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Abstract. B2B electronic marketplaces have provided the participants a variety of services, such as spot trade, capacity options, providing retailers a new avenue to do their business, and thus has changed supply chain structures. This paper investigates the retailer’s optimal ordering strategies in a B2B electronic marketplace, where market demand and market prices of commodities are uncertain. The study shows that the options in B2B electronic marketplaces provide a new chance for retailers to reduce risk of market uncertainty. These findings also have significant meaning for buyers, suppliers and the third-party B2B electronic marketplaces in supply chain.

Introduction

Since the end of the last century, China's e-commerce has made considerable progress and progress, based on the vertical industry B2B electronic trading market is particularly prominent, has become one of the highlights. B2B electronic trading market is from the 20th century, 90 years, in China, the rise and development of a new market, it uses the network platform for oil, steel, coal and other commodities for large quantities of transactions, also known as commodity trading market. With the rapid development and expansion of China's Internet, the third-party B2B electronic trading market has developed rapidly. At present, China's B2B electronic trading market has reached more than 200, located in Beijing, Shanghai, Guangdong and other 23 provinces and cities. One of Shanghai’s largest steel electronic trading center, the joint steel network, Global Metal Network, China's sugar network has become an important industry in their own procurement and sales market. In addition, B2B electronic trading market in the transaction varieties related to industrial raw materials, energy and agricultural and sideline products and many other areas, has now become the main driving force of China's e-commerce. In 2009, the total turnover of 56 large-scale electronic trading markets in China has reached 1.8 trillion yuan. The first 10 months of 2011, the national B2B electronic trading market turnover has exceeded 10 trillion yuan. By the end of 2013, China's e-commerce platform, the total transaction has reached 10.2 trillion yuan, an increase of 29.9%. Of which B2B e-trading market transactions amounted to 8.2 trillion yuan (of which 50% from the contribution of SMEs), an increase of 31.2%, which shows that the development of B2B electronic trading market in China's e-commerce development has played a strong effect.

The rise of B2B electronic trading market, so that the functions of third-party electronic trading market more and more perfect, and rely on its powerful circulation function in the supply chain occupies an important position to change the traditional linear structure of the supply chain, forming a new network structure. In addition, the emergence of electronic trading market has changed the traditional supply chain in the upstream enterprise pricing initiative, it is the supply chain enterprises to provide a more open and transparent price guidance, so that the traditional upstream enterprises must be based on market supply and demand to develop their own. The best commodity pricing strategies have greatly weakened their right to dominate the price. The rise of B2B electronic trading market not only to the supply chain has brought changes, but also to the supply chain in the various enterprises to bring a new decision-making issue, the upstream manufacturers have to refer to the B2B market prices and then make decisions. Retailers should also consider the online and offline purchase channels, in order to make the best ordering strategy.
Literature Review

Peleg and Lee [1] compared the three procurement strategies (based on long-term contracts, spot markets, and a combination of both) in the context of short-term e-procurement strategies and long-term e-procurement strategies. The optimal strategy for finding retailers depends on the market structure. Hausman, Seifert and Thonemann [2] studied the impact of the online spot market on retailers and explored the best strategies for retailers in the online spot market. They argued that when the electronic trading market and traditional contracts were simultaneously used as purchasing channels. The retailer's profit and service level will be improved, but the risk of profit fluctuations will increase. Milner and Kouvelis [3] studied the impact of the B2B electronic trading market on the relationship between producers and buyers. Analyzes the impact of the emergence of online transactions on corporate inventories, option speculation and purchasing strategies. Wu [4] explored the supply chain decision-making and coordination issues in the options contracts on the B2B e-trading market line with the long-term contracts under the traditional lines, and later, Wu [5] Using the degree of market access to measure the liquidity risk of the spot market, and study the strategies of enterprises in the supply chain.

