Cause and Control of the Main Risks for Financial Derivatives

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Abstract. With the development of the economy, the risks of financial derivatives derived from traditional financial products have gradually become apparent. Based on published papers, this paper analyzed three main risks of financial derivatives, namely credit risk, liquidity risk and market risk, and to seek ways to avoid them. According to the research findings, countermeasures including improving the transparency of derivatives markets, establishing internal management systems, strengthening risk monitoring and developing human resources can be used to avoid risks to a certain extent. However, finding effective ways to avoid risks is still a long-term and difficult task in front of the general economic workers.

Keywords: Financial derivatives; Credit risk; Liquidity risk; Market risk.

1. Introduction

With the development of the financial industry, more and more people pay attention to the financial derivatives. Financial derivatives are financial products which based on basic financial instruments (such as currency, exchange rate, interest rate, stock index, etc.). Nowadays, they are not only important products of the modern financial development, but also become an indispensable component, which meets the needs of market participants from investment to the various needs of risk avoidance, and plays an important supplementary role in the development and improvement of the financial market.

At the same time, financial derivatives were affected by many types of products and the complex market environment, which makes it usually have a high instability and high risk, especially those financial derivatives based on commodity prices, stock price indexes, securities, credit, etc. The risk of financial derivatives has become something we have to pay attention to. This paper tries to divide the risk type into three parts: credit risk, liquidity risk and market risk. Based on the different types of the risk, this paper then analysis what are causing the risk and what can we do to prevent the risk.

The reminder of this paper is organized as follows: Section 2 introduces the credit risk; section 3 introduces the liquidity risk and section 4 introduces the market risk.

2. Literature review

2.1 Credit risk

2.1.1 The definition of the credit risk of financial derivatives

Credit risk is the most important and difficult element to manage risk of financial derivatives trading [1]. Financial derivative credit risk is the risk that one party to a derivative contract fails to fulfill its contractual responsibilities and obligations to the other party in the course of a financial derivative transaction or the risk of loss due to changes in the creditworthiness and performance ability of the counterparty (debtor) resulting in changes in the creditor's assets. For the same contract, as time passes, the performance status and credit rating of the counterparty involved in the financial derivative contract will continue to change, and its credit risk will also change continuously and the longer the term, the greater the credit risk [2].

2.1.2 The causes for the credit risk of financial derivatives

There are several seasons for financial derivatives' credit risk. The first and main reason is that most of the trading contracts are still in the outstanding stage and then there is a possible uncertainty of performance, which creates some unavoidable credit risk. If either party defaults, the other party will suffer a direct financial loss. A representative example is counterparty credit risk which means that the risk of counterparty default between the last cash flow settlement of a transaction occurs mostly for transactions that require cash flow settlement in the future, and counterparty credit risk generally refers to pre-settlement risk [3]. Counterparty credit risk was almost similarly to Basel Agreement, considering counterparty credit risk as the risk that a counterparty to a derivative transaction default on its contract before maturity and fails to make all contractual payments [4].

Besides, the trading venue of financial derivatives products of trading institutions often determines the level of credit risk [5]. The exchange market usually has a complete system of credit risk prevention, and the possibility of triggering credit risk is extremely low. However, over-the-counter (OTC) transactions lack the protection of a margin system and can only rely on both parties to assess credit risk based on each other's creditworthiness and ability to perform, so most of the credit risk of financial derivatives products is concentrated in the OTC market. The financial derivative products nowadays are very technical and the trading procedures are quite complicated, and the pricing is also quite difficult. Therefore, only the strong and creditworthy large financial institutions have sufficient ability to innovate, design, issue and sell financial derivative products. Therefore, the credit risk of financial derivatives transactions is mostly concentrated in these few financial institutions. If these financial institutions have unavoidable problems, the whole derivatives market will be in turmoil, triggering a chain reaction and endangering the whole financial system [5].

Randomly fluctuating prices in financial markets and the difficulty of capturing the symmetry of their relevant information are the third reason. Interest rates and exchange rates in financial markets change daily, and it is impossible to find the pattern of their fluctuations, thus causing randomness, and then the credit risk that is about to arise will increase over time. At the same time, the occurrence of credit risk will be increased if the information asymmetry under control. Information asymmetry is a classic assumption of information economics, which breaks the assumption of symmetric information in traditional perfectly competitive markets [6]. Information asymmetry occupies a central position in the theory of credit risk management for financial derivatives, because the trading of financial derivatives is characterized by leverage and virtual nature, while the development of OTC markets and international markets has further increased the degree of information asymmetry, and moral hazard occurs frequently. The parties to a transaction can only judge from the above information whether the other party has the ability to perform the contract, and cannot be completely sure whether the information disclosed by the other party is symmetrical. If the information disclosed by one party is not symmetrical, it is very likely to cause moral hazard and credit risk. And if a counterparty defaults, the other counterparty will be forced to default, thus causing a chain reaction of default risk and financial crisis. Today's financial derivative products are becoming more and more diversified, and the more complex and difficult to control, the higher the probability of significant losses to investors, and the greater the risk of default.

