

# Risk Control of Financial Derivatives in Commercial Banks

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## Abstract

Financial derivatives is a product of financial innovation by means of risk transfer, which plays a great role in promoting the development of financial market, helping investors avoid risks and hedge. But it also has the risk of creating turmoil in financial markets. Therefore, in the use of financial derivatives, we must fully study the risk of financial derivatives, strictly prevent the risk of financial derivatives at the same time. Firstly, this thesis analyzes the characteristics of financial derivatives, such as leverage, complexity, value constrained by basic instruments and risk aversion; Secondly, it discusses the risks faced by its development from default, supervision, information and other aspects. This thesis selects the financial annual report data published by 16 listed commercial banks in China from 2010 to 2016 and other relevant data, and uses the model to empirically study the impact of financial derivatives on bank related risks. It puts forward some risk management measures, such as perfecting laws and regulations, strict supervision by relevant departments, and strengthening self-management of financial institutions.

## Keywords

Financial Derivatives; Commercial Banks; Risk Control.

## 1. Characteristics of financial derivatives

With the collapse of the Bretton Woods system in 1973, the fixed exchange rate system centered on the US dollar collapsed. In order to obtain more benefits, countries have adopted the floating exchange rate system. With the increasingly close ties of the global economy, international capital flows are becoming more frequent, and the competition among countries makes the exchange rate rise and fall frequently, and the risk also increases. The traditional financial instruments can not meet the needs of people to avoid risks. The market urgently needs new financial instruments to achieve the purpose of hedging. Because of this, the financial derivatives market has developed rapidly since 1970s. The three factors of interest rate, exchange rate, price and inflation are intertwined, the changing trend is complex, risks and opportunities coexist, and challenges and opportunities multiply. Since the 1990s, financial derivatives have been innovating and developing rapidly, and they have occupied an important position in the financial market.

### 1.1. Financial derivatives are leveraged

Lever is originally the principle of physics, which means that "small force" can make "big force". On the other hand, in economy, because of the existence of certain expenses, when one economy changes by a small margin, another economy changes by a large margin. Financial derivatives have the characteristics of leverage, that is, "small and broad". On the one hand, it controls the change of several times of capital by investing a small amount of capital. This change makes enterprises not only avoid risks, but also profit from them, effectively avoid the occupation of too much capital, improve the efficiency of capital use, and create better economic benefits. On the other hand, this characteristic also brings the risk of loss to investors. Some big companies,

such as COSCO and CRCC, have suffered huge losses because of the unreasonable use of financial derivatives.

### **1.2. The value of financial derivatives is subject to the underlying instruments**

Financial derivatives are based on or derived from basic financial instruments, which can be divided into stock derivatives, foreign exchange derivatives, interest rate derivatives, etc. Its price is derived from the basic financial instruments that can be traded. Its value will change with the change of interest rate, exchange rate, credit index, commodity price and other similar variables. Interest rate is an important factor affecting financial derivatives. In order to reduce interest rate risk, various countries launch various instruments. Nowadays, the form of international interest rate is complex and changeable, and the fluctuation range of interest rate is very large. Therefore, more and more enterprises and investors choose financial derivatives to avoid risks and make speculative profits.

### **1.3. Financial derivatives are complex**

Compared with basic financial instruments, financial derivatives are more complex. One reason is that it is difficult to understand and operate the concept of financial derivatives, such as futures and forward. Second, the application of financial derivatives is more complex and difficult to judge because of various combination technologies. The institutions and enterprises that design financial products are required to have rich knowledge of finance, mathematics, law and so on. They need to use modern computer network and big data technology to design and simulate the financial market. When developing and designing financial derivatives, they need to make use of modern computer network and big data technology Using artificial intelligence and automation technology. But it will also further increase the difficulty of understanding and operating financial derivatives, making it difficult for ordinary investors to accept and determine the risk.

### **1.4. Financial derivatives can avoid risks**

The traditional financial instruments lag behind the financial derivatives, which shows that the financial risks of the traditional financial instruments are bound together. Through the combination of financial derivatives, these financial risks can be untied and decomposed, and the risks can be scientifically combined again, so as to realize the balance of risk and interest.

