

**DETERMINANTS OF NON-PERFORMING LOANS: EVIDENCE FROM  
CHINA**

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## ABSTRACT

With the development of China's economy, as the core of the modern economy, China's commercial banks are also constantly strengthening their own strength in the social and economic development. It plays an important supporting role for the economic development. However, since the subprime mortgage crisis in 2008, the non-performing loans of China's commercial banks have undergone significant changes. Judging from the overall situation of commercial banks, it has changed from the previous "double reduction" of non-performing loan balances and non-performing loan ratios to a "double increase" situation. According to the classification of commercial banks, the composition of non-performing loans of China's commercial banks has also undergone tremendous changes. In 2009, it was the only large commercial bank, but by 2019. It has developed into a "four-legged confrontation" situation. The non-performing loan ratio is often the leading indicator of the financial crisis, and the continuously increasing non-performing loan ratio has laid a hidden danger for the healthy development of China's social economy. Therefore, it is of great significance to explore the influencing factors of non-performing loans of various commercial banks for preventing and solving the problem of non-performing loans.

First of all, this paper analyzes the research results of domestic and foreign scholars on non-performing loans. Through many documents, it can be found that domestic scholars mainly study the influencing factors of non-performing loans of commercial banks as a whole or the influencing factors of non-performing loans of a certain type of commercial banks, such as large commercial banks. There are few studies on the difference of the influence factors of non-performing loans of various commercial banks. Therefore, from a macro perspective, this paper explores the factors affecting the non-performing loan ratio

of various commercial banks and tries to answer the core question of "Why are the non-performing loan ratios of different types of commercial banks different?", which is a supplement to the study on non-performing loan.

Furthermore, this paper sorts out the relevant theories of the formation of non-performing loans, the theories involved mainly include credit theory, financial vulnerability theory, government intervention theory and bank credit behavior theory. Among them, credit theory, financial vulnerability theory and government intervention theory can theoretically explain the impact of macroeconomic factors on non-performing loans of commercial banks, while bank credit behavior theory can theoretically support the path of micro-factors on non-performing loans of commercial banks.

Then, based on the analysis of the current situation, this paper adopts the data of commercial banks as a whole, large commercial banks, joint-stock commercial banks, urban commercial banks, rural commercial banks and foreign banks from 2010 to 2022. This paper selects GDP, broad money supply, one-year benchmark lending rate of the central bank, actual funds in place for real estate development and investment, and total export value as macroeconomic and industry indicators to study the factors affecting the non-performing loan ratio of various commercial banks from a macro perspective and tries to predict the future non-performing loan rate with their current variables. The results of the empirical analysis are as follows: (1) From the perspective of the types of macro factors, there are similarities between large-scale commercial banks and joint-stock commercial banks, and similarities between small-scale city commercial banks and rural commercial banks; (2) The changes of non-performing loan ratio of large commercial banks, joint-stock commercial banks, foreign banks and urban commercial banks can basically be explained

by macro factors, but the non-performing loan ratio of rural commercial banks cannot be completely explained by macroeconomic factors; (3) The factors affecting the non-performing loan ratio of each type of commercial bank are different, and these differences can be explained by the bank's positioning, business strategy and service objects.

Finally, based on the empirical results, this paper puts forward suggestions on macro policies, and puts forward targeted suggestions for large commercial banks, joint-stock commercial banks, city commercial banks and rural commercial banks.

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# CHAPTER 1

## INTRODUCTION

### Research Background

Finance is the core of the modern economy, and commercial banks are essential to China's financial system. In China's social economy, indirect financing is dominant, and the primary provider of indirect financing is commercial banks. It is easy to see that commercial banks play a pivotal role in China's economic development and in maintaining social stability.

Under the new normal, China's economy faces a new development situation. The global economy is still at a low ebb, China's GDP growth rate is slowing down, the actual economy will face short-term development difficulties, the economic structure is transformed and upgraded, the real estate market bubble still exists, interest rate liberalization reforms are gradually carried out, and commercial banks are the foundation of financial development. We must continue to expand the scale of operations and focus on risk management and control, improve asset quality, reduce non-performing loan ratios, and avoid systemic risks. In the process of economic development, the balance of commercial banks' non-performing loans has shown an upward trend, and the non-performing loan ratio has continued to climb to a high level. The regional distribution and structural composition have also shown more complex new features. Potential non-performing loans have shown signs of deterioration. The total amount of loans will maintain an upward trend, and the non-performing loan ratio will gradually stabilize. However, there is no expectation of a decline for the time being. In the future, the risk of non-performing loans in China's commercial banks will continue accumulating. In order to

effectively reduce the non-performing loan ratio, it is necessary to find out the symptoms of the current high non-performing loan ratio.

As of the end of 2018, the non-performing loan ratio of Chinese commercial banks is gradually approaching the 2% level, which is a hazardous signal. Among the loans of China's commercial banks, regular loans accounted for 95.31%, and the remaining accounted for 4.69%, which is the sum of the remaining four types of non-performing loan ratios. At the end of 2019, the non-performing loans of China's commercial banks had reached 2.41 trillion yuan, an increase of 46.3 billion yuan from the previous quarter, and the non-performing loan ratio of commercial banks reached 1.86%. Affected by the new crown epidemic, the first quarter of 2020 was the worst time of the epidemic. During this period, non-performing loans increased by nearly 200 billion. The non-performing loan ratio continued to rise in the first three quarters of 2020, rising to 1.96% in the third quarter, reaching its highest peak in nearly a decade. Since the fourth quarter of 2020, the non-performing loan ratio of banks has shown a clear downward trend, but the balance of non-performing loans of banks has declined slowly and is still higher than before the epidemic. According to the latest non-performing loan data for the fourth quarter of 2021, commercial banks' non-performing loans are rising again. Excessive non-performing loans will seriously affect the regular operation of commercial banks. Therefore, it is necessary to find out the influencing factors of non-performing loans and propose corresponding countermeasures to effectively solve the problem of non-performing loan banks so that banks can operate normally and the financial industry can develop stably.

## Research Question

In recent years, with the development of China's economy, the scale of China's commercial banks is also expanding. In the list of the top 1000 global banks in 2020 released by the well-known British magazine "The Banker", Chinese-funded banks ranked the top four for the third consecutive year in terms of Tier 1 capital, namely Industrial and Commercial Bank of China, China Construction Bank, and Agricultural Bank of China. Moreover, the Bank of China, among which ICBC topped the list for eight consecutive years. In addition to the four central banks, different types of commercial banks such as Bank of Communications, China Merchants Bank, Bank of Shanghai, Bank of Jiangsu, Chongqing Rural Commercial Bank, and Shanghai Rural Commercial Bank are also ranked in the top 200 in the world. While China's commercial banks are generally developing, the stable operation of commercial banks is also an issue worthy of attention. The operation of commercial banks is not only related to commercial banks themselves but also affects the stability of the financial system and even the entire social economy. Therefore, the non-performing loan ratio, one of the core indicators to evaluate commercial banks' operating risks, profitability, and competitiveness. It has consistently received significant attention from the government, regulatory authorities, bank operators and scholars.

After the subprime mortgage crisis, the non-performing loans of China's commercial banks have undergone significant changes. From 2008 to 2010, the non-performing loan balance and non-performing loan ratio of China's commercial banks continued to decline, and the quality of bank assets was good. However, the good times did not last long, and the bank's asset quality changed in 2012. Since 2012, the credit asset

quality of China's commercial banks has begun to decline, the non-self-loan balance and non-self-loan ratio have increased significantly, and the growth rate of non-performing loans has also been faster than before. From the first quarter of 2012 to the fourth quarter of 2019, the non-performing loan ratio of China's commercial banks rose from 0.94% to 1.86%, an increase of more than 97%, and the balance of non-performing loans reached 2,413.5 billion yuan. During the more than ten years when the non-performing loan ratio "first decreased and then increased", it is worth noting that during this period, the non-performing loan ratios of various commercial banks also showed different changes. At the same time, according to the classification of commercial banks, the composition of non-performing loans in China's commercial banks has also undergone tremendous changes. It has changed from a single large commercial bank in 2009 to a "four-legged confrontation" in 2019.

China is currently in a critical period when the social economy has stepped into the "new normal", but the continuous increase of the scale of non-performing assets of commercial banks is a hidden danger to the economy. At the same time, different commercial banks in China have business objectives and service customer groups, so we also need to consider differentiation factors. Most of the research on non-performing loans at home and abroad focuses on the research of multiple macro- and micro-influencing factors, and there are also pieces of literature that focus on a specific type of commercial banks (mainly state-owned banks or city commercial banks) or focus on the non-performing loans of a single bank. However, it is rare to analyze the difference in non-performing loan ratios of different types of commercial banks. Therefore, this paper attempts to study the differences in factors affecting non-performing loans of various

commercial banks from a macro perspective, which can provide a new entry point for the empirical analysis of factors affecting non-performing loans of various commercial banks. For commercial banks, management policies and credit policies can be formulated in a differentiated manner. For regulatory agencies, targeted and differentiated regulatory policies can be implemented to achieve refined management. For the entire social economy, it is conducive to ensuring the healthy and sustainable development of China's economy. Provide a theoretical basis for the government to formulate a series of policies.

## CHAPTER 2

### LITERATURE REVIEW & THEORY

Scholars study the factors that affect the non-performing loan ratio of commercial banks from a macro perspective. In some capitalist developed countries, due to the early start of their financial industry, scholars in these countries also realized the importance and necessity of exploring the non-performing loan ratio earlier. Research has been carried out from multiple angles, and the research methods are becoming more and more mature.

