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Multi-echelon Supply Chain Inventory Optimization

Abstract:

Determining appropriate inventory levels at each node of a multi-echelon supply chain in order to guarantee customer service levels is a challenging task for supply chain planners because of the complexities that arise due to various sources of uncertainties. In this seminar, I will discuss various concepts and ideas we have explored while working on such problems at Dow Chemical. Starting with single-echelon systems, I will demonstrate how conventional type-II service level models become inaccurate for practical systems that review inventory periodically, though frequently but not perpetually, because they fail to capture the undershoot caused by such periodic inventory monitoring, and will present an improved model. Various challenges presented by the multi-echelon systems for inventory assessment will be highlighted. Mathematical programming based multi-echelon inventory optimization models developed in the literature quantify uncertain demand or lead time assuming a Normal or Poisson distribution. I will demonstrate how such assumptions can severely impact and underestimate optimal inventory, and discuss the drawbacks of mathematical programming approaches. A novel simulation-optimization framework will be presented that not only generates more accurate results by bootstrapping historical data, but is also versatile to capture non-standard inventory policies and decisions. The discussion will be supported using a few business case studies from Dow Chemical.

Biography:

Anshul Agarwal is an Associate Research Scientist in Core R&D in The Dow Chemical Company with his research focused on application of computational methods, statistical data analysis, discrete event simulation, and operations research to production planning, batch scheduling, supply chain optimization, and various other R&D and manufacturing problems. He is a certified Six Sigma Green Belt Project Leader. Dr. Agarwal earned his PhD in Chemical Engineering from Carnegie Mellon in 2010 and his Bachelor of Technology from the Indian Institute of Technology Delhi.

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