

Application of Financial Engineering in Supply Chain Risk Management

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Abstract: This article is based on the financial engineering and corporate supply chain risk. In this article, it first explained the meaning of financial engineering and the role of financial engineering in risk management. Then, supply chain risk management is explained from two perspectives: the mechanism of supply chain risk and the characteristics of supply chain risk. Finally, the measures to integrate financial engineering into risk management are analyzed from two aspects: the role of financial derivatives and the specific application of financial derivatives.

1. Introduction

The term “financial engineering” was introduced in the 20th century. The financial engineering contains a lot of content which mainly relies on the concept of engineering management (Neftci, Salih N, 2008). It mainly uses a variety of engineering techniques to design, develop and implement new financial products. It can be said that a financial innovation is specifically used to solve problems in financial management (Finnerty, John D, 1986). Judging from its specific content, it not only includes the overall design, pricing and transaction content of the product, but also includes the management of financial risk. In a narrower sense, financial engineering mainly includes the design, development and implementation of innovative financial tools and financial instruments, and the creative solution of financial problems that arise (Lyu, Yuh-Dauh, 2002). As for the characteristics of financial engineering, the most obvious is innovation, so it can be used as a technical support for financial innovation. In this way, not only the investment and financing problems in finance can be better solved, but also the problem of risk management (Finnerty, John D, 2007). Therefore, as an important aspect of modern development, financial engineering can play a very important role in promoting the development of enterprises.

From the perspective of financial engineering development and management, enterprises that take some risk can not only obtain more effective equity through capital market management and innovative means, but also use the capital market as a platform to transfer some of the risk to investors (Cuthbertson, Keith, and Dirk Nitzsche, 2001). So from this perspective and aspect, the role of financial engineering in risk management is constantly increasing and expanding. As for the connection and relationship between risk management and financial engineering, both fields are comprehensive (Tunaru, Radu Sebastian, 2015). As far as understand the concept of risk, it primarily means that people can clearly understand the possibility of consequences and the manifestations of that possibility before things happen. When faced with real risks, financial

engineering can formulate and take appropriate actions to avoid risks by understanding the trends in risk assessment.

In the development of society and the market, scientific and rational management and operation are the goals that every enterprise constantly pursues. In terms of the current economic development and methods of enterprise management, the supply chain is currently a more scientific and modern management model (Stevens, Graham C, 1989). In this era of rapid development of science and technology, effectively avoiding potential risks has become one of the problems that many enterprises need to solve, whether in enterprise management or fund management. In addition, through the design and development of some relatively new financial products and the application of relatively advanced financial methods, financial engineering must comprehensively promote a variety of technical methods (Geunes, J. and Pardalos, P.M., 2003). This includes the ability to effectively manage financial problems. In addition, many enterprises have already benefited from this approach when it comes to financial engineering and supply chain management (Laínez, J.M., et. al., 2009). Therefore, this article provides a specific analysis of the application of financial engineering in supply chain risk management.

2. Risk Management Issues in the Supply Chain

2.1 The Mechanism of Supply Chain Risk

The supply chain risk refers to the actual production and management process when some imponderables may occur in the supply chain companies that cannot be foreseen inside and outside the system (Pardalos, Panos M., et.al., 2013). Based on the general situation, the risks that supply chain enterprises generally face can be divided into two types: exogenous risks, which are comparable to natural environmental risks, and endogenous risks which are comparable to market risks and moral hazards (Pardalos, Panos M., et. al., 2004). In addition, the cooperators of the companies subject to greater uncertainty regarding the specific development of the company. If the cooperators cannot bear the corresponding responsibility or there are problems in the internal management of the cooperative enterprise, this will cause the supply chain issues. There may be some risks in the supply chain due to changes in the natural and social environment faced by the company or problems with product quality and prices of suppliers and partners (Simchi-Levi al. et., 2012).

2.2 Characteristics of Supply Chain Risk

Interactive games and collaboration. Although supply chain firms must be involved in certain projects and ventures to serve corporate interests, their interest orientations are different because these firms exist as independent individuals in the marketplace. Therefore, if there is no scientific and complete monitoring mechanism, it is possible that each enterprise will lead to fierce competition and game to pursue its own best interests. Since the enterprises in the supply chain need to understand the market information in a timely manner, proper cooperation is required to ensure the full operation of the supply chain (Tang, Christopher S, 2006).

Transitivity. As for the operation and development of an enterprise, internal scientific management may have some driving effect on the development of the enterprise itself. But when it is placed in the market, several companies must be involved in the process of product development, production, and final dissemination (Manuj, I. and Mentzer, J.T., 2008). In the sequential development and management of products, potential risks accumulate at each stage, and after the risks have accumulated, they are passed on to the next manufacturer and the next company. In this process of continuous passing and accumulation, the security of the whole supply chain is also

affected to some extent. Therefore, this state of transitive risk directly affects the overall operation and risk level of the supply chain.

The difficulties of supply chain risk management. The supply chain is not simply the operation of a single enterprise, but a systematic management model, that is, a virtualized system between the market and the enterprise. The members of the system tend to have their own positions and interests and therefore treat some of the information as trade secrets to be protected and preserved. Since the company has a certain level of selfishness, this also leads to the fact that some of the information and resources cannot really be shared. Therefore, there will be some discrepancy between the price of the product and the actual value, which also leads to difficulties in risk management. In addition, there are many companies and suppliers that manage the supply chain. This situation and the involvement of other government management departments also lead to the expansion of supply chain risks (Tang, O.et.al.,2011).