## **2. Literature review**

### **2.1. Basic concepts of derivatives**

Derivative is a kind of financial instrument, which is generally expressed as an agreement between two entities, and its price is determined by the price of other basic products. And with corresponding spot assets as the subject matter, the transaction does not need to be delivered immediately, but can be delivered in the future. Typical derivatives include forward, futures, options and swaps.

In terms of scale, commercial banks are the main body engaged in derivatives trading. In the wave of economic development, they use technology, system and other means to continuously innovate and develop financial derivatives based on futures, options, forward and swap. From the perspective of demand, the current financial derivatives market in China is mainly foreign exchange derivatives, interest rate derivatives and stock index derivatives. For commercial banks, the most important and the largest proportion of derivative transactions is hedging. Whether from the perspective of the basic financial attributes or the extended financial attributes of financial derivatives, they play a positive role in the asset liability management and risk prevention of commercial banks.

## 2.2. Motivation of commercial banks to use derivatives

In reality, the market is not perfect. When commercial banks use derivatives to maintain their value, they often bring transaction, agency, bankruptcy costs, tax, financial distress costs and so on, thus affecting the overall income and risk allocation of banks. Based on this, many scholars at home and abroad have studied the motivation of commercial banks to use derivatives from the aspects of income, risk aversion and financial management

Based on the quarterly panel data of 25 U.S. bank holding companies from 2003 to 2009, Li Shaofang (2010) established the income impact analysis model, and found that the impact of exchange rate financial derivatives on the income of commercial banks is more significant. Shanker, an American scholar, investigated the interest rate derivatives transactions of 55 largest bank holding companies in the United States from 1986 to 1993, and found that interest rate derivatives were mainly used to hedge interest rate risk. Guo Shuhua et al. (2009) creatively used sur method to analyze the impact of changes in interest rate and exchange rate on listed banks. The results show that due to the differences in individual and time factors of banks, the market risk, interest rate risk and exchange rate risk coefficients are different, which may be the reason for the differences in bank risk exposure positions. Ma Ying (2009) analyzed the reasons for commercial banks to use financial derivatives from a financial perspective. First, managers can maximize their own interests through earnings management and other means.

In contrast, income, risk and financial factors are only intermediate targets. The ultimate goal of banks is to increase their own value by using derivatives to increase income, avoid risks and effectively manage finance. Therefore, improving value is the most important goal for banks to use derivatives.

## 2.3. The impact of derivatives use on the value of commercial banks

From the perspective of commercial banks' income, interest income and non interest income are complementary. The rational and effective use of derivatives can increase non interest income, thus reducing the impact of interest rate volatility on bank value. Staikouras and Rosie et al. (2003) found that the volatility of interest income and non interest income is opposite through the investigation of the banking industry in EU Member States. It is precisely because of this negative correlation that the volatility can adjust to each other, so as to stabilize income and enhance value.

The research of Guay (1999) shows that the risk factors affecting the securities price of commercial banks mainly include interest rate risk, exchange rate risk, policy risk and other industry-related risks. The use of financial derivatives can effectively manage the relevant risks and stabilize the price of bank securities. In addition, Chinese banks can also use credit derivatives to improve the liquidity of assets, reduce the non-performing loan ratio, achieve the purpose of managing credit risk, and indirectly enhance their own value.

## 3. Risks faced by the development of financial derivatives

### 3.1. Default risk

The generation of financial derivatives should be based on contracts. Derivatives are often not traded in the current period, but both parties choose to trade at a certain time in the future according to their agreed conditions or choose whether to trade. The contract will clearly specify its form, delivery date and method, and the rights and obligations of both parties. Although both sides of the transaction have signed the contract, there is still the possibility that one party will not abide by the contract and violate the terms of the contract. Once this happens, it will inevitably bring great losses to the other party.

