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The Study on the Impact of Financial Derivatives Business on the Profitability of Listed Commercial Banks in China

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Abstract

In recent years, with the deepening of financial innovation, more and more financial derivatives continue to emerge. Because financial derivatives have the function of hedging risks, these financial derivatives are also very popular among listed commercial banks. In recent years, the scale of the financial derivatives business of commercial banks is also getting bigger and bigger. However, financial derivatives bring benefits to commercial banks, but also bring relatively large risks to commercial banks, which also need to be paid attention to commercial banks. This paper analyzes the current situation of the financial derivatives business of listed commercial banks in China and the influence mechanism of financial derivatives business on the profitability of listed commercial banks in China, and puts forward suggestions.

Keywords

Financial Derivatives Business, Listed Commercial Banks, Profitability

1. Introduction

With the collapse of the Bretton Woods system, many countries have gradually shifted their exchange rate system from a fixed exchange rate system to a floating exchange rate system, and the central bank has no longer intervened in the foreign exchange market, which has exacerbated the volatility of the foreign exchange market. At the same time, since the 1970s, financial innovation has entered a stage of rapid development, and some countries have begun to reform their own interest rate markets and implement market-oriented interest rates: for example,

China began market-oriented interest rate reform in 1996 [1]. The reform of the interest rate market and the foreign exchange market has also brought greater interest rate and exchange rate risks, thereby exacerbating macroeconomic instability. If these risks are not properly managed, they may have adverse effects at any time: for example, improper management of interest rate risk by a listed commercial bank may lead to the failure of the bank, or even spread to other financial institutions through the contagion effect of risk, which may lead to the collapse of financial institutions; improper management of exchange rate risk can also have a negative impact on the operations of some multinational enterprises, which can lead to financial distress and ultimately bankruptcy. It is for the purpose of managing risk that financial derivatives were born. Because financial derivatives can hedge risks and have relatively low transaction costs, they are favored by many financial and non-financial institutions.

Listed commercial banks are also users of financial derivatives, and they have many types of risks, such as credit risk, interest rate risk, exchange rate risk, and operational risk. Listed commercial banks must properly manage these risks; otherwise, they may cause a crisis at any time [2]. Among them, the use of financial derivatives by listed commercial banks can effectively hedge interest rate risk and exchange rate risk, thereby ensuring operational stability. In addition, listed commercial banks can also obtain a certain amount of income by using financial derivatives, which can improve the profitability of listed commercial banks, thereby improving the competitiveness of listed commercial banks. It should be noted that due to the high leverage of financial derivatives, listed commercial banks must also conduct good management of their financial derivatives business. Currently, the scale of financial derivatives worldwide is increasing, and the number and destructive power of crises caused by financial derivatives are also increasing. Therefore, it is also of great significance to study the impact of the financial derivatives business on the profitability of listed commercial banks.

The advantages and disadvantages of financial derivatives make it necessary for listed commercial banks to conduct financial derivatives business scientifically [3]. The research significance of this topic mainly includes the following aspects:

Firstly, it points out the current situation of listed commercial banks' financial derivatives business in China. Due to the popularity of financial derivatives among banks, the financial derivatives business of listed commercial banks is also relatively large. Through a series of data, it is possible to analyze the current situation of listed commercial banks' financial derivatives business, and then clearly analyze the problems existing in China's listed commercial banks' financial derivatives business.

Secondly, clarify how the financial derivatives business affects the profitability of listed commercial banks and the extent to which it affects the profitability of listed commercial banks. In terms of the situation in China, the financial derivatives market in China started relatively late and has a short history. Therefore,

there is not much research on the profitability of listed commercial banks in China regarding financial derivatives. This article aims to analyze the impact of financial derivatives on the profitability of listed commercial banks in China through a series of analyses.

Thirdly, based on my own analysis, I have clearly given a series of suggestions to enable China's listed commercial banks to better manage their financial derivatives business. Due to the high risk of financial derivatives, listed commercial banks in China must steadily operate the financial derivatives business. Moreover, listed commercial banks in China are the most important financial institutions in the field of indirect financing, so the stability of listed commercial banks is also related to the stability of the entire financial market. Therefore, by putting forward a series of suggestions on operating financial derivatives business, listed commercial banks in China can enhance their operational robustness, thereby preventing banking risks, and ensuring the sound operation of the financial market in China.

