Analysis of China's Real Estate Industry and Banking Industry Based on NPL And China Real Estate Climate Index

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Abstract. This paper explores the relationship between real estate risks and banks through two sets of data: the China real estate Climate Index and bank non-performing loans. Correlation analysis showed a moderate negative correlation between the two factors, with correlation=-0.61333. The downside risk of the real estate sector will be passed on to the banks and may trigger a credit crisis for the banks. From the perspective of real estate developers, implementing the three red-line financing policies of China's real estate enterprises has caused difficulties in financing. On the buyer side, residents' expectations that real estate prices would rise forever have reversed. Meanwhile, the recurrence of COVID-19 in China has severely affected the country's economy and made residents' expectations for the future more uncertain. These common factors have led to downward pressure on the property sector. This scenario poses a challenge for Chinese policymaking. China's policies must rescue the property sector while ensuring it does not overheat again.

Keywords: China real estate climate index; non-performing loans; potential risks.

1. Introduction

1.1 Background

China's real estate industry has played an essential role in China's economic development over the past two decades and has become an essential component of China's financial system [1]. The banking sector was also widely involved in the real estate boom. Banks established close relationships with the real estate industry through direct and indirect debt and investment instruments. Solid research proves China's property market is in a bubble [2]. However, when, why, and how the housing bubble will burst? Evergrande's debt crisis in 2021 shattered a decades-long boom in the Chinese real estate industry. Since 2022, various levels of the Chinese government and the central government have introduced measures to save the declining real estate industry. However, there are still a series of real estate enterprises, such as the Sunac debt crisis, given the depth of banks' involvement in China's real estate development over the past decade. Debt, trust, and other investments may transmit risks in the real estate sector to the banking sector. This transfer of risk may lead to the expansion of the bank's risk exposure and may lead to a potential financial crisis [3]. It becomes meaningful to study the inherent relationship between real estate market risk, banks, and potential risks.

1.2 Literature Review

The research of Fung et al. tried to explore the development of China's real estate industry. The results show that China's real estate industry is developing rapidly. It has grown from an insignificant small industry in early 1978 to an essential part of China's economy. The real estate industry is an integral part of production service activities. Numerous industries are dependent on the development of the real estate industry. In the long run, China's policies and economic activities are favorable for the continued development of China's real estate industry. Fung et al. 's paper reveal the pillar role of China's real estate industry in China's economic development [1].

Zhi et al. 's paper fill the gap in the research on bubbles in China's real estate industry. This study aims to conduct a series of bubble monitoring analyses in 35 representative cities in China. This study mainly uses the Log-Periodic-Power-Law-Singularity model to detect whether there are unsustainable speculative behaviors in real estate prices. The results indicate that ten of the 35 representative cities show significant bubble characteristics. However, only ten cities in the study had

typical bubble characteristics, which still accounted for about a third of the total. That means China's property market is indeed in a bubble. Zhi et al.'s conclusion provide a theoretical basis for exploring the transfer of real estate market risks to the banking industry. There is a bubble in the real estate market [2].

Deng et al. Studied the contagion of banks' systemic risk under the impact of real estate prices. The report adopts complex net theory, modeling real estate assets as banks' common exposure to real estate. A model with two risk transmission channels is proposed. Its two channels are financial networks and real estate fire sales. The results of this paper show that the risk of real estate is transmitted to banks in the financial system, and the more closely connected the system is, the more likely it is to collapse. However, financial networks are only one of the main channels for risk transmission. Based on the low liquidity of real estate, the liquidity effect formed by the fire sale of assets becomes the main channel of risk propagation. Finally, the banking system is susceptible to real estate. Since Evergrande defaulted on its debt, the characteristics of the systemic crisis in the real estate industry have become more apparent. Therefore, the conclusion of this paper is instructive to study the transmission of real estate risk to the banking industry [3].

Ferrari et al. 's research provide a formal statistical assessment of potential early warning indicators of real estate-related banking crises. This study evaluates the predictive power of predictors based on bank-related real estate crisis data from 25 European countries. The paper emphasizes the important role of real estate price volatility and credit development in predicting real estate-related crises. In addition to the systematic development of these variables, other variables with multiple dimensions can also enhance their predictive power of these variables. The reason is that variables with multiple dimensions can help to cover more information, such as the inflation rate, interest rate, and other macroeconomic factors. In other words, combining multiple variables is more predictive than a single variable. In addition, this paper also points out that individual variables have different forecasting abilities in different countries or economies. Adjustments should be made according to different economies to obtain more accurate forecasting effects. Although this paper does not directly study the risk indicators of Chinese real estate, the research on the related bank risk indicators provides a reference for selecting Chinese real estate risk indicators [4].