### 3.2. Regulatory risk

China's financial market started late, the development of financial derivatives is slow, the internal construction is obviously stagnant, and there are many defects in the supervision and

management system. On the one hand, the people's Bank of China, the Securities Regulatory Commission and the Banking Regulatory Commission have regulatory power. However, in some places, because there are many institutions to manage, the boundary is blurred, there are no clear departments to manage, and there is no standardized management system. On the other hand, due to the weak self-regulation of enterprises, the management of enterprises slackens the regulatory standards in the face of huge interests, and there is a fluke mentality, which leads to enterprises easily ignore the risk when using financial derivatives for investment. If the enterprise can establish a strict supervision system, operate and supervise in accordance with the standardized process, and pay attention to risks, even if the market declines, the situation of misjudgment of the future will also be within the scope of the enterprise; on the contrary, if the enterprise's internal supervision is loose, and there are ultra vires operation or violations, the supervision is not effective, and it does not play its due restrictive role, especially in the enterprise. When the enterprise carries on the large-scale transaction, it will cause the great loss to the enterprise, even the disaster.

### 3.3. Information risk

In the current financial derivatives market, there is still a serious problem of information asymmetry. Information is the first consideration of investors in decision-making, which plays a decisive role in their final choice. However, information disclosure is not open and independent, which is affected by many factors and further increases the risk of investors. According to the data, China adopts the mode of government approval at present, and there is almost no information disclosure among financial institutions, which makes the information that investors know more limited. In addition, financial derivatives are very complex. If investors lack professional knowledge, they are easy to be deceived by incorrect or one-sided information.

### 3.4. Market risk

Market risk refers to the risk of losses caused by the price changes of basic financial instruments. The price of the market is changeable, adverse changes will cause losses and bring risks. For example, for futures and swaps, market risk is the risk of price base or interest rate changes. The price risk in the financial market is the driving force generated by the uncertainty of price. For options, the market risk is also affected by the volatility of the underlying price and the exercise period of options. The market risk of all derivatives is affected by market liquidity and its global and local political events. Market risk is one of the most common risks, which exists in the transaction of every kind of financial derivatives. It shows that the value of financial derivatives changes with time.

### 3.5. Liquidity risk

Liquidity risk refers to the failure of holders of financial derivatives to sell or close their positions at a reasonable price. Liquidity risk includes two types, one is market liquidity risk, the other is capital liquidity risk. The former refers to that the transaction can not be carried out as scheduled due to changes in market environment such as national policies and poor transportation; the latter refers to that the cash flow of traders is disordered, resulting in cash losses. The credit risk of a trader's failure to fulfill the payment obligation within the prescribed time.

### 3.6. Legal risk

The financial market is not perfect, especially in China, the development of financial derivatives is only a few decades, and many relevant legal provisions are not perfect or even missing. This has left a great hidden danger to both parties who use financial derivatives. On the one hand, the innovation of financial derivatives emerge in endlessly, and the updating speed of laws and

regulations is slow. When disputes arise in some transactions, we may not find the corresponding provisions to deal with them, resulting in losses. On the other hand, the design of some financial derivatives will seize the weak part of the law and deliberately evade the control of the law. In addition, if the makers of laws and regulations lack the corresponding financial knowledge and understanding of the actual situation, it will also cause legal risks.

## 4. Research model

### 4.1. Design

According to the methods of Zhong Jin (2006) and Yu Chenghui (2015), the total value of banks is measured by the following methods: bank value = goodwill value + net asset value. The value of goodwill has been described in detail above. Net asset value refers to the difference between the total assets and total liabilities of the bank. In order to measure the impact of financial derivatives on the value of commercial banks, we need to separate out other possible factors, so we need to introduce some factors that may affect the value of commercial banks into the model as control variables. According to the content described above, the proportion of other business income in the total income, the non-performing loan ratio, the length of operation time and so on affect the goodwill of the bank, and then affect its total value. In addition, according to the research of other scholars, the ratio of net assets to total assets, the capital adequacy ratio, the shareholding ratio of the first shareholder of the bank, and the growth rate of the main business income of the bank all affect the bank Bank value has an important impact. According to the model fitting results, this paper selects the ratio of net assets to total assets (x1), the shareholding ratio of the first shareholder (x2), the growth rate of main business (x3), the proportion of other income except deposit and loan business in total income (x4), the non-performing loan ratio (x5) and the length of business history (x6) as the basic control variables. X1 mainly measures the bank's asset size and risk degree; x2 from the perspective of agency problem, because a large number of existing studies have shown that the ownership structure has a significant impact on the bank's performance, so the first shareholder shareholding ratio is taken as an important control variable; the main business growth rate X3 is taken as the control variable because it reflects the development speed of the bank, including the growth rate of the bank Including the future development trend, it can more comprehensively explain the value of banks by incorporating it into the value system; X4 is the quantitative index of goodwill value system resources; X5 measures the credit risk status of banks; X6 is the quantitative index of goodwill value and bank reputation. On this basis, the logarithm of the total value of commercial banks 1 is used to regress the logarithm of the value of financial derivatives

