use in multi-armed bandit problems, we derive product-specific index functions approximating the benefit of ordering a marginal unit of a product. We show that using the proposed index functions is optimal in multiple special cases of the problem with no holding costs and is asymptotically optimal in a regime of a large number of products or in a regime of high budget. Through an extensive numerical study, we show that following the index policy typically leads to a cost within 5% of optimality and vastly outperforms other policies such as a base-stock, myopic or constant order quantity policies. Furthermore, in the special case of full backlogging for all products, adapting our index policy to include holding costs outperforms those proposed by [1] and [2] for sufficiently small holding costs. The proposed index policy provides a novel approach to resource allocation in capacitated inventory systems. Applying the index policy leads to 3.2 to 5.6 times stockout reduction when applied to our motivating field data.

References

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