Lastly, regulation problem also could cause credit risk in financial derivatives. The technical and complex nature of the regulatory aspect of financial derivatives greatly increases the difficulty of the regulatory work such as financial derivatives disclosure mechanism. The ability to complete a series of design, pricing and trading processes according to the special nature of financial derivatives depends on the quality of the personnel responsible and the security of their computerized trading and analysis systems, which makes the regulatory requirements very high. At the same time, the unsystematic legal system does not provide guidance to commercial banks on financial derivatives innovation and credit risk management, and the regulatory legal system can only be updated after problems arise, which can make financial derivatives costly in the process of development [7]. For example, an important reason for the 2008 financial crisis was the deregulation of financial derivatives by the government as well as by law [8].

2.1.3 Approaches to avoiding credit risk

One of the most important solutions is to create a fair competition environment. An important feature of the financial derivatives market is fair competition [9]. To prevent market manipulation and monopolization by a small number of traders, which is a safeguard against the credit risk of financial derivatives; all market players should adhere to similar trading rules and compete on an open and fair basis. The establishment of a thorough reporting system for large orders to prevent excessive operations by market participants, the improvement of the derivatives market's transparency, the reduction of information asymmetry in the signing and execution of derivatives contracts, the strict enforcement of the margin system, daily settlement system, guarantee and collateral system, etc.

Moreover, strengthening the self-regulation of participants is also important. While external regulation is significant, it is also difficult to prevent credit risk in derivatives trading effectively if there is a lack of internal self-regulation. For example, improve the internal control system of each institution, improve internal constraints, strengthen risk monitoring, etc. And it is even more important to strengthen the self-regulation of market participants with asymmetric information disclosure.

Finally, using multiple ways to transfer credit risk in order to reduce credit risk are efficient [9]. The first way is credit support which can reduce current and potential exposure to credit risk [9]. It contains guarantee and net settlement agreement. The former is a basic legal tool to guarantee the performance of the other party's contractual obligations and prevent the risk of claims, while the latter is aimed at reducing the actual payments under the contract and is related to the method of payment. Besides, credit risk is also can be transferred by credit derivatives [9], which means by offering insurance against losses incurred as a result of credit events, credit derivatives are financial contracts intended to mitigate or eliminate credit risk exposure [10]. Traders of financial derivatives can take out and partially or fully transfer the credit risk on the derivatives by purchasing some credit derivatives with the financial derivatives as the underlying asset.

2.2 Liquidity Risk

2.2.1 The definition of the liquidity risk of financial derivatives

Liquidity risk is the risk that a derivative holder cannot sell the instrument quickly at a reasonable price within a relatively short period, cannot offset or hedge the established financial derivative position, and can only wait for the execution of the final delivery. Financial derivatives, as innovative financial instruments, involve trading large amounts of capital. In the event of large market fluctuations, the liquidity risk is high because of the possibility of not being able to hedge the derivative financial assets due to the lack of counterparties.

2.2.2 The causes for the liquidity risk of financial derivatives

There are two reasons for liquidity risk, one is that the financial derivatives themselves may have the defect of poor liquidity, such as some forward contracts; the other is that the derivatives holders' liquidity is poor and they cannot offset or hedge their positions. Take China Aviation Oil (Singapore) Limited (hereinafter referred to as Singapore Company) as an example, in October 2004, the company had to pay $50 million in the margin to the bank for every $1 increase in the price of a barrel of oil, which caused the company's cash flow to dry up due to the rise in oil prices. The Singaporean company suffered an actual loss of $132 million when it was forced to close out its positions twice because it could not cover the margins on some contracts [11].

The magnitude of liquidity risk depends on the degree of standardization of contracts, market trading rules, and changes in the market environment. For contracts traded over-the-counter, liquidity risk is low due to the high degree of standardization, large market size, and well-informed traders can always decide to sell their positions at the discretion of market changes, in contrast, each contract of financial derivatives traded over-the-counter is a "made-to-measure" contract, lacking a liquid secondary market In contrast, each contract of financial derivatives traded over-the-counter is

essentially "made-to-measure" and lacks a liquid secondary market, and therefore has high liquidity risk [12].