#### Literature Review

##### *Research on the Macro-influencing Factors of Non-performing Assets*

Yang Zhengmei (2013) pointed out that we must first find its causes and problems to solve non-performing loans. First of all, it is necessary to see the general trend of the macroeconomy and strengthen the ability to judge the economic situation to adjust the bank credit policy according to the economic trend at any time, Approval credit process, enhance operational efficiency, and reduce loan concentration: Thirdly, non-performing loans must be disposed of reasonably, eliminated by legal means, asset securitization business is carried out, and asset quality is improved. Bernanke (1983) involved the problem of non-performing loans while studying the "Great Depression". He mainly analyzed the impact of macro factors on non-performing loans. His research found that when the economy goes down, the credit efficiency decreases, the credit cost of enterprises increases, and the availability of credit decreases, and then the repayment ability of enterprises is affected, which leads to the increase of non-performing loans of banks. After that, many foreign pieces of literature have studied the influencing factors of commercial banks' non-performing loans from a macro perspective. Salas and Saurina (2002) analyzed the factors

affecting the loans of Spanish commercial banks from 1985 to 1997 through panel data. They found that at the macro level, GDP growth rate, corporate and household debt, and rapid credit expansion are the main factors to explain credit risk. Jimenez and Saurina (2006) found that rapid credit growth has strong empirical support for loan losses, with a certain lag. Nkusu (2011) used two complementary methods to study the relationship between macroeconomics and non-performing loans of commercial banks. They find that rising NPLs are associated with adverse macroeconomic developments, while sharp increases in NPLs weaken macroeconomic performance in the long run. DeBock and Demyanets (2012) study found a significant relationship between the bank's asset quality, credit and macroeconomic aggregates. The deterioration in quality has reduced credit growth. Klein (2013) investigated the non-performing loans of Central Europe, Eastern Europe and South-Eastern Europe from 1998 to 2011 and found that the macroeconomics largely affected the non-performing loans of commercial banks. Non-performing loans had a strong feedback effect on the real economy. Akinlo, Emmanuel, and Jalbert (2014) provided Nigeria's macroeconomic model for NPLs. Their empirical analysis confirmed that economic growth is negatively correlated with NPLs. Unemployment, credit to the private sector, and the exchange rate have a negative impact on NPLs in Nigeria. Make a positive impact. Mohaddes et al. (2017) examined the relationship between Italy's GDP growth rate and non-performing loans. They found that the non-performing loan ratio would drop significantly if real GDP growth exceeded 1.2% and continued for several years. Like foreign literature, domestic scholars have also studied the impact of macroeconomic factors on commercial banks' non-performing loans from the perspectives of GDP, exchange rate, total credit, and unemployment rate. Sun Guanglin, Wang Haijun

and Wang Xuebiao (2016) built a PVAR model based on panel data from 2005 to 2014 to study the relationship between economic fluctuations, overcapacity, and non-performing loans of commercial banks. The results show that the non-performing loan ratio of commercial banks will decrease during the economic prosperity period and increase during the economic contraction period. Cui Fucheng (2018) constructed a VAR model and analyzed the dynamic relationship among economic growth, monetary policy, total credit, corporate operating conditions, and non-performing loans through impulse response and variance decomposition methods. The results show that economic growth, monetary policy, and non-performing loan ratio are negatively correlated in the short term. Jin Xinxue (2018) used factor analysis and a linear regression model to analyze the factors of non-performing loans of commercial banks. The research shows that: economic aggregate, economic benefits, trade development and investment development are all negatively correlated with non-performing loans. Qiu Zhaoxiang and Liu Yuanliang (2011) established a theoretical econometric model. They empirically found that when the macroeconomic decline, deflation, and monetary policy tighten, the non-performing loan ratio will increase significantly. Qian Xiaoan (2000) started with an analysis of the credit crunch and revealed that the credit crunch would lead to an increase in non-performing loans. Fan Yu and Sun Jian (2004) found that when analyzing the long-term equilibrium of non-performing loans of commercial banks in China. The low economic efficiency of industrial and commercial enterprises and the poor macroeconomic environment are reasons for generating non-performing loans. Enron (2012) selected four macroeconomic indicators when exploring China's non-performing loan ratio of commercial banks. Through the analysis of the classical econometric model and the VAR model, it was concluded that high inflation,

excessive loans, shortage of working capital for residents and enterprises, or fiscal expenditures A decrease will lead to an increase in the bank's non-performing loan ratio. Wang Wei and Zhao Anping (2013) used Beveridge-Nelson's (B-N) trend cycle decomposition technology to find that expanding commercial bank credit scale will not increase non-performing loans and risk exposure. Wang Guangwei and Tong Yuansong (2014) used various methods, such as descriptive statistical analysis and multiple regression, to explore the factors affecting the non-performing loan ratio of commercial banks in China from a macro perspective. The rate of non-performing loans of commercial banks will rise, while the rise of the US dollar exchange rate will increase the non-performing loan rate of commercial banks. The research results of Li Sihui and Yan Xiangnong (2007) show that when the economic benefits are good, it is beneficial to reduce the possibility of non-performing loans; when there is an economic bubble, it increases the possibility of non-performing loans; and when the economic bubble bursts and the economy enters During a recession, non-performing loans may turn from potential to reality. The better the economic development, the lower the non-performing loan ratio. Based on this, we propose three hypotheses. Hypothesis 1: The non-performing loan ratio of commercial banks is affected by the gross domestic product (GDP). The higher the GDP, the lower the non-performing loan ratio, and vice versa. On the one hand, some scholars have found that loose monetary policy is conducive to reducing the non-performing loan ratio (Xie Bing, 2009; Huang Lixin & Zheng Jianming, 2012). On the other hand, in the long run, a loose monetary policy will increase the non-performing loan ratio (Cui Fucheng & Tao Hao, 2018). Because under the loose monetary policy, commercial banks tend to expand their loans further. Once there is blind expansion, it is easy to cause an increase in

the non-performing loan ratio. Since Cui Fucheng and Tao Hao's (2018) research is closer to our research, their conclusions may have greater reference significance for this paper. We put forward Hypothesis 2: loose monetary policy will increase the non-performing loan ratio. Regarding interest rates, Bernanke (2006) pointed out that the relationship between non-performing loans and loan interest rates deserves attention. The loan interest rate reflects the loan price. When the loan interest rate is too high, the lender's cost also rises. The borrower generally avoids the debt to avoid high-interest rates. The amount of non-performing assets increases accordingly, and the book losses of commercial banks further intensify. Xie Haidong and Hao Yibo (2017) used the data from 2000 to 2015 to analyze the macro-external causes of non-performing loans of commercial banks in China. By establishing a VAR model, they found that although the increase in GDP growth and market interest rates is beneficial to non-performing loans in the short term, in the long run, these two factors will lead to an increase in the non-performing loan ratio. Therefore, we put forward Hypothesis 3: An increase in the benchmark lending rate will increase the non-performing loan ratio.

Liu Yan (2014) used a regression analysis model to analyze the causes of non-performing loans based on the source of commercial bank loans. The results showed that loans in the real estate industry and current interest rates significantly impacted the course of non-performing loans. Gholizadeh, Golzarian, Pour, and Shakoori (2019) examine the effect of housing prices on non-performing loans in the Iranian banking system. Using a dynamic panel model, they analyzed a sample of 15 banks from 2005 to 2016. The results showed that housing price changes and the non-performing loan ratio of commercial banks were negatively correlated. In contrast, the ratio of housing construction industry loans to

total loans had no relationship with non-performing loans. Liu Yan (2014) mainly started from the real estate industry to study the impact of this industry on the non-performing loan ratio of commercial banks. The study found that the increase in housing sales will lead to a decrease in the non-performing loan ratio of commercial banks. In contrast, the increase in real estate investment from domestic loans will increase the non-performing loan ratio. Based on this, we put forward Hypothesis 4: The more funds invested in real estate, the higher the non-performing loan ratio.

Xie Bing (2009) pointed out that the sound development of foreign trade will help to improve the efficiency and income of relevant economic entities on the one hand, improve the repayment ability of borrowers. It also plays a role in stimulating the national economy on the other hand. Under the combined effect of the two aspects, it is conducive to reducing the non-performing loan ratio. Based on this, we put forward Hypothesis 5: A high level of foreign economic and trade development is conducive to reducing the non-performing loan ratio.

Sun Xiangyu and Zhou Qiong (2018) found that in recent years, the overall non-performing loans of China's commercial banks have increased slightly, and there has been a phenomenon of differentiation among different institutions and different business types, industries, and regions have shown specific differentiation. On this basis, they put forward a series of suggestions, such as the need for a structured way of thinking in managing non-performing loans. Sun Guanglin (2018) used the dynamic panel system GMM model to explore the impact of factor price distortions on the non-performing loan ratio of commercial banks. The study found that the distortion of factor prices will increase the non-performing loan ratio. He also analyzed the transmission mechanism of factor price

distortions affecting the non-performing loan ratio through production capacity, consumer demand, and financial efficiency and leverage. Li Jinzhi and Liu Wenfang (2019) selected multiple macroeconomic indicators such as M2 and PMI to analyze the macroeconomic factors affecting the non-performing loan ratio of various commercial banks in China and obtained the critical macro-economic impact of the non-performing loan ratio of each type of commercial bank factor. Based on this, we put forward Hypothesis 6: Different types of commercial banks have different influencing factors on the non-performing loan ratio.

#### *Empirical Analysis of the Influencing Factors of Non-performing Assets*

The measurement and statistics of the causes of non-performing loans in China started relatively late. Scholars have found the significant influencing factors of non-performing loans by collecting research data and establishing statistical models. They were putting forward countermeasures accordingly, which has reference significance for further in-depth research on non-performing loans. Xie Bing (2009) analyzed the factors affecting non-performing loans from a macro perspective with the help of changes in the economic situation. The research uses all the quarterly data from 2004 to 2009. First, descriptive statistical analysis is made on the data during this period, and the structure, region and development trend of non-performing loans are analyzed in detail. Then, for the study of macroeconomic factors, the non-performing loans of commercial banks. According to the mechanism of action, typical macroeconomic variables are selected as the explanatory variables of the research. According to the quantitative relationship obtained in the model, the quantity and positive and negative relationship between the selected macro explanatory variables and non-performing loans can be known. At the same time, it also provides a corresponding reference value for government supervision. Chen Lu (2015) analyzed the

mechanism of various economic factors on non-performing loans and found that macroeconomic factors significantly impact non-performing loans. In order to further confirm the hypothesis, economic variables such as GDP growth rate, fiscal and tax revenue, and total import and export volume were selected. It analyzes the relationship between these economic variables and the non-performing loan ratio one by one. Finally, it finds the optimal model combination between each macroeconomic variable and the non-performing loan ratio, and formulate a solution to deal with non-performing loans according to the model results. The article by Wang Bing and Zhu Ning (2016) mainly studies the impact of macroeconomic factors on non-performing loans. Since non-performing loans have prominent regional and industrial characteristics, they are greatly affected by macroeconomic factors. Typical macroeconomic indicators are selected in this paper, including economic variables such as GDP growth rate, consumer price index, fiscal revenue, labour cost, loan-to-deposit ratio, and willingness to save, to study the impact of these macro indicators on non-performing loans. It is found that these economic variables are significantly related to the non-performing loan ratio. Liang Qiuxia's (2016) article analyzed from a theoretical perspective that the non-performing loan ratio of commercial banks has a great relationship with the ownership structure of the bank and the political policies of the region, which is consistent with the research results of previous scholars; in addition, macroeconomic changes and the bank's internal operating efficiency also has a significant relationship with non-performing loans. Establish a classic multiple linear regression model among variables such as GDP growth rate, money supply growth rate, total loan amount, and loan-to-deposit ratio. After excluding the correlation between variables, it is concluded that these economic variables have a significant relationship with

the non-performing loan ratio. Qin Lanchuan (2017) aimed to study the two-way relationship between changes in the economic situation and non-performing loans of commercial banks. Starting with theoretical analysis, he conducted an in-depth analysis of why economic changes impact non-performing loans of commercial banks. The reason loans react to economic growth is studied, and the vector autoregressive model is further established to analyze the relationship between non-performing loans and their lag period. The future development trend of commercial banks' non-performing loans is analyzed using the vector autoregressive impulse response.

