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Empirical Analysis of the Transmission of Housing Investment Price Fluctuation to the System Financial Risk in China based on SVAR Model

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Abstract

This paper selects the monthly data of first-tier cities from 2015 to 2020 to construct a house price volatility index reflecting the attributes of housing investment, and builds a systematic analysis and evaluation index system based on five financial risk dimensions of commercial banks, securities markets, currency markets, foreign exchange markets, and government departments. Using structural vector autoregressive model, we make an empirical analysis of the transmission effect of the housing investment price fluctuations on systemic financial risks in China. The study found that the decline in housing investment prices in first-tier cities since 2015 has released some systemic financial risks. Although the rebound in housing investment prices has promoted the slow accumulation of systemic financial risks, they are still in a stable state. This shows that the relevant real estate control policies have played a positive role in preventing systemic financial risks.

Keywords

Housing Investment Price; Systemic Financial Risk; Structural Vector Autoregressive Model.

1. Introduction

The 19th National Congress of the Communist Party of China proposed to actively prevent and effectively resolve major risks, and put forward a clear positioning of "houses are for living, not for speculation". Guide real estate to return to the origin of residential properties, resolutely curb the risk of bubble formation caused by excessive real estate investment, and promote the healthy development of the real economy. Since the 21st century, with the continuous expansion of the economic and financial industry in China, the proportion of non-performing credit in the banking system has continued to rise, and housing investment prices in some cities have been at abnormally high levels for a long time. Excessive investment and financing activities in the capital-intensive real estate industry have increased the degree of real estate bubbles and brought a huge impact to the stability of the financial market. Therefore, the impact of excessively rapid housing investment prices on systemic financial risks has also become a hot topic in this era. The central government and administrative departments at all levels have successively introduced relevant policies to strengthen the supervision of financial risks in the real estate industry and the financial industry. This is of great significance for effectively preventing systemic risks and promoting the healthy and stable development of the real estate industry.

Many scholars believe that although the rapid increase in housing investment prices has driven the rapid growth of real estate and related industries in the short term, it has also brought many

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negative effects on the financial market. Pan H, Wang C. (2013) analyzed the quarterly data of 268 cities in the United States including New York and Washington from 1990 to 2010 and found that the rapid rise in housing prices would have a greater impact on the financial market by affecting bank stability [1]. Liu Xiaoxin and Lei Lin (2017) deeply studied the influence mechanism of financial leverage and real estate market prices on the stability of the financial system, and found that the relationship between real estate prices and financial leverage is continuously circular and mutually reinforcing. When financial leverage increases, the supply of real estate increases, which eventually leads to rising housing prices. The rise in housing prices will in turn increase the number of bank loans and increase financial leverage, so that the mutual rise of the two will easily lead to financial risks [2]. Cai Zhen (2018) found a close connection between my country's real estate industry and financial risks based on the three dimensions of the banking system, local government debt and capital flight pressure [3]. Yang Zihui (2018) uses four types of risk measurement methods: VaR, MES, CoVaR, and ΔCoVaR to study the systemic financial risk relationship between listed financial institutions and real estate companies in my country and found that all four risk measurement indicators can accurately identify the tail of the risk concentration of my country's financial sector Event, and the financial system as a whole has a relatively obvious cross-sectoral risk contagion effect [4]. Zhang Hui (2019) found that shadow banking can alleviate credit constraints and reduce financial risks in the short term, but this effect will weaken over time, which will have a negative impact on the financial market. In addition, the mutually reinforcing relationship between shadow banking and real estate prices will further cause financial system risks [5].

It is not difficult to see in the existing reference literature that domestic and foreign scholars have achieved certain results in the transmission mechanism of real estate to systemic financial risk, risk measurement and credit system, etc., so that this article has a wealth of research results for reference. However, the research still has certain limitations: When studying the impact of real estate price fluctuations on systemic financial risks, most scholars at home and abroad generally choose the average sales price of commercial housing as an indicator to measure housing price fluctuations, and lack the structural decomposition of different properties of real estate. The strategic positioning of "housing to live without speculation" indicates that residential attributes are the fundamental attributes of real estate. The government should guide real estate to return to the source of housing, curb real estate investment attributes, and emphasize that real estate investment bubbles are the source of systemic risks. Therefore, this article refers to the research of Ma Li and Fan Wei (2021) on the classification of real estate price attributes, and divides real estate prices into basic prices determined by residential attributes and investment prices determined by investment attributes. When measuring the real estate market price, the basic price factor is not considered, and only the transmission effect of the housing investment price on the system financial risk is studied [6]. Due to the complex formation mechanism of systemic financial risks, a variety of factors cross-influence each other, and the traditional VAR model is difficult to effectively identify and capture the immediate structural relationship between multiple variables.