2.2.3 Approaches to avoiding liquidity risk

The creation, development and application of financial derivatives have brought great wealth to some economically developed countries, but if the financial derivatives cannot be properly harnessed and the risks of the financial derivatives cannot be controlled, the lessons it brings to people are also very painful, such as the collapse of the Bank of Bahrain in the United Kingdom in 1995 and the subprime mortgage crisis that broke out in the United States in 2007. Minghui Li mentioned that for financial derivative instruments, to reasonably avoid the impact of liquidity risk, it is not only necessary to establish a risk control system that suits the actual situation, but also to supervise it [13].

To avoid losses, first of all, it is necessary to improve the professionalism of judgment and the rationality of strategic decision-making and to raise the awareness of supervision of financial derivatives liquidity risk, including the identification of risks, the assessment of risks, the pre-setting of risk contingency plans and the estimation of risks. Secondly, the internal management of financial derivatives liquidity risk should be strengthened, i.e., a corresponding control system and an emergency rescue system should be established to effectively avoid the impact of liquidity risk.

2.3 Market Risk

2.3.1 The definition of the market risk of financial derivatives

What is the marketing risk of the financial derivative? Recent years, with the constant development of the internet, its application in the financial field have been deepened too. This has led to the development of financial derivative, but also rapidly accumulates its risks. Due to the uncertainty of the whole market, there are huge risks of financial derivatives. To put it another way, those risks that are caused by the market is called the marketing risks [14]. Some of them are inevitable, like the influence of the global epidemic result in the fluctuation of the financial derivatives' market; others are avoidable, for instance, the risks caused by the absence of the financial supervision. In a nutshell, the marketing risk is a very important risk that all of the financial derivatives' investigators have to face.

2.3.2 The causes for the market risk of financial derivatives

The marketing risks of the financial derivative are caused by the uncertainty of the market, more specifically, by the market price fluctuation of the different assets. The market price fluctuation has been classified into four categories [15]. Initially, the market price fluctuation may be caused by risk of interest rate, which manifests itself in the potential loss of assets due to fluctuation of interest rate. Also, risk of exchange rate may be a reason of the market price fluctuation. For instance, the sudden rise of the exchange rate will cause the devaluation of the local currency. Moreover, the possible risk caused by the change of the total stock price in the market or the change of the price of a single stock probably results in the market price fluctuation, which is known as risk of equity. Eventually, risk of commodity price, which is caused by the change of the global price of a particular commodity, is a significant factor that cannot be ignored in the market price fluctuation.

These are the most common forms of market risk of the financial derivative. It should be noticed that the marketing risk is hard to predict and control, because the four types of risk mentioned above can be affected by so many other factors, for example, the risk of the commodities' prices. The relationship between supply and demand can significantly affects the price, in some special condition, even one percent changing of the amount of supply can cause up to thirty percent change of the commodities' prices.

2.3.3 Approaches to avoiding market risk

Knowing the different reasons that cause the marketing risk, several solutions have been proposed in order to prevent the risk. The first and the most important solution is to strengthen the financial supervision of the financial derivative from different aspects. First of all, strengthen the supervision

of the relevant market entities, for instance, those companies, especially those who make profits in a new and unstable market, we should require these companies to make supplementary explanations on these new and controversial market. It will increase the openness and transparency of the market by adding these new explanations[15]. Secondly, strengthen the supervision on the invent of the new instrument that can be used on the financial derivatives and strictly limit its scale in the early stage of its development in order to avoid the tail risk caused by the large scale of relevant instruments. Finally, government should increase the number of supervisors and strengthen the qualification examination of the financial supervision practitioners to make sure the efficiency and effectiveness of the financial supervision. More supervision will certainly benefit the stability of the market and the marketing risk is less likely to occur.

Another solution is to train some professional risk arrangement worker in order to prevent the marketing risk[15]. First thing that can do to help the training of the professional risk arrangement worker is to strengthen the training of the risk identification, which can make them correctly classify the different types of the risk, and the risk control practice that can improve their ability of controlling the financial risk in an acceptable range. Secondly, it is necessary to promote the communication between financial regulatory institutions and risk management institutions. By promoting the communication among the relevant units, those financial derivatives risk management workers are able to have more personnel experience and enable them to better understand the rules of the financial derivatives. The way of selecting professional risk arrangement workers can also be improved. The method of selecting professional risk arrangement worker, especially regulatory talents, should not only be selected from universities but also from social financial enterprises. Only those who have experienced in the social capital market have more personal experience which enable them to be are more aware of the impact of some extreme conditions or some violent fluctuations of the market. The new way of training risk arrangement workers and the new method of selection will contribute to the stable and development of the financial derivative market.

