

Coordination in Supply Chain through Option Contract under Disruption risk

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Both natural and man-made disasters, called disruption risks, may interrupt the in-bound supply of a firm, which adversely affect the firm's short term and long term profit. Supply contract is one of the strategies to manage such kind of risks. In this research, we investigate coordination issues in a two-stage supply chain consists of a firm (buyer), two low-cost unreliable main suppliers facing disruption risk, a high-cost reliable backup supplier, and a spot market. The buyer purchases short life-cycle product from the main suppliers to satisfy uncertain market demand. However, due to disruption, the main suppliers are unable to deliver the exact quantity. Therefore, the buyer is coordinating with the backup supplier through option contract to share supply and demand uncertainty. In case of further shortage, the buyer also uses a spot market. The study proposes option contract based strategies to assist buyer's order allocation and backup supplier's production decision. We study three settings; first, a centralized solution as a benchmark; second, we explore decentralized setting where the buyer signs wholesale price contract with the backup supplier, and third, we reconstruct the optimization problem through option contract with the backup supplier. Under option contract with voluntary compliance regime, we have two strategic situations depending on whether the buyer or the backup supplier is the market leader. We compare different settings through numerical examples. Our findings show that option contract can achieve supply chain coordination even if the probability of disruption and demand uncertainty are high.

References

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