

OPTIMIZED ORDERING STRATEGY FOR FOOD SUPPLY CHAIN WITH BIDIRECTIONAL OPTIONS

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ABSTRACT. *To reduce the uncertain risk for the short life cycle and improve the flexibility of the food supply chain, it is necessary to develop the response mechanism of the supply chain. The bidirectional option is introduced and option model with single cycle is established in this paper, in the light of fluctuant price and stable price, respectively. While the food price is fluctuation, it is assumed the market demand is correlation with price. For the situation of stable price, we allow retailer to reorder at the third stage to improve the flexibility of the food supply chain. How bidirectional options provide flexibility to a food retailer when market changes in the second period is shown, and the optimal policy for each stage is presented. Besides, the implication of such arrangements between a retailer and a supplier for coordination of the channel is studied. At last, the model is discussed through a numerical example, and the result shows that the supplementary ordering way with bidirectional option is useful to reduce the risk of food supply chain and enhance the profit of the whole supply chain for the food with short life cycle.*

Keywords: Food supply chain, Bidirectional options, Contract model, Ordering policy, Profit function

1. Introduction. With the development of social economy and the intense competition among supply chain partners, risk sharing and profits distribution among supply chain partners became an important problem. The coordination between the buyers and sellers is one of the key factors for the whole supply chain coordination operation. Furthermore, in recent years, it has become widely recognized that firms should have the capability to response quickly to the changing market, which is focused especially in food supply chain with short life cycle. Therefore, it is necessary to improve the response mechanism.

The above problem has been extensively study in the past by many people using supply chain contract. Donohue [1] developed a supply contract where the supplier has two production modes: normal mode and fast mode. Fast mode allows the buyer to order additional products in order to take advantage of updated demand forecasts. Bonser and Wu [2] performed computational experiments to show an efficient purchase strategy wherein the buyer makes a minimum commitment for each period at the beginning of a planning horizon, and determine additional procurement decisions at the beginning of each period according to updated market information. Chen and Xu [3] introduced a two-stage (TS) operating system for a two party supply chain. Under a TS system, the buyer can place a reorder later to incorporate more demand information. Chen and Xu analyzed its impact on both parties of a supply chain with uncertain demand. Kraiselburd *et al.* [4] studied the supply chain contract with stochastic demand, and in their model, they considered the influence of the substitute products. For more recent results on this topic, we refer readers to [5-8].