University of Chicago Booth School of Business

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Title: Approximation algorithms for Stochastic Inventory models: Two applications in industry

Abstract:

In this talk, we look at two well known and somewhat well studied stochastic inventory problems. The first is a periodically reviewed Random Yield problem with correlated yield and correlated demand. This problem is known to be hard. In fact, the standard random yield model with i.i.d. problem parameters is itself unwieldy and a host of numerical recipes have been proposed in the literature. We use a variant of the so-called linear inflation heuristic to construct the first known approximation algorithm with a constant guarantee to the yield problem. We then discuss its application to a capacity and inventory management problem with a partner firm, Dow Agro Sciences. The second is a periodically reviewed stochastic inventory problem with N products where demand is random and products share a common capacity. Instances of this problem where no restrictions are imposed except that demands are independent over time are known to be NP-Hard and beyond the obvious implications of convexity, not much is known about the optimal policy. We propose a class of weighted shortfall based policies and show their theoretical properties and performance against a lower bound. We discuss an application to the B.C. Children's hospital, where we use some of these results and insights to manage surgical capacity for elective surgeries.