It can be seen from the literature review above that since finance is the core of the economy, banks are the core of finance. When scholars studied economic issues such as the "Great Depression" in the early days, they inevitably needed to study the problem of banks' non-performing loans. With the deepening of research and the increased disclosure of various data, in recent years, scholars have analyzed the problem of non-performing loans of banks from multiple macro perspectives. However, for the problem of non-performing loans of different types of commercial banks, many pieces of literature only list the data of bank classification in the link of non-performing loan status, and there are few in-depth discussions on it. Therefore, this article aims to start from this perspective, selecting GDP, broad money supply M2, loan benchmark interest rate, real estate, and total export value to analyze and explore the non-performing loans of different commercial banks.

#### *Explanation and Forecast on Non-performing Assets*

Most of the methods used by domestic scholars to predict the non-performing loan ratio of banks are based on time series models. Li Xinjie (2008) firstly elaborated on the

basic situation of non-performing assets, including a series of problems such as the definition, current situation, causes and impact on China's economy of non-performing assets. Secondly, the method and usage used in the forecast of the non-performing assets in China are analyzed. Thirdly, combining with the achievements of predecessors, the forecast model of the non-performing assets in state - owned commercial banks is given by using Markov method. At last, the author gives some countermeasures against the non-performing assets of state-owned commercial banks. Qin Huiqun and Zhong Qian (2013) adopted "interest income, capital adequacy ratio, total assets, total payment for goods, total deposits and inventory ratio" as the factors affecting the non-performing loan of Shenzhen Development Bank through the relevant data of non-performing loan in recent years. It established multiple regression analysis model to control the amount of non-performing loan, and applied MATLAB to conduct residual analysis. Combined with the concept of correlation degree in gray prediction, it is concluded that the important order of each influencing factor of non-performing loans is interest income, capital adequacy ratio, total assets, total loans, total deposits and loan-to-deposit ratio. Jiang Lingmin (2003) analyzed and predicted the non-performing loans of Chinese commercial banks by using Markov chain based on the previous data of non-performing loans of Chinese commercial banks. Some scholars also constructed a grey prediction model to predict the non-performing loan ratio: Liu Yu (2006) selected the quarterly data of non-performing loans of major state-owned banks and joint-stock banks in China and constructed a grey prediction model to predict the non-performing loans of major commercial banks in China. Wang and Deng (2017) selected the non-performing loan ratio data of Agricultural Bank of China and predicted the non-performing loan ratio of Agricultural Bank of China in the next five years

by constructing the grey prediction model of GM (1,1). Qin Huiqun and Zhong Qian (2013) selected 10 years' data of Shenzhen Development Bank and established a regression model to predict non-performing loans by taking interest income, loan-to-deposit ratio and other indicators as influencing factors. Wang and Lin (2017) used the ARIMA model to study the changing trend of the amount of non-performing loans of China's large commercial banks and added the intervention analysis model to predict the short-term non-performing loans of their research objects.

## Theory

### *The Concept and Definition of Non-performing Loans of Commercial Banks*

Non-performing loans of commercial banks refer to loans in which the borrower cannot repay the principal and interest within the specified time due to his reasons, which causes the bank to generate credit risk or even cause credit loss. Some also believe that non-performing loans mean the borrower fails to repay the principal and interest beyond the time stipulated in the contract. The collateral pledged by the borrower to the bank also depreciates. The bank will bear the corresponding financial losses.

The non-performing loan ratio refers to the ratio of non-performing loans to the total loan amount. It is an essential indicator for observing commercial banks' non-performing assets and credit risks. Banks are unique enterprises that rely on financing to make profits. The vast amount of loans shows that commercial banks have a potential solid profit level. However, if commercial banks blindly expand their credit scale while ignoring loan quality, the number of non-performing loans will expand rapidly. Then the absolute value of this indicator will become more prominent, exceeding the red line requirements

of the China Banking Regulatory Commission, and commercial banks will also bear the operational burden caused by excessive non-performing assets.

Table 1 Loan type

Loan type	Meaning
Normal loan	The borrower can perform the contract and has been able to repay the principal and interest normally, and there is no negative factor affecting the timely and full repayment of the principal and interest of the loan. The bank is fully confident that the borrower will repay the principal and interest of the loan in full and on time. The probability of loan loss is 0.
Focus on loans	The borrower has a good credit record and has a strong ability to repay the principal and interest, but there are still credit risks recorded in the credit record, and there will be factors that negatively affect the repayment whether it is subjective or objective. The probability of having a loan loss will not exceed 5%.
Subprime Loan	The credit record of the borrower has deteriorated, there have been many defaults, and the ability to repay the principal and interest has basically been lost. It is impossible to repay the loan solely relying on operating income, and it is necessary to sell assets to repay the bank loan. The probability of loan loss is 30%-50%.
Suspicious loan	The borrower has determined that it is unable to repay all the principal and interest. Whether it sells assets through market means or pursues the legal responsibility of the lender through legal means, it cannot get full compensation for the principal and interest of the loan. The probability of loan loss is between 50% and 75%.
Loss loan	The borrower has determined that there is no possibility of repaying the principal and interest. Whether it is selling assets through market means or pursuing the legal responsibility of the borrower through legal means, the bank's losses cannot be recovered. The bank has a great possibility to absorb this part of the loss by itself. The probability of its loan loss is 75%-100%.

Referring to international practice, the People's Bank of China divides loans into five categories according to the degree of risk: regular, special mention, substandard, suspicious, and loss. The latter three are non-performing loans.

### *Credit Theory*

Marx's economic credit theory was produced in the early 1940s. Marx believed that credit is a unique "value movement" different from general commodity circulation, which

includes the relationship between "loan" and "remuneration" and other economic dimensions.

The role of credit in promoting economic development is mainly reflected in several aspects: First, it promotes the equalization of profits. The credit system makes it possible for the free transfer of capital and can promote competition among various sectors so that the development of the market economy can enter a high-level stage. Marx believed that only credit could play the role of leverage in capital transfer and the balance of profit rate; second, the credit system can help save various circulation costs and accelerate the reproduction process; third, the credit system can accelerate the accumulation and concentration of capital and promote the establishment of the emerge and develop.

However, Marx pointed out that while credit brings positive effects to economic development, it also brings various adverse effects, making economic crises more likely to occur. On the one hand, pre-consumption and deferred payment are all possible based on credit. People can get overdrafts on the next stage of consumption. As the overdraft gradually accumulates and expands, people will get closer and closer to the consumption limit. Economic crises often erupt when the expansion of actual transactions exceeds social demand limits. On the other hand, through the credit system, when much social capital is used by non-owners of social capital, driven by interests and greed, after a specific investment field reaches the limit, they will continue to look for other fields for investment, approaching the investment step by step. Production and consumption boundaries, exacerbating overproduction and leading to the economic crisis.

Banks provide a safe and convenient channel for the public and businesses to deposit their funds and can provide depositors with interest. Then banks can use these

deposits to provide loans to all walks of society and charge interest on loans. These loans can help businesses and industrial development to promote economic development. It is the bank's role as a credit intermediary, and while playing this role, the bank inevitably needs to bear the risks brought about by credit. Because in the final analysis, these operations of banks are inseparable from credit. Without credit, no financial institution can operate. Depositors are willing to deposit deposits in the bank based on the bank's credit, and banks are willing to grant loans to borrowers based on the borrower's credit. However, whether it is the judgment of the bank's credit or the judgment of the borrower's credit, it occurs before deposits and loans. The judgment of credit will also change whenever the economy and the market change. Credit or Trust is efficiently dissipated, whether based on reason or irrationality. Trust can dissipate at any time, and when credit recedes, it is usually challenging to re-establish. If depositors lose their Trust in the bank, a run will often occur. Without government or outside intervention, the bank will face an excellent liquidity risk: if the borrower's business conditions change and the income cannot meet expectations. It will often lead to loan default. Due to the existence of the loan period, the generation of non-performing loans is an inevitable phenomenon.

The credit relationship between the bank and the borrower is a multiple one-to-one. The credits of multiple parties are connected in series to form a "credit chain" in the social economy. Stiglitz (2003) proposed a general equilibrium model of the credit relationship. The enterprises  $A_n$  on the circle are interdependent, and the bank is at the centre, providing supplemental loan funds for each enterprise. When the economic environment changes significantly, the bank will implement a credit tightening policy in consideration of risk control, which will cause a particular company (such as  $A_1$ ) to be overly impacted and lead

to bankruptcy. The bankruptcy of A: will further cause other related companies  $A_2, A_3 \dots A_n$  is also affected, which in turn causes credit risk to be gradually transmitted to the entire industry, and eventually, the bank's non-performing loans have increased significantly. However, there are specific differences in the loan objects of different types of banks. The main difference is the difference in the scale and qualification of the loan company, that is, the enterprise  $A_n$  in the equilibrium model is different. When the qualifications of the bank's loan recipients are all good, the credit, as mentioned above, risk transmission is not easy to happen. On the contrary, when the qualifications of the loan recipients are not good, the credit risk is often easy to pass on.