From the perspective of five dimensions, this paper uses the structural vector autoregressive model (SVAR) not only to reflect the transmission mechanism of housing investment price to system financial risk, but also to reflect the mutual influence between housing investment price and the five system financial risk dimensions. The model can comprehensively examine the transmission mechanism of housing investment shocks to systemic financial risks in multiple dimensions. The research results have important reference significance for maintaining the stability of my country's housing investment price, preventing and dissolving systemic financial risks, and strengthening the micro and macro prudential supervision of the real estate market and financial market.

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2. Theoretical Analysis on the Transmission of the Risk of Housing Investment Price Fluctuation

Based on the existing literature, from the perspective of supervision, combing and analyzing the system's financial risk transmission mechanism, the article roughly divides the financial risk evaluation system into five dimensions. They are commercial banks, securities markets, money markets, foreign exchange markets, and government departments. Financial risks gather together through these five dimensions to form systemic financial risks.

2.1. Commercial Bank Channel

My country's financial market is dominated by the banking industry, and financial stability is closely related to the credit status of commercial banks. A large amount of credit funds of commercial banks are concentrated in the real estate industry, and the expansion of commercial bank credit risks caused by housing price fluctuations is often one of the important reasons for financial risks. Participants in the real estate market are subject to credit constraints and their demand for capital will change with fluctuations in housing investment prices. When the housing investment price rises, the real estate collateral appreciates, and the higher the credit rating of real estate holders, the easier it is for them to obtain bank credit funding support. If housing investment prices continue to rise and the fixed assets of real estate holders continue to increase, credit rating agencies will continue to upgrade the credit ratings of real estate holders in view of this. Commercial banks and other financial institutions will increase the investment of credit funds in the face of good credit ratings, resulting in a large amount of credit funds flowing into the real estate market. Since the price of housing investment cannot continue to rise, when real estate investors expect that the price of housing investment reaches its peak and cannot rise again in the short term, they will sell the real estate they hold. This will cause the supply of real estate to increase sharply and the value of real estate to fall. Eventually, a vicious circle of continued decline in housing prices is formed. Since the price of housing investment cannot continue to rise, when real estate investors expect that the price of housing investment reaches its peak and cannot rise again in the short term, they will sell the real estate they hold. This will cause the supply of real estate to increase sharply and the value of real estate to fall. Ultimately, housing prices will form a vicious circle of continuous decline. On the contrary, when the price of housing investment drops, the price of real estate collateral shrinks. At this time, the credit rating of real estate owners declines, and their ability to obtain credit loans decreases. The decrease in real estate supply and demand will lead to further declines in housing investment prices. When the housing investment price shows a significant downward trend, investors in the real estate market will choose to give up mortgaged real estate and default by facing moral hazard. The non-performing loan rate of commercial banks has increased sharply, which in turn spreads the risk in a large area of financial markets such as banks, and finally triggers large-scale systemic financial risks.

2.2. Securities Market Channel

The increase in housing investment prices has caused excessive expansion of credit in the financial market, which will cause a large amount of funds to enter the securities market, forming high leverage and asset bubbles in markets such as stocks, bonds, and futures. Although high leverage can increase the utilization of funds, the resonance effect generated by its high volatility will cause the financial vulnerability of the securities industry to become prominent through the risk contagion mechanism, and increase the instability of the securities market (Fang Dingchuang et al., 2020) [8]. When the real estate market receives adverse external shocks or policy controls, the rapid deleveraging policy of the securities market can easily cause the market value of securities products to fall, which will inevitably lead to major losses in the securities market. In addition, the impact of housing investment prices will cause the banking

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system's funds to flow into the securities market to fail to flow back to the banks as scheduled. A large amount of capital outflow devalues the currency, which has a negative impact on the stable development of the currency market, and accelerates the economic recession. Of course, it will also affect the stability of the financial market and cause systemic financial risks.

2.3. Money Market Channel

The mechanism by which housing investment price fluctuations affect the money supply is closely related to the credit supply of commercial banks. The rapid development of the macro economy has driven the real estate industry to thrive, and profit-seeking investors have driven the rapid growth of commercial bank credit through direct or indirect financing. As a result, derived money and social leverage have been increased, and the social money supply has been increased (Chen Kuihong et al., 2019) [9]. Both short-term and long-term housing investment price fluctuations have a positive impact on the money supply. The rise in housing prices can enhance the endogenity of the money supply, thereby reducing the controllability of the intermediary target of the amount of money (Duan Zhongdong et al., 2008) [10]. When the money market lacks effective risk management measures, the exogenous impact of housing prices will lead to an imbalance in the equilibrium relationship between money supply and demand. When the liquidity of the market is affected, systemic risks will spread rapidly in the currency market, and will spread rapidly to affect markets such as banks, securities and foreign exchange, and ultimately cause the entire financial market to fluctuate.

