

Xi'an Real Estate Financial Risk Early Warning System Construction

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Abstract: In order to effectively measure and identify the real estate financial risks and better complete the real estate financial management work, this paper takes Xi'an as an example to construct a quantitative analysis method, and constructs an index analysis model for the real estate market operation in Xi'an from January 2000 to June 2024. Through empirical analysis, this paper studies the real estate financial risks in Xi'an, which has reference value for reducing the real estate financial risks in Xi'an, and predicts the real estate financial risks in Xi'an.

Keywords: Real estate, Financial risk, Warning system.

1. Introduction

The '14th Five-Year Plan' issued in March 2021 clearly stated that 'implement a financial security strategy, maintain the bottom line of no systemic risk', 'establish a linkage mechanism between housing and land, and strengthen real estate financial regulation'. Real estate financial risk refers to the systemic financial risk caused by the economic loss of commercial banks due to the influence of uncertain factors in the financial services activities of commercial banks providing financing, financing and liquidation for the real estate industry. For example, the Japanese bubble economy in the 1980s, the Southeast Asian financial crisis in the 1990s, and the US subprime mortgage crisis in 2007 are all closely related to the volatility of the real estate financial market.

According to national statistics, from 2008 to 2020, the annual average price of commercial housing in Xi'an increased by more than 5.5 % year-on-year. At the same time, the degree of financialization of real estate in Xi'an is deepening and the trend of bubble is gradually increasing. Under the impact of the new coronavirus infection epidemic, the average price of commercial housing in Xi'an decreased by 5.7 % year-on-year in 2022. The real estate economy in Xi'an shrank, the supply of residential mortgages was cut off, and the bad debts of commercial banks continued to rise. Structural contradictions such as overheating in the real estate market in Xi'an have become increasingly prominent. Therefore, this paper comprehensively considers the background of Xi'an real estate development, puts Xi'an local government debt risk, credit expansion and Xi'an real estate financial risk into the same research framework, and analyzes the evolution characteristics and prevention strategies of Xi'an real estate financial risk, in order to provide a new perspective and new path for Xi'an government to prevent systemic financial risks, and also has important practical significance for implementing China's financial security strategy.

Foreign literature on real estate finance research currently has a relatively complete system. For example, Tim Rogmans (2019) pointed out that the ARCH model and VAR model were introduced into the real estate financial risk assessment when the early warning mechanism model was established internationally. Brunnermeier et al. (2020) empirically

analyzed the real estate financial risks in 15 OECD countries and established an early warning system. Lausberg et al. (2021) conducted a heuristic measure of real estate financial risks and established a Hirschman index evaluation. Galke et al. (2021) pointed out that the government can effectively regulate the real estate market through fiscal and monetary policies. Bhutta et al. (2022) believed that the policy of adjusting mortgage interest rate should be adopted to prevent and control real estate financial risks [1].

Domestic related research started late. Pei Jihang (2019) uses factor analysis to measure real estate financial risks. Wang Lingling (2019) took Liuzhou as a case to establish an early warning system for financial risks in the real estate market to judge the financial risks of real estate. Jiang (2019) analyzed China's real estate regulation policies and effects from 1998 to 2018. Li Jing (2020) comprehensively applied the weighting model to the provincial housing [2].

2. Index Selection

2.1. Analysis of Influencing Factors

The main participants involved in real estate financial activities are local governments, financial institutions and real estate development enterprises. Fully considering the theoretical analysis and index selection of the participants, the real estate financial risk research in Xi'an will be more accurate and comprehensive.

First, the local government level. Under the trend of macroeconomic downturn, the tax revenue of local governments has decreased. In order to increase fiscal revenue, local governments can obtain funds by transferring land. In order to obtain more fiscal revenue to promote urban development, local governments will raise the price of land transfer, and the increase of land price will drive the increase of housing price, thus increasing the risk. In addition, the current land transfer fees in many areas account for a very large proportion of local fiscal revenue. If excessive dependence on land income leads to a relatively single source of income, the level of risk response will also decrease. The policies issued by the government will also greatly affect the market situation. Through policy adjustment, the supply and demand situation of the real estate market and the problem of high housing prices can be improved. If the government's

policies are too lagging behind, it will also lead to the risk can not be reduced in time.

Secondly, financial institutions. Buyers and real estate development enterprises obtain funds through bank lending. The whole process of real estate from development to sale basically requires the participation of financial institutions. The degree of association between financial institutions and the real estate industry is very deep. However, the anti-risk ability of China 's banks is still insufficient. Once a large proportion of bank funds enters the real estate credit field, when house prices fall, the risks of housing enterprises and buyers will inevitably change into the risks of banks, resulting in a large amount of bank funds. Unable to recover, the risk level increases.

