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The Impact of Macroeconomic Factors on Bank Credit Risk

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Abstract: Credit risk has become one of the main risks faced by banks under the background of increasing loan demand. Meanwhile, bank credit risk may be affected by a number of factors, including the expansion rate of Gross Domestic Product (GDP), changes in interest rate, unemployment rate and even more. These macroeconomic factors are crucial in determining how credit risk for banks is shaped. This paper concludes the different impacts of different macroeconomic factors discussed in several papers on the risks of bank credit, and illustrates how changes in GDP growth rate and rate of interest affect credit risks. Through comprehensive literature review and empirical research, this paper finds that macro factors, including the expansion rate of GDP and the rate of interest, have considerable impacts on banks' credit risk. Bank credit risk will decrease as GDP growth rate increases; however the risk of bank credit will increase as interest rates rise. At the end, the paper provides several suggestions for the development of risk management strategies, including the monitoring of macroeconomic factors and the adjustment of credit policies under different economic situations. The research results are intended to help researchers in related fields understand current research findings and patterns of development in the research field, to give a theoretical foundation and backing for their investigations, and to offer important guiding significance for banks and relevant regulators to formulate risk management strategies.

Keywords: macroeconomic factors, credit risk, GDP growth rate, interest rate

1. Introduction

Under the background of increasing loan demand, credit, as a new project, has become an important asset business and a main mean of profit for many commercial banks. Compared with mortgage loans, credit has the characteristics of fast payback and wide applicability to people. However, since the lending of credit business is out of the control of the bank and only the credit of the borrower is used as the collateral, there is a great risk of not being able to collect principal and interest on time [1]. Therefore, mastering credit risk control is a very essential task for banks' capital control.

While banks are affected by fluctuations in credit risk, credit risk itself is also affected by many different aspects. Through various studies, scholars have revealed and explained the main causes of changes in credit risk of bank, namely macroeconomic determinants and bank-specific determinants [2-4]. For bank-specific determinants, such as the amount of provisions, Quagliariello pointed out in his research by reporting that during economic booms, banks typically loosen credit criteria and cut their provisions, while stakeholders view higher provisions as evidence of poorer quality of credit [4].

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Apart from those bank-specific factors, several macroeconomic determinants also help to explain changes in bank credit risk, and the banking business is more heavily influenced by macroeconomic factors than other industries are [5]. Among these factors, as far as the way that macroeconomic variables affect credit risk of bank is concerned, there is a common finding in relevant empirical literature, that is, economic growth is the key factor affecting bank credit risk [6]. As Castro, Naili and Lahrichi indicated in their research, bank credit risk would be strongly affected by macroeconomic environment, containing more detailed factors like the changing rate of GDP growth, interest rate, unemployment rate and more [3, 7].

Since macroeconomic factors are the primary determinants of risk of credit as indicated by most studies [6], and the rate of expansion in GDP and interest rate are two of the macro factors that have the greatest influence on credit risk of bank [8], this paper focuses on macroeconomic factors, analyzes and compares the research results of several papers, and explains their impacts on bank credit risk from the aspects of the expansion rate of GDP and the rate of interest. Through the research, it is found that economic prosperity is usually accompanied by the increase of credit loans and the improvement of credit quality. Therefore, the increase of GDP expansion rate will result in the reduction of the default risk of borrowers, thus reducing the overall risk of credit. The rise in interest rates will bring a huge burden to borrowers, so it is more likely that non-performing loans (NPLs) will rise, leading to higher credit risks.

The significance of this paper is to help relevant researchers understand the existing research results and the development trends in the research field of credit risk by finding out how the rate of growth in GDP and interest rate affect bank credit risk, to help them to find out limitations in the previous research on factors affecting credit risk, to provide theoretical basis and support for their researches on the other possible determinants of risk of credit in the future, and also to provide reference and improvement direction for their innovative research methods. In addition, this paper also enables banks to set its risk preference and adjust its lending decisions according to the overall macroeconomic environment, in order to deal with the credit risk fluctuations affected by macroeconomic factors, and to give full play to its role in activating the economy.