Strengthen the supervision and training talents are solutions that government can take to control the marketing risk, but company can't only rely on the whole marketing controlling system of the financial derivatives. All the enterprises who involved in financial derivatives should do more market prediction work in order to lower the marketing risk. To effectively predict the risk, enterprise should measure the potential risk of the market and the transaction. This requires the enterprise to analyze and study the risk level, calculate the size of various financial derivatives trading risks, and the risk level that the enterprise can bear. A complete risk measurement should include monitoring all possible events of the market that may affect the transaction, and predicting according to the enterprise's own tolerance. The possibility of these factors that can cause the marketing risk shall be considered in the analysis process, including commodity price fluctuation, sudden change of the rate risk and the risk of the equity. There are already several models that have been proved to be efficient of the risk controlling: VAR model, KMV model, Credit risk+ method, etc. The application of these models can not only be used to precisely measuring the risk, but also can be used to understand the potential influencing factors and the loss of the risk. According to the risk level given by the model, measures can be taken in advance to reduce the plausible losses and maximize the company's profit.

3. Conclusion

The paper summarizes the three main risks of financial derivatives: credit risk, liquidity risk and market risk, and analyses the definition, causes and methods of these risks. Firstly, the uncertainty of compliance, market venues, regulatory issues and information asymmetry are the main causes of credit risk. Secondly, for liquidity risk, defects in the financial derivatives themselves and illiquidity of derivative holders are the two main causes of its creation. The main ways to reduce liquidity risk are to establish a risk control system and to strengthen supervision. Finally, market volatility is the main cause of market risk. Strengthening supervision, training relevant professionals and promoting more market forecasting work by companies are the main ways to avoid market risk. Obviously,

improving regulation is mentioned in every risk resolution measure, so people should focus on addressing regulation in the future. However, as economic researchers are still at the basic stage of exploring the risks of financial derivatives, there is still work to be done on how to effectively avoid them.

References

[1] LinliangYe. Financial derivatives and their risk management - A perspective based on the US subprime mortgage crisis. Enterprise Economy, 2011(5):3.

[2] Na Li. Types of financial derivatives risk and management. Manager Journal, 2009(8X):2.

[3] Picout, E. Economic capital for counterpart credit risk. The RMA Journal, 2004, (7):44-50.

[4] Zhu Steven H, Pykhtin, Michael. A guide to modeling counterparty credit risk. GARP Risk Review, 2007, 37(17):16-22.

[5] YuhongZhang, TianxiangHuo, Zongxian Feng. An exploration of the development of the OTC financial derivatives market. Shanghai Finance ,2006, 8(3):44-46.

[6] Michael C. Jensen, William H. Meckling. Theory of the firm: Managerial behavior, agency costs and ownership structure. Journal of Financial Economics, 1976, 3(4):305-360.

[7] Haiyan Wang. Analysis of credit risk management of commercial banks in China. Jingjishi, 2010, (9):2.

[8] Ameadeo, K. 2008 Financial crisis: Causes, costs, and whether it could happen again, 2022. Available at: https://www.thebalance.com/2008-financial-crisis-3305679.

[9] YuhongHuang, Kai Zhao. Suggested countermeasures to enhance credit risk management of financial derivatives. Economic Research Guide, 2012, (16):2.

[10] Moorad C. Chapter 2 - Credit Derivative Instruments: Part I, Editor(s): Moorad Choudhry, An Introduction to Credit Derivatives (Second Edition), Butterworth-Heinemann, 2013, 17-52, ISBN 9780080982953.

[11] HuaLiu. Case Study of China National Petroleum Corporation Singapore Departmental Control. Journal of Shanghai Institute of Economic Management Cadres. 2008, 03:16-20.

[12] Zheng Zhang, Ying Liu, Dongmei Li. Risk Analysis of Energy Financial Derivatives Market, China Industry Development Research Center, Peking University, China ZhenHuaOil Co., Ltd, 2007.

[13] MinghuiLi. Risk Control of Derivatives in the Light of the Bahrain Bank Case and AVIC Oil Incident, 2006.

[14] Shi Sha. (2016). Financial derivatives are the cornerstone of building risk-informed capital markets. TsinghuafinancialreviewMay 2016. DOI: 10.3969/j.issn.1673-291X.2012.16.030

[15] ZechenSun, MiuyuWu, Wenjie Teng. A study of financial derivatives market risk based on a speculator's perspective. Economic Research Guide (21), 2, 2021.