2.4. Foreign Exchange Market Channels

There are various risks in the foreign exchange market, among which exchange rate risk, foreign exchange reserve risk and import and export risk are the main risks. There is a two-way relationship between foreign exchange market risk and housing investment price fluctuations. When the exchange rate of the foreign exchange market declines or the foreign exchange reserves decrease, the prices of some domestic commodities will fall, and the consumption capacity of residents will expand accordingly, and the demand for real estate consumption will also increase, which will promote the increase of housing investment prices. A study by Pan Aimin (2014) found that rising housing prices stimulated the increase in foreign exchange reserves by absorbing hot money inflows. The increase in foreign exchange reserves will change the release of my country's base currency through foreign exchange reserves, which will cause the money supply to increase exponentially, and put the RMB facing depreciation pressure on my country's currency market, which is likely to cause systemic risks in the foreign exchange market [11]. Chen Chuanglian (2015) found that the financial markets of most developing countries are not perfect, and economic growth is highly dependent on foreign investment. When there are greater risks in the domestic foreign exchange market, international investors will choose to enter or withdraw from the country to avoid risks, which will cause huge pressure on the domestic currency, commodities and economic development. When the policies and measures adopted by the government cannot effectively alleviate risks such as foreign exchange market exchange rates and foreign exchange reserves, foreign exchange market risks will form systemic financial risks, leading to the occurrence of financial crises [12].

2.5. Government Channel

The rapid development of my country's financial industry mainly depends on investment expansion. The increase in government revenue has led the government to increase investment in various assets such as real estate, which will lead to a further increase in the leverage ratio of my country's government departments and make my country face a greater risk of government debt. High leverage will not only increase the maintenance cost of financial stability operation, but also increase this risk effect through the squeezing effect on the physical

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sector and the distortion effect of capital allocation, which will cause a negative impact on financial stability (Xia Yue, 2018) [13].

3. Variable Selection and Model Construction

3.1. Variable Selection and Data Sources

3.1.1. Housing Investment Price

The essential function of real estate is residence, and residence attributes are reflected in the basic price of real estate. However, in addition to residential properties, real estate also has strong investment properties. In the research process, it is necessary to decompose real estate prices in order to clearly define what "living" or "speculation" is. For the measurement of real estate prices, this article refers to the research on real estate price attributes by Ma Li and Fan Wei (2021), and divides real estate prices into basic prices determined by residential attributes and investment prices determined by investment attributes [6]. When measuring the real estate market price, we remove the basic price factor and only study the impact of housing investment prices on systemic financial risks. House rent usually reflects the price that families are willing to pay for purchasing the residential function of real estate. Therefore, this paper chooses the arithmetic mean of the housing price to rent ratio of the four first-tier cities in Beijing, Shanghai, Guangzhou and Shenzhen as the basic housing price of real estate; chooses the difference between the standard value of 100 and the housing price as the real estate investment price, which is the housing investment price measured in this paper. Taking into account the completeness of the data required for the research and the convenience of obtaining it, the data selected in this article are monthly time series data from January 2015 to December 2020, and the data are all from the Tonghuashun website.

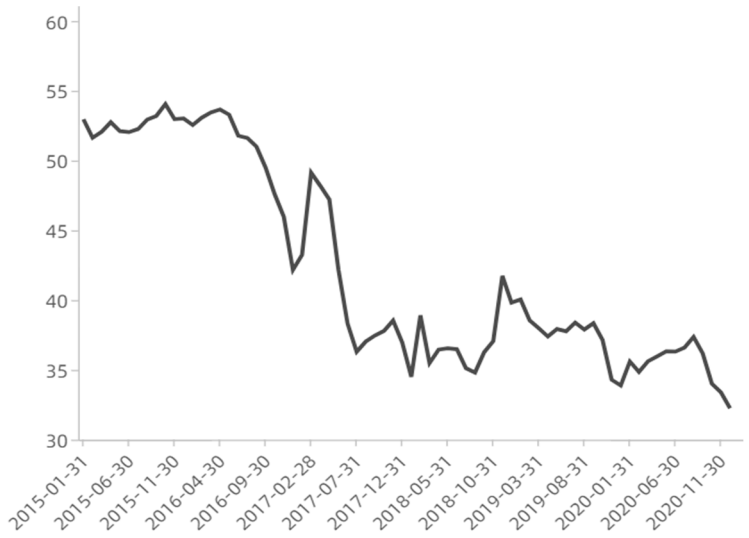

Fig 1. The housing investment prices from 2015 to 2020 in China

It can be seen from Figure 1 that from 2015 to 2020, my country's housing investment prices fluctuated significantly, and the degree of bubbles generally showed a downward trend. In 2015, my country's housing investment prices only fluctuated slightly. Since 2016, housing investment prices have fallen, showing sharp fluctuations. After 2017, housing investment prices experienced a short-term increase followed by a rapid decline. The degree of bubble formation reached a high point in February, and then housing investment prices fell to a low point again in December. In the following years, although the overall housing investment price fluctuates little, it fluctuates frequently.