With the rapid development of China's B2B e-commerce, more and more domestic scholars began to explore the B2B electronic trading market. Xing, Wang and Feng [6] from the supply chain and logistics point of view of B2B electronic trading market research. At the beginning of the study, scholars began to study the B2B electronic trading market mainly from how to reduce the transaction cost and how to influence the transaction mode. More and more scholars began to explore the influence of the B2B electronic trading market on the decision-making in the supply chain. Shi and Feng [7] studied the impact of the B2B market on the optimal strategy of retailers. It is assumed that the retailers are risk aversion, and the research shows that the B2B electronic trading market will allow retailers to bear greater market uncertainty Risk, only in a particular context in which retailers can increase revenue, while B2B electronic trading market will reduce the price of goods, and finally to consumers at lower prices to obtain goods to consumers end benefit. You and Feng [9] studied the equilibrium strategy of retailers in B2B electronic trading environment. Trading services, trading options in the B2B electronic trading market can be traded again after the signing to the expiry date. The results show that the option contracts can be re-traded as retailers in the supply chain to provide new speculative channels, significantly increasing the number of retailers' options for option contracts, and the impact on long-term contract purchases with fixed suppliers. Obviously, the retailer's online orders with the online market will increase.


Description of the Problem

The traditional supply chain is a single linear structure, the retailer orders from the supplier, and then sold to the consumer. This paper is based on the B2B electronic trading market under the network supply chain structure for the research background, and only consider a cycle. This structure consists of a supplier, a retailer (risk neutral) and a third party B2B e-trading market.

B2B electronic trading market in the trading model there are two, one option trading, and the second is the spot transactions [5-8]. Their study show that the spot market is mobile, they are the market liquidity is defined as: traders intend to buy and sell, according to the then market price can only be a certain probability to find the right transaction Object, this article also uses this definition. In addition, because in the bulk of the commodity value is generally relatively high, and B2B trading market transaction costs are relatively small, so this article does not consider the transaction costs.

Hausman, Seifert and Thonemann [2] show that retailers’ profit levels are improved when both electronic trading options and long-term subscriptions are used as purchasing channels. Therefore, the
retailer will enter into a long-term order contract with the supplier. At the same time, in order to avoid the risk of uncertainty, the retailer will sign in the B2B electronic trading market.

After entering the sales period, the retailer will be based on market demand and the market price of goods to develop their own strategies. After the expiration of the option contract, the retailer can choose whether to execute the option or speculate to sell the option; when the retailer's sales capacity can not meet the retail market demand, the retailer needs to immediately purchase the spot transaction in the B2B trading market Merchandise to meet the demand. Retailers try not to be out of stock, if the order contract and option contracts can not meet the needs of the time, retailers need to purchase goods in the spot market, to meet the needs of the retail market. This paper sets out the number of items ordered by the retailer at the supplier and the order quantity of the option contract signed in the B2B market as the decision variable to establish the optimal ordering strategy for the retailer.

Parameter Settings

According to the model settings, this paper sets the following parameters:

- \(Q\): The number of goods ordered by the retailer from the supplier
- \(Q_b\): The number of options contracts entered into by retailers in the B2B electronic trading market
- \(P\): The price at which the retailer orders the goods from the supplier
- \(P_e\): The execution price of the option contract signed by the retailer in the B2B electronic trading market
- \(P_m\): The market price of goods, but also the commodity in the B2B trading market in the spot price (for a random variable)
- \(x\): The unit cost of the option contract signed by the retailer
- \(m\): B2B electronic trading market liquidity (as a constant)
- \(D\): The demand for goods in the retail market (for a random variable)
- \(r\): The price of goods in the retail market

Model Establishment

After entering the sales period, retailers can observe the market demand and market prices, and then there will be the following two cases:

When the retail market is less than or equal to the number of retailers ordered from the supplier, the retailer sells the quantity of goods at the price, and the remaining goods \((Q - D)\) will enter the B2B e-trading market at the market price. Because the reasons for the flow of the market, can only sell the goods \(m(Q - D)\), the rest of the goods can only be dealt with the price \(w\). If the market price is higher than the strike price of the option contract signed by the retailer, the retailer will execute the option and then sell it in the B2B market at the same price as the market liquidity can only be sold. If the market price below that (including equal to the execution price of the option contract signed by the retailer), the option contract is not executed. In this case, the retailer's profit is:

\[
\pi_s = -PQ - xQ_b + rD + P_m m(Q - D) + \varphi(P_m - P_e)(P_m mQ_b - P_e Q_b)
\]