### *Financial Fragility Theory*

The theory of financial fragility has a long history. Scholars have conducted research since the development of capital markets in western developed countries. The most definitive explanation of this theory is the "financial fragility" theory of Minsky and Krieger, which focuses on studying financial markets. It mainly refers to all financial risks, including credit and market risks. In addition to risk, it also includes risk loss. Today's academic circles believe that the source of financial fragility is "information asymmetry".

#### (1) Currency vulnerability

The theory of financial fragility is derived from the fragility of currency, and the fragility of currency stems from its nature. The earliest research on currency fragility can be traced back to Fisher and Keynes. They believed that currency fragility has typical external characteristics. The value of the currency is either higher than its price or lower than its price; on the other hand, because in a commodity economy society, prices are not static and the supply of money is constantly changing, it is difficult to maintain the supply

and demand of money. It is always in an equilibrium state, so it will cause the actual purchasing power of money for commodities to be in an unstable state. In addition, because currency itself is a particular commodity, it has the functions of the transaction, means of payment and storage of wealth. These special currency functions make it very different from other commodities and thus aggravate its risk and vulnerability. The most typical is that the time difference in currency use is compensated by interest. Interest is compensation for people sacrificing immediate consumption, but interest cannot guarantee that the principal can be recovered when it matures, which creates currency risks.

## (2) Safe boundary theory

The so-called safety margin is an optimal interest level that can guarantee the interests of both the borrower and the lender. When the borrower temporarily lacks liquidity due to investment or other needs, the borrower has to make a loan to borrow funds, and any borrowing of funds needs to pay the price. It can also be understood that the loan has a transaction price, the borrower needs to pay a capital price in exchange for the qualification of the loan, and the lender also needs to obtain the necessary compensation for lending funds at the expense of immediate liquidity. In terms of the risk comparison between the borrower and the lender, the lender faces. The most significant risk is the total loss of principal and interest. Therefore, to make up for the lender's liquidity and loan risks, the borrower needs to give the lender reasonable interest compensation. Of course, the interest level is determined by the borrower's willingness, within the scope of the ability to afford.

### (3) Information asymmetry

The source of financial fragility theory is generally considered to be information asymmetry. In the credit market, because commercial banks do not have enough information about borrowers, and even borrowers deliberately conceal their credit capabilities and asset status, commercial banks and the information asymmetry between the borrower and the borrower makes commercial banks misjudge the borrower, and it is easy to bury hidden dangers.

#### *Theory of Government Intervention*

There is no clear proposer of the theory of government intervention in the formation of non-performing loans, but in many pieces of literature on non-performing loan ratios, especially domestic literature, the mechanism of government intervention leading to the formation of non-performing loans is mentioned. Referring to the theories of Tan Jinsong, Sun Guanglin and others, excessive government intervention to affect the non-performing loans of commercial banks leads to the deterioration of bank asset quality by distorting financial efficiency. From the government's perspective, "GDP performance" is one of the leading indicators for China's promotion of local officials. GDP depends on economic growth. Economic growth depends on investment, and financial resources strongly support investment. Since China's financing channels are relatively single, local governments will inevitably compete for bank credit resources. Most commercial bank branches in China are divided into local administrative regions, so the local government becomes the manager of these bank branches, can influence the bank's decision-making and makes government intervention possible. Because of excessive government intervention, commercial banks will suffer severe consequences. The direction of commercial bank loans is affected by the

government's preference. Many enterprises that do not have market competitiveness have obtained bank loans, and the bank's credit resources have been misallocated.

When inefficient enterprises or industries receive a large amount of bank credit support, their products are not accepted by the market, and the problem of overcapacity occurs. Enterprises' products are unsalable, need more cash to repay bank loans, and banks' non-performing loan ratio has increased. The behaviour of government intervention is affected by the degree of marketization. In areas with a high degree of marketization, the competition between the market and banks is relatively fierce. There are few obstacles to the deposit and flow of financial resources, so it is difficult for the government to intervene in bank credit extension. The close relationship between commercial banks and the government is closely related to government intervention. City commercial banks and rural commercial banks have close relationships with local governments and are vulnerable to government intervention.

### *Theory of Bank Credit Behavior*

It is generally believed that bank credit decision errors are divided into two categories: the first category occurs during economic prosperity, when the economy is prosperous, the bank believes that the business prospects of the enterprise are good, implements a loose loan policy, and grants loans to many borrowers with poor qualifications<sup>1</sup>, this type of loan is often complex to repay in the end and becomes a non-performing loan; the second type occurs during the economic downturn, during which banks generally raise the credit threshold and reject many high-quality borrowers. Obviously, due to the influence of many factors, such as the bank's risk judgment and

business objectives, there will be differences in the credit behaviour of various banks. For these banking behaviours, the following are more representative theories:

(1) Disaster myopia

The disaster myopia theory put forward by Guttentag and Herring can explain the credit behaviour of banks to a certain extent: whenever the financial crisis is overcome, and the social economy gradually develops for the better, the bank believes that the possibility of another financial crisis becomes very low, or even if When certain risk events occur, banks also believe that the social economy and financial system have room for a rebound. After the previous financial crisis, the social economy and the banks experienced a series of small recessions and fluctuations. After these tests, the banks may be in a state of overconfidence, which leads to Banks facing greater credit risk. During this period, banks have accumulated more potential non-performing loans.

(2) Herding behaviour

Bankers, as bounded rationalists, exhibit herd behaviour. When the social economy is prosperous, bank credit policies tend to be loose, and various banks generally issue many loans to their customers. They will also grant loans to customers with general or poor qualifications: when the economy is in recession, various Banks also routinely reject loan applications from their poorly qualified clients. Furthermore, this situation of increasing loans and reducing loans often occurs together in most banks, that is, herding behaviour. Herding behaviour makes the credit expansion and contraction in the credit market more intense, making the credit market more turbulent. In addition, due to the existence of herd behaviour, the bank's loan concentration increases. When the bank's loans are concentrated

in large enterprises, it will bring about an adverse selection effect. Banks and borrowers have less leverage in lending, making post-loan management more difficult.

### (3) Principal-agent theory

The principal-agent theory is the logical starting point of modern corporate governance. It is also one of the main contents of contract theory in institutional economics, which American economists Burleigh and Means proposed. The principal-agent theory believes that because the principal and the agent have different utility functions, there will inevitably be a conflict of interest. There is also an information asymmetry between the principal and the agent, which will lead to adverse selection and the emergence of moral hazard problems. These factors will lead to damage to the principal's interests.

The principal-agent problem also exists in commercial banks. For bank leaders, what they pursue is not only income but also the responsibility to bank shareholders and even the social economy. However, credit account managers often pursue more personal interests. Even if there is a problem with a loan, it will take a certain amount of time for the problem to manifest and the loan to turn into a non-performing loan. However, the feedback of the loan to the customer manager and the handling unit is generally reflected when the loan is issued. Although the approval of the loan needs to be approved, the customer manager and the handling unit have enough motivation to strive for the loan and convince the approver. Moreover, the borrower, the account manager, and even the leader of the handling unit transfer benefits obtains loans by reducing the approval authority by breaking them into parts. Therefore, under the influence of the principal-agent problem, problematic loans will still be issued, banks' credit quality will gradually deteriorate, and the non-performing loan ratio will increase.

#### (4) Loan Competition Theory

Eaton, Gersovitz, and Stiglitz proposed the loan competition model in 1986. The model points out that to fight for profits. Commercial banks will release more loans by reducing their profit margins. In this process, the ability of banks to resist risks is weakened. This theory is similar to the law of supply and demand. When commercial banks compete with each other, they constantly reduce their profit margins. When the competition reaches equilibrium, the profits of all commercial banks are zero.

## CHAPTER 3

### INTRODUCTION OF MODEL

#### Variable Selection

This paper will select the quarterly panel data of China's large commercial banks, joint-stock banks, city commercial banks, rural commercial banks and foreign banks from the first quarter of 2010 to the third quarter of 2022 in the past 13 years as samples. The innovation of this paper is that the independent variable of the current period is used to explain the NPL interest rate of the next period. The advantage of this is that it is more instructive in predicting the non-performing loan ratio. To make the time series change trend less affected by seasonal factors (such as sales and production cycles, climatic conditions, holidays, etc.) as much as possible. We combined macroeconomic and industry data, using Eviews and Stata software, to conduct an empirical test on the differences in the image factors of non-performing loans of various commercial banks in China. Referring to the research results at domestic and abroad, we plan to choose the non-performing loan ratio as the explained variable. In terms of macro factors, this paper explores its impact on non-performing loans of various commercial banks from six aspects: macroeconomy, money supply, interest rate level, agricultural development, real estate development and export.

This article's non-performing loan ratio data comes from the official website of the China Banking and Insurance Regulatory Commission, covering all large banks, joint-stock banks, city commercial banks, rural commercial banks and foreign banks in China, which is a relatively comprehensive data representation. The gross domestic product, broad money supply, actual funds for real estate development and investment, and gross exports

come from the National Bureau of Statistics. The central bank's benchmark interest rate for one-year loans comes from the official website of the People's Bank of China.

#### *Dependent Variable*

Non-performing loan ratio NPL: The non-performing loan ratio can better evaluate commercial banks' credit asset safety status. Hence, the research on non-performing loan issues takes the non-performing loan ratio as the research object. In the empirical analysis of the text, NPL\_A, NPL\_L, NPL\_J, NPL\_C, NPL\_R, and NPL\_F are used to represent the non-performing loan ratios of commercial banks as a whole, large commercial banks, joint-stock commercial banks, city commercial banks, rural commercial banks, and foreign banks respectively.

#### *Independent Variable*

1. Gross domestic product (GDP): Gross domestic product (GDP) refers to the final results of the production activities of all resident units in a country or region within a certain period calculated according to the national market price. According to the theory of financial fragility, when the economy turns from prosperity to a recession, speculative enterprises and Ponzi enterprises often find it challenging to pay bank debts, resulting in the fragility of the financial system resulting in non-performing loans. In many pieces of literature analyzing non-performing loans of commercial banks, most scholars regard GDP as the explanatory variable of non-performing loans.

2. Broad money supply (M2): It includes transaction currency (M1, that is, the total amount of currency in circulation plus current deposits), time deposits and savings deposits. The money supply reflects the money stock of the whole society, and it is also an essential

monetary policy operation target of the central bank. On the other hand, commercial banks create money, and the interaction between commercial banks and the money supply will eventually be reflected in the contraction or expansion of loans, which will affect the non-performing loans of commercial banks.

