Pricing and Inventory Strategy of Dual-channel Supply Chain under Random Demand and Retailer’s Capital Constraint

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ABSTRACT

A dual-channel supply chain system composed of one manufacturer and one retailer is considered in this paper, which existed uncertainty demands in both distribution channels and capital constraint on retailer. It set up the profit model of manufacturer dominated dual-channel supply chain system, studied to the optimal pricing and inventory strategies of decentralized and centralized supply chain, obtained the optimal pricing and inventory strategy of the two kinds of supply chain system. The analysis to the optimal solution indicated that the demand uncertainty of two distribution channels, deferred-payment rate etc, are all have certain influence relation on the pricing strategies of manufacturer and retailer. Numerical experiment has showed the effectiveness of the conclusions.

Keywords: Capital Constraint, Deferred-Payment, Dual-Channel, Pricing Strategy, Random Demand

1. INTRODUCTION

With the rapid development of internet technology and the advent of the Third-party Logistics, more and more brand manufacturers have began to set up direct sales by introducing internet channel. Such as IBM, HP, Nike, Dell and so on. They are all obtained a great success by dual-channel strategy [Chiang, 2010]. But the introducing of internet channel also gives rise to the channel conflict and the benefit game between manufacturer and retailer, and consequently lowers the efficiency of supply chain [Agetz, 2008]. Webb [Webb, 1997] pointed out that product pricing is the primary factor on channel conflict, so the pricing strategy is an important issue to the study

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of dual-channel supply chain. While in reality, many enterprises will be faced with the problem of capital scarcity, especially some small enterprises. In a supply chain system, retailer’s capital scarcity not only affects its own profit, but also affects other’s decision and profit on supply chain. Retailer’s capital scarcity will lower its order quantity, and decrease the profit of retailer, and the reduction of retailer’s order quantity will affect the profit of manufacturer, in addition, if the product quantity cannot meet the market demand, it will cause the market price fluctuations, affect the stability of market, and increase consumers’ purchase cost. Under the retailer’s capital constraint, whether the price game between manufacturer and retailer has the equilibrium, which factors will affect their product pricing, the paper will attempt to resolve these problems.

There are many scholars studied the pricing of the supply chain. Zhang Juliang etc [J. Zhang, 2004] studied how to design the contract to maximize the profit of supply chain system when the product demand is random and depend on the effort of retailer, but the supply chain system the studied is single channel. Chen Yuangao etc [Chen, 2010] studied the service competition of dual-channel supply chain and the influence of acceptance level of internet channel to the product pricing and profit distribution. Shan Bin etc [Shan, 2011] studied the influence of product complementarity to channel pricing by establishing Bertrand model, where retailer also sailed complementary product in traditional channel. But the above researches are all under the condition that the certain demands in two distribution channels. Zeng Mingang etc [Zeng, 2013] studied the pricing strategy of dual-channel supply chain under the uncertain demands, but they disregard the condition of retailer’s capital constraint. There are also plenty of research results about capital restraint problem, the early studies [Xu, 2015(a); Luo, 2011; Hu, 2014; Wei, 2015; Xu, 2015(b); Xu, 2014; L. Wang, 2013] on capital constraint mainly consider its influence on inventory management and pledge decision-making. There are also many research results about supply chain financing, Lee etc [Lee, 2010] studied the coordination of price discount, buy-back, two-part tariff and revenue sharing these four coordination mechanism to financing supply chain, and proved that the four coordination mechanism are unable to coordinate the supply chain which direct financing from financial institution, and can coordinate the trading credit supply chain, and they indicated that the price discount, buy-back, two-part tariff contract bring more profits to supply chain than revenue sharing contract, subsequently, they studied the trading credit supply chain from the manufacturer’s perspective [Lee, 2011], combing with on sale and compensation mechanism, and put forward the coordinate contract. Lai etc [Lai, 2009] proved that when the fund is insufficient, manufacturer prefer to the combined sales model of retailer orders in advance and consignment sales; Zhu Wengui etc [Zhu, 2007] studied the pricing model for inventory impawn financing by third part logistics provider when manufacturer permits the retailer delayed payments; Chen Xiangfeng etc [X. Chen, 2008(a); Chen, 2008(b)] studied the ordering policy of retailer financing and its impact on supply chain system; Zhang Xiaojuan etc [X. Zhang, 2014] studied that under the certain demands in distributions channels, the underfunded retailer choose deferred-payment and loan-payment modes, respectively, and provided the optimal strategy of manufacturer and retailer. Wang [Y. Wang, 2011(a); Y. Wang, 2011(b); Y. Wang, 2013; Y. Wang, 2014(a); Y. Wang, 2014(b)] proposed the framework of cognitive learning.

Although there are many research results on capital constraint supply chain and dual-channel supply chain, the study on the dual-channel supply chain with the uncertainty demands in both distribution channels and retailer’s capital constrain is seldom, the paper studied the dual-channel supply chain combing with capital constraint and random demands, suppose that manufacturer permits retailer delayed payments, and built the deferred-payment model under the environment of random demands, studied the pricing and inventory strategy of manufacturer and retailer under the uncertainty demands in both distribution channels and retailer’s capital constraint.
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