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3.1.2. Systemic Financial Risk

For the selection and measurement of basic indicators of systematic financial risks, my country has not formed a unified standard. This article selects dimensions from a regulatory perspective, and divides the basic indicators for measuring system financial risks into the following five secondary indicators: first, commercial bank risk (CBR), which is mainly manifested in capital adequacy ratio, financial institution loan-to-deposit ratio, and bank non-performing loan ratio ; the second is the securities market (SM), which is represented by the total market price of stocks/GDP, bond turnover/GDP, and the futures market turnover/GDP; the third is the money market (MOM), which is reflected in the year-on-year growth rate of M2; the fourth is the foreign exchange market (FEM), which is mainly manifested in the year-on-year growth rate of foreign exchange reserves and the year-on-year growth rate of total import and export; fifth is the government sector (GOS), which is reflected in the growth rate of government sector leverage and fiscal deficit.

For the basic index of measuring the financial risk of the system, this paper adopts the principal component analysis method and uses the software SPSS 26.0 to transform it into a variable that comprehensively measures the secondary index of financial risk. The selected data is the monthly data from January 2015 to December 2020, which comes from the statistical database of China Economic Network, China Banking Regulatory Commission and Oriental Fortune website. Because some indicators only publish quarterly and annual data, this article uses Eviews11.0 to process all selected quarterly data into monthly data.

This article adopts the analysis of comprehensive indicators. There are positive indicators and reverse indicators among the selected indicators. Therefore, all inverse indicators are forwarded before fitting indicators, specifically: $x'=-x$.

Finally, this article defines the relevant variables as: HIP stands for housing investment price, SFR stands for system financial risk level, CBR stands for commercial bank risk level, SM stands for securities market, MOM stands for money market, FEM stands for foreign exchange market, GOS stands for Government sector.

Table 1. Systematic financial risk level evaluation index system

First-level indicators	Second-level indicators	Third-level indicators	Relationship with system financial risk level
Evaluation Dimensions of System Financial Risk Level(SFR)	Commercial bank risk (CBR)	Capital adequacy ratio	Reverse change
		Financial institution loan-to-deposit ratio	Positive change
		Bank non-performing loan ratio	Positive change
	Stock market (SM)	Total stock market value/GDP	Reverse change
		Bond turnover/GDP	Positive change
		Futures market turnover/GDP	Reverse change
	Monetary market (MOM)	M2 year-on-year growth rate	Positive change
	Foreign exchange market (FEM)	Year-on-year growth of foreign exchange reserves	Reverse change
		Year-on-year growth rate of total import and export	Reverse change
	Government sector (GOS)	Government sector leverage	Positive change
		Fiscal deficit growth rate	Positive change

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3.2. Model Building

The SVAR model is a way to structure the VAR model. It can capture the instant structural relationship between various variables in the model system. Although the traditional VAR model has been widely used in multivariate time series analysis, the structural correlation is transferred or hidden in the variance-covariance matrix of the random disturbance vector, which cannot clearly reflect the structural relationship between variables. Based on a certain economic theory, this paper introduces the structural relationship between housing investment price and system financial risk and its secondary evaluation index into the VAR model, and builds the SVAR model. The general form of the p-order VAR model is set as follows:

$$A_0 Y_t = c_0 + \sum_{i=1}^{p} A_i Y_{t-i} + \varepsilon_t \quad (1)$$

Among them, Y_t is a 7×1 vector of endogenous variables, Y_t = [CBR_t, SM_t, MOM_t, FEM_t, GOS_t, SFR_t, HIP_t]. A_0 represents a 7×7 synchronization matrix, A_i is a 7×7 autoregressive coefficient matrix, and ε_t is a 7×1 vector, assuming structural interference with zero covariance. The covariance matrix of structural disturbance takes the following form: $E[\varepsilon_t \varepsilon_t] = D = [\sigma_1^2 \delta_2^2 \delta_3^2 \delta_4^2 \delta_5^2 \delta_6^2 \delta_7^1] \times I$.