3. Measures to Integrate Financial Engineering into Risk Management

3.1 The Role of Financial Derivatives

If there is a large discrepancy in a company's supply chain between the price of the product in the market and the expected price, there is some risk that will significantly reduce the company's operating profit (Kwok, Yue-Kuen, 2008). Therefore, the power of financial derivatives can be used to manage the risk in the supply chain. By using financial derivatives, product transactions can be made more flexible. In turbulent financial markets, even if the price of products fluctuates wildly, financial derivatives can transfer the corresponding risks, allowing companies with a higher tolerance for risk. Take the risk. This can effectively avoid risks for small enterprises and also bring profit opportunities for large enterprises. Enterprises should acquire the appropriate excellent talents to avoid risks and make profits through the wise use of financial derivatives. This is very important for the operation of a company to have its own core competitiveness and not dominated by risks. In the supply chain, if there is a large discrepancy between the price of the product in the market and the expected price, risk problems arise that drive up the cost of actual transactions and administration and reduce the profit that can be earned. Due to their inherent characteristics of timeliness, accuracy, management flexibility and cost advantages, financial derivatives can not only effectively reduce the cost of actual management and operation, but also reduce the actual risks in the supply chain. Therefore, they have become an important choice for risk avoidance today. Financial derivatives are unique in terms of hedging transactions and margin transactions. Therefore, in flexible transactions, no matter how much the price fluctuates, financial derivatives can transfer risks to individuals with a higher risk tolerance. In this way, not only can risks be effectively avoided, but also some of the risks can be transformed into profit opportunities that investors can take advantage of and control. Thus, if managers can effectively use financial derivatives, they can not only effectively avoid risks, but also create profit opportunities for some companies (Quail, R. and Overdahl, J.A.,2002).

3.2 Specific Applications of Financial Engineering

Hedging realizes the commitment of costs in the futures market. The supply chain is closely interconnected, so in practice profits in one market can be hedged by losses in another. In this process, wholesalers, manufacturers or operators can use the spot market or the futures market to perform the reverse transaction. In this way, profits and costs can be effectively controlled and managed. In the supply chain, production equipment companies can naturally take full advantage of hedging to avoid risks. In addition, the supply chain promotes the production and sale of the

company's products, so that the company can fully exploit the relationships and commitment between upstream and downstream companies to complete the sale of product quantities. (Aragon, G.O. and Martin, J.S.,2002). The risk factors caused by changes in internal prices can be effectively avoided through the joint assumption of risks by related enterprises, so that the stability and continuity of production can be better ensured in this way. The first link in the supply chain (the commodity producers) can hedge the risk of commodity price fluctuations in the futures market. At the same time, it can enter into a physical futures contract between upstream and downstream companies and short sell through futures contracts so that upstream companies in the supply chain commit to purchase a certain amount of product in future periods, and they can also purchase an option from the supplier and deliver through the option.

Set up options and futures contracts to avoid risk. The so-called option is actually a kind of right of first refusal and agreement. In exchange for paying a certain fee, the buyer can enter into the transaction at the price that has been set and negotiated in advance for a certain period of time in the future. In this procedure, the buyer can buy or sell at the agreed price but does not have to buy or sell the product of the agreed party itself. Therefore, in this procedure, investors have more choices amid drastic market changes. After a certain time and date, this option contract loses its restrictions and advantages, and it can no longer restrict both parties. At the same time, buying options with opposite price expectations can reduce the risks in the supply chain companies to a certain extent. Options trading can offer investors more choices in the face of large price swings. Whether futures prices rise or fall, as long as volatility reaches a certain level, risk can be avoided and profits can be made. If the trader predicts that the future price will rise, he will also buy the put option of the corresponding option at the same time as the futures contract. If the price of the futures contract moves in an unfavorable direction and falls, exercise the put option to buy the futures contract at a lower price to make a profit and reduce the loss from holding a long position in futures. If the futures price actually rises and moves in a direction beneficial to investors, investors can sell the futures contract at a high price in the futures market to hedge and close out their positions while giving up the put options. The only loss to the investor is a limited premium, but they can keep the risk to a minimum. By depositing a certain deposit (royalty) between the supply chain companies, they get the right (options) to buy or sell a certain number of certain products (futures contracts) at an agreed price at a certain time in the future, while buying the opposite options and accepting the expected price fluctuations, minimizing the risk of the supply chain companies and achieving profitability (Deutsch, Hans-Peter, 2009).

4. Conclusion

Through the overall analysis of the above content, we can gain a deeper understanding of financial engineering and risk management in the supply chain. The integration of financial engineering into enterprise risk management is very helpful for the development of enterprises. The current international and domestic situation is relatively complicated. If enterprises want to achieve stable operation, they must learn to avoid risks reasonably. The application of financial engineering is very important for enterprises. Evaluated.

Although financial engineering has played a very important role in supply chain risk management, it must note that due to the immature development of some developing countries' capital market, financial prices cannot be fully balanced, so financial engineering is manufactured. The functions of derivatives in risk avoidance and price discovery cannot be fully utilized. In particular, the use of certain financial derivatives is limited by the system and relevant laws and regulations, such as the lack of a short sale mechanism. The development of basic financial instruments in the emerging economies is also insufficient, there is a lack of a large number of

financial derivatives, and the development of the derivatives market and relevant laws and regulations are far from mature. All these have limited the application of financial engineering in the risk management of my country's supply chain. Although financial engineering has brought revolutionary changes to risk management, it is still not the “solution” to risk management. Therefore, enterprises need to think comprehensively, continuously strengthen their own strengths, improve labor productivity, advocate scientific management and decision-making, establish efficient operation mechanisms, etc., and quietly face various risks and challenges to continue to grow and prosper in the fierce market competition.

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