Integrated supply chain planning under uncertainty using an improved stochastic approach

ABSTRACT

This paper proposes an integrated model and a modified solution method for solving supply chain network design problems under uncertainty. The stochastic supply chain network design model is provided as a two-stage stochastic program where the two stages in the decision-making process correspond to the strategic and tactical decisions. The uncertainties are mostly found in the tactical stage because most tactical parameters are not fully known when the strategic decisions have to be made. The main uncertain parameters are the operational costs, the customer demand and capacity of the facilities. In the improved solution method, the sample average approximation technique is integrated with the accelerated Bendersô decomposition approach to improvement of the mixed integer linear programming solution phase. The surrogate constraints method will be utilized to acceleration of the decomposition algorithm. A computational study on randomly generated data sets is presented to highlight the efficiency of the proposed solution method. The computational results show that the modified sample average approximation method effectively expedites the computational procedure in comparison with the original approach.

Keyword: Supply chain network design; Stochastic programming; Sample average approximation; Combinatorial optimization; Bendersô decomposition; Surrogate constraints