

DISRUPTION COORDINATION OF CLOSED-LOOP SUPPLY CHAIN NETWORK (II) – ANALYSIS AND SIMULATIONS –

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ABSTRACT. *To investigate how to coordinate the complicated supply chain, a closed-loop supply chain network is studied, which consists of a single supplier, multiple demand markets, many retailers and one third party logistics (TPL) entity in every market. Three kinds of situations, while the deviation of market's demand scale is negative and great, positive and also great, and last smaller and smaller, are respectively considered theoretically, when the supply chain network is disrupted by sudden, disruptive events. In this paper, the feasibility of the models formulated before are demonstrated with actual numerical simulations using Matlab software. The results show that the models in each situation are effective. When deviation of demand is sufficiently large and negative, the buyback contract $T(b_s, b_i)$ should be adopted; when the deviation is positive, $AWQD(w_1, w_2, \{Q'_i\})$ is more appropriate. On the other hand, if the deviation is small, both of the two contracts mentioned above are not appropriate. It is feasible to deal with the disruption so that the retailers just adjust retail prices appropriately.*

Keywords: Closed-loop supply chain, Quantity discount, Buy-back contract, Disruption coordination

1. Introduction. Without question, nowadays the world has become a risk world, filled with all kinds of threats, both natural and man-made, such as SARS in China, 911 and Anthrax mail in the USA, Ebola in the Congo and so on. Also, the supply chain faces more and more indeterminate factors, which make predetermined plans need to adjust frequently, and these factors even threaten the subsistence and development of supply chain partners.

Disruption coordination of a closed-loop supply chain network is one of the research hotspots that concern how to coordinate the supply chain under sudden, disruptive events, which remains challenging in the field of supply chain management and related study areas. To the best of our knowledge, literatures on the supply chain coordination has mainly focused on quantity discount contracts, buy-back contracts, minimum purchase contracts, flexibility quantity contracts, etc. referred to in references [1-5]. Numerical examples or simulations in these papers are idealized and the results show that the supply chain can be coordinated with different kinds of contracts or discount policies. Other related researches have been investigated by many scholars in, e.g., [6-9]. However, examples or numerical simulations in these papers are based on the assumptions that demand is deterministic or that the supplier has perfect information of the price demand relationship, which is rarely available in practice. Besides, previous literatures have rarely considered the price competition [10-13]. Simulations in these papers have always depicted one or two special cases for the models.