Overview

In this optimization problem we develop models for the joint supply chain design and stochastic inventory management problem[1]. By assuming normally distributed demands, we develop equivalent deterministic optimization models. The models simultaneously determine the supply chain design decisions including the locations of distribution centers (DCs), assignment of retailers to DCs, shipment levels from supplier to DCs and from DCs to retailers, and inventory decisions including working inventory, safety stock, order quantity and reorder point. The models also capture risk-pooling effects by consolidating the safety stock inventory of retailers at DCs.

Two nonconvex mixed-integer nonlinear programming (MINLP) formulations of this problem are introduced. (P1) is a "bad" formulation that is a straightforward model in which all the 0-1 variables are declared as integer, and equations are written in compact form but involving products of discrete and continuous variables. (P2) is a "good" formulation in which a subset of 0-1 variables are treated as continuous variables based on a theoretical analysis, and equations are simplified by proper formulation. Data for one instance is presented to illustrate the application of the models and compared their computational efficiency using BARON.

Reference

You, F. and I.E. Grossmann, "Mixed-Integer Nonlinear Programming Models and Algorithms for Large-Scale Supply Chain Design with Stochastic Inventory Management," submitted for publication (2008).