Finally, the real estate development enterprise level. Real estate development enterprises directly affect the supply of the real estate market. When the supply far exceeds the actual demand, the vacancy rate of housing gradually increases, resulting in a decline in housing prices, which further makes it difficult to recover the capital flow of real estate enterprises, making a large number of real estate enterprises bankrupt, and then triggering a financial crisis. From the perspective of the

source of funds for real estate enterprises, real estate enterprises in developed countries can finance through bank loans, equity financing, real estate trust investment funds and other ways. However, China's financial market is still immature, and the financing channels are relatively single. Some real estate enterprises will even achieve asset expansion through various ways of 'adding leverage'. In addition, the asset-liability ratio of the housing enterprise itself is high, and the funds obtained through the later sale of the house are repaid to repay the funds borrowed from financial institutions such as banks. Once the housing enterprise goes bankrupt or the capital chain breaks due to unfinished buildings, virtual property mortgages, etc., it will bring huge.

2.2. Index Selection

With reference to the classic real estate financial risk cases, in the study of real estate financial risk, the government, real estate enterprises, financial institutions and other interrelated and common subject selection indicators can be more comprehensive and accurate to measure the risk. The selection of specific indicators is shown in table 1.

Table 1. Synthesizes the observation variables selected in the Xi 'an real estate financial pressure index

First indexes	Second index	Indicator meaning
Government Level	real estate development	Real estate development investment / GDP
	Real Estate Contribution	The contribution rate of real estate industry to GDP
	real estate financial condition	(Real estate output value + financial industry output value) / GDP
Financial institution level	Proportion of loan balance	Commercial real estate loan balance / loan balance of financial institutions
	Loan balance growth	Commercial real estate loan balance year-on-year growth rate
	non-performing loan	Non-performing loan ratio of commercial banks
Real estate	real estate development loan	Growth rate of real estate development loans
	real estate fund	Total domestic loan / real estate development funds
	residential lending	Growth rate of per capita housing loans

The first is the government level indicators. The ratio of real estate development investment to GDP can reflect the local government's dependence on the real estate industry. The high ratio indicates that the local government's income is more dependent on the real estate industry, and the risk is higher. The contribution rate of the real estate industry to GDP, this ratio can determine whether the development of real estate is compatible with the development of China's economic level. If the ratio is larger, the risk is greater. The high local fiscal deficit rate means that government expenditure exceeds income and needs to fill the fiscal gap by borrowing. In order to support infrastructure and social welfare expenditures, the government may rely too much on the development of the real estate market to increase fiscal revenue, while over-reliance on the real estate industry will bring higher financial risks. (Real estate output value + financial industry output value) / GDP can indirectly reflect the government's land supply and land costs. The greater the value, the higher the degree of risk. Real estate development investment completion / GDP reflects the hot and cold degree of real estate development in different stages of economic development. The higher the index, the higher the risk of real estate finance.

Then there are indicators at the level of financial institutions. The index of real estate loan balance / loan balance of financial institutions reflects the expenditure intensity of financial institutions on the real estate industry. If the value is too large, it indicates that the financial institutions

have too much expenditure on the real estate industry, and the fate of the two is closely related, and the possibility of being implicated in the event of risk is greater. The year-on-year growth rate of commercial real estate loan balance reflects whether real estate investment is reasonable. If the ratio is too large, beyond a reasonable range, it will increase the risk of real estate finance. The non-performing loan ratio of commercial banks reflects the risk status of the bank itself [3].

Followed by the real estate enterprise level indicators. Domestic loans / real estate development and utilization of the sum of the funds, the higher the index, indicating that the more single financing channels for housing enterprises, there is no diversified and stable source of funds, easy to encounter the risk of loan default. Similarly, from the index of the sum of funds for domestic loans / real estate development and utilization, the high proportion of domestic loans also indicates that its debt level is high and the risk is likely to occur. The total amount of domestic loan / real estate development funds and the year-on-year growth rate of per capita housing loans reflect the expected state of the housing enterprises for the future market. The former reflects the expectation of the future land market, and the latter reflects the expectation of the real estate market. The higher the ratio, the better the expectation. The growth rate of real estate development investment reflects the market heat. The more investment in real estate development, the more supply in the market. If the demand does not match it, the market will overheat and speculation will occur.

3. Empirical Analysis

Based on the basic filtering steps of the state space model with Markov regime switching, this paper establishes a prediction model to realize the prediction of Xi'an real estate financial condition index (FCI). The measurement equation and state equation are:

$$y_t = H_{s_t} \beta_t + A_{s_t} z_t + e_t \quad (1)$$

$$\beta_t = \tilde{\mu}_{s_t} + F_{s_t} \beta_{t-1} + G_{s_t} v_t \quad (2)$$

$$\begin{pmatrix} \beta_0 \\ e_t \\ v_t \end{pmatrix} \sim N \left(\begin{pmatrix} \tilde{\beta}_0 \\ 0 \\ 0 \end{pmatrix}, \begin{pmatrix} \tilde{P}_{s_t} & 0 & 0 \\ 0 & R_{s_t} & 0 \\ 0 & 0 & Q_{s_t}^* \end{pmatrix} \right) \quad (3)$$

According to this algorithm, on the basis of the previous analysis, the dynamic prediction and cumulative prediction of FCI in 36 periods are further carried out, and the calculation is completed by Oxpro programming. The prediction results are shown in Figure 2.