Jouini and Messai looked at the determinants of non-performing loans between Italy's Syrah and Spain. The results show that the GDP growth and yield rates harm non-performing loans. The unemployment rate and real interest rate have a positive impact on NPLS. Moreover, NPL statistics are vital during recessions because they represent, to some extent, the stability of banks. By extension, non-performing loans can be used as an indicator of the stability of banks [5].

Zhang et al. Studied the relationship between China's real estate market and bank stability with non-performing loans as an example. This paper puts forward three testable hypotheses to relate real estate investment to the stability of regional commercial banks. Its findings reveal that. First, the investment in the real estate industry reduces the NPLs of the bank. Second, the stability of the real estate investment and the bank is sensitive to the cycle of the real estate industry. The damage from the property slump is more evident than the gains from the expansion. The third inter-bank competition can amplify the positive returns brought by real estate investment, but the relative excessive competition may lead to risky behaviors of banks. The speculative behavior leads to excessive exposure of banks to the property sector. This paper discusses the relationship between banks and real estate from the perspective of NPLs, which lays the foundation for the subsequent research [6].

Su et al. 's paper analyzes whether falling housing prices will cause credit risk. Through the sub-sample rolling window test, the research results confirm that the housing price decline will increase loan defaults and thus increase the credit risk. In addition, the study points out that the increase in bank credit is irrational, which may lead to the accumulation of credit risks. In the context of slowing credit growth, China's credit risks are unlikely to erupt systematically. However, given the critical role of real estate loans in China's credit structure, it is crucial to be alert to credit risks caused by

individual or corporate defaults. This paper provides the foundation for studying banks' credit risk under the condition of real estate prices [7].

Zheng and Xiong have studied the risks in China's financial system. In the housing risk, Zheng and Xiong mentioned the high housing price in China for two reasons. The first is that Chinese homebuyers tend to take past expectations as future expectations, believing that house prices will always rise. The second is the belief that the government will intervene when prices fall because property plays a critical role in the Chinese economy. Both have driven the boom in the housing sector from the demand side. There are serious consequences if those expectations are breached [8].

1.3 Objective

This paper uses correlation analysis to study the relationship between real estate risk and banks. Real estate uses the national real estate climate index as an indicator. The bank aspect adopts non-performing loans as the indicator. The time frame for data collection is from January 2020 to September 2022 for both measures. The data is every quarter. The reason chose this period is that in early 2020, COVID-19 hit China, bringing instability to China's finances and economy. In early 2021, China officially promulgated the "three red line policy for housing enterprise financing," which hugely impacted the real estate industry. Section 1 includes an introduction, related research, and objective. Section 2 contains data and methods. Results will be illustrated in section 3 and discussed in section 4. Finally, section 5 will summarize.

2. Data Selection and Methodology

The CERCI, namely the national real estate climate index, is a comprehensive index used to reflect the overall situation of China's real estate industry. The index uses 2012 values as a base of 100 points. The index consists of eight calculation indicators:

(1) land transfer income index;
(2) Complete the development land area index;
(3) real estate development investment index;
(4) Fund source index;
(5) Commercial housing sales price index;
(6) New construction area index;
(7) floor area index;
(8) Vacant area index.

The reason for adopting the national housing climate index is that the national housing climate index is a comprehensive index that can represent the overall Chinese real estate industry better. In addition, considering that indicators contain a variety of indicators, they are generally considered to have more substantial representative power [4].

Table 1 shows the data, and corresponding statistical results of the national real estate climate index collected from the National Bureau of Statistics [9].

Table 1. National real estate climate index

Date	Index
03/2020	296.050
06/2020	298.240
09/2020	301.000
12/2020	302.010
03/2021	303.860
06/2021	303.530
09/2021	302.490
12/2021	301.300
03/2022	290.350
06/2022	286.790
09/2022	285.180