Financial derivatives have a very large system structure, and can be classified from the perspective of product types and original assets. From the perspective of product types, it can be divided into forward, futures, options, and swaps; from the perspective of the original assets of derivative instruments, they can be divided into: stocks, interest rates, exchange rates, and commodities. Currently, the financial derivatives of listed banks in major countries in China can be mainly divided into foreign exchange, interest rate, commodity, and others [4].

The impact of financial derivatives on the risk level of state-owned listed banks is as follows: 1) hedging and risk aversion, 2) diversified investment and risk diversification, 3) mismatch problems increase risk, and 4) adverse selection leads to increased bank risk [5].

2. The Status Quo of Financial Derivatives Business Carried out by Listed Commercial Banks in China

2.1. Business Characteristics

Currently, there are two main purposes for listed commercial banks in China to engage in financial derivatives business: the first is to earn commission fees for customer transactions; the second type is trading to avoid risks. Among them, the former is called transactional financial derivative business, and the latter is called non-transactional financial derivative business. From the current stage of China's listed commercial banks, compared to transactional financial derivatives business, the scale of non-transactional financial derivatives business is relatively small. The scale of the financial derivatives business of listed commercial banks in China is equal to the sum of the scales of transactional and non-transactional financial derivatives businesses.

In addition, there are two main types of transactional financial derivatives business for listed commercial banks in China. The first type is proprietary trading; in which commercial banks use their own funds to trade financial derivatives in

order to earn a certain profit. Proprietary trading is an on balance sheet business, and commercial banks' profits and losses are recorded on their balance sheets [6]. The second type is agency trading, in which commercial banks use customers' funds to trade financial derivatives. Valet trading is an intermediary business of commercial banks. In this process, commercial banks only receive commission income from it, and the risks in the transaction process are borne by the customer. Due to the high risk of proprietary trading, commercial banks may suffer huge losses at any time if they are not good at risk management. Therefore, at this stage, the transactional financial derivatives business of listed commercial banks in China mainly refers to agency trading.

In recent years, with the internationalization of RMB and the implementation of market-oriented interest rate reform in China, the risks faced by listed commercial banks in China in terms of exchange rate and interest rate are gradually increasing. Listed commercial banks in China are also increasingly inclined to use financial derivatives for risk management to ensure their profitability, which also makes the types of derivatives increasingly rich. For example, the managed floating exchange rate system implemented in China has increased exchange rate risk [7]. In order to avoid exchange rate risk, listed commercial banks in China have begun to introduce a series of foreign exchange derivatives such as foreign exchange forwards and foreign exchange swaps; the increase in interest rate risk caused by the market-oriented reform of interest rates has led China's listed commercial banks to introduce a series of interest rate derivatives such as interest rate ceiling options and interest rate floor options. In short, the increasingly rich variety of financial derivatives can help listed commercial banks in China better manage a series of market risks they face to a certain extent.

Currently, the risks related to the management of financial derivatives by Chinese commercial banks are divided into two departments: internal control and external supervision. In terms of internal control, domestic commercial banks even spend a lot of money to purchase risk management systems for monitoring; In terms of external supervision, the China Banking Regulatory Commission (CBRC) issued the "Interim Measures for the Management of Financial Institutions' Derivative Product Trading Business" in 2004, and made several revisions and additions based on the annual development situation [8].

2.2. Existing Problems

At this stage, China's listed commercial banks also have a series of problems in the process of engaging in financial derivatives business, mainly including the following aspects:

Firstly, there are few types of financial derivatives in China, which may make listed commercial banks in China unable to fully hedge risks, thereby affecting the profitability of commercial banks. Due to the high-risk nature of the banking industry, listed commercial banks in China are facing various risks. There are few types of financial derivatives in China, which may make commercial banks

unable to find the most suitable financial derivatives for managing certain risks, thereby failing to minimize risks and ultimately affecting the profitability of commercial banks.