3. Loan prime rate (LPR): The loan benchmark interest rate is the guiding interest rate for loans issued by the People's Bank of China to commercial banks and is one of the monetary policy tools used by the People's Bank of China to regulate the operation of the social economy and financial system. When the benchmark lending rate changes, commercial banks will also change their deposit rate mix according to the change. An increase in the benchmark lending rate represents a tightening of credit, a decrease in social liquidity, and an increase in borrowing costs, and vice versa. Similar to the money supply, changes in the scale of credit, social mobility, and credit costs will lead to changes in the non-performing loans of commercial banks.

4. Real estate paid-in investment (REC): Real estate development investment funds in place refer to various monetary fund's actually in place by real estate development enterprises that can be used for real estate development, including domestic loans, foreign capital, self-raised funds, deposits and advance receipts, personal Mortgage loans and other funds. The real estate industry is one of the principal investment directions of China's commercial banks. The actual funds for real estate development and investment can not only reflect the development of the real estate industry through the actual funds in place but also domestic loans and personal mortgage loans are also related to commercial bank loans. By importing this indicator, the impact of real estate on non-performing loans of various commercial banks can be tested.

5. Total export value (EX): The total export value refers to the total value of a country's exports to foreign countries within a certain period, called the total export trade or total export value. The total export value can not only reflect the degree of trade openness of China but also show the operation and sales of export-oriented enterprises in China to a large extent. If the export situation is not good, the sales of such enterprises will be affected, and the repayment ability of enterprises will be weakened, which will also affect the non-performing loans of commercial banks.

### Model Selection

This paper mainly studies the differences in factors affecting non-performing loans of various commercial banks. The model is set as follows:

$$dlnpl_t = \beta_0 + \beta_1 GDP_{t-1} + \beta_2 M2_{t-1} + \beta_3 LPR_{t-1} + \beta_4 REC_{t-1} + \beta_5 EX_{t-1} + \varepsilon_t$$

Among them,  $t$  represents the time series, that is, the time point from the second quarter of 2010 to the third quarter of 2022;  $\beta_0$  represents the intercept term;  $\varepsilon_t$  represents the random error term.  $GDP_{t-1}$ ,  $M2_{t-1}$ ,  $LPR_{t-1}$ ,  $REC_{t-1}$  and  $EX_{t-1}$  respectively represent the result of one period lag of the independent variables GDP, broad money supply, loan prime rate, real estate paid-in investment and total export value.  $\beta_1$ ,  $\beta_2$ ,  $\beta_3$ ,  $\beta_4$ ,  $\beta_5$  respectively represent the coefficients corresponding to the independent variables.

## CHAPTER 4

### EMPRICIAL REGRESSION ANALYSIS

#### Unit Root Test

Financial data often have a non-stationary nature. If the non-stationary data is regressed, a pseudo-regression will appear. This regression relationship cannot truly reflect the equilibrium relationship between the dependent and explanatory variables. First, logarithmic processing is performed on all variables to reduce the difference between the data values. Then the ADF test is performed on the variables, and the results are as follows:

Table 2 Unit root test

Variable	Prob.	Test Result
LNPL A	0.77	Unstable
DLNPL A	0.00	Stable
LNPL L	0.47	Unstable
DLNP L	0.00	Stable
LNPL G	0.71	Unstable
DLPNL G	0.00	Stable
LNPL C	0.81	Unstable
DLNPL C	0.00	Stable
LNP R	0.53	Unstable
DLNP R	0.00	Stable
LNP F	0.48	Unstable
DLNP F	0.00	Stable
LGDP	0.63	Unstable
DLGDP	0.00	Stable
LM2	0.00	Stable
LLPR	0.00	Stable
LREC	0.82	Unstable
DLREC	0.01	Stable
LEX	0.03	Stable

In the table 2, they are adding L before the variable name means taking the logarithm. It can be seen that the non-performing loan ratio is not stable after taking the logarithm. Therefore, the non-performing loan ratio of various commercial banks is

differentially processed. The results show that the non-performing loan ratios of the research objects are stable after the difference. In terms of explanatory variables, the gross domestic product (GDP) and real estate capital (REC) are not stable but are stable after differential processing. So far, all variables are stable and can be used for model estimation.

### Descriptive Statistical Analysis

Among the five major types of commercial banks in China, rural commercial banks have the highest non-performing loan ratio. Before 2022, the non-performing loan ratios of state-owned commercial banks, joint-stock commercial banks, and city commercial banks will be relatively close, among which the city commercial banks have the highest non-performing loan ratio in recent years, exceeding the overall level of non-performing loan ratios of commercial banks. Next are joint-stock and state-owned banks, and foreign-funded banks have the lowest non-performing loan ratio. The non-performing loans of rural commercial banks are not the largest in volume, but the non-performing loan ratio is the highest among the five major types of banks. The possible reason is that rural commercial banks serve the development of local agriculture, rural areas, and farmers, and most of their loans are agricultural credit. Loans and the management of rural commercial banks are relatively backward compared with other banks, and the possibility of loan losses is the greatest. Compared with rural commercial banks, the non-performing loan ratio of China's state-owned commercial banks is relatively low. The reason may be that China's state-owned commercial banks have relatively sufficient capital and more funds for credit system construction. Therefore, the prevention effect of non-performing loans of state-owned banks is better than that of small and medium-sized banks. At the same time, it is worth noting that after 2016, China has strengthened its efforts to dispose of non-

performing loans, such as restarting non-performing loan asset securitization for the five largest state-owned banks and China Merchants Bank, which will also have a particular impact on reducing non-performing loans of large banks.

Table 3 Descriptive statistical result

VarName	Obs	Mean	SD	Min	Median	Max
DLNPL_A	49	0.00	0.05	-0.11	0.00	0.11
DLNPL_L	49	-0.00	0.07	-0.27	-0.01	0.25
DLNPL_J	49	0.01	0.13	-0.58	0.00	0.58
DLNPL_C	49	0.01	0.14	-0.55	0.01	0.64
DLNPL_R	49	0.01	0.27	-1.18	0.01	1.44
DLNPL_F	49	0.00	0.14	-0.42	-0.00	0.28
DLGDP	49	0.01	0.05	-0.13	0.03	0.08
LM2	49	6.63	0.17	6.30	6.65	6.89
LLPR	49	-3.04	0.19	-3.31	-3.15	-2.72
DLREC	49	0.02	0.34	-0.61	0.13	0.39
LEX	49	8.76	0.12	8.27	8.76	8.99

Table 4 Non-performing loan ratios of major commercial banks from 2010 to 2022

Quarter	NPL_A	NPL_L	NPL_J	NPL_C	NPL_R	NPL_F
2010Q1	1.40%	1.59%	0.86%	1.19%	2.47%	0.74%
2010Q2	1.30%	1.46%	0.80%	1.11%	2.34%	0.72%
2010Q3	1.20%	1.35%	0.76%	1.00%	2.16%	0.65%
2010Q4	1.10%	1.31%	0.70%	0.91%	1.95%	0.53%
2011Q1	1.10%	1.20%	0.70%	0.90%	1.80%	0.50%
2011Q2	1.00%	1.10%	0.60%	0.80%	1.70%	0.50%
2011Q3	0.90%	1.10%	0.60%	0.80%	1.60%	0.40%
2011Q4	1.00%	1.10%	0.60%	0.80%	1.60%	0.40%
2012Q1	0.94%	1.04%	0.63%	0.78%	1.52%	0.49%
2012Q2	0.94%	1.01%	0.65%	0.82%	1.57%	0.58%
2012Q3	0.95%	1.00%	0.70%	0.85%	1.65%	0.62%
2012Q4	0.95%	0.99%	0.72%	0.81%	1.76%	0.52%
2013Q1	0.96%	0.98%	0.77%	0.83%	1.73%	0.59%
2013Q2	0.96%	0.97%	0.80%	0.86%	1.63%	0.60%
2013Q3	0.97%	0.98%	0.83%	0.87%	1.62%	0.57%
2013Q4	1.00%	1.00%	0.86%	0.88%	1.67%	0.51%
2014Q1	1.04%	1.03%	0.92%	0.94%	1.68%	0.52%
2014Q2	1.08%	1.05%	1.00%	0.99%	1.72%	0.59%
2014Q3	1.16%	1.12%	1.09%	1.11%	1.86%	0.69%
2014Q4	1.25%	1.23%	1.12%	1.16%	1.87%	0.81%
2015Q1	1.39%	1.38%	1.25%	1.29%	2.03%	1.07%
2015Q2	1.50%	1.48%	1.35%	1.37%	2.20%	1.16%
2015Q3	1.59%	1.54%	1.49%	1.44%	2.35%	1.19%
2015Q4	1.67%	1.66%	1.53%	1.40%	2.48%	1.15%

Table 4 Non-performing loan ratios of major commercial banks from 2010 to 2022

2016Q1	1.75%	1.72%	1.61%	1.46%	2.56%	1.30%
2016Q2	1.75%	1.69%	1.63%	1.49%	2.62%	1.41%
2016Q3	1.76%	1.67%	1.67%	1.51%	2.74%	1.41%
2016Q4	1.74%	1.68%	1.74%	1.48%	2.49%	0.93%
2017Q1	1.74%	1.64%	1.74%	1.50%	2.55%	0.89%
2017Q2	1.74%	1.60%	1.73%	1.51%	2.81%	0.85%
2017Q3	1.74%	1.54%	1.76%	1.51%	2.95%	0.76%
2017Q4	1.74%	1.53%	1.71%	1.52%	3.16%	0.70%
2018Q1	1.75%	1.50%	1.70%	1.53%	3.26%	0.66%
2018Q2	1.86%	1.14%	0.95%	0.88%	1.00%	0.78%
2018Q3	1.87%	1.47%	1.70%	1.67%	4.23%	0.73%
2018Q4	1.83%	1.41%	1.71%	1.79%	3.96%	0.69%
2019Q1	1.80%	1.32%	1.71%	1.88%	4.05%	0.76%
2019Q2	1.81%	1.26%	1.67%	2.30%	3.95%	1.01%
2019Q3	1.86%	1.32%	1.63%	2.48%	4.00%	0.83%
2019Q4	1.86%	1.38%	1.64%	2.32%	3.90%	0.67%
2020Q1	1.91%	1.39%	1.64%	2.45%	4.09%	0.71%
2020Q2	1.94%	1.45%	1.63%	2.30%	4.22%	0.69%
2020Q3	1.96%	1.50%	1.63%	2.28%	4.17%	0.67%
2020Q4	1.84%	1.52%	1.50%	1.81%	3.88%	0.58%
2021Q1	1.80%	1.47%	1.45%	1.94%	3.70%	0.61%
2021Q2	1.76%	1.45%	1.42%	1.82%	3.58%	0.60%
2021Q3	1.75%	1.43%	1.40%	1.82%	3.59%	0.58%
2021Q4	1.73%	1.37%	1.37%	1.90%	3.63%	0.56%
2022Q1	1.69%	1.35%	1.35%	1.96%	3.37%	0.65%
2022Q2	1.67%	1.34%	1.35%	1.89%	3.30%	0.80%
2022Q3	1.66%	1.32%	1.34%	1.89%	3.29%	0.83%