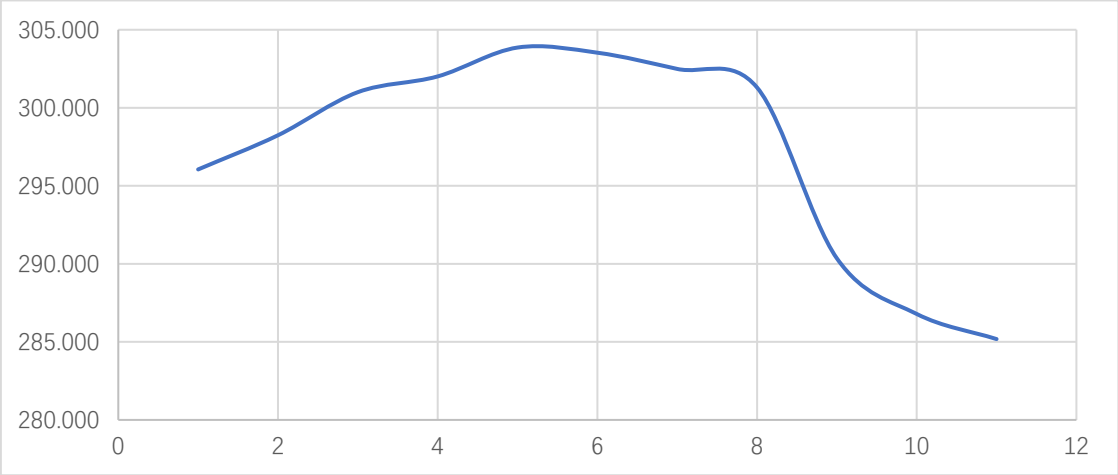

Fig. 1 Graph of national real estate climate index

Table 2. Empirical statistical data

Data Sources	National Bureau of Statistics
Mean	297.3454545
Variance	46.87370727
Standard Deviation	6.846437561
Skewness	-0.936513946
Kurtosis	-0.697458064
Variable Coefficient	0.023025197
Max	285.18
Min	303.86
Median	301
Period of Reference	11

Non-performing loans are chosen as a risk indicator for banks. Non-performing loan ratio (NPL) is an essential index of bank operation stability [5]. In addition to being an indicator of bank stability, another factor in selecting non-performing loans is considering the relationship between real estate and banks. Real estate is an asset-heavy industry. In China, real estate generally maintains a high

leverage ratio, meaning that banks hold many loans related to real estate. Non-performing loans can better reflect the role of real estate risk.

Table 3 shows the data and corresponding statistical results of NPLs. The data was collected from China Banking Regulatory Commission [10].

Table 3. Nonperforming loans of banks

Date	Billion RMB
03/2020	2612.089
06/2020	2736.382
09/2020	2835.041
12/2020	2701.477
03/2021	2788.250
06/2021	2790.755
09/2021	2833.494
12/2021	2847.023
03/2022	2912.334
06/2022	2953.911
09/2022	2991.243

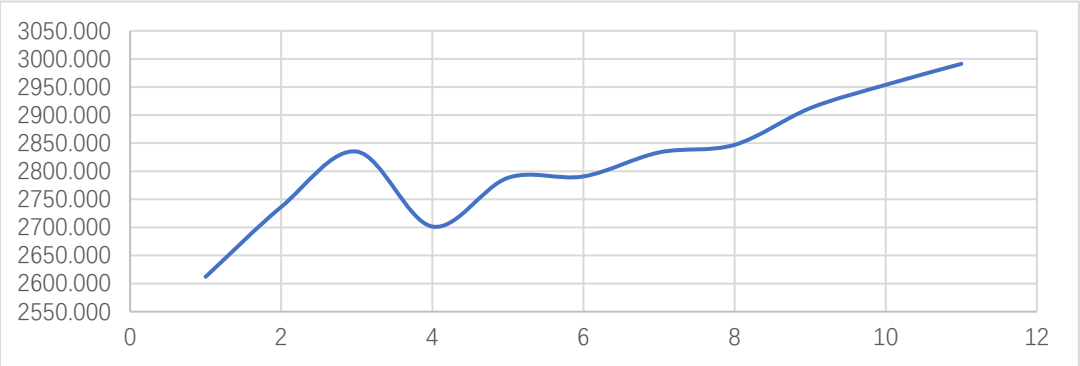

Fig. 2 Graph of nonperforming loans of banks

Table 4. Empirical statistical data

Data Sources	China Banking Regulatory Commission (CBRC)
Mean	2818.363705
Variance	12302.10004
Standard Deviation	110.9148324
Skewness	-0.219842539
Kurtosis	-0.104545405
Variable Coefficient	0.039354336
Max	2612.089094
Min	2991.243475
Median	2833.494314
Period of Reference	11

3. Results

Correlation analysis is used to study the relationship between the national real estate climate index and bank non-performing loans. The formula (1) illustrate below:

$$Correl(X,Y) = \frac{\Sigma(x-\bar{x})(y-\bar{y})}{\sqrt{\Sigma(x-\bar{x})^2\Sigma(y-\bar{y})^2}} \quad (1)$$

The result Correl= -0.61333, which indicate a moderate negative correlation.

4. Discussion

According to the results, from January 2020 to September 2022. There is a negative correlation between the national real estate climate index and bank non-performing loans. The downward trend of the national real estate climate index will lead to the upward trend of the non-performing loan ratio of the bank.

During the past housing boom, bank debt on real estate enterprises is one of the most direct causes. In the past few decades, China's continuous real estate boom has led to a large amount of capital flowing into the real estate industry in China. Large banks' heavy lending to property developers has led to a large concentration of loans on banks' balance sheets in the sector. In addition, competition from regional banks has further concentrated overall bank debt in the real estate sector [6]. Banks also set up investment subsidiaries through trust and other instruments to continue to invest in the real estate industry. These direct and indirect debts and investments link the banking and property sectors closely.

