Bootstrap Enhanced Scenario Optimization, a Case Study in Two-Echelon Logistics for Large-Scale Retail

Integration of bootstrapped autoregressive models and scenario-based optimization in a real-world logistic case study

The case study is based on a 2-echelon supply chain with retail stores allocated to distribution centers (DCs).

The problem was to minimize the allocation cost and the corresponding aggregated demand to each DC when the retailer requests are forecast based on historical data.

This process allows us to determine the inventory required to be stocked in each DCs, and consequently the size needed to hold it.

We propose grounding the forecasting phase on bootstrapped autoregressive models, which demonstrated effectiveness compared to alternative methods.

The bootstrapped series are used to generate scenarios, which in turn are incorporated into a deterministic equivalent formulation.

The problem is an instance of allocation with split assignments. The results demonstrate the effectiveness of the approach for the presented use case and for a general benchmark.

The approach has a validity that extends beyond the case study forming the basis of a more general framework for prescriptive analytics called Bootstrap Enhanced Scenario Optimization (BESO).

Livio Fenga, *University of Exeter Business School*, Vittorio Maniezzo, *University of Bologna*