Secondly, China's listed commercial banks lack the internal control ability to control the risks related to financial derivatives. If commercial banks cannot properly manage these risks, it may lead to significant losses for commercial banks. Due to the large risks inherent in financial derivatives, commercial banks must establish a sound risk control mechanism. Currently, listed commercial banks in China are mainly managed by risk management departments, while other departments do not pay enough attention to risk management. Therefore, the risk control capabilities of listed commercial banks in China need to be further improved.

Thirdly, China's listed commercial banks do not yet have the ability to scientifically price financial derivatives independently. Due to the relatively late start of the financial derivatives market in China, currently, the financial derivatives of listed commercial banks in China are priced using foreign models, and China does not have an independent pricing model for financial derivatives. Therefore, at this stage, the independent pricing ability of listed commercial banks in China for financial derivatives needs to be improved.

3. Empirical Analysis

3.1. The Selection of Variables

3.1.1. The Explained Variables

China's listed commercial banks are profitable enterprises, so listed commercial banks will have some indicators to measure their profitability. For example, Profit Margin (PM) on sales, Return on Assets (ROAs), and Return on Equity (ROE). The rate of return on net assets is the ratio of net profit to owner's equity, which is:

$$\text{Return On Equity}\left(\text{ROE}\right)=\frac{\text{Net Profit}}{\text{Owner's Equity}}$$

Considering that return on equity can measure the return of shareholders of listed commercial banks, it can also be used to calculate the sustainable growth rate of commercial banks. Therefore, we choose the Return on Equity (ROE) as the explanatory variable to better study the impact of financial derivatives business on the profitability of commercial banks [9]. Return on equity can be obtained from the annual reports of various commercial banks. This paper analyzes the 2020 annual reports of 12 listed commercial banks in China, and obtains a total of 12 data on return on equity.

3.1.2. The Interpret Variables

In the annual reports of 12 banks, the nominal values of all financial derivatives held by the bank and the nominal values of various types of financial derivatives can be found. Due to the large gap in asset size among commercial banks, pro-

portional data should be used as an explanatory variable to exclude the impact of scale effects on commercial banks. This paper selects three explanatory variables: the ratio of nominal value of all derivatives (TDERs) to total assets, the ratio of nominal value of Foreign Exchange Derivatives (FECDs) to total assets, and the ratio of nominal value of Interest Rate Derivatives (IRDs) to total assets. They represent the scale of all derivatives transactions, foreign exchange derivatives transactions, and interest rate derivatives transactions of commercial banks [10].

3.1.3. The Control Variables

In addition to the three financial derivatives factors that affect the profitability of listed commercial banks, there are many factors that affect the profitability of listed commercial banks [11]. Therefore, this paper needs to select control variables to reduce errors. This paper selects two indicators as control variables:

1) Capital Adequacy Ratio (CAR): Capital adequacy ratio is the ratio of total capital to risk weighted assets of a commercial bank. Capital adequacy ratio can reflect the ability of commercial banks to bear losses, so it can affect the profitability of listed commercial banks.

2) Provision Coverage (PC) ratio: The provision coverage ratio can reflect the ability of commercial banks to withstand credit risks, and this indicator can also reflect the asset quality of commercial banks. Therefore, provision coverage can also affect the profitability of commercial banks.

3.2. Model Construction

This paper selects one explained variable, three explained variables, and two control variables to establish a multiple linear regression model, as shown below:

$$ROE_i = c + \alpha TDER_i + \beta FECD_i + \gamma IRD_i + \delta CAR_i + \varepsilon PC_i$$

The meaning of each variable is shown in Table 1.

Table 1. Meaning of variables.

Variable	Meaning	Data Sources
ROE_i	Represents the return on equity of the ith listed commercial bank	According to the 2020 annual reports of China's 12 listed commercial banks
$TDER_i$	Represents the size of all derivatives transactions of the ith listed commercial bank	
$FECD_i$	Represents the size of foreign exchange derivatives of the i listed commercial bank	
IRD_i	Represents the interest rate derivatives trading size of the ith listed commercial bank	
CAR_i	Represents the capital adequacy ratio of the ith listed commercial bank	
PC_i	It represents the provision coverage rate of the first i-listed commercial banks	