In order to obtain the simplified form of the structural model, multiply both sides of the equal sign of equation (1) by A_0^{-1} to obtain equation (2):

$$Y_t = a_0 + \sum_{i=1}^{p} B_i Y_{t-1} + u_t \quad (2)$$

Structural interference can be obtained by imposing appropriate restrictions on A_0. The relationship between short-term constraints, SVAR disturbance items and structural shock items applied in this model can be expressed by equation (3):

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ a_{21} & 1 & 0 & 0 & 0 & 0 & 0 \\ a_{31} & a_{31} & 1 & 0 & 0 & 0 & 0 \\ a_{41} & a_{42} & a_{43} & 1 & 0 & 0 & 0 \\ a_{51} & a_{52} & a_{53} & a_{54} & 1 & 0 & 0 \\ a_{61} & a_{62} & a_{63} & a_{64} & a_{65} & 1 & 0 \\ a_{71} & a_{72} & a_{73} & a_{74} & a_{75} & a_{76} & 1 \end{bmatrix} \begin{bmatrix} u_t^{CBR} \\ u_t^{SM} \\ u_t^{MOM} \\ u_t^{FEM} \\ u_t^{GOS} \\ u_t^{SFR} \\ u_t^{HIP} \end{bmatrix} = \begin{bmatrix} b_{11} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & b_{22} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & b_{33} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & b_{44} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & b_{55} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & b_{66} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & b_{77} \end{bmatrix} \begin{bmatrix} \varepsilon_t^{CBR} \\ \varepsilon_t^{SM} \\ \varepsilon_t^{MOM} \\ \varepsilon_t^{FEM} \\ \varepsilon_t^{GOS} \\ \varepsilon_t^{SFR} \\ \varepsilon_t^{HIP} \end{bmatrix} \quad (3)$$

4. Empirical Analysis

4.1. Unit Root Test

Most of the classification indicators used to measure system financial risks are non-stationary. In order to ensure the stability of the data of all variables in the model and avoid the seemingly good "pseudo-regression" phenomenon, it is necessary to first perform a unit root test on the time series of the above economic variables. Table 2 lists the ADF test results of each time series and its first-order difference series. ADF and PP unit root tests show that SM, FEM, GOS, and SFR are all I (0), and CBR, MOM, and HIP are all I (1).

The results of the ADF unit root test show that the securities market (SM), foreign exchange market (FEM), government sector (GOS), and systemic financial risk (SFR) are in a stable sequence at the 5% confidence level. Commercial bank risk (CBR), money market (MOM) and housing investment price (HIP) pass the ADF test after first-order difference. Therefore, the securities market, foreign exchange market, government departments, and system financial

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risks are in a stable sequence, and the commercial bank, money market, and housing investment price sequence is a first-order stable sequence.

Table 2. ADF test results of each variable sequence

variable	Inspection type(c,t,k)	ADF value	1% level	5% level	10% level	P value	result
CBR	(1,1,0)	-2.2913	-4.0925	-3.4743	-3.1644	0.4329	unstable
D(CBR)	(1,0,0)	-9.3356	-3.5270	-2.9035	-2.5892	0.0000	stable
SM	(0,0,0)	-2.3974	-2.5979	-1.9454	-1.6137	0.0170	stable
MOM	(0,0,0)	-0.3378	-2.5979	-1.9454	-1.6137	0.5447	unstable
D(MOM)	(0,0,0)	-9.3015	-2.5984	-1.9455	-1.6137	0.0000	stable
FEM	(0,0,0)	-2.6245	-2.5989	-1.9455	-1.6137	0.0093	stable
GOS	(0,0,0)	-2.8206	-2.5984	-1.9455	-1.6137	0.0054	stable
SFR	(0,0,0)	-2.4266	-2.5979	-1.9454	-1.6137	0.0157	stable
HIP	(0,0,0)	-1.5918	-2.5979	-1.9454	-1.6137	0.1044	unstable
D(HIP)	(0,0,0)	-7.6790	-2.5984	-1.9455	-1.6137	0.0000	stable

Remark: The test types c, t, k respectively represents the constant term, trend term and lag order. 0 means that the test model does not include a constant term, a time trend term, or the lag order is 0. D(CBR), D(MOM) and D(HIP) are the first-order difference sequences of CBR, MOM and HIP, respectively.

4.2. Lag Order Determination

Before constructing the SVAR model, we must determine the best lag order p. This paper selects the multi-criteria joint method and adopts the LR, FPE, AIC, SC, and HQ criteria to determine the lag order of the SVAR model as the first order. The results are shown in Table 3.

Table 3. Selection results of SVAR lag order p

Lag	LogL	LR	FPE	AIC	SC	HQ
1	-195.5267	NA	3.92e-06*	7.4099	9.0355*	8.0522*
2	-151.0989	70.0075*	4.69e-06	7.5484	10.7997	8.8331
3	-107.4757	59.4861	6.18e-06	7.7113	12.5883	9.6385
4	-51.3379	64.6434	6.33e-06	7.4950	13.9977	10.0645
5	8.9611	56.6446	7.01e-06	7.1526	15.2809	10.3645
6	93.6301	61.5774	5.16e-06	6.0718*	15.8257	9.92605

4.3. Cointegration Test

Because the original data CBR, MOM, and HIP are all non-stationary series, they are stable after first-order difference, and there may be a long-term stable proportional relationship between the series, that is, a co-integration relationship. In this paper, Johansen cointegration test method is used to conduct cointegration test on the above three variables. From the test results, at the 5% confidence level, there is a long-term stable equilibrium relationship between the cointegration equations composed of various variables, so the SVAR model can be constructed for the above variables.