The moderate negative correlation indicates that the risks of the real estate industry have threatened the stability of the bank to some extent. The consequences of this threat could be severe. Although, according to some past studies, credit risk does exist in China's banking system, it will not break out systematically in the short term [7]. However, that theory could be challenged. According to the trend in Table 2, China's real estate boom index shows a rapid decline, which means the rapid growth of bank credit risk. The housing crisis could be worse than expected. Homebuyers continuing to buy houses is crucial in promoting real estate enterprises' development. There is speculation among Chinese homebuyers that prices will always rise [8]. However, the expectation that housing prices will continue to rise from 2020 has been shattered. In August 2020, the Chinese government issued three red lines on financing for property developers, which increased the difficulty of financing for property developers. That has led Chinese homebuyers to wonder if the government is reversing its historically supportive attitude toward real estate. In September 2021, the Evergrande Thunder began to arouse Chinese consumers' concerns about real estate companies. These two events have somewhat altered consumers' expectations of sustained house price growth. Instead of rushing to buy homes as in the past, many consumers will stay on the sidelines. This phenomenon could lead to a decline in social finance and a bank debt crisis. As seen from the Fig.3 [11], the total amount of newly added social finance in China shows a gradual decline.

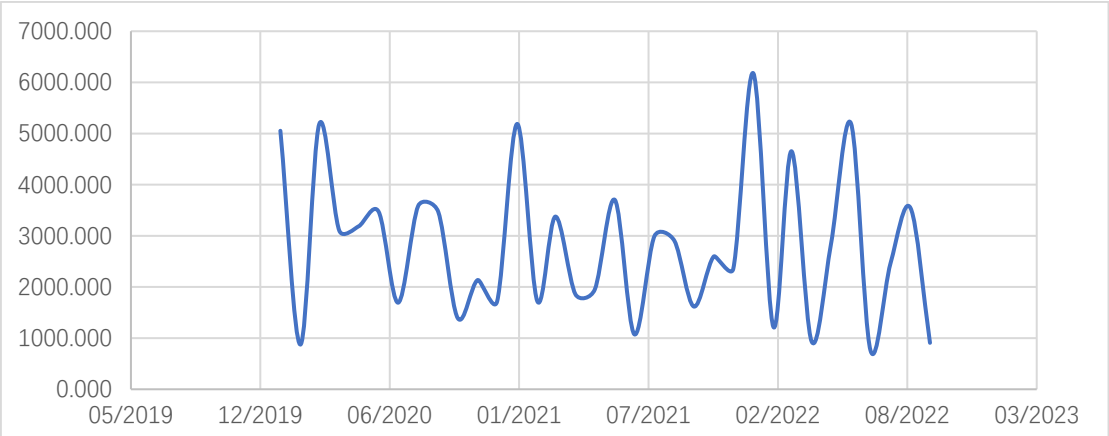

Fig. 3 Total social finance: increase

In addition, repeated outbreaks of COVID-19 in China and large-scale lockdowns across the country have somewhat worsened residents' incomes. The COVID-19 pandemic severely impacted China's economy and caused massive unemployment [12]. The unstable income and job expectations

for Chinese households make them more cautious about spending and borrowing. This has effectively reduced the willingness and ability of Chinese residents to buy homes, further draining the already flagging property market of momentum. The synergy of these causes will further hit the real estate sector. The instability will eventually feed through to the banking sector and amplify the crisis facing the banking sector, which could lead to a total banking collapse.

China's policymakers are facing challenges. On the property front, China's policymakers need to try to reverse the perception of a property slump while ensuring that the property market does not overheat again and cause a bubble to burst. From the aspect of banks, the Chinese government should not only maintain the transfusion of the banking sector to the real estate industry but also ensure that the banks and the real estate industry will not be too deeply involved.

5. Conclusion

In conclusion, this paper analyzes the internal relationship between the real estate industry of the banking industry by selecting two indicators, namely China's real estate climate index, and bank non-performing loans. According to the result data of correlation analysis. There is a moderate negative correlation between the real estate climate index and the non-performing loans of banks in China. Excessive bank lending to the sector during China's property boom in the past few decades was one reason for the tight correlation. A prolonged downturn in the real estate sector could lead to a credit crisis in the banking system. The reason is that people's expectation that housing prices will rise is broken, and the novel coronavirus pneumonia has seriously impacted China's economy. The complex situation poses a challenge for Chinese policymaking. China should safeguard the property market to stabilize financial risks and ensure that the property market does not overheat and cause the bubble to burst simultaneously.

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