Based on this model, we can know that if $\alpha \neq 0$ or $\beta \neq 0$ or $\gamma \neq 0$, and passing the test at a significance level of 5%, it can indicate that the scale of all financial derivatives or foreign exchange derivatives or interest rate derivatives has an impact on the profitability of listed commercial banks; If $\alpha > 0$ or $\beta > 0$ or $\gamma > 0$, and passing the test at a significance level of 5%, it can indicate that the scale of all financial derivatives or foreign exchange derivatives or interest rate derivatives has a positive impact on the profitability of listed commercial banks; If $\alpha < 0$ or $\beta < 0$ or $\gamma < 0$, and passing the test at a significance level of 5%, it can be shown that the scale of all financial derivatives or foreign exchange derivatives or interest rate derivatives has a negative impact on the profitability of listed commercial banks.

3.3. Descriptive Statistics of Variables

Descriptive statistics of variables are shown in Table 2. From Table 2, we can see that the maximum and minimum values of the three explanatory variables differ greatly, which well represents the gap between state-owned commercial banks, joint-stock commercial banks, and urban commercial banks, indicating that the sample is well representative; Moreover, the average scale of foreign exchange derivatives of listed commercial banks in China is higher than the scale of interest rate derivatives, indicating that the financial derivatives business of listed commercial banks in China is mainly foreign exchange derivatives business.

3.4. Correlation Test

The results of the correlation test are shown in Table 3, and the correlation test of variables aims to test for multicollinearity between variables. From Table 3, we can see that the absolute value of the correlation coefficient between each variable is less than 0.7, which indicates that there is no problem of multicollinearity among the variables.

Table 2. Description statistics.

	ROE	*TDER*	*FCED*	*IRD*	*CAR*	*PC*
Mean	0.118375	0.180642	0.124400	0.050542	0.142658	2.484283
Median	0.111300	0.129300	0.103050	0.028950	0.142700	1.920550
Maximum	0.165300	0.512800	0.325100	0.177200	0.168800	5.055900
Minimum	0.068100	0.004700	0.003500	0.001100	0.100900	1.393800
Std. Dev.	0.027592	0.134532	0.084159	0.051877	0.018938	1.281054
Skewness	0.204368	1.199154	1.014257	1.269382	−0.555648	1.091889
Kurtosis	2.528207	4.109391	3.800197	3.854828	3.077225	2.540952
Jarque-Bera	0.194827	3.491315	2.377594	3.588025	0.620471	2.489805
Probability	0.907181	0.174530	0.304587	0.166292	0.733274	0.287969
Sum	1.420500	2.167700	1.492800	0.606500	1.711900	29.81140
Sum Sq. Dev.	0.008374	0.199087	0.077910	0.029603	0.003945	18.05210
Observations	12	12	12	12	12	12

Table 3. Correlation tests.

	TDER	*FCED*	*IRD*	*CAR*	*PC*
TDER	1.000	0.677	0.543	0.164	0.653
FCED	0.577	1.000	0651	0.0628	0.635
IRD	0.543	0.651	1.000	0.235	0.613
CAR	0.164	0.092	0.235	1.000	0.090
PC	0.653	0.635	0.613	0.090	1.000

4. Regression Analysis

The regression analysis of the model can be performed by using the Eviews8.0 software, and the regression results are shown in **Table 4**.

4.1. The Regression Model Expression

Based on the above regression results, we were able to determine the following regression model expressions:

$$ROE_i = 0.11 + 3.91TDER_i - 4.14FECD_i - 3.79IRD_i - 0.25CAR_i + 0.02PC_i$$
$$(3.89)\ (3.07)\qquad (-3.19)\qquad (-2.90)\qquad (-1.28)\qquad (5.55)$$
$$R^2 = 0.93 \quad F = 16.11$$

Table 4. Regression results.