4.4. Stationarity Test

Before the impulse response analysis and robustness test of the model, the stationarity test is an indispensable step. The test result is shown in Figure 2. All the characteristic roots in the model are located in the unit circle. Therefore, it is determined that the model is a stationary system, and subsequent impulse response and robustness tests can be performed.

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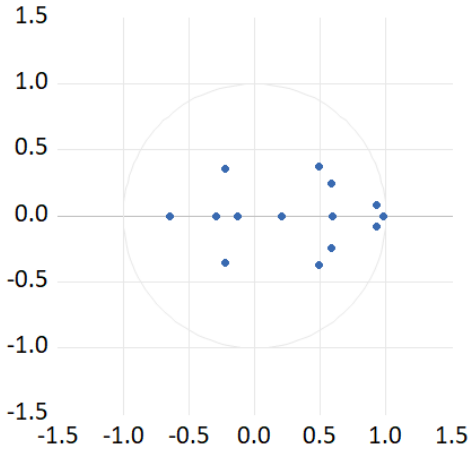

Fig 2. Stationarity test results

4.5. Impulse Response

The impulse response function reflects the dynamic impact of a unit standard deviation applied to the random disturbance term on other variables. This is a relatively short-term dynamic change between variables, which can vividly describe the dynamic relationship between variables. It can be seen from the above related tests that the SVAR model is stable and can be used for impulse response analysis. The following is a detailed analysis of the contents of Figure 3-9. The fluctuation of the housing investment price (HIP) is used as the shock variable. Take commercial banks (CBR), securities market (SM), money market (MOM), foreign exchange market (FEM), government sector (GOS) five indicator dimensions, housing investment price (HIP) and systemic financial risk (SFR) as their own Response variable, and carry out the impulse response analysis in turn. In order to reveal the dynamic changes of housing investment prices when they are impacted by their own, systemic financial risks and various secondary indicators.

It can be seen from the impulse response chart 3 that given the external shock of one standard deviation of the housing investment price (HIP), the risk of commercial banks (CBR) gradually rises with the number of shock periods, and finally remains stable at 0.0789. . This shows that the price of housing investment has a relatively large impact on commercial banks and has a lasting impact.

As shown in Figure 4, the securities market (SM) has increased risk in the initial stage of receiving housing investment price shocks, and the market risk peaked in the third period, after which the risk gradually decreased and tended to zero. There is a long-term positive correlation between housing investment prices and securities market risks. The housing investment price can have a significant impact on the security market risk, and it can play a positive role in the security market risk, that is, as the housing investment price rises, the security market risk will also increase.

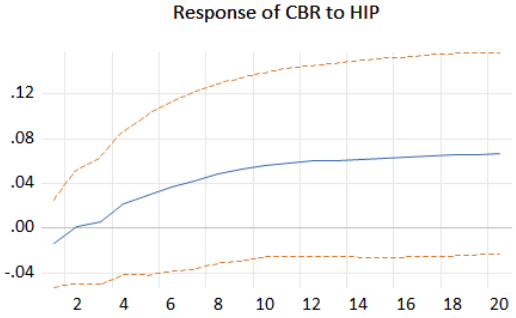

Fig 3. The impulse response of commercial banks to housing investment price fluctuations

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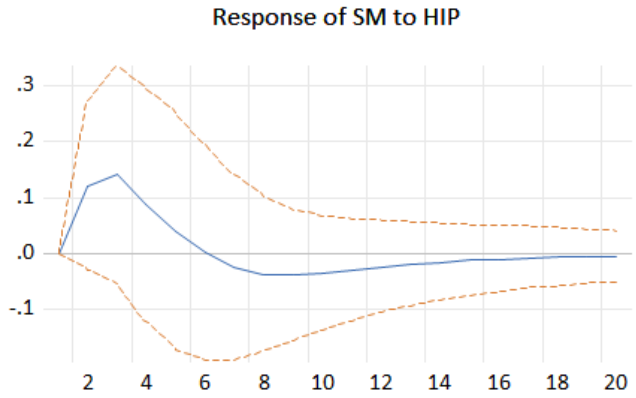

Fig 4. The impulse response of the stock market to fluctuations in housing investment prices

As shown in Figure 5, in the initial stage of the impact of the money market (MOM), the market risk declined slowly. In the 2nd-8th period, the risk is on the rise, and the positive effect has been maintained, and then the risk reduction tends to zero.