### 4.2. Impact model of derivatives on total value

According to the estimated value of the above goodwill model and the value model of Vit git AIT, the fitting value of the total value of commercial banks from 2010 to 2016 is obtained. On this basis, the impact of the value of derivatives on the total value of banks is explored

#### 1. Descriptive statistics of variables

The explanatory variable D and the explained variable V, that is, the value of derivatives and the total value of banks, are the main objects of this paper. From the descriptive statistical results, they show different trends. The total value of V varies from several million to tens of thousands (billion yuan), which may be the result of a variety of factors. On the whole, the value D of derivatives is small, and some sample banks even did not use derivatives during the survey period, which indicates that the use of derivatives in China's commercial banks is still in its infancy, and there is no need for such innovative business It is in the stage of exploration and development. Nevertheless, whether the derivatives business has an impact on the value of banks, and what the direction and size are, make this study have its practical necessity.



Table 1. Descriptive statistics of derivatives' impact on total value model variables

| Variable | Number of samples | average | Maximum  | minimum | median  | standard deviation |
|----------|-------------------|---------|----------|---------|---------|--------------------|
| V        | 112               | 4641.12 | 20296.33 | 312.15  | 2302.34 | 4975.32            |
| D        | 112               | 119.77  | 1305.49  | 0       | 45.81   | 213.02             |
| X1       | 112               | 6.35    | 9.06     | 3.35    | 6.28    | 0.99               |
| X2       | 112               | 31.94   | 67.72    | 12.68   | 21.03   | 18.07              |
| X3       | 112               | 21.08   | 75.44    | -5.62   | 19.26   | 14.06              |
| X4       | 112               | 21.18   | 39       | 7.02    | 20.79   | 7.28               |
| X5       | 112               | 1.08    | 2.39     | 0.38    | 0.98    | 0.42               |
| X6       | 112               | 37.81   | 109      | 14      | 25      | 28.49              |

In addition, the listed x1, X2, X3, X4 and X5 are all percentages, and the variable D is the final value of derivatives, which is logarithmic to the total value v when brought into the model. For x1, To a certain extent, the ratio of net assets to total assets reflects the size of the bank's own liabilities and risk exposure. The percentage ratio of this index fluctuates less than 10, which indicates that the net assets ratio of listed commercial banks in China is more unified, and it is also an important factor for their steady development. The first shareholder shareholding ratio x2 has a larger change Existing studies have shown that the ownership structure has an important impact on the performance of banks, and it is essential to include it into the control variable of bank value; the main business income growth rate index X3 has a negative value in the statistical observation, which indicates that the growth trend of some commercial banks is slow or even in recession at the present stage. Of course, there is also a better development trend, reaching 75%, and the overall growth rate is low For example, the main business income of commercial banks is still on the rise; the proportion of other businesses in the total income X4 is basically between 10-40%, which indicates that the main source of income of banks is deposit and loan income, while the proportion of derivatives and other businesses is small; the asset status of all banks in the survey period is good, and the non-performing loan rate is about 1%, with little difference; the operation history of banks is relatively stable In terms of time, except bank of communications and Bank of China, which have been operating for hundreds of years, the rest are decades, and the overall difference is not very big.

