An exact algorithm for the Stochastic Inventory Routing Problem with Transshipment

**Objective**

Minimize the distribution and inventory cost during the planning horizon as well as the expected lateral transshipment cost of recourse actions, in order to avoid stock-out occurrence at any retailer.

**First Stage Decisions**

1. When to serve a retailer.
2. How much to deliver to retailer when served.
3. Which delivery route to use.

**Second Stage Decisions**

1. Which retailer will facilitate the transshipment process.
2. How much to transship to avoid shortages.

**Contribution**

- Introduce a formulation for the SIRP as a stochastic programming model with recourse using transshipment as recourse action.
- Introduce new valid inequalities to enhance the computational process of the optimal transported quantities under Maximum Level policy.
- Use Bender Decomposition to incorporate demand uncertainty in the context of Production Routing Problem.

**Reference**

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**Results**

- Algorithm was coded in C++ using Concert Technology and CPLEX 12.4.
- Benchmark instances of Arhetti et al. (2007) were used to evaluate the proposed valid inequalities.

**Conclusions**

- Computational experiments indicate that the decision of accounting for forthcoming period demand to determine the delivered quantities improves the optimal value by an average of 15%.
- Transshipment was proved to be a powerful recourse action when demand uncertainty exists.

**More Information**

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