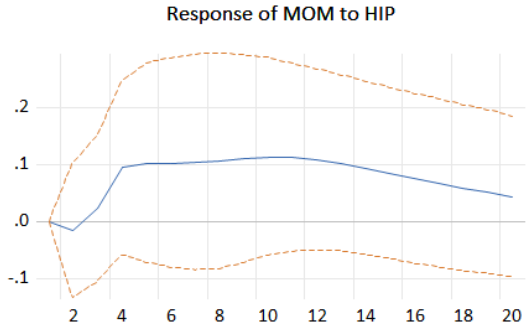

Fig 5. The impulse response of the money market to fluctuations in housing investment prices

As shown in Figure 6, the positive housing investment price shock caused the foreign exchange market (FEM) risk increment to rise slowly, and the risk decreased after the second period. The fourth period began to maintain the negative effect, and then gradually stabilized.

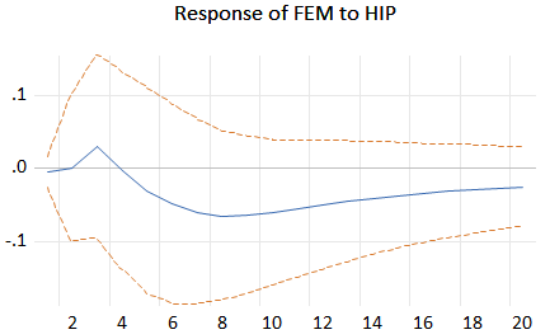

Fig 6. The impulse response of the foreign exchange market to housing investment price fluctuations

As shown in Figure 7, the government sector (GOS) risk increases after being affected by the positive impact of housing investment prices, and the impulse response mostly maintains a negative effect. The second period showed a short-term positive effect. Afterwards, although the government department risk fluctuated, the overall fluctuations were not large, and finally slowly returned to a stable state. The overall negative effect is greater than the positive effect.

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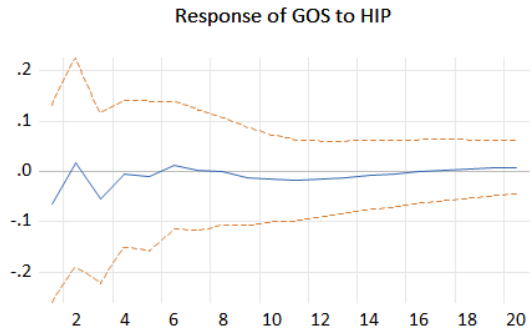

Fig 7. The impulse response of government sector leverage to housing investment price fluctuations

It can be seen from Figure 8 that the impulse response of the housing investment price (HIP) to itself reflects that the initial housing price shock effect has a continuous positive effect, forming a strong housing price increase expectation.

It can be seen from Figure 9 of the impulse response that after the systematic financial risk (SFR) is impacted by a positive impact of one standard deviation of the housing investment price, the first two periods show a negative effect, reducing the risk of the financial system. However, after the second period, the shock response has shown a sharp upward trend, and financial market risks are still slowly accumulating. Although the subsequent shock response increased gradually and gradually stabilized, the negative effect was always maintained, and the financial system was generally stable. This shows that in recent years, my country's housing price control policies have played a certain role in controlling systemic financial risks.

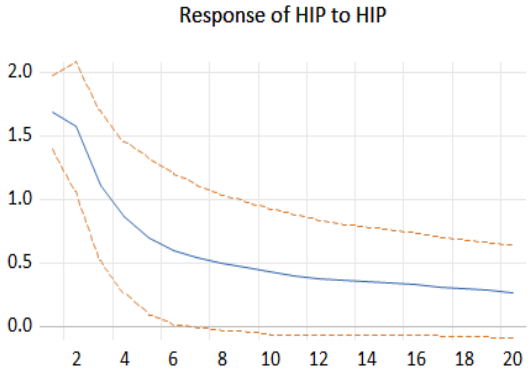

Fig 8. The impulse response of housing investment price fluctuation to itself

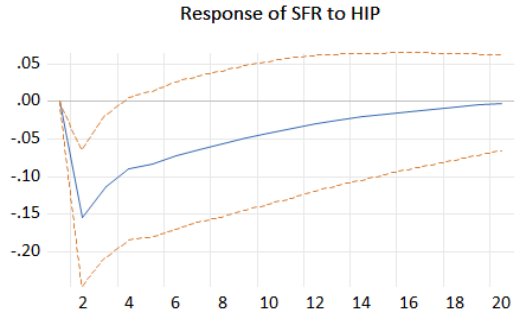

Fig 9. The impulse response of systemic financial risks to housing investment price fluctuations

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The reason for the above phenomenon lies in the in-depth business exchanges between the real estate market and commercial banks, securities markets, currency markets, foreign exchange markets and government departments. The risk of housing investment price fluctuations has a leverage effect on the financial market, which in turn amplifies systemic financial risks. The foregoing analysis has shown that rising housing investment prices have increased the value of real estate mortgages, real estate mortgage loans are safer in the short term, and the proportion of non-performing assets of commercial banks has declined, which will reduce the short-term risks of the financial system. Over time, the rise in real estate prices will prompt government departments to increase their real estate investment, the government's leverage ratio will increase, and some real economy companies will also invest funds in the real estate industry, resulting in insufficient funds in other industries, which is not conducive to the upgrading and adjustment of the industrial structure. At the same time, more and more commercial bank credit funds flow into the real estate market, and the massive outflow of currency has devalued the domestic currency, devaluing the domestic currency against foreign currencies, which is not conducive to domestic exports and has a negative impact on the foreign exchange market. The impact of housing investment has caused long-term risks in the financial market systems of commercial banks, securities markets, currency markets, foreign exchange markets, and government departments to accumulate, which is not conducive to the long-term stable development of the financial system.

