Robust solutions for the Inventory-Routing Problem with uncertain travel times

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Abstract

We assess an inventory routing problem (IRP) where a supplier distributes a single product to multiple customers under uncertain travel times. The travel times are independent and symmetric random variables that take values in an interval around their nominal value. Based on the concepts of 'The Price Of Robustness' of Bertsimas and Sim, we develop a robust optimization model for the problem that allows to control the degree of conservatism of the solution. We demonstrate how the valid inequalities that exist for the IRP can be adapted for the robust IRP (RIRP). Furthermore, we present a Benders' decomposition-based matheuristic to solve the problem effectively. Experimental results confirm the success of this approach compared to other robust optimization techniques.

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