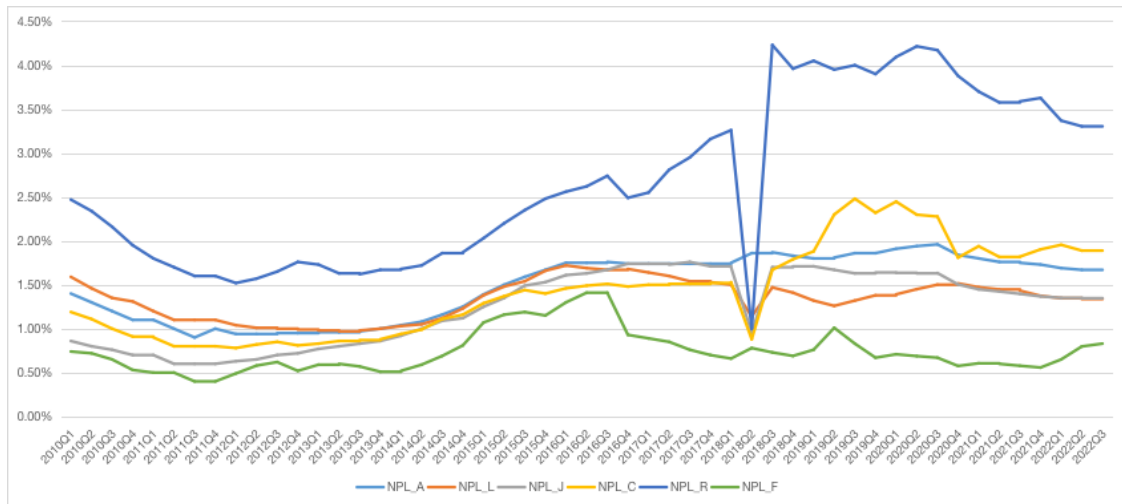


Figure 1 Line chart of non-performing loan ratios of major commercial banks from 2010 to 2022

## Data Correlation Test

Before estimating the model, the correlation analysis of the selected independent variables is carried out to understand the relationship between the variables more intuitively.

Table 5 Correlation analysis

	NPL A	NPL L	NPL J	NPL C	NPL R	NPL F	GDP	M2	LPR	REC	EX
NPL A	1.00										
NPL L	0.78***	1.00									
NPL J	0.91***	0.77***	1.00								
NPL C	0.87***	0.55***	0.82***	1.00							
NPL R	0.83***	0.56***	0.79***	0.94***	1.00						
NPL F	0.47***	0.66***	0.56***	0.28**	0.15	1.00					
GDP	0.78***	0.37***	0.75***	0.80***	0.76***	0.16	1.00				
M2	0.83***	0.43***	0.80***	0.84***	0.78***	0.25*	0.97***	1.00			
LPR	-0.95***	-0.73***	-0.88***	-0.86***	-0.82***	-0.44***	-0.85***	-0.90***	1.00		
REC	0.47***	0.20	0.48***	0.47***	0.46***	0.08	0.76***	0.61***	-0.52***	1.00	
EX	0.32**	0.07	0.30**	0.32**	0.32**	0.01	0.72***	0.61***	-0.46***	0.69***	1.00

t statistics in parentheses \* p < 0.1, \*\* p < 0.05, \*\*\* p < 0.01

It can be seen from the figure that there is a high correlation between the gross export value and the gross domestic product, broad money supply, benchmark interest rate, and actual funds for real estate development. In addition, there is also a specific correlation between the gross domestic product and the actual capital invested in real estate development. There is also a specific correlation between the benchmark interest rate and the broad money supply. Although there are independent variables with specific correlations in the model, these variables are still included in the model for estimation in this paper. The main reasons are: first, this paper selects the leading macroeconomic indicators, and in the same economic environment. There is inevitably a specific correlation between macroeconomic indicators. Second, referring to other literature on factors affecting the non-performing loan ratio of commercial banks, the indicators selected in this paper are common macroeconomic indicators that scholars generally adopt. Third,

when estimating the model in this paper, the model and the variables in the model will be tested, and if there are variables that cannot pass the test, they will be eliminated.

#### Autocorrelation Test

The method used in this paper is multiple linear regression. If the model has autocorrelation, the accuracy of the regression results will be reduced. In fact, since most economic activity is continuous, there is a high probability of autocorrelation. The existence of autocorrelation will also bring a series of adverse effects to the econometric model, which will not only increase the variance of the estimator, but also may make the estimator invalid, and even make the whole model completely lose the prediction function. Therefore, it is necessary to conduct the autocorrelation test of the model. The methods of autocorrelation test mainly include drawing, BG test, Q test and DW test. Among many test methods, this paper mainly uses DW test to carry out the autocorrelation analysis of the model. Meanwhile, in order to ensure the reliability of the test, this paper also chooses BG test for further verification.

Table 6 Autocorrelation test results

	All	Large	Joint	City	Rural	Foreign
DWtest	2.18	2.79	2.14	1.78	1.73	2.35
BGtest	0.18	0.08	0.23	0.05	0.03	0.11

When the value of DW test is 2, it can be considered that there is no autocorrelation; when it is less than 2, there is positive autocorrelation; when it is greater than 2, there is negative autocorrelation; and the farther the test value is from 2, the greater the possibility of autocorrelation. For all models, the DW test values are around 2, indicating that there is no obvious autocorrelation. However, the P-values of BG test is all greater than 0.01, and the null hypothesis of "no autocorrelation" cannot be rejected at the significance level of

1%, so it can be roughly considered that there is no autocorrelation. According to the results of DW and BG tests, it can be considered that there is basically no autocorrelation in the model.

### Result of Regression

Table 7 Regression result (1)

	(1)	(2)	(3)	(4)	(5)	(6)
	DLNPL A	DLNPL L	DLNPL J	DLNPL C	DLNPL R	DLNPL F
DLGDP	-0.22	-0.94***	-1.30**	-2.96***	-3.10***	-0.65***
	(-0.26)	(-0.74)	(-1.33)	(-1.07)	(-0.91)	(-0.32)
LM2	0.18**	0.35***	0.89***	0.11**	0.91**	1.07**
	(0.69)	(0.51)	(0.96)	(0.37)	(0.86)	(0.25)
LLPR	0.82***	0.88**	0.54***	0.28	0.21	0.97***
	(3.47)	(2.42)	(0.76)	(0.34)	(0.13)	(1.66)
DLREC	0.02	0.20*	0.57*	0.50	0.98	0.12***
	(0.22)	(1.26)	(1.81)	(0.42)	(1.37)	(0.48)
LEX	0.01	0.00*	0.06**	0.06	-0.01	0.01**
	(0.13)	(0.02)	(0.18)	(0.16)	(0.01)	(0.03)
cons	-0.32	-0.47	-1.64	-2.45	-2.02	-3.98**
	(-0.46)	(-0.43)	(-0.78)	(-1.04)	(-0.42)	(-33)
N	49	49	49	49	49	49
adj. R <sup>2</sup>	0.75	0.72	0.63	0.35	0.48	0.69

t statistics in parentheses \* p < 0.1, \*\* p < 0.05, \*\*\* p < 0.01

Firstly, the non-performing loan ratios of the six types of commercial banks are regressed separately, and the coefficient of determination of the regression models of commercial banks as whole, large commercial banks, joint-stock commercial banks and foreign-funded banks are above 0.6. For commercial banks' overall non-performing loan ratio, the broad money supply and the benchmark interest rate are significant at the 5% level. The regression results of large and joint-stock commercial banks are relatively close. The actual funds for real estate development are significant at the 10% level, the total export value is significant at the 5% level, and the rest of the influencing factors can pass the 5% significance level. For the regression results of foreign banks, all variables are

significant at the 5% level. From the regression results, the model fitting degree of commercial banks as a whole, large commercial banks, joint-stock commercial banks, and foreign-funded banks is relatively high.

Table 8 Regression result (2)

	(1)	(2)	(3)	(4)	(5)	(6)
	DLNPL A	DLNPL L	DLNPL J	DLNPL C	DLNPL R	DLNPL F
DLGDP	-0.22 (-0.26)	-0.94*** (-0.74)	-1.30** (-1.33)	-1.55*** (1.55)	-0.75*** (-0.93)	-0.65*** (-0.32)
LM2	0.18** (0.69)	0.35*** (0.51)	0.89*** (0.96)	1.23*** (0.41)	1.30** (0.87)	1.07** (0.25)
LLPR	0.82*** (3.47)	0.88** (2.42)	0.54*** (0.76)	0.23* (0.35)	0.35* (0.71)	0.97** (1.66)
DLREC	0.02 (0.22)	0.20* (1.26)	0.57* (1.81)	0.27** (1.12)	/	0.12*** (0.48)
LEX	0.01 (0.13)	0.00* (0.02)	0.06** (0.18)	/	/	0.01** (0.03)
cons	-0.32 (-0.46)	-0.47 (-0.43)	-1.64 (-0.78)	0.79* (0.28)	0.64 (0.76)	-3.98** (-33)
<i>N</i>	49	49	49	49	49	49
adj. <i>R</i> <sup>2</sup>	0.75	0.72	0.63	0.48	0.54	0.69

t statistics in parentheses \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

It can be seen from the empirical results that the same macro-influencing factors have a relatively low degree of fitting for city commercial banks and rural commercial banks, and the coefficients in the model, except for GDP and broad money supply, pass the 5% significance level test. The rest of the variables failed the test. The empirical results show significant differences in the impact of major macroeconomic factors on the non-performing loan ratios of larger large commercial banks, joint-stock commercial banks, and smaller urban commercial banks and rural commercial banks. In order to better analyze the influencing factors of non-performing loans of urban commercial banks and rural commercial banks, based on the estimation, the influencing factors of urban commercial and rural commercial banks are deleted. After the deletion of influencing factors, the

goodness of fit of both urban and rural commercial banks has increased. The remaining influencing factors can pass the 5% significance level test.

