

A bilevel approach to enhance flexibility in retailer-supplier agreements for perishable products

One key condition in these retailer-supplier agreements is the Minimum Life On Receipt (MLOR) rule, which defines the maximum product age acceptable by the retailer to pay the full price. In this study, we propose a model that helps negotiate the retailer-supplier agreement's conditions to make them more flexible. Specifically, we define the share of orders that may be accepted by the retailer beyond the MLOR at a discount.

We formulate the problem as a bilevel program considering the individual objectives of the retailer (leader) and the supplier (follower), as well as a consumer demand driven by prices and product freshness. The bilevel problem is solved with a reformulation-and-decomposition algorithm. We compare the supply chain benefits of solving the bilevel program with those of optimizing the retailer's and supplier's objectives jointly in a centralized approach. We also compare it with the standard contracted terms, in which products are returned if the supplier fails to comply with the MLOR. Our results highlight the advantages of adopting these flexible agreements, with an average increase of profits of up to 4% for the retailer and up to 13% for the supplier. We also provide suggestions on how to design a new clause in these agreements according to consumer demand variability and the retailer's order frequency.

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