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Transformation of optimization problems in revenue management, queueing system, and supply chain management

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Abstract

For revenue optimization problems in the literature on revenue management, supply chain management, and queueing systems, some assumptions (such as concavity of revenue functions or increasing generalized failure rate) are often needed to ensure the problems to be analytically tractable. We show that these assumptions are not necessary. For this, we present and study a parametric revenue maximization problem to unify some problems in the literature. Without the usual assumptions, we transform the problem into an equivalent one where the revenue function is increasing, continuous and concave. We then apply the transformation method to a continuous time revenue management problem and conclude that the monotone results are robust to demand function and allowable price set. Also, we apply the transformation method to study a parametric cost minimization problem. We further apply our method to two optimal control problems in queueing systems and an inventory control problem in a supply chain with price-only contract.

Keywords: Revenue management; Revenue maximization problem; Cost minimization problem; Assumptions; Optimization in queueing systems; Supply chain.

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