### Prediction

Prediction is one of the main uses of the regression model, that is, using the known value or predicted value of the independent variable in the prediction period, to estimate the value of the dependent variable in the prediction period (in the sample or out of the sample). The estimates include point estimates (forecasts) and interval estimates (forecasts) as required.

Point estimation (prediction) is to predict a possible value of the corresponding explained variable according to the value of the given explanatory variable. Point estimates in turn include point estimates based on means and point estimates based on individual values. The point estimate of the mean is actually an estimate of the population parameter, while the point estimate of the individual values is an estimate of some specific value of the dependent variable.

The multiple regression model is set as follows:

$$y_t = \hat{b}_0 + \hat{b}_1x_{1t} + \hat{b}_2x_{2t} + \cdots + \hat{b}_kx_{kt} + \mu_t$$

If the parameter vector  $\hat{B}$  is estimated according to the given sample, and the model passes the corresponding test, the sample regression equation is obtained:

$$y_t = \hat{b}_0 + \hat{b}_1x_{1t} + \hat{b}_2x_{2t} + \cdots + \hat{b}_kx_{kt}$$

Then the values of the explanatory variables outside the sample are calculated  $X_f = (1, x_{1f}, x_{2f}, x_{3f}, \dots, x_{kf}, )$ . The fitted value of  $y_f$  is:  $\hat{y}_f = X_f\hat{B} = \hat{b}_0 + \hat{b}_1x_{1t} + \hat{b}_2x_{2t} + \cdots + \hat{b}_kx_{kt}$ .

Considering the existence of sampling fluctuations and the zero-mean assumption of the random item  $\mu_t$  is not completely in line with the actual situation, there is generally an error in the estimated value of  $\hat{y}_f$  and  $y_f$  and its mean value  $E(y_f)$ .

The model predicts the non-performing loan ratio of China's commercial banks in the third quarter of 2022 and compares it with the actual value of the non-performing loan ratio in the third quarter of 2022. It can be seen that the gap between the predicted value and the real value is small, and the error is within 5%, which proves that the model prediction result is accurate.

Since the error between the predicted value and the true value is small, the 2022Q4 model can be predicted. Table 11 shows the dynamic forecast results of the non-performing loan ratio of China's commercial banks. The forecast shows that the non-performing loan ratio of foreign banks will maintain a growing trend. For large commercial banks, united commercial banks, urban commercial banks and rural commercial banks, the growth rate of non-performing loan interest rate will decline, and foreign banks have the most obvious decline, followed by united commercial banks. The NPL ratio of urban commercial banks and rural commercial banks changed most steadily.

Table 9 Actual and predicted values for different commercial banks in 2022Q3

	Large	Joint	City	Rural	Foreign
Actual Value	0.001	0.003	0.002	-0.005	0.039
Predicted Value	0.001	0.004	0.003	-0.005	0.035
Difference Value	0.000	0.001	0.001	0.000	0.004

Table 10 Forecast value of various commercial banks in 2022Q4

	DLNPL Lf	DLNPL Jf	DLNPL Cf	DLNPL Rf	DLNPL Ff
2022Q4	-0.056	-0.156	-0.024	-0.032	0.086

## Discussion

### *Similarities and Differences Between Various Commercial Banks*

When considering the impact of macro factors on non-performing loans of commercial banks, large commercial and joint-stock commercial banks, city commercial banks, and rural commercial banks, respectively, show certain similarities. In contrast, large-scale commercial banks, joint-stock commercial banks, foreign-funded banks, and scale There are apparent differences between smaller city commercial banks and rural commercial banks. This is not completely consistent with our hypothesis 6, only GDP growth and broad money supply are significant in the non-performing loan ratio of different commercial banks.

From the perspective of the explanatory power of various macro factors to the non-performing loan ratios of various commercial banks, the five macro factors of the growth rate of GDP, broad money supply, the central bank's one-year benchmark interest rate for loans, the growth rate of real estate development and investment funds, and total exports Factors can better explain the changes in the non-performing loan ratio of large commercial banks, joint-stock commercial banks and foreign commercial banks. As for the non-performing loan ratio of city commercial banks, it can be explained only by the four macro variables of the growth of GDP, broad money supply, central bank's one-year benchmark lending rate, and the change of real estate development and investment, while the change of non-performing loan ratio of rural commercial banks can only be explained. It is explained by the three variables of the growth rate of GDP, broad money supply, and the central bank's one-year benchmark lending rate. In this regard, micro factors significantly

impact the non-performing loan ratio of rural commercial banks. In contrast, the impact of macro factors is more significant for the other three types of commercial banks.

### *Analysis of Specific Influencing Factors*

First, there is a significant negative correlation between various commercial banks' GDP growth rate and non-performing loan ratios. The non-performing loans of commercial banks are primarily affected by the macro economy, which is consistent with the theoretical assumptions. Moreover, from comparing large commercial banks and joint-stock commercial banks, the non-performing loan ratio of joint-stock commercial banks is more susceptible to the impact of macroeconomics. On the one hand, joint-stock commercial banks have relatively more small and micro-enterprise loan customers. On the other hand, the theory of financial fragility shows that compared with the loan customers of large commercial banks and joint-stock commercial banks, there are more speculative and Ponzi enterprises. They are likelier to fail to repay their bank loans in a lousy economy. Similarly, from the comparison between urban commercial banks and rural commercial banks, the loan quality of urban commercial banks is more susceptible to economic fluctuations. Since rural commercial banks have more small and micro-enterprise loan customers than city commercial banks, and cities have more speculative opportunities and space, a more reasonable explanation is that city commercial banks have more speculative enterprises and Pond's loan customers.

Second, from the perspective of money supply in a broad sense, there is a positive correlation between money supply and non-performing loan ratios of various commercial banks, indicating that an increase in money supply will lead to an increase in non-performing loan ratios. When the amount of money in the social economy increases, banks

tend to increase credit to enterprises. Enterprises quickly obtain excess credit, leading to capital flow to non-operating areas, resulting in speculation and deterioration of credit quality. Another explanation is that the period of monetary easing is often also when the economy is in a recession, and easy money is needed to promote economic development. Currently, in addition to their debt pressure, large enterprises are considering prudent management and tend to retain as many funds as possible to avoid future risks. Under such circumstances, it is still difficult for small enterprises to recover their loans, and it is even more difficult to recover their loans, which increases the non-performing loans of commercial banks. Compared with large commercial banks, joint-stock commercial banks are more affected by the money supply, indicating that when the monetary policy is loose, the risk control of joint-stock commercial banks is relatively weak, and the proportion of small business loans is relatively more significant, which is prone to more non-performing loans. However, as state-owned banks, large commercial banks tend to have more non-market factors in their loan scale, and their loan grants are relatively stricter.

Third, the one-year benchmark lending rate of the central bank has a great impact on the non-performing loan ratio of large commercial banks, joint-stock commercial banks and foreign banks, and is positively correlated with the change of the non-performing loan ratio. The one-year benchmark lending rate of the central bank is the guiding basis for the pricing of loans. When the benchmark lending rate rises, the financing cost of enterprises will increase. When a business is badly run, it will be harder to repay money, so the NPL ratio falls. At the same time, this factor has a significant impact on the non-performing loan ratio of urban commercial banks and rural commercial banks at the level of 10%. A more reasonable explanation is that the loan pricing of these two types of commercial banks is

higher than that of large commercial banks and joint-stock commercial banks, and they have less reference to the benchmark interest rate. In addition, the loan customers of urban commercial banks and rural commercial banks are not sensitive to the loan interest rate. Therefore, the benchmark interest rate has less impact on its non-performing loan ratio.

Fourth, the impact of the growth rate of actual funds in real estate development investment on the non-performing loan ratio of the four types of commercial banks is basically the same, and they are all positively correlated, that is, the greater the growth rate of inflows of funds in real estate development, the higher the non-performing loan ratio of commercial banks. From 2010 to 2022, the government has continuously introduced real estate market regulation policies to stabilize housing prices. Under the background of continuous tightening of regulation policies, the reshuffle of the real estate industry has intensified, the operation of various real estate enterprises has been greatly tested, and the loan quality of the real estate industry has also been affected. As for rural commercial banks, the growth rate of the actual funds in place for real estate development investment has no significant impact on the non-performing loan ratio of rural commercial banks. The possible reason is that compared with large commercial banks and joint-stock commercial banks, rural commercial banks have limited real estate customers, and most of them are local customers. Therefore, the growth rate of the actual funds in place for real estate development investment in the country cannot explain the change of the non-performing loan ratio of such commercial banks perfectly.

Fifth, the total value of exports significantly impacts the non-performing loan ratios of the three types of commercial banks, and they all show positive correlations. The increase in the total export value indicates that the sales of export-oriented enterprises have

expanded, resulting in more demand for loan funds, and the loan volume of the export industry has increased. While expanding sales revenue, some enterprises will also fall into the difficulty of recovering accounts receivable, leading to difficulties repaying such enterprises. From the perspective of specific bank classification, the impact of total export value on the non-performing loan ratio of foreign-funded banks is more significant than that of other banks. To a certain extent, this influencing factor reflects the sensitivity of various commercial banks to changes in the international economic environment.

## CHAPTER 5

### CONCLUSION

#### Suggestion

First, macroeconomic fluctuations have significantly affected the non-performing loan ratios of various commercial banks, and the non-performing loan ratios tend to go down during economic booms. The government's macroeconomic regulation and control can not only help people's livelihood issues, such as employment but also play a significant role in maintaining the stability of the credit and financial systems. Therefore, necessary macroeconomic regulation and control are needed. When the economy is improving, the non-performing loan ratio is low, and enterprises and banks are operating stably, further improving the economy and forming a virtuous circle. However, at the same time, it should be noted that during the period of economic development and when enterprises can obtain a large number of bank loans, a group of speculative and Ponzi enterprises is often bred. They are the hidden dangers of the outbreak of non-performing loans and economic recession. It is tough to improve the stability of banks during economic booms because banks and the entire financial system appear to be very healthy during this period, and it is difficult to see hidden dangers. In this regard, the more prosperous the economy is, the more we must be prepared for danger in times of peace. The China Banking and Insurance Regulatory Commission should strengthen the supervision of the flow of loan funds to prevent loan funds from being used for speculation.