4.6. Robustness Test

Considering that the results of the SVAR model analysis may have an impact on the results of the empirical analysis due to different factors such as selected sample differences, variable order, and time intervals. In order to test the representativeness of the above-mentioned sample interval estimation results, and to test the accuracy of the above-mentioned estimation results on the current reality of my country's real estate market and financial market, we should continue to test the robustness of the SAVR model. Therefore, this article adjusts the endogenous variables in formula (3) to the following order: (SM, MOM, FEM, CBR, GOS, SFR, HIP) and (FEM, MOM, SM, GOS, CBR, SFR, HIP). The test results show that the impulse response function of the impact of housing investment price fluctuations on the system financial risk and its various secondary indicators under the new variable order is very similar to the above picture, which shows that the above SVAR model is robust and its display results are universal.

5. Conclusions and Policy Implications

Based on principal component analysis, this paper constructs a comprehensive evaluation system of my country's systemic financial risk level from five dimensions: commercial banks, securities markets, currency markets, foreign exchange markets, and government departments. In the real estate market price research, excluding the basic price determined by the housing attributes of real estate, only the impact of housing investment prices on systemic financial risks is studied. On this basis, the SVAR model is used to conduct an empirical analysis of the dynamic relationship between my country's housing investment price and systemic financial risks and various indicators. The research results show that: housing investment price fluctuations are the cause of systemic financial risks, and there is a long-term negative relationship. In the short term, rising housing investment prices will reduce systemic financial risks to a certain extent. In the long run, housing investment shocks will still lead to the slow accumulation of systemic financial risks, which is not conducive to the long-term stable development of the financial system. Therefore, based on the research conclusions and the tasks and objectives of China's real estate market and financial market in the report of the 19th National Congress of the Communist Party of my country, this article draws the following policy implications:

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(1) The government should vigorously support the development of new industries in all walks of life, and promote the coordinated operation of market entities, objects, and structures. Reduce the dependence of the financial market on the real estate market, and balance the strategic position of various industries in the development of the macro economy. Increase the rate of return of real enterprises and guide the coordinated development of the real estate industry with other industries such as the financial industry. Continuously promote the optimization of the social and economic structure and accelerate the adjustment of the social and economic structure. Create a sustainable economic growth model with balanced development of all walks of life in society, and fundamentally restrain the generation of systemic financial risk spillover effects.

(2) After the economy enters a new normal, the government must still maintain reasonable supervision of the real estate industry, continue to pay attention to the long-term potential risks of the real estate industry, and be alert to the negative effects of housing investment price bubbles. Faced with the cyclical fluctuations of real estate prices, in the short term, we will strictly curb speculation in the real estate market, adopt targeted preventive measures, and adopt a prudent monetary policy. In the context of the current impact of the new crown pneumonia epidemic, central banks generally implement loose monetary policies, increasing the flow of funds in the market through measures such as reducing taxes and lowering the reserve ratio, stimulating economic revitalization, and avoiding social and economic depression. However, the real economy has a low rate of return, and the released liquid currency is likely to flow into the real estate market, causing the price of housing investment to rise rapidly in the short term, thereby weakening the effectiveness of monetary policy and weakening consumer demand. In response, the central government should regulate monetary policy and other policy systems to guide the rational flow of currency.

(3) At present, there is an imbalance in the level of regional economic development in China. Some tier city city has attracted large numbers of high-quality immigrants from the economic level, educational resources and medical environment. This has increased the housing demand of the city, which will lead to a shortage of demand in the real estate industry in the long run and generate housing bubbles. Therefore, the central government needs to introduce regulatory policies, pay attention to policy pertinence and avoid "one size fits all". In the short term, the government should focus on the city with higher bubble level and stabilize the housing price from the source. For small and medium-sized city with relatively low foam level and easy to be infected in the process of foam infecting, the regulation can be relaxed, and the development of small and medium-sized city is greatly supported. The city's educational investment, medical security and social welfare level are increased, so that the gap of economic development between regions is too large. In the long run, the government should correctly handle the problem of housing bubble infection caused by population migration, guide the rational flow of city population, control the demand of housing for large city population, and promote the coordinated development of regional real estate market.

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