Abstract:
Inventory-based pricing under lost sales is an important, yet notoriously challenging problem in the operations management literature. Since the first attempt to solve this problem in the mid-fifties, the existing analyses are still limited to either single-period or long-term stationary models with restrictive assumptions on the price-demand relationship. We start with summarizing the latest developments on the single-period problem, pointing out the limitations and proposing an alternative approach to tackling this problem. In particular, we show that, under very general conditions on the demand function, the objective function is concave along the optimal price path provided that the price is decreasing in the post-order inventory level. The concavity of the single-period problem, however, does not imply the concavity of the multi-period problem. Using properties of stochastic functions, we derive a set of general conditions on the demand function under which the dynamic problem is concave along the optimal price path whenever the optimal price is decreasing in the inventory level. These conditions are general enough to cover both (stochastically) concave and convex demand functions. A decreasing price path, though not always optimal, is practically appealing and intuitive to implement. In the case when the optimal price is not monotone in the post-order inventory level, we identify a bounded set of candidate decreasing price paths, along which the objective function is concave. Any decreasing price path outside of this set would lead to a lower expected profit than some path within the set. Our extensive numerical testing suggests that the restriction of decreasing price path does not lead to a significant optimality gap---The optimal price path is indeed decreasing in most instances and, even when it is not, the profit loss is very marginal.
this is a joint work with Qi Annabelle Feng and Sirong Luo.

Bio:

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All are welcome!