

The University of Chicago Booth School of Business

Operations Management/Management Science Workshop

Tuesday, November 22, 2016

Professor Linwei Xin, University of Illinois at Urbana-Champaign

Title: Beating the Curse of Dimensionality in Inventory Problems with Lead Times

Paper Links:

[Optimality Gap of Constant-Order Policies Decays Exponentially in the Lead Time for Lost Sales Models](#)

[Asymptotic optimality of Tailored Base-Surge policies in dual-sourcing inventory systems](#)

Abstract:

Many classical inventory models become notoriously challenging to optimize in the presence of positive lead times, since the state-space blows up and dynamic programming techniques become intractable. This includes, for example, lost sales models with positive lead times, and dual-sourcing models with positive lead time gap between the two suppliers. In this talk, we will present a new algorithmic approach to such problems, which shows that as the lead time grows large, simple policies become asymptotically optimal. These results are quite surprising, as this setting had remained an open algorithmic challenge for over forty years. In particular, we will show that a simple constant-order policy is asymptotically optimal for lost sales models with large lead times, and provide explicit bounds on the optimality gap which demonstrate good performance even for small-to-moderate lead times. We will also show that the so-called Tailored-Base Surge heuristic for dual-sourcing problems is asymptotically optimal as the lead time gap between the two sources grows large. In both cases, our results provide a new algorithmic approach to these problems, as well as a solid theoretical foundation for the good performance of these algorithms observed numerically by previous researchers. Moreover, we will talk about the implementation of Tailored-Base Surge policies at Walmart.com.

This is joint work with David A. Goldberg (Georgia Tech) and @WalmartLabs.

Bio:

Linwei Xin is an assistant professor of Industrial and Enterprise Systems Engineering at UIUC. He received his Ph.D. in Operations Research from Georgia Tech in 2015. His research focuses on supply chain, inventory and revenue management, optimization under uncertainty, data-driven decision-making, and personalization. His work has been recognized with several INFORMS paper competition awards, including First Place in the 2015 George E. Nicholson Student Paper Competition, Second Place in the 2015 JFIG Paper Competition, and a finalist in the 2014 MSOM Student Paper Competition. He won a \$330,654.00 NSF grant as PI. He also accomplished teaching with distinction (by being ranked excellent in U of I's List of Teachers).