Dependent Variable: ROE

Method: Least Squares

Date: 04/18/21 Time: 15:14

Sample: 1 - 12

Included observations: 12

Variable	Coefficient	Std. Error	t-Statistic	Prob.
FCED	−4.135423	1.295383	−3.192431	0.0188
IRD	−3.785832	1.306002	−2.898796	0.0274
TDER	3.907000	1.271843	3.071921	0.0219
CAR	−0.252974	0.197016	−1.284025	0.2465
PC	0.017526	0.003160	5.546879	0.0015
C	0.110946	0.028523	3.889665	0.0081
R-squared	0.930678	Mean Dependent Var		0.118375
Adjusted R-squared	0.872909	S.D. Dependent Var		0.027592
S.E. of Regression	0.009836	Akaike Info Criterion		−6.098599
Sum Squared Resid	0.000581	Schwarz Criterion		−5.856146
Log Likelihood	42.59159	Hannan-Quinn Criter.		−6.188364
F-statistic	16.11045	Durbin-Watson Stat		1.460903
Prob. (F-statistic)	0.002018			

4.2. The Test of the Economic Significance of the Model

According to the regression model expression, every 1% increase of all derivatives (TDERs) trading scale of listed commercial banks will cause a 3.91% increase in Return on Equity (ROE); every 1% increase of Foreign Exchange Derivatives (FECDs) trading scale of listed commercial banks will cause a 4.14% decrease in Return on Equity (ROE); every 1% increase in Interest Rate Derivatives (IRDs) trading scale of listed commercial banks will cause the decrease of Return on Equity (ROE) by 2.90%.

4.3. The Goodness of Fit Test

In the multiple linear regression analysis, we used the decisive coefficient R2To reflect the degree of fit of the model, the decisive coefficient R2The calculation formula is as follows:

$$R^2 = \frac{\text{ESS}}{\text{TSS}} = 1 - \frac{\text{RSS}}{\text{TSS}}$$

where ESS is the sum of regression squares, TSS is the total deviation sum of squares and RSS is the sum of residual squares. In Table 4, the determincoefficient R2As can be seen directly, the R^2 = 0.93. Owing to R2The closer to 1, the higher the model fit, so the model fits well.

4.4. The F-Test

The F-test can test the significance of the overall model, and the F-statistic is calculated by the following formula:

$$F = \frac{\text{ESS}/k}{\text{RSS}/(n-k-1)}$$

where ESS is the sum of regression squares, k is the number of explanatory variables plus control variables, and n is the sample size. At a 5% significance level, we can determine that the $F_{0.05}(k, n-k-1) = F_{0.05}(5,6) = 4.39$. From Table 4, the model F = 16.11, which is greater than the threshold of 4.39, so we reject the original hypothesis, and that "All Derivatives Trading Size (TDER)", "derivatives (FECD)", "Interest Rate Derivatives (IRDs) trading", "Capital Adequacy Ratio (CAR)" and "Provision Coverage (PC)" has a significant impact on "return on equity (ROE)".

4.5. The T-Test

A t-test can test the significance of the individual variables. At a 5% significance level, we can determine that the $t_{0.025}(n-k-1) = t_{0.025}(6) = 2.45$. According to Table 4, Of t =3.07 for "All Derivatives Trading Size (TDER)", which is greater than the critical value of 2.45, so we reject the null hypothesis, It is considered that "All Derivatives Trading Size (TDER)" has a significant impact on "Return on Equity (ROE)" when other conditions remain unchanged; of t = −3.19 (FECD), its absolute value is greater than the critical value of 2.45, so we reject the null

hypothesis, it is considered that "the trading scale of Foreign Exchange Derivatives (FECDs)" has a significant impact on the "Return on Equity (ROE)" when other conditions remain unchanged; of $t = -2.90$ for "Interest Rate Derivatives (IRDs) trading size", its absolute value is greater than the critical value of 2.45, so we reject the null hypothesis, it is considered that "Interest Rate Derivatives (IRDs) trading size" has a significant impact on "Return on Equity (ROE)" with other conditions unchanged.

5. Conclusions

Based on the above regression analysis results, we can draw the following conclusions:

First, the trading scale of foreign exchange derivatives and interest rate derivatives has a negative impact on the profitability of China's listed commercial banks [12]. The reason is that China's exchange rate system and interest rate system need to be further deepened, and China's listed commercial banks still lack risk management experience for foreign exchange and interest rate derivatives business, which makes the foreign exchange and interest rate derivatives business have a negative impact on the profitability of commercial banks.

Second, the trading size of all derivatives has a positive impact on the profitability of China's listed commercial banks. In addition to foreign exchange and interest rate derivatives businesses, commercial banks also have other types of financial derivatives businesses, such as precious metal derivatives business and credit derivatives business. This shows that these other types of financial derivatives have a positive impact on the profitability of listed commercial banks in China, and the role of these derivatives has been fully played.

In short, due to the result of our country's financial derivatives market development history is short, which makes the listed commercial banks of financial derivatives management is not mature, so part of the financial derivatives business (such as foreign exchange and interest rate derivatives) has the positive role of listed commercial bank profit did not play.

6. Suggestions

Countermeasures and suggestions for risk management of financial derivatives of listed commercial banks in China: 1) Strengthen the risk management awareness of operators, 2) Improve and continuously improve the risk management system, and 3) Enrich regulatory means to improve the quality of supervisors [13].

According to the impact of financial derivatives business on the profitability of China's listed commercial banks and the status of financial derivatives business of listed commercial banks in China, three suggestions are put forward on how to better operate financial derivatives business in China's listed commercial banks:

First, strengthen the internal supervision of foreign exchange and interest rate derivatives business. At present, foreign exchange and interest rate derivatives

have a negative impact on the profitability of China's listed commercial banks, so it is necessary for commercial banks to strengthen their supervision in this respect. Among them, supervision is divided into external supervision and internal supervision, and the supervision of commercial banks belongs to internal supervision. To do a good job of internal supervision, it is necessary to coordinate different departments and establish a perfect internal control system. For example, the board of directors shall develop the overall development strategy for the foreign exchange and interest rate derivatives business of commercial banks, and to the foreign exchange and interest rate derivatives business related personnel close supervision; risk management department shall formulate a risk management mechanism for foreign exchange and interest rate derivatives business of commercial banks, so as to constantly monitor the various risks generated by the financial derivatives business, avoid incalculable losses; derivatives business departments should do a good job of isolating the corresponding business links, different business links should be done by different employees, to avoid a series of fraud; the information technology department shall study, develop, and maintain the trading system of the commercial bank, and to the close supervision of the accounts in the trading system, to avoid accidents, causing significant losses to the bank; auditors for a careful assessment of a series of related reports on the foreign exchange and interest rate derivatives business, to evaluate whether the business report is true, accurate and complete. In addition, the audit department will evaluate a series of processes for developing derivatives of foreign exchange and interest rates. In short, doing a good job of internal supervision requires the joint efforts of different departments.

Second, expand the types of financial derivatives. At present, there are not many kinds of financial derivatives in China, but with the change of a series of factors such as macroeconomic environment, commercial banks are facing more and more risks, and the customers of commercial banks have more and more strong demand for financial derivatives business. This requires commercial banks to expand the types of financial derivatives to better manage risks and meet customer needs. How to expand the types of financial derivatives, The following suggestions are given: First, China's listed commercial banks can be based on some new financial derivatives of foreign commercial banks, combined with the actual situation in China, to design some new financial derivatives; next, commercial banks operate in OTC financial derivatives, due to the rich variety of financial derivatives in China, therefore, China's listed commercial banks can design OTC financial derivatives according to some financial derivatives in the exchange; last, China's listed commercial banks can improve the professional ability of their customers' financial derivatives, then consult customers for their demand for relevant financial derivatives, then commercial banks can design some new financial derivatives according to the needs of these customers.

Third, continuously improve the professional quality of relevant employees of commercial banks in managing financial derivatives business. Managing the financial derivatives business is complex work, which requires China's listed com-

mercial banks to have a group of professional employees. For financial derivatives business, a professional employee needs the following aspects: first, employees must have rich knowledge of financial engineering; second, employees must have a good ability to collect and process data information in order to better grasp the market trend; again, employees need a certain ability to cope with daily high-intensity work; finally, employees must have professional ethics and do not engage in any fraudulent behavior. The ways to improve the professional management of the financial derivatives business are: on the one hand, China's listed commercial banks should strengthen the training of their employees to improve their theoretical knowledge and practical ability; on the other hand, China's listed commercial banks can also actively introduce talents from universities to increase the number of professional talents.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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