### 4.3. Correlation among variables

Table 2. Correlation coefficients between variables in the total value impact model of derivatives

|    | V     | D     | X1    | X2    | X3    | X4    | X5    | X6    |
|----|-------|-------|-------|-------|-------|-------|-------|-------|
| V  | 1     | 0.72  | 0.64  | 0.53  | -0.54 | 0.46  | 0.49  | 0.57  |
| D  | 0.72  | 1     | 0.52  | 0.50  | -0.44 | 0.51  | 0.36  | 0.48  |
| X1 | 0.64  | 0.52  | 1     | 0.35  | -0.40 | 0.47  | 0.36  | 0.43  |
| X2 | 0.53  | 0.50  | 0.35  | 1     | -0.18 | 0.34  | 0.21  | 0.49  |
| X3 | -0.54 | -0.44 | -0.40 | -0.18 | 1     | -0.53 | -0.58 | -0.38 |
| X4 | 0.46  | 0.51  | 0.47  | 0.34  | -0.53 | 1     | 0.59  | 0.35  |
| X5 | 0.49  | 0.36  | 0.36  | 0.21  | -0.58 | 0.59  | 1     | 0.32  |
| X6 | 0.57  | 0.48  | 0.43  | 0.49  | -0.38 | 0.35  | 0.32  | 1     |

Only from the perspective of correlation coefficient, there is a strong correlation between bank value V and derivative value D. although the specific form of the relationship between the two is not clear, it can be preliminarily determined that the use of derivatives has a positive role in promoting the improvement of bank value. X1 ~ X6 are the selected control variables, and D is the main explanatory variable. The main business growth rate (x3) of the control variable is negatively correlated with other variables. In addition, the correlation between the variables is positive. However, the absolute values of most of the correlation coefficients are less than 0.5,

and some of the higher ones are less than 0.8. The multicollinearity is not obvious, and all the control variables can be retained temporarily.

## **5. Risk management measures of bank financial derivatives**

On the one hand, the market of financial derivatives has a certain scale, which has been widely recognized and applied by investors. Its existence is of great positive significance. But on the other hand, the maturity of financial derivatives market is not high, lack of supervision, so it also has certain risks, so we still need to pay attention to its disadvantages and formulate good control policies.

### **5.1. Improving laws and regulations**

Perfecting laws and regulations is the fundamental guarantee to stabilize the order of financial market and promote the healthy development of financial derivatives. Only morality and agreement can not restrain all bad behaviors. Only perfect law can maintain market order. China's existing laws are very weak and have many loopholes, which can not better adapt to the development trend of financial derivatives.

### **5.2. The relevant departments shall strictly supervise and disclose the information in a timely manner**

In order to meet the needs of customers, there are more and more kinds of financial derivatives, and the terms are more and more complex. Some countries advocate financial liberalization and deregulation, so that financial institutions seize this opportunity and begin to focus on emerging markets consciously, in order to seek higher market share and profits and expand new business. In order to prevent financial institutions from focusing only on interests and harming the interests of others, it is necessary to strictly design and supervise the contents of financial derivatives designed by them, so as to make them meet the market requirements. The contents should be standardized and institutionalized, and be in line with the international advanced standards. Relevant departments should make information public in time and strengthen information disclosure. Information disclosure means that the degree of supervision is greatly strengthened in both breadth and depth, which is conducive to the improvement of the efficiency of the operation process and the scientificity of the trading behavior, so that the financial market can operate more stably and well.

### **5.3. Financial institutions strengthen self-management**

With the progress of science and technology, all kinds of equipment and science and technology are constantly introduced. Information globalization and networking make the financial markets of various regions in series. Data transmission and capital flow become more convenient and rapid, while reducing transaction costs. The reduction of transaction cost makes financial institutions have more time and capital to launch new products. In the face of development opportunities, financial institutions must strengthen self-management, improve management system, and formulate strict internal review system. The management should be self-discipline, fair and honest; the operation process of the organization should be open and transparent, orderly and efficient; the management and monitoring indicators should be in line with international standards, scientific and accurate.