2. Credit Risk

Credit business is one of the most essential businesses of many commercial banks. By extending credit and collecting interest as well as principal, the difference after deducting costs is the bank's profit [1]. However, since the credit loan only takes the credit of the borrowers as collateral, the bank faces the risk that the loan cannot be paid back (in part or in whole) to the lender, that is, the credit risk of the bank [7]. Banks will evaluate each credit applicant's credit risk level before determining whether to offer funding to them in order to determine the likelihood that potential borrowers will not be able to repay their loans [9]. In 1997, Credit Suisse Financial Products proposed the actuarial method, which simply took default into account [10]. This assessment approach was then followed by CreditPortfolioView as proposed by McKinsey, which shown that the likelihood of default depends on macro factors like the speed of economic growth, the interest rate level, unemployment, and more [11].

NPLs occur when the lender default or fails to perform, resulting in a loss of bank assets, and most scholars believe that NPLs are one of the most essential contributing elements to credit risk of bank in nowadays [3, 9]. As a result, the ratio of the total number of NPLs of a bank to the total loans on its balance sheet can largely reflect the bank's credit risk [7]. In addition to the default impact brought by the credit and repayment ability of the lender, some external environmental factors such as changes in the macroeconomic climate will also significantly affect the bank's credit risk.

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3. Macroeconomic Determinants of Bank Credit Risk

Macroeconomic factors refer to a series of factors in the overall economic environment, including economic expansion, rate of interest, inflation rate, unemployment rate, etc. In the study of Figlewski, Frydman and Liang, candidate variables of macroeconomic factors were divided into three categories, namely those referring to overall macroeconomic circumstances (such as the unemployment rate), those indicating how the economy is changing (such as real GDP growth), and the remaining group being signs of the condition of the financial markets (such as the level of interest rate) [12]. Macro factors have significant impacts on bank credit risk level. More specifically, the rate of GDP growth and interest rate level have been identified by most studies as the most important macroeconomic factors affecting credit risk [2, 6]. During economic downturn, the possibility of default will increase [13], which means that bank credit risk is facing a rising trend.

3.1. GDP Growth Rate

One of the key macro factors that shapes the risk of bank credit is GDP growth rate, which refers to the percentage change in GDP from one year to the next [2, 9]. Through a series of empirical studies, most academics concur that NPLs have a negative relationship with the expansion rate of GDP, which means that the credit risk of bank will decrease as the growth in GDP increases [2, 3, 13]. For instance, with the purpose to control the macroeconomic determinants of the level of credit risk, Jiménez and Saurina selected the expansion rate of real GDP as one of the explanatory variables in 2006 [13]. The effect of GDP growth rate on the level of credit risk was examined by employing dynamic panel data approach to track the dependent variable, namely the ratio of NPLs [13]. The analysis provided by Jiménez and Saurina covered two credit cycles in the Spanish banking industry between 1984 and 2002, and it hypothesized that NPLs would be inversely connected with the growth rate of GDP [13]. Their empirical findings demonstrate that the long-term elasticity of the expansion rate of GDP is 1.19 on the average of the variables, that is, every 1 percentage point increase in the growth rate of GDP decreases the ratio of NPLs by 30.1% [13]. The limited income sources of borrowers during tough times, which result in a greater level of NPLs, could be the causation of this negative link between GDP growth rate and the proportion of NPLs [13]. Thus, the acceleration of GDP level brings with it a reduction in NPLs, namely a reduction in bank credit risk.