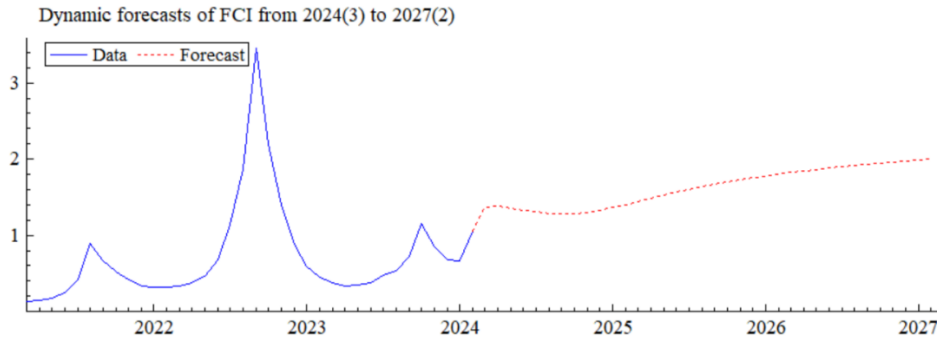


Figure 1. FCI 36-period dynamic prediction

Figure 2 shows the 36-period dynamic prediction of the FCI variable. In the next one year, China's financial situation shows a trend of improvement, which is manifested by the increase of the FCI value, but the FCI value will gradually

increase in the next two years. In general, the Xi'an real estate financial index (FCI) is in a relatively stable state in the next three years, and the possibility of financial crisis is not large.

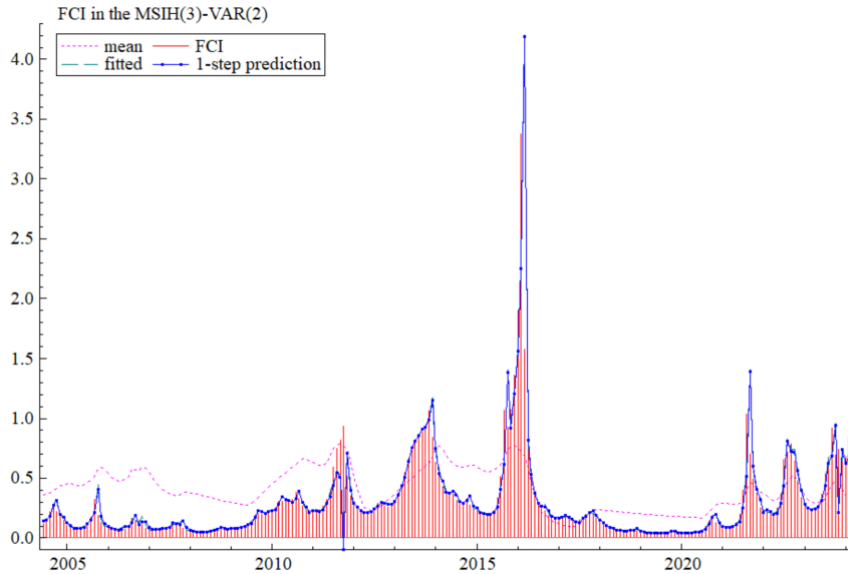


Figure 2. The Effectiveness of Model Prediction

4. Conclusion

Based on the perspective of time-varying parameters and structural enhancement factors, this paper improves the traditional FCI index construction method, selects the real estate financial risk data from January 2000 to June 2024 to construct the Xi'an real estate financial pressure index system from three dimensions of financial subsystems, and uses the time-varying parameter factor enhanced vector autoregressive model to synthesize the Xi'an real estate financial condition index (FCI). Finally, the risk warning effect of FCI is evaluated and the FCI level in the next three years is predicted.

Based on the indicators selected from the three dimensions of Xi'an government, financial institutions and real estate

management, this paper constructs the index system of Xi'an real estate financial situation, which can comprehensively reflect the basic information of Xi'an real estate financial situation. The potential factors extracted by TVP-FAVAR model can match the changing trend and fluctuation of the fundamental variables of Xi'an real estate financial situation. The conclusion of the TVP-FAVAR model is reliable. The selected index system and the estimation results obtained by the model are reasonable and effective. The TVP-FAVAR model is used to extract the potential factors, and the Xi'an real estate financial condition index (FCI) with time-varying parameters is constructed. It can comprehensively reflect the development of real estate finance in Xi'an and can be used as an important early warning indicator for analyzing the systemic financial risk of real estate in Xi'an.

Through the Markov regime switching basic filter to construct the prediction model, it can be judged that in the next three years, Xi'an real estate is still in a low risk state and the financial situation is relatively stable. It can be concluded that although the potential systemic financial risk in Xi'an has increased, for a long time, the real estate financial situation in Xi'an is relatively stable, and it is still in the accumulation stage of systemic financial risk, which is not enough to trigger the financial crisis. Combined with the actual situation of China's economic and financial development, it can be seen that in recent years, China has actively carried out economic counter-cyclical adjustment, advocated a two-pillar regulatory mechanism, and raised the degree of attention to the stable development of Xi'an real estate finance.

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