Moreover, the government and regulatory authorities should formulate plans to be implemented if a financial crisis occurs and establish and strengthen financial stability departments. Otherwise, the financial crisis may have already begun while new regulations

still struggle to make their way through policymaking. From the empirical results of this paper, joint-stock commercial banks are more susceptible to the impact of the economic environment than large commercial banks, and city commercial banks are more likely to be affected by the economic environment than rural commercial banks. Considering that supervisory resources are scarce, the supervisory authority can, based on comprehensive supervision of all types of commercial banks, further supervise some commercial banks with emphasis or in-depth to achieve refined supervision.

Second, monetary policy is also an essential means of regulating the economy. When the government introduces monetary policy, it needs to consider whether the increase in money supply will eventually enable enterprises that need to supplement operating funds to obtain loans. During the period of monetary easing, commercial banks often also get some favorable policies for granting loans to encourage lending to enterprises. At this time, we need to pay attention to how many loans is granted, to whom the loans are granted, and where the loans flow. The problem of China's large enterprises defaulting on small enterprises' loans is still prominent. In the period of increasing money supply, many funds still have yet to flow to small enterprises, and there are still non-performing loans due to the difficulty of repayment of goods. For such situations, the government can encourage commercial banks to develop supply chain financial services and inclusive financial services to solve the financing difficulties of small and micro enterprises effectively.

Third, in terms of industry policies, for industries strongly supported by the state, such as agriculture and new energy industries, the state has support policies to encourage commercial banks to issue loans. However, in many cases, commercial banks have lowered

the requirements for loan approval to support the industry too much. At the same time, they have issued too many loans, which is not conducive to the normal development of the industry, and once the industry adjusts, it is easy to lead to a large number of non-performing loans. For industries that are already undergoing adjustment or reshuffle, commercial banks tend to overreact and over-compress the industry's loans, which leads to an increase in the non-performing loan ratio of commercial banks. In this regard, government departments should introduce or refine related policies. Commercial banks should moderately adjust the intensity of loan extension or compression, whether they are supporting or withdrawing industries. Exaggerated responses are not conducive to the development or adjustment of industries and need to be more conducive to the loan quality of commercial banks.

#### *Large Commercial Bank*

Large-scale commercial banks are the most significant type of banks among all commercial banks in China, and they are all state-owned commercial banks. From the empirical results of this paper, compared with the second most significant type of joint-stock commercial banks, the non-performing loan ratio of large commercial banks is less affected by economic fluctuations, money supply fluctuations, and industry changes than joint-stock commercial banks. Robustness is demonstrated. The macro variables selected in this paper can explain the changes in the non-performing loan ratio of large commercial banks, which means that the impact of micro-factors on the non-performing loan ratio of large commercial banks is relatively limited, indicating that the internal management and risk control systems of large commercial banks are relatively complete. The influencing factors are minor. Therefore, when the economy is in recession, large commercial banks

can provide more loans to small and micro enterprises. For the entire social economy, this can solve the complex and expensive financing difficulties of small enterprises to a certain extent: large commercial banks, as state-owned banks, need to bear specific responsibilities for maintaining economic stability, and the current large commercial banks are not in good condition. The loan ratio is relatively low, and the scale of existing loans is large. Loans to small and micro enterprises can further consolidate the market position of large commercial banks without increasing the overall non-performing loan ratio too much. It is also beneficial to their development.

#### *Joint-stock Commercial Bank*

As the second largest group of commercial banks in China, the healthy development of joint-stock commercial banks has a decisive impact on the entire economic environment. On the whole, joint-stock commercial banks are the banks whose non-performing loan ratio is most vulnerable to macroeconomic changes among the four types of commercial banks studied in this paper. Joint-stock commercial banks should pay special attention to changes in the macroeconomy and industry environment when operating, strengthen economic and industry research, actively adjust and optimize the structure of credit assets, and avoid excessive expansion and loans in a particular industry. In addition, there is relatively fierce competition among joint-stock commercial banks. In this regard, joint-stock commercial banks should use approval efficiency and product design as a means of competition rather than lowering the entry threshold to attract customers. The vicious competition will lead to subsequent non-performing loan rate rise.

### *City Commercial Bank*

City commercial banks mainly serve the local economy. Compared with large commercial banks and joint-stock commercial banks, changes in the non-performing loan ratio of city commercial banks have a weaker relationship with the macroeconomy. When studying the non-performing loan ratio of city commercial banks, it is necessary not only to pay attention to the national macroeconomic and industry changes but also to pay special attention to the local development situation. From the perspective of the development history of city commercial banks, the operation and development of city commercial banks can only do with the support of the local government. Correspondingly, local governments often intervene in the operation of city commercial banks. It may also be why the non-performing loan ratio of city commercial banks is relatively less affected by macroeconomic changes. Therefore, how to properly handle the relationship with the local government is a problem that city commercial banks need to consider. On the one hand, city commercial banks should vigorously strive for local government financial deposits and high-quality project loans and make full use of regional and resource advantages to carrying out operations, which also increases the proportion of low-risk loans, thereby reducing the non-performing loan ratio; Commercial banks should also strengthen communication with local governments. Policy businesses can cooperate with large local commercial banks and joint-stock commercial banks to prevent or reduce non-performing loans caused by excessive government intervention.

### *Rural Commercial Bank*

Among the four types of commercial banks studied in this paper, the non-performing loan ratio of rural commercial banks is least affected by macro factors. First of

all, similar to city commercial banks, rural commercial banks are based in local rural areas and have the characteristics of being "small and scattered." Compared with the national economic environment and industry changes, local economic and industry changes often significantly impact their non-performing loan ratios. The area served by the rural commercial bank is also known as the economic area based on "agriculture, rural areas, and farmers," and there is a relative lack of high-quality enterprises. In this regard, rural commercial banks must not only assume the social responsibility of serving the "three rural areas" but also control risks, which is difficult to achieve. They need to seek more supportive policies from the government, such as establishing a guarantee fund for the government to mitigate risks. However, at the same time, it is not allowed to lend money just because of government credit enhancement blindly, and the critical review should still be carried out. Second, most rural commercial banks in China need to be bigger in scale. Their internal management and operating systems need to be standardized enough so they are prone to non-performing loans caused by human factors. Rural commercial banks generally need a sound management and approval system for loan customers with relatively poor qualifications among Chinese commercial banks. For rural commercial banks that need the ability and strength to independently develop, purchase, or improve the supporting approval system, the government may consider corresponding supporting support. Only when rural commercial banks' approval efficiency and accuracy are improved can they entirely play their role in supporting the local economy. Third, most rural commercial banks are small in scale and have insufficient capital, which leads to amplified risk leverage and low liquidity. Capital funds act as shock absorbers to help banks absorb losses, maintain public confidence in them, and remain solvent in times of

crisis. Therefore, the government or regulatory authorities should pay attention to small-scale banks with insufficient capital, such as rural commercial banks, and increase the capital adequacy ratio and other indicators to guide such banks to operate more steadily.

### *Foreign-funded Bank*

In the regression results, foreign banks are affected by macro factors. Having developed in the Chinese market for many years, the business development of foreign-funded banks could be faster, with slow growth in scale and limited market share. For foreign-funded banks, the first step is to improve asset quality and optimize bank asset structure. Foreign-funded banks can take advantage of the advantages of their parent banks and focus on mid-to-high-end customers and high-net-worth users. At the same time, it clarifies banks' competitive advantages in specific fields in China, determines the market positioning, develops high-quality customers with high integrity in vertical fields, and develops diversified banking products in market segments. Secondly, according to the current operating conditions, foreign-funded banks, especially wholly foreign-funded banks, should adequately adjust the provision coverage ratio, capital adequacy ratio, and other reserves. The level of loss reserve ratio to speed up asset flow, improve capital utilization, and optimize asset quality. At the same time, foreign-funded banks should pay more attention to the intermediary business, explore new business growth points, adjust the bank's income structure, increase the bank's profit target, and seek breakthroughs. Finally, wholly foreign-funded banks actively leverage their synergistic advantages with their parent banks to promote RMB internationalization. At the same time, increase the emphasis on overseas enterprises and Chinese-funded enterprises investing in countries along the "Belt and Road" and use the parent bank's outlets in countries along the "Belt and Road"

to assist Chinese-funded enterprises to conduct business overseas; at the same time, use business innovation as a breakthrough, expand customer channels, and grasp the customer resources of Chinese-funded enterprises.

### Research Limitations and Future Prospects

First, as far as the public information disclosed by various commercial banks in China is concerned, the information of large and joint-stock commercial banks is relatively public. However, the data on city commercial banks, rural commercial banks, and foreign-funded banks is relatively limited. There are certain limitations in the overall situation of the bank, limited by the availability of data during the research period; this paper can only analyze from the perspective of macro-influencing factors. Although the non-performing loans of large commercial banks, joint-stock commercial banks, and city commercial banks can be explained by changes in macro factors, for rural commercial banks, micro factors still deserve attention.

Second, although the research scope of this paper is relatively broad, covering the overall situation of the five commercial banks, it still needs to do a statistical analysis of the specific data of each bank in each type of commercial bank. Judging from the current public information, the data of each bank in large commercial banks and joint-stock commercial banks are more detailed. However, the data on city commercial banks, rural commercial banks, and foreign-funded banks is still relatively lacking, and the main ones that can be obtained are large-scale or listed banks. Suppose the individual data of each bank or most banks in various commercial banks can be obtained in future research. In that case, it is possible to conduct a more in-depth study of the differences in the influencing

factors of non-performing loans of various commercial banks by establishing a panel data model and other methods.

Finally, from the changes in non-performing loans of commercial banks in recent years, the asset quality of the city and rural commercial banks is not optimistic. Foreign banks are subject to strict controls within China and are therefore the most affected by macro factors. In future research on non-performing loans of commercial banks, we can focus on and deeply explore the influencing factors of the non-performing loan ratio of these two types of banks, especially the influence of micro-factors. City and rural commercial banks play a pivotal role in the local economy. This kind of research can also provide a theoretical basis for the policies of local governments and regulatory authorities and strengthen the stability of the local economy and financial system.

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