In order to learn the elements that affect credit risk, the dynamic panel data approach was employed by Louzis, Vouldis, and Metaxas in 2012 to investigate the causation of NPLs in the banking industry in Greece [2]. To determine how the GDP growth rate would affect bank credit risk, the association between the first difference of the percentage of NPLs and the expansion rate of real GDP was then investigated. The loans made by nine Greek commercial banking institutions during the first several months of the year 2003 and the third quarter of the year 2009 were included in a panel data set and used by these researchers [2]. Their findings demonstrate that, for all macroeconomic factors, their projected long-term coefficients are highly significant and also have the predicted negative sign [2]. This finding implies that decreasing economic growth could bring negative influence to the percentage of NPLs, and that the ability of creditors to fulfill their financial obligations is largely dependent on the economic cycle: a boom period is usually accompanied by an increase in credit and an improvement in credit quality, while the chance of debtors defaulting may increase during a recession. In addition, these scholars also found that the effect brought by GDP growth rate to NPL level is the largest among all observed macroeconomic variables [2], that is to say, one of the most crucial elements in cutting credit risk is a rise in GDP growth rate.

Similar to these researchers, Castro applied the dynamic panel data approach in 2013 to take time consistency into consideration while analyzing credit risk, and also discovered that the rate at which GDP grows could cause a considerable negative effect on the bank's credit risk level [7].

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The dynamic panel data method of Louzis, Vouldis and Metaxas, and Jiménez and Saurina can reduce the bias caused by data summing by capturing individual differences in the process of data dynamic adjustment [2, 13]. As for methodological limitations, Louzis, Vouldis and Metaxas suggest that Greek businesses tend to be smaller on average, which may be another factor contributing to this negative effect, since it makes them less diversified and more susceptible to negative macroeconomic shocks [2]. However, this factor is not reflected in their research process, which may lead to inaccurate empirical results.

3.2. Interest Rate

The level of interest rate has an important impact on bank credit risk. A large number of literature provide convincing evidence that high interest rates will lead to a high banks' lending rates, resulting in a rise in the overall amount of NPLs [3, 7, 13], since the borrower's repayment pressure increases in a high interest rate environment, which could result in a rise in the risk of credit [14]. There are several different methods to set the interest rate as the independent variable. For instance, Jiménez and Saurina established the real interest rate, which is determined by the interbank interest rate minus the inflation of that time period, as one of the explanatory variables to control the macroeconomic factors that influence credit risk in 2006 [13]. By observing the dependent variable, namely the NPL ratio, analyses were done to determine how changes in interest rates affect credit risk. Their empirical research results show that a 100-basis-point increase results in a 21.6 percent increase in the NPL ratio [13]. This positive correlation between real interest rates and NPL ratio can be explained by the surge in interest payments of borrowers during periods of rising borrowing rates, since the rising borrowing rates will damage borrowers' ability to repay, which will then result in higher NPL ratio and higher bank credit risk.

In 2013, Castro examined the variables influencing the risk of credit in Greece, Ireland, Portugal, Spain, and Italy (GIPSI) by applying the appropriate dynamic panel data approach as well as depending on the Arellano-Bond estimator [7]. By collecting the data of interest rate and NPL ratio of this specific group of nations from the time period between the first several months of the year 1997 and the third quarter of the year 2011, the relationship between them was studied to observe how bank credit risk would be affected by interest rate [7]. Instead of using pure real interest rate as the baseline for the research just like other scholars did, Castro chose the long-run interest rate, which represents the market interest rate for more than one year, since he considered that most loans are usually long-term. According to his research, NPL ratio rises by around 0.07 percentage points for every 1 percentage point expansion in long-run rate of interest [7]. This result demonstrates the change in the interest rate will affect the percentage of NPLs, that is, the rise in the rates of interest will lead to a rise in NPL ratio, which indicates that the level of bank credit risk will also increase.