### **5.4. Strengthening internal risk management**

So that enterprises can implement the responsibility of risk management, strengthen the identification and evaluation of major risk factors, and give early warning in time. On the one hand, different departments should exercise different functions, and the same trading activity should be operated by different departments, each performing its own duties and supervising each other. On the other hand, we should strengthen accounting control to make accounting

information true and effective. For domestic commercial banks, to deal with the risks of derivative financial instruments, we should first improve the financial audit management standards of financial derivative financial instruments. China's securities derivatives financial instruments audit business scale development is relatively late, so the effective strengthening of internal management control is particularly important, banks should focus on the following aspects:

① Focus on the control measures of important business and problems, high-risk areas and links; ② the departments responsible for supervision and inspection should have good independence; ③ no one should have special power over internal control; ④ strengthen the internal control of banking derivative financial business, and the specific implementation methods are as follows:

(1) Scientific and effective division of responsibilities. The bank should clearly divide the responsibilities of various departments, establish a system of job incompatibility, and form a working mechanism. Each person should perform his or her own responsibilities, which is an effective method to facilitate evaluation and mutual restriction.

(2) We will continue to strengthen the risk control of government authorization and administrative examination and approval. The business managers at all levels in the bank must exercise their functions and powers in accordance with the law within the scope of business authorized by the bank, and the staff handling business matters must be responsible for handling various businesses within the scope of business authorized by the bank. The personnel of internal risk control management department shall strictly supervise all business departments and each post of the bank, timely review the relevant business data of the bank with authenticity, rationality and information integrity, review the procedures including derivatives, financial instruments and their businesses in accordance with the law, and clearly decide whether to approve or disapprove the signature business review .

(3) Establish and improve the internal business report management system. First of all, clear reporting information, including the collection, analysis, reporting and business information of financial derivatives and financial instruments. Second, when there is important derivative financial instrument business information in banking business, it should be reported in advance. The pertinence and timeliness of information reporting can strengthen the internal management of commercial banks. The report forms include daily analysis report, real-time analysis report, special report, comprehensive analysis report, etc.

(4) Compared with other banks in the same industry, we regularly track and analyze the financial derivatives and financial instruments business accounting activities of other banks in the world, the potential risks of issuing cash derivatives and financial instruments business, and the problems existing in the monitoring system by using banking ratio forecast analysis, comparative forecast analysis, factor forecast analysis, trend forecast analysis and other methods And so on.

(5) Establish a scientific performance index evaluation system, and evaluate the performance of each department and employee in the current period. By comparing the budget index, profit level and return on investment of performance index, we can realize the reward and punishment, and strengthen the incentive and constraint to the employees of each department.

(6) In terms of technical means, the main purpose of strengthening the control of bank electronic information audit technology and bank information system is not only to reduce and eliminate the impact of human factors on business operation, to ensure the effective implementation of internal control management, but also to ensure the development and maintenance of bank electronic information internal audit management system, data signal input and information output, and file information storage Storage and data protection, network security, the use of electronic information system means to establish bank information



derivative business, to meet the needs of bank information processing effective control operation, improve the efficiency of bank information processing, eliminate the impact of some human factors on the operation, at the same time, computer electronic information audit system and its development and maintenance, access and business operation changes, data information management The effective control of number input and information output, file information storage and data storage, network security and other aspects to prevent human modification is the premise to ensure the effective operation and use of electronic information system.

## 6. Conclusion

Financial derivatives are developing steadily and play an important role in the world financial market. For the better development of the world economy, industry managers must face up to the problems encountered in the process of its development and realize the nature of the coexistence of risks and opportunities. Starting from various aspects, we should formulate correct and effective measures to prevent risks, promote fair and transparent transactions, and maintain a peaceful and stable market. With the gradual opening of China's financial market, we hope that banks can give full play to derivative financial instruments to promote the benign flow of domestic funds. The birth of derivative financial instruments is to effectively reduce the long-term uncertainty in global financial activities through risk hedging. However, because they have no entity as guarantee, the investment risk is high. This paper aims to discuss the internal control of the risks in the use of derivative financial instruments, so that China's commercial banks can make more standardized use of various derivative financial instruments and obtain stable profits.

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