Resilient supply chain network design under disruption and operational risks

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Abstract

Nowadays, supply chain resilience has drawn widespread attention from academics and practitioners due to the high likelihood of operational risk and the destructive consequence of disruption risk. However, the studies on resilient supply chain design considering these two types of risks are limited. Furthermore, how to quantify the uncertainty arising from the lack of historical data in the planning stage is not sufficiently studied. Aiming at these problems, this paper presents two uncertain programming models that optimize the strategic decisions before disruptions and supply chain operations after disruptions. The presented models introduce p-robustness measure to bound the cost in disruption scenarios. Besides, uncertainty theory is adopted to handle parameter uncertainty in the absence of historical data. Later, these two programming models are converted into their corresponding deterministic equivalents, which can be solved by cplex. Finally, we illustrate the validity and feasibility of the proposed models and explore the impact of critical parameters on the optimal solution by implementing a series of randomly generated instances and a practical case. The observations may provide some interesting managerial insights for decision-making in reality.

Full Text

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Figures

Figure 1

The supply chain network

Figure 2

The objective value at different α when $S=30$

Figure 3

The objective value at different α when $S=60$

Figure 4

Optimal locations under different capacity limitation

Figure 5

The objective value under different capacity limitation

Figure 6

Optimal locations under different extent of damage

Figure 7

The objective value under different extent of damage