Besides, the generalized method of moments (GMM) for linear analysis was used by Mahrous, Samak, as well as Abdelsalam to determine the dynamic connection between interest rate and credit risk [14]. Unlike other scholars, the three researchers used lending interest rates, which is the rate at which a bank charges interest to borrowers when making a loan, as well as the loan interest rate's squared term as the standard for their examination. A dynamic panel threshold approach was then used to investigate the link between interest rates and the level of credit risk by gathering interest rates and ratios between NPLs and total loans in banking industries of Middle Eastern and Northern African (MENA) nations [14]. The reason for this is that they believe that credit risk fluctuates, and this method can show whether there is a specific level of interest rate that can be used to predict the trend of development of credit risk above this level [14]. As shown in the research results, interest rates and credit risk are correlated positively, and this kind of correlation is significant under a certain threshold value: The MENA banking sector's credit risk will increase if the loan interest rate exceeds

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6.3, since doing so will significantly increase the burden on the borrower and it is more likely to have NPLs and rising credit risks [14].

The benefits of the three research methods mentioned above vary. The dynamic panel data method of the three groups of scholars can overcome the bias and inconsistency caused by Ordinary Least Squares (OLS) estimation method by capturing individual differences in the process of data dynamic adjustment. More importantly, the dynamic panel threshold method adopted by Mahrous, Samak and Abdelsalam can use different regression slopes more effectively to determine the threshold, which is helpful to find the non-linear effects of changes in interest rate on credit risk [14].

4. Strategies to Bank Credit Risk Control

Risk management is a core element of banking, which aims to identify, assess and control risks to ensure the sound operation of banks and the health of the financial sector. Numerous empirical researches have demonstrated that NPLs are the symbol of the start of the banking crisis, since under the action of various macroeconomic factors, the growth in the proportion of NPLs will result in a rise in credit risk for banks. To minimize this impending threat and maintain sustainable economic growth, policymakers and market participants can create suitable financing strategies and propose adaptive regulatory and supervisory improvements with the aid of a thorough understanding of the underlying determinants [3].

When facing the effects brought by various macroeconomic factors to bank's risk of credit, it is very important to formulate effective risk management strategies. For instance, strategies like the establishment of macroeconomic factors monitoring mechanism and the adjustment of credit policies under different economic situations. Factors that are possible to bring negative influences on the risk of bank credit could be immediately recognized through the monitoring and analysis of economic expansion, rate of interest, inflation and other macroeconomic indicators, and some appropriate warning measures could then be taken as well [3]. Or, banks can formulate risk response and adjustment strategies, and adjust credit policies and risk management measures timely according to changes in macroeconomic factors. For example, when economic growth is slowing down, the repayment ability and debt sustainability of borrowers should be carefully assessed. A series of measures should be implemented to cope with the changes in credit risks that may be brought by different macroeconomic factors, so as to stabilize the bank's earnings and stabilize the whole financial system [7].

5. Conclusion

This paper covers the definitions and concepts of credit risk and macro factors through the discussion of how macro factors affect the risk of bank credit. Also, by studying a large number of empirical studies, this paper primarily demonstrates the significant impact of two macroeconomic parameters on bank credit risk, namely the expansion rate of GDP and the level of interest rate. In general, the rise in GDP growth rate will promote the credit quality of creditors, which will diminish NPL ratio and also the level of bank credit risk. The growth in interest rate level will push up the borrower's repayment pressure, which will further boost the proportion of NPLs and the bank's credit risk.

These research results all show that macroeconomic factors play an important role in shaping bank credit risk. By examining how macroeconomic parameters affect bank credit risk, this paper can not only help other researchers understand the existing research results and limitations in the field of credit risk research, but also provide ideas for future research directions. For example, to further explore the influences of macro factors on other types of risks (such as market and operational risk), and the differences among different types of banks (such as commercial banks and investment banks) affected by macroeconomic factors.

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In addition, these findings provide important empirical evidence and risk management strategies for banks and regulators. By strengthening the cognition of macroeconomic factors and risk management, regulators can timely monitor and evaluate the risk status of banks and formulate corresponding regulatory policies and rules, so that banks can better cope with uncertainties and lower as much credit risks as they can. Therefore, the stability of the entire financial system in the changing macro environment could be maintained.

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