When the retail market demand is greater than or equal to the number of goods ordered by the retailer from the supplier and less than or equal to the number of retailers who order from the supplier and the option contracts purchased in the B2B market, the retailer Sell the number of goods. If the market price is higher than the strike price of the option contract signed by the retailer, the retailer will execute the option, which is used to meet the sales demand, sell at the price, and remain in the B2B market for sale, as is the market liquidity If the market price is lower than the purchase price of the option contract signed by the retailer, the retailer will purchase it in the B2B market in spot trading and will also be restricted by the market liquidity. To the quantity of goods, the remaining goods obtained by executing the option contract.
\[
\pi_2 = -pq - xQ_B + rQ + \varphi(P_m - P_B)\left[(r - P_B)(D - Q) + P_m(Q + Q_B - D) - P_BQ_B\right] + \\
\varphi(P_B - P_m)\left[(r - P_m)m(D - Q) + (r - P_B)(1 - m)(D - Q)\right]
\] (2)

**Case Study**

In the actual case, some data is completely random, only a random variable that there is not enough data to determine its branch, then if you can get the maximum and minimum value of the variable, then the decision can be used. Evenly distributed to do the approximate treatment, this method in the previous study has also been widely used. Based on this theory, this paper makes a simple case study based on the uniform distribution. Assuming the uniform distribution of the spot price of the third-party B2B electronic trading market, the uniform distribution of the demand for the retail market, the subscription price of the long-term contract is 75, the cost of the option contract is 5, the execution price of the option contract is 50, and sales price is 125.

Assuming \(m = 0.8\), then \(\frac{\partial \pi_1}{\partial Q} = -19\), the longer the amount of long-term contract purchase, the greater the profit. It can be calculated that \(m = 0.8 > \frac{(x + P_B)/\overline{P_m}}{0.78}\). Therefore, the calculation results in line with the above conclusions.

In the case of keeping other parameters unchanged, the change in the long-term contract price, the results show that with the long-term contract purchase price increases, retailers through long-term contracts to reduce the number of goods will be reduced by the option contract. The number of purchases of goods will increase. This shows that the emergence of B2B electronic trading market weakened the supplier's price-led rights, electronic trading market spot prices for the line under the transaction price to provide guidance.

In the actual situation, because the long-term contracts and options contracts at the same time, B2B market liquidity spot \(m\) exists in a specific range. When the number of items used in the case study \(m\) increases, the number of items purchased by the retailer through the option contract increases, and meanwhile the number of goods purchased through the long-term contract decreases. This conclusion is well understood that the market liquidity becomes larger, the option of procurement options is more significant, retailers can be based on the market price changes strategy to purchase at a lower price, but also the remaining goods can be re-placed in the market in the sales profit, so the increase can help retailers to reduce procurement costs, increase the final profit.

**Summary**

At present, China's bulk commodities, such as steel, coal and other industries, the capital are more intensive, the upper reaches of large enterprises hold the price of the initiative. Which makes the industry in the middle of the circulation of small and medium enterprises can only passively bear a very high market risk. B2B options in the electronic trading market options trading and spot trading for many middle and lower reaches of the enterprises to provide a new shopping channel has become an important tool to avoid market risks, while the market price of goods has a guiding significance. This is more conducive to the middle and lower reaches of small and medium enterprises and large enterprises between the upper reaches of the negotiations and games, is conducive to the healthy development of the market. Although the emergence of B2B e-trading market will affect the upstream business supply chain in the dominant position, shunt off the downstream suppliers of offline supply, but they also become B2B trading market supply sources. Therefore, the upstream enterprises should also be combined with the market under the market and B2B market advantage, so that their own as much profit. Of course, only to ensure a moderate market liquidity under the premise of B2B market to attract more enterprises in the industry to participate. Market liquidity is too high, which will make the market speculation in a serious atmosphere led to excessive speculation. Market liquidity is too low, that will make enterprises not want to enter the market, which is not conducive to the
development of the industry. Therefore, the organizers need to develop sound rules and systems to ensure good market operation. When liquidity is at a good level, B2B e-trading market can improve the efficiency of the entire supply chain, so that the overall supply chain gains.

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References
[2] Reference to a book: