Research on the Impact of Finance on the Profitability of Commercial Banks under the Background of Internet+

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Abstract: With the continuous progress and prosperity of mobile Internet science and technology, relying on it and the operation of Internet finance is also natural, and with its advantages of high transparency, good cooperation, intermediate costs and low cost, quickly occupied China's financial market. Based on the measurement and analysis of the risk value of Internet finance and commercial banks, this paper studies the risk spillover effect of Internet finance on commercial banks from the macro and micro levels. Based on the principle of minimum AIC, BIC and maximum likelihood, this paper selects the best ArMA-GARCH model for the selected 2 groups of index series and 13 groups of return series, and calculates their risk value and risk spillover value on the basis of fitting (Wang 2021). In the aspect of risk measurement, the value of risk is quantized by calculating the value of risk (Va R), and in the aspect of risk spillover, the risk spillover effect is comprehensively analyzed by calculating the conditional value of risk (Co Va R), its derived index risk spillover value (△Co Va R) and relative risk spillover degree (%Co Va R). The empirical results show that the impact of Internet financial risks makes commercial banks suffer from positive risk spillover, but there is no consistency between macro and micro in the direction of risk spillover (Liu). On the macro level, the empirical results show that Internet finance has positive risk spillover to commercial banks, but on the micro level, Yu 'ebao has positive and negative risk spillover to 12 commercial banks, and the spillover directions of different commercial banks are not consistent. In terms of overflow intensity, there is no uniform rule for different types of commercial banks.

1 INTRODUCTION

Internet financial in the process of its development has a direct impact to the traditional financial industry, the traditional financial sector operate a shift in the direction of formalization and digitization two, so the Internet finance and traditional finance also closely relates in together, when the Internet through financial risk, the risk was amplified, endanger the development of the traditional financial industry, That is, there is a spillover effect. In China's financial system, the banking industry has always played a very important role, and the competition and cooperation between Internet finance and banks in business will inevitably bear the brunt of the risk spillover effect of Internet finance. Exploring the risk spillover effect of Internet finance on China's banking industry, on the one hand, can provide reference opinions for Internet finance enterprises and commercial banks to carry out scientific and reasonable risk control and improve the risk assessment system; On the other hand, it can also help investors to have a clearer understanding of investment risks, so that investment tends to be transparent and reasonable, and create a healthy investment environment (Yan 2019).

On November 3, 2020, ant Financial, a giant Internet financial company, was suspended from listing, which once again shows that behind the rapid development of Internet finance, there is actually a huge financial risk. This risk not only affects ant itself, but also spreads to other financial institutions through the whole network of financial system. Serious or even the outbreak of systemic financial risks (Chen 2021). The bank is the core of the financial system, the safety of the bank is related to the security of the whole country's economy. At the same time, on the one hand, the development of Internet finance has impacted all kinds of business of banks; On the other hand, the arrival of THE 5G era also speeds up the pace of banking capitalization, resulting in the formation of numerous links between

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banks and Internet finance. Therefore, paying close attention to the risk of Internet finance and the spillover effect of such risk on commercial banks is the basis of providing some reference suggestions for reasonable control of such risk.

2 THE RELATED THEORY

2.1 Internet Finance

On October 13, 2016, The General Office of the State Council issued the Notice on the Implementation Plan of the Special Rectification of Internet Financial Risks and pointed out that: Internet finance is not simply the combination of the Internet and finance, but a new model and business, of course, it is created to meet the new needs of users after the realization of security, need to trust and accept mobile radio and other network technology (Wang 2021).

Traditional financial institutions begin to use new technologies to upgrade their businesses and optimize their own management. For example, artificial intelligence technology is used to replace ordinary labor, thus reducing business costs while improving business efficiency and quality. Big data technology can be used to mine and process customer information to reduce information asymmetry and thus reduce bank operation risks (Chen 2021).

2.2 Fin Tech

Fin tech is a financial disinter mediation activity carried out by innovative enterprises using science and technology to traditional financial institutions (such as commercial banks). The Monetary Authority of Singapore sees fin tech as an innovative technology that can be used in the traditional financial sector as well as relevant regulatory bodies. In 1992, with the establishment of The China Association for the Promotion of Science and Finance, the word fin tech gradually entered the Chinese people's vision. In recent years, with the progress of information technology and its development and innovation in the financial field (Li 2021), fin tech has become the driving force and support for the innovation and development of financial business from the intermediate link in the beginning, and its role in the financial industry is growing and its influence cannot be underestimated. From the perspective of the application of technology in financial business, the development of fin tech in China can be divided into three stages: financial electrification stage, Internet finance stage and deep integration stage.

2.3 Profitability of Commercial Banks

Profitability of commercial banks refers to the nature that banks can make profits by operating their own assets. This nature is not only affected by the bank itself, but also by the external operating conditions of the bank. It is one of the three characteristics followed by the operation and management of commercial banks, and it is also the object that commercial banks focus on. Specifically, profitability refers to the ability of a bank to obtain income and achieve its asset appreciation target through its own business operation within a certain accounting period. Therefore, this paper mainly measures this index through return on total assets (ROA) (Liang 2021). On the other hand is the income structure of commercial banks, which mainly refers to the composition of profits or operating revenues of commercial banks (including: By comparing the income structure and the proportion changes of each part, we can effectively see the development of commercial banks in different businesses, and measure whether the current development of commercial banks is reasonable. Therefore, This paper mainly measures the contribution rate of bank's balance sheet business and off-balance sheet business to bank profits by the proportion of non-interest income to total operating income, and analyzes the impact of fin tech on the income structure of commercial banks according to the changes of the two.

3 RISK MEASUREMENT AND MODEL CONSTRUCTION

3.1 Risk Measurement Method Va R

Va R is derived from English 'Value at Risk', which refers to the maximum loss faced by a certain financial asset or portfolio under normal market fluctuations. In July 1993, G30 members proposed that Va R was first used to measure financial risk. In 1999, Basel committee encouraged the use of Va R to measure the credit risk of commercial banks. Subsequently, in 2004, the measurement object of Va R was expanded to the sum of credit, market and operational risks. At the same time, many scholars also strongly advocated using Va R to measure some risks common to commercial banks. Since then, Va R

has been widely used and plays a very important role in risk measurement (Zeng 2021).

From a statistical point of view, Va R refers to the maximum possible loss of a certain financial asset or portfolio value in a specific period in the future at a certain probability level or confidence level, which can be expressed as:

$$P(\Delta P \le VaR) = \alpha \quad (1)$$

$\triangle P$ represents the value loss of a certain financial asset or portfolio within a certain holding period; P represents probability and α represents significance level. Generally, the significance level is set at 5%, which reflects the risk preference or acceptance degree of financial asset managers. Different significance levels represent different risk degrees. Generally speaking, the significance level is determined according to the investor's preference, acceptance and acceptance degree of risk.

3.2 CoVa R

The emergence of Va R has realized the transformation of risk analysis from qualitative to quantitative, but it can only be used to measure the maximum loss at risk faced by a single financial institution or market. In the same market environment, when a certain financial institution has a risk, other financial institutions may also be affected by the risk spillover, but Va R cannot calculate the size of the risk spillover or judge the direction of the spillover.

In 2009, Adrian & Brunnermeier proposed Co Va R, which is used to measure the economic loss that a portfolio may face in a crisis or high risk situation (Ren 2021). Its expression is:

$$P(X^{m} \le CoVaR_{\alpha}^{mn} \mid X^{n} = VaR_{\alpha}^{n}) = \alpha \quad (2)$$

Where, VaR_{α}^{n} represents the value of risk faced by financial institution n at a given significance level α; $CoVaR_{\alpha}^{n}$ represents the value of risk faced by financial institution n at a given significance level, and the value of risk is VaR_{α}^{n}. $CoVaR_{\alpha}^{mn}$ is the conditional Va R of financial institution m with respect to financial institution n, used to measure the total Va R of financial institution m facing risks. It is the sum of the Va R VaR_{α}^{m} of financial institution m and the risk spillover value of financial institution n to financial institution m when the market is at a normal fluctuation level (Luo 2021).The risk spillover value is usually expressed as $\Delta CoVaR_{\alpha}^{mn}$, which is the difference between the conditional Va R $CoVaR_{\alpha}^{mn}$ and Va R VaR_{α}^{m} of financial institution m.

$$\Delta CoVaR_{\alpha}^{mn} = CoVaR_{\alpha}^{mn} - VaR_{\alpha}^{m} \quad (3)$$

$\Delta CoVaR_{\alpha}^{mn}$ N measures the financial institutions for financial institutions m generated by the size of the risk of overflow, but different size of the risk value of financial institutions tend to have difference, in order to better facilitate comparison and study, to deal with the dimensional change risk tend to overflow value, n get financial institutions for financial institutions risk spillover, m $\%CoVaR_{\alpha}^{mn}$ .It is used to measure the proportion of risk spillover received by a financial institution to its own risk, and its specific mathematical expression is as follows (Zhang 2021):

$$\%CoVaR_{\alpha}^{mn} = \frac{\Delta CoVaR_{\alpha}^{mn}}{VaR_{\alpha}^{m}} \times 100\% \quad (4)$$

This paper will study the risk spillover effect of Internet finance on commercial banks by combining $CoVaR_{\alpha}^{mn}$, $\Delta CoVaR_{\alpha}^{mn}$, $\%CoVaR_{\alpha}^{mn}$ and three indicators.

3.3 Va R and Co Va R Values Are Calculated based on ArMA-GARCH Class Model

A mean equation plus a Va Riance equation forms a time series. The residual of ordinary ARMA model is the white noise sequence that cannot analyze any information, so the Va Riance equation is ignored. The mean value of GARCH model is usually assumed to be a constant, and the residual has ARCH effect, so the research focus is on the Va Riance equation, and the mean value equation is usually ignored. In order to model both the mean and the difference, the two models are combined (Teng 2021).

The ARMA(P,q)-GARCH(m,n) model is constructed, and its expression is:

$$X_{t=\phi_0} + \sum_{i=1}^{p} \phi_i X_{t-i} + \sum_{j=1}^{q} \theta_j \varepsilon_{t-j}^{2} + \varepsilon_t \quad (5)$$

$$\sigma_t^2 = \omega + \sum_{j=1}^{m} \alpha_i \sigma_{t-i}^2 + \sum_{j=1}^{n} \beta_j \varepsilon_{t-i}^2 \quad (6)$$

It can be seen from the above expressions that the ArMA-GARCH model is a random process in which the mean value meets the ARMA process and the Va Riance meets the GARCH process.

In this paper, arma-garch model is used to fit the data of Internet finance and commercial banks, and the model with the best goodness of fit is selected to obtain the regression results, so as to calculate the corresponding Va R and Co Va R values. For easy understanding, we assume that ARMA (1,1) -garch (1,1) is used.

The model best fits the data of financial institution M as an example to illustrate the calculation principle, and its expression is as follows (Fan 2021):

$$X_t^m = \mu^m + \phi_1^m X_{t-i}^m + \phi_2^m S_{t-1}^m + \theta_1^m \varepsilon_{t-1} + \varepsilon_t \quad (7)$$

$$\sigma_t^2 = \omega^m + \alpha_1^m \sigma_{t-1}^2 + \alpha_2^m S_{t-1}^m + \beta_1^m \varepsilon_{t-1}^2 \quad (8)$$

Where, is the return rate of financial institution M, is the state Va Riable, and is the conditional Va Riance. $X_t^m \ S_{\text{t-1}}^m \ \sigma_t^2$

$$X_t^m = \phi_0^m + S_{t-1}^m + \sum_{i=1}^{p} \phi_i^m X_{t-i}^m + \sum_{i=1}^{q} \theta_i^m \varepsilon_{t-i}^m + \varepsilon_t^m = \mu_t^m + \varepsilon_t^m \quad (9)$$

Then, the risk value of financial institution M affected by the risk of financial institution n can be calculated by the following formula: $CoVaR_t^{mn}$

$$CoVaR_t^{mn} = X_t^m - Q(1-\alpha)\sigma_t^m \quad (10)$$

4 INTERNET FINANCE AND RISK ANALYSIS OF COMMERCIAL BANKS

This paper measures and analyzes the value-at-risk of Internet finance and commercial banks from macro and micro levels. First, the selection of sample data and Va Riable symbols are explained, followed by descriptive statistics of sample data, and then the data are tested. On the basis of passing the test, the best ArMA-GARCH model is selected for each sequence to fit according to the minimum AIC and BIC principles and the maximum likelihood principle. Finally, Va R is calculated and analyzed.

4.1 Sample Selection

Macroscopically, the Internet financial sector selects THE China Securities Internet Finance Index to represent the whole industry, while the commercial banking sector selects the China Securities Bank Index to represent the whole industry. The two indexes are both compiled by China Securities Corporation and are the most authoritative indexes in these two industries in recent years, reflecting the overall performance of the two major industries of Internet finance and commercial banking. The data comes from the official website of China Securities Index Co LTD.

In the micro part, select a single Internet financial product and some commercial banks, calculate their risk value, and further study the risk spillover of Internet financial products to commercial banks on this basis. This paper selects the yield data of Shanghai Composite Index as the state Va Riable. The data of micro part and Shanghai Composite Index come from RESSET database.

For the micro part, considering the late listing time of some commercial banks, the first day is selected as January 1, 2016, and the last day is consistent with the macro part, which contains half data of 4 years in total. Except weekends and holidays, 1,072 observation values are included. Since the listing dates of Bank of Shanghai and Bank of Hangzhou were both later than January 1, 2016, only 860 and 874 observations were included, respectively.

4.2 Descriptive Statistics of Data

The stationarity of price series is generally poor. In contrast, logarithmic return series has the advantages of convenience and stability (Yu 2021). Based on this, this paper adopts logarithmic return rate series, whose calculation formula is as follows:

$$r_t = \ln(P_t) - \ln(P_{t-1}) \quad (11)$$

Among them, the rt Represents the logarithmic rate of return at time t, PtRepresents the price level at time t, Pt-1Represents the price level of the previous period. There are 16 logarithmic return rate series used in this paper, including return rate series of Internet finance and commercial banks, return rate series of Shanghai Composite Index, return rate series of Yu 'ebao and return rate series of 12 commercial banks. Since the value of the return rate itself is small, in order to improve the differentiation, the return rate and its descriptive statistics are uniformly reserved to 4 decimal places. The descriptive statistics are shown in Table 1 and Table 2.

Table 1: Descriptive statistics of yield series (macro).

r_t	hlw	yh	mk
Mean	0.0007	0.0004	0.0002
Max	0.0830	0.0817	0.0576
Min	-0.0967	-0.0997	-0.0849
Std	0.0197	0.0155	0.0139
Skewness	-0.4727	0.1970	-0.9331
Kurtosis	5.5887	9.6903	9.5103

Table 2: Descriptive statistics of return rate series (micro).

ri	yb	gs	jt	ny	zg	zs	gd
Mean	0.0014	0.0003	0.0000	0.0003	0.0001	0.0008	0.0001
Max	0.1211	0.0631	0.0558	0.0708	0.0636	0.0687	0.0714
Min	-0.1368	-0.0581	-0.0658	-0.0531	-0.0581	-0.0644	-0.0721
Std	0.0195	0.0115	0.0106	0.0105	0.0101	0.0162	0.0129
Skewness	0.0177	0.2281	-0.2464	0.3231	-0.0451	0.2643	0.2723
Kurtosis	12.6391	7.4005	9.1438	8.4762	8.2491	4.9284	7.6242

Table 1 shows the data of Internet finance index, banking index and Shanghai Composite Index. It can be seen from the table that the average return rates of Internet finance, banking index and Shanghai Composite Index are all positive and decrease successively. In contrast, the average return rate of Internet finance index is significantly higher than the other two indexes, reaching 0.0007, which is consistent with the characteristics of high return of Internet finance. The bank index followed with an average yield of 0.0004. The Yield of the Shanghai Composite Index is only 0.0002, which is the smallest in comparison.

Standard deviation is used to reflect the fluctuation of a set of data, and the greater the standard deviation, the greater the fluctuation of the set of data, and vice versa. It can be seen from Table 1 that the fluctuation range of the three series is not large. The fluctuation range of the banking index is very close to that of the SSE Composite Index, while the standard deviation of the Internet finance index is slightly larger than that of the first two series, indicating that the fluctuation range of the Internet finance index is larger than that of the banking index and the SSE Composite Index.

4.3 Calculation and Analysis of Va R Value

The premise of calculating Va R is to build a model to fit the rate of return data. In order to consider both the mean and Va Riance, this paper selects Arma-garch class model. Different sequences of data have different characteristics, so the selected ArMA-GarCH model is not consistent. After the model is established, step forward prediction is made to obtain the step forward prediction values of mean and Va Riance, denoted as $\hat{X}_t^m$ and $\hat{\sigma}_t^m$ respectively, and then according to the formula:

$$VaR_t^m = \hat{X}_t^m - \hat{\sigma}_t^m Q(1-\alpha) \qquad (12)$$

It can calculate the at risk values of Internet finance index, China Securities Bank Index, Tianhong Yu 'ebao and selected commercial banks at a given significance level. The calculation results are as follows.

Table 3: Calculation results of Va R (macro part).

Va R	The mean	The maximum	The median	The minimum value	The standard deviation
hlw	0. 0236	0. 0234	0. 0491	0. 1341	0. 0181
bk	0.0214	0. 0191	0. 0297	0. 1212	0. 0139

After calculation, the mean value of Va R of Internet finance index is -0.0236, and that of China Securities Bank index is Va R. The median risk value of the Internet finance index is 0.0491, while the median risk value of the China Securities Index is 0. 0297. Both the mean and the median risk value of the Internet finance index are higher than that of the banking index, so the risk of Internet finance is relatively high. To compare the standard deviation, the chart shows that the risk of Internet financial index value of the standard deviation is 0. 0181, the risk of bank index value of standard deviation is 0. 0139, much smaller than the Internet financial index, shows that the risk of Internet financial index value of volatility than bank index, namely that stability of the risk, the banking sector is superior to the Internet.

5 ANALYSIS OF INTERNET FINANCE'S RISK SPILLOVER EFFECT ON COMMERCIAL BANKS

5.1 Risk Spillover of Internet Finance to the Asset Business of Commercial Banks

The business of using assets to create income is the asset business of commercial banks, which generally refers to Va Rious types of loans. In Internet finance, P2P industry, online credit consumption, Internet crowd-funding and other industries with financing business compete with the asset business of commercial banks. With their unique advantages, the asset business of commercial banks is threatened and challenged due to many alternatives. Loans from traditional financial institutions

The business threshold is high and the approval procedures are complicated. Small, medium and micro enterprises often find it difficult to borrow the funds they need because of their congenital lack of conditions, while the private lending market is chaotic and risky. The emergence of P2P network

platform loans has solved these two problems well. The PEER-to-peer (P2P) industry is gaining popularity because of its timeliness, low barriers to entry and simple processes. However, the financing scale of P2P industry is limited and the risk is large, which greatly reduces the attractiveness of customers with superior conditions.

The emergence of crowdfunding platforms makes it possible for many enterprises or individuals to raise funds through the Internet. Internet crowdfunding is popular because of its transparency and speed of raising funds, as well as its low transaction costs. By taking advantage of these advantages, crowdfunding platforms have attracted a large number of customers with capital needs, resulting in the reduction of the loan business of traditional commercial banks and bringing a certain impact to commercial banks. If consumer credit platforms cooperate with banks, consumer information can be converted into customer credit recognized by banks. However, Internet technology is not fully mature, and it is easy to spread its own risks to banks, bringing default risks and economic losses to banks.

5.2 Indirect Risk Spillover of Internet Finance to Commercial Banks

The risk spillover of Internet finance not only directly affects the business of commercial banks, but also indirectly infects the risks to banks through the financial association network, among which the most common way is to induce and cause some systemic risks to the commercial banks.

(1) Internet technology is not yet mature, and the online business of commercial banks relies on mobile Internet technology, so there are risks. The potential risks brought by Internet technology to banks can be analyzed from three aspects. First, there are vulnerabilities in computers and mobile devices used for transactions. Secondly, commercial banks' online trading platforms or APPS have security risks. Finally, the transaction data between customers and banks relies on the Internet network for transmission, and there is a risk of theft. The immaturity of Internet technology mainly threatens the banking industry from these three aspects. If any problem exists in any aspect, it will cause information leakage or damage to data integrity, and finally threaten the security of customers' funds.

(2) Internet finance can influence the macro economy. With the popularization and rapid development of Internet finance in China, it has become an important part of the whole macro economy, so its change will have an important impact on the whole Macro economy of China. For example, changing the interest rate, driving the economy and changing the supply and demand of money will lead to the change of macro policies, which will threaten the operation efficiency of banks and lead to the expansion of bank credit. These are inverted shadows

It will lead to market instability, increase economic volatility, and ultimately lead to systemic risks.

(3) There is information contagion between Internet finance and banking. The emergence of Internet finance, such as platform abandonment, centralized rectification and policy risks, has brought crisis to the industry, which has been reported and spread by the media and infected the banking industry. At the same time, the investor's psychological risk prediction may be on their investment business activities and financial management directly impact behavior, spread too much negative news may even directly affect the investor's psychological risk prediction, make investor psychology becomes fragile, eventually lead to investment behavior change, reduce the profitability of commercial Banks, eventually trigger a systemic risk.

6 CONCLUSIONS

This paper studies the risk spillover of Internet finance to commercial banks. Before risk spillover analysis, the risks of Internet finance and commercial banks should be measured first. This paper measures the risks of Internet finance and commercial banks from macro and micro levels. From the macro point of view, we measure and analyze the financial risks of the two research objects by using the Internet finance index and the bank index of China Securities Corporation. On the micro level, the return rate series of representative Internet financial product Antiphon Yu 'eBay and 12 listed commercial banks of different types are selected to calculate and analyze their respective risk values. Secondly, the risk spillover effect of Internet finance on commercial banks is studied. Similarly, risk of overflow from the macroscopic and microscopic two level, the difference is that we study the risks are not only a quantitative risk only when overflow of overflow value calculation, but prior to the Internet in our country finance for commercial bank risk caused overflow has carried on the qualitative analysis, qualitative analysis at the direct and indirect two aspects to analysis the risk of overflow , let us have a more comprehensive understanding of the risk

spillover mechanism of China's Internet finance for commercial banks.

This paper innovatively selects yu 'eBay, the largest Internet monetary fund, and 12 listed commercial banks from a micro perspective to study the risk spillover effect of a single Internet financial product on different banking institutions from a new perspective. Based on the analysis of the Internet on commercial bank financial risk spillover, although the macro level, it is concluded that the Internet financial overflow the risks of commercial Banks has positive conclusion, the empirical results show that the micro Internet financial products celestial balance treasure of the selected 12 listed commercial Banks to the risk of overflow direction is negative, the overflow direction is inconsistent, However, this paper does not further explore the specific reasons for different risk spillover directions at the micro level.

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AUTHOR INTRODUCTION

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