Title: Managing inventory for a multi-divisional corporation with cash pooling

Abstract:

Cash pooling is a powerful management tool that allows each division’s cash balance to be transferred to a single account managed by the corporate treasury. While the reported benefits of cash pooling are associated with the reduction of transaction and financing costs, the value of cash pooling is not clear from a perspective of improving operational efficiency. In this paper, we examine the benefit of cash pooling on inventory replenishment for a corporation with multiple divisions, each replenishing inventory to meet its local demand while receiving cash payments from customers in a finite-time horizon. The corporation can reserve part of the cash for purchasing inventory, and the rest for external investments that yield a positive return. There are holding costs for the on-hand inventory and unfilled demands incur backorder costs. The objective is to obtain the optimal joint cash retention and inventory replenishment policy that maximizes the expected net worth (equity). We show that the problem is equivalent to minimizing the expected total cost, consisting of the cash-related costs and the inventory-related costs. We formulate this problem into a dynamic program. Due to curse of dimensionality, we provide a simple and effective heuristic derived from the construction of a lower bound to the optimal value function. Our lower bound improves the so-called Lagrangian-relaxation bound and the induced-penalty bound in the literature. A numerical study suggests that the value of cash pooling is most significant when the demands are increasing and negatively correlated between the divisions. Our solution approach can be applied to the classic one-warehouse-multi-retailer inventory system with non-stationary demands. The resulting lower bound outperforms those in the multi-echelon literature. This stream of research leads to a new online simulation game, called Cash Beer Game, which incorporates cash flows into the standard Beer Game. I shall demonstrate this online game at the end of this talk. Here is a link to the